Oracle® Linux Virtualization Manager
Architecture and Planning Guide
Oracle Legal Notices

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# Table of Contents

Preface ................................................................................................................................. v
About this document .......................................................................................................... vii
1 Architecture ...................................................................................................................... 1
  1.1 Engine ............................................................................................................................ 1
  1.2 Host Architecture .......................................................................................................... 2
  1.3 Self-Hosted Engine ....................................................................................................... 4
  1.4 Data Warehouse and Databases .................................................................................. 5
  1.5 Administration Interfaces ............................................................................................ 5
  1.6 Directory Services ........................................................................................................ 6
  1.7 Consoles ...................................................................................................................... 6
2 Requirements and Scalability Limits ............................................................................... 9
  2.1 Engine Host Requirements ......................................................................................... 9
  2.2 KVM Host Requirements ............................................................................................ 10
  2.3 Firewall Requirements ............................................................................................... 11
    2.3.1 Engine Host Firewall Requirements .................................................................... 11
    2.3.2 Remote Component Firewall Requirements ...................................................... 12
    2.3.3 KVM Host Firewall Requirements .................................................................... 13
  2.4 Storage Requirements ................................................................................................ 14
  2.5 Scalability Limits ........................................................................................................ 14
  2.6 Guest Operating System Requirements .................................................................... 15
3 Planning Your Environment ............................................................................................. 17
  3.1 Data Centers ................................................................................................................ 17
  3.2 Clusters ........................................................................................................................ 18
  3.3 Hosts .............................................................................................................................. 19
  3.4 Virtual Machines ......................................................................................................... 20
    3.4.1 Considerations When Using Snapshots .............................................................. 21
    3.4.2 Virtual Machine Consoles ................................................................................ 21
  3.5 High Availability and Optimization ........................................................................... 21
  3.6 Networks ...................................................................................................................... 24
    3.6.1 Logical Networks ............................................................................................... 24
    3.6.2 VLANs .................................................................................................................. 26
    3.6.3 Virtual NICs ......................................................................................................... 28
    3.6.4 Bonds ................................................................................................................... 28
    3.6.5 MAC Address Pools ......................................................................................... 29
  3.7 Storage .......................................................................................................................... 30
    3.7.1 Storage Domains ............................................................................................... 30
    3.7.2 Storage Pool Manager ...................................................................................... 30
    3.7.3 Storage Leases .................................................................................................. 31
    3.7.4 Local Storage ..................................................................................................... 32
  3.8 System Backup and Recovery ..................................................................................... 32
  3.9 Users, Roles, and Permissions .................................................................................... 32
  3.10 System State and History .......................................................................................... 33
  3.11 Event Logging and Notifications ............................................................................. 33
Preface

The Oracle® Linux Virtualization Manager documentation provides information on installing and configuring a virtualization environment that you can use to manage compute, network and storage resources.

Audience

This document is intended for both new and existing users of Oracle® Linux Virtualization Manager. It is assumed that readers are familiar with virtualization and have a general understanding of Windows and UNIX platforms.

Documentation Location

The documentation for this product is available at:

https://docs.oracle.com/en/virtualization/oracle-linux-virtualization-manager/

Conventions

The following text conventions are used in this document:

• **boldface**: Boldface type indicates graphical user interface elements associated with an action, or terms defined in text or the glossary.

• *italic*: Italic type indicates book titles, emphasis, or placeholder variables for which you supply particular values.

• **monospace**: Monospace type indicates commands within a paragraph, URLs, code in examples, text that appears on the screen, or text that you enter.

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About this document

This document is part of the documentation set for Oracle Linux Virtualization Manager, which is available at https://docs.oracle.com/en/virtualization/oracle-linux-virtualization-manager/.

This documentation set comprises:

**Oracle Linux Virtualization Manager: Release Notes**

This document provides a summary of the new features, changes, fixed bugs, and known issues in the Oracle Linux Virtualization Manager. It contains last-minute information, which may not be included in the main body of documentation.

**Oracle Linux Virtualization Manager: Architecture and Planning Guide**

This document provides an architectural overview of Oracle Linux Virtualization Manager, prerequisites, and planning information for your environment.

**Oracle Linux Virtualization Manager: Getting Started Guide**

This document explains how to install, configure and get started with the Oracle Linux Virtualization Manager. There is an example scenario that covers some of the basic procedures for setting up the environment, such as, adding hosts and storage, creating virtual machines, configuring networks, working with templates, and backup and restore tasks. In addition, there is information on upgrading your engine and hosts as well as deploying a self-hosted configuration.

**Oracle Linux Virtualization Manager: Administration Guide**

This document provides common administrative tasks for Oracle Linux Virtualization Manager. In addition, you will find information on setting up users and groups, configuring high-availability, memory and CPUs, configuring and using event notifications, configuring vCPUs and virtual memory.

In addition to the Oracle Linux Virtualization Manager documentation, you can also refer to the upstream documentation:

- oVirt Documentation
- oVirt 4.3.10 Release Notes

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Chapter 1 Architecture

Table of Contents

1.1 Engine .................................................................................................................................................. 1
1.2 Host Architecture ............................................................................................................................... 2
1.3 Self-Hosted Engine ............................................................................................................................. 4
1.4 Data Warehouse and Databases ......................................................................................................... 5
1.5 Administration Interfaces .................................................................................................................... 5
1.6 Directory Services ................................................................................................................................ 6
1.7 Consoles ............................................................................................................................................... 6

The following information gives you an architectural overview of Oracle Linux Virtualization Manager. For general planning information, see Chapter 3, Planning Your Environment.

Based on the open source oVirt project, Oracle Linux Virtualization Manager is a server virtualization management platform that can be used to configure, monitor, and manage an Oracle Linux Kernel-based Virtual Machine (KVM) environment, including hosts, virtual machines, storage, networks, and users. The Manager is accessed through the Administration Portal or VM Portal, web-based portals that are available from a Oracle Linux Virtualization Manager landing page.

Oracle Linux Virtualization Manager also provides a Representational State Transfer (REST) Application Programming Interface (API) for managing your Oracle Linux KVM infrastructure, allowing you to integrate the Manager with other management systems or to automate repetitive tasks with scripts. For most day to day operations, many users will rely on the administrative portal or the lighter weight VM Portal.

Figure 1.1 Overview of Architecture

1.1 Engine

The workhorse of Oracle Linux Virtualization Manager is the oVirt engine (engine) which is a JBoss-based Java application that runs as a web service and provides centralized management for server and desktop virtualization. The engine provides many features including
Host Architecture

- Managing the Oracle Linux KVM hosts
- Creating, deploying, starting, stopping, migrating, and monitoring virtual machines
- Adding and managing logical networks
- Adding and managing storage domains and virtual disks
- Configuring and managing cluster, host, and virtual machine high availability
- Migrating and editing live virtual machines
- Continuously balancing loads on virtual machines based on resource usage and policies
- Monitoring all objects in the environment such as virtual machines, hosts, storage, networks

The engine communicates with the Virtual Desktop and Server Manager (VDSM) service which is a host agent that runs as a daemon on the KVM hosts. The engine communicates directly with the VDSM service on Oracle Linux KVM hosts to perform tasks such as managing virtual machines and creating new images from templates.

The majority of tasks you can do through the Administration Portal. Additionally, you can perform a subset of tasks using the VM Portal or Cockpit.

1.2 Host Architecture

The engine runs on an Oracle Linux server and provides the administration tools for managing the Oracle Linux Virtualization Manager environment. Oracle Linux KVM hosts provide the compute resources for running virtual machines.

For more information, see Section 3.3, “Hosts”.

Figure 1.2 Basic Host Architecture
| Kernel-based Virtual Machine (KVM) and Quick Emulator (QEMU) | As a loadable kernel module, KVM
| | • provides full virtualization through the use of hardware extensions.
| | • allows a host to make its physical hardware available to virtual machines.
| | • runs in the kernel space and the virtual machines running on it run as individual QEMU processes in the user space.
| QEMU enables KVM to become a complete hypervisor by emulating the hardware for the virtual machines, such as the CPU, memory, network, and disk devices.
| KVM enables QEMU to execute code in the virtual machine directly on the host CPU. This allows a virtual machine's operating system direct access to the host's resources without any modification.
| Host Agent and libvirt | The Virtual Desktop and Server Manager (VDSM) service is a host agent that covers all functionality required by the engine for managing hosts, virtual machines, networks and storage. All communication between the engine and the KVM hosts is handled by the VDSM service that runs on the KVM hosts.
| | The **libvirt daemon** runs as a service (**libvirtd**) on Oracle Linux KVM hosts and it provides an application programming interface (API) for managing various hypervisors, including Oracle Linux KVM. VDSM uses **libvirt** to manage the complete life cycle of virtual machines and their virtual devices on the host, and to collect statistics about them.
| Guest Agent | The guest agent runs inside the virtual machine, and provides information on resource usage to the engine. Communication between the guest agent and engine is done over a virtualized serial connection.
| | The guest agent provides:
| | • information, notifications, and actions between the engine and the guest.
| | • the guest machine name, guest operating system, and other details to the engine, including associated IP addresses, installed applications, and network and RAM usage.
| | • a single sign-on so an authenticated user to the engine does not need to authenticate again when connected to a virtual machine.
1.3 Self-Hosted Engine

In Oracle Linux Virtualization Manager, a self-hosted engine is a virtualized environment where the engine runs inside a virtual machine on the hosts in the environment. The virtual machine for the engine is created as part of the host configuration process. And, the engine is installed and configured in parallel to the host configuration.

Since the engine runs as a virtual machine and not on physical hardware, a self-hosted engine requires less physical resources. Additionally, since the engine is configured to be highly available, if the host running the Engine virtual machine goes into maintenance mode or fails unexpectedly the virtual machine is migrated automatically to another host in the environment. A minimum of two self-hosted Engine hosts are required to support the high availability.

You use the oVirt Engine Virtual Appliance to install the engine virtual machine. The appliance is installed during the deployment process; however, you can install the appliance on the host before starting the deployment if required:

```bash
# yum install ovirt-engine-appliance
```

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 these interfaces before deployment.

If you want to customize the engine virtual machine, you can use a custom cloud-init script with the appliance. You can generate a default cloud-init script during deployment and customize as needed.

To deploy a self-hosted engine, see Self-Hosted Engine Deployment in the Oracle Linux Virtualization Manager: Getting Started Guide.
1.4 Data Warehouse and Databases

There are two PostGres databases in Oracle Linux Virtualization Manager. The engine configuration creates a PostgreSQL database called engine. If you elect to install the ovirt-engine-dwh package, a second database called ovirt_engine_history is created:

- The engine database (engine) stores persistent information about the state of the Oracle Linux Virtualization Manager environment, its configuration, and its performance. The historical configuration information and statistical metrics are collected every minute.
- The data warehouse database is a management history database (ovirt_engine_history) that can be used by any application to retrieve historical configuration information and statistical metrics for data centers, clusters, and hosts.

The data warehouse service (ovirt-engine-dwd):

- extracts data from the engine database, performs ETL, and inserts it into the ovirt_engine_history database.

- tracks three types of changes:
  - When new entity is added to the engine database, ovirt-engine-dwd service replicates the change to the ovirt_engine_history database.
  - When an existing entity is updated, ovirt-engine-dwd service replicates the change to the ovirt_engine_history database.
  - When an entity is removed from the engine database, a new entry in the ovirt_engine_history database flags the corresponding entity as removed.

Both the history and engine databases can run on a remote host to reduce the load on the engine host. Running these databases on a remote host is a technology preview feature. For more information, see Technology Preview in the Oracle Linux Virtualization Manager: Release Notes.

1.5 Administration Interfaces

Oracle Linux Virtualization Manager provides two portals you can use to configure and manage your environment: Administration Portal and VM Portal.

The Administration Portal is the graphical administration interface of the oVirt Engine server. Administrators can monitor, create, and maintain all elements of the virtualized environment from web browsers. Tasks that can be performed from the Administration Portal include:

- Creation and management of virtual infrastructure (networks, storage domains)
- Installation and management of hosts
- Creation and management of logical entities (data centers, clusters)
- Creation and management of virtual machines
• User and permission management

The **Cockpit web interface** enables you to monitor a KVM host's resources and to perform administrative tasks. Cockpit must be installed and enabled separately. You can access a host's Cockpit web interface from the Administration Portal or by connecting directly to the host.

### 1.6 Directory Services

You can use Active Directory, OpenLDAP, and 389d as an external directory server to provide user account and authentication services. If an external directory server is being used, the oVirt engine uses these directory services to receive user and group information when assigning permissions for roles.

### 1.7 Consoles

You can use either Virtual Network Computing (VNC) or Remote Desktop Protocol (RDP) to provide graphical consoles for virtual machines. From the console, you can work and interact directly with your virtual machines as you would with physical machines.

**VNC**

When using VNC, either use the Remote Viewer application or a VNC client to open a console to a virtual machine.

If you want to use a locally installed remote-viewer application, you can install the application using your package manager (`yum` or `dnf install virt-viewer`) or download it from [Virtual Machine Manager](https://Virtual Machine Manager).

If you want to use a browser-based console clients, the certificate authority must be imported in your browser since the communication is secured. You can download the certificate authority by navigating to `https://<your engine address>/ovirt-engine/services/pki-resource?resource=ca-certificate&format=X509-PEM-CA`.

**RDP (Windows only)**

RDP is only available when you access virtual machines from a Windows machine on which the Microsoft Remote Desktop application has been installed. You must also set up remote sharing on the virtual machine and ensure the firewall is configured to allow remote desktop connections before you can connect to a Windows virtual machine using RDP.

For more information see *Installing Remote Viewer on Client Machine* in the *Oracle Linux Virtualization Manager: Getting Started Guide*. 
Figure 1.4 Client Consoles Connected to Linux KVM Host
Chapter 2 Requirements and Scalability Limits

Table of Contents

2.1 Engine Host Requirements ................................................................. 9
2.2 KVM Host Requirements ................................................................. 10
2.3 Firewall Requirements ................................................................. 11
   2.3.1 Engine Host Firewall Requirements ........................................... 11
   2.3.2 Remote Component Firewall Requirements ................................ 12
   2.3.3 KVM Host Firewall Requirements ............................................. 13
2.4 Storage Requirements ................................................................. 14
2.5 Scalability Limits ................................................................. 14
2.6 Guest Operating System Requirements ........................................... 15

The following sections provide detailed requirements for a Oracle Linux Virtualization Manager Release 4.3.10 environment as well as the scalability limitations.

2.1 Engine Host Requirements

The following are the system requirements for the host system where you want to install Oracle Linux Virtualization Manager.

• Oracle Linux 7.6 (or later) with Minimal Install selected as the base environment for the installation.

  Note

  Oracle Linux 8 is currently not supported for either the Engine host or the KVM host.

• Unbreakable Enterprise Kernel Release 5 Update 1 (or later) or Unbreakable Enterprise Kernel Release 6

The following table identifies the specific system hardware requirements for the host system where you want to install Oracle Linux Virtualization Manager.

Table 2.1

<table>
<thead>
<tr>
<th>Resource</th>
<th>Minimum</th>
<th>Recommended</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU</td>
<td>64-bit dual-core CPU</td>
<td>64-bit quad core or greater CPU</td>
</tr>
<tr>
<td>Memory</td>
<td>4 GB of available system RAM</td>
<td>16 GB or greater of system RAM</td>
</tr>
</tbody>
</table>

  Note

  If Data Warehouse is installed and if memory is being consumed by existing processes, consider using the
### KVM Host Requirements

<table>
<thead>
<tr>
<th>Resource</th>
<th>Minimum</th>
<th>Recommended</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>recommended amount of system memory.</td>
</tr>
<tr>
<td>Hard disk</td>
<td>25 GB local writable hard disk</td>
<td>50 GB or greater of local writable hard disk</td>
</tr>
<tr>
<td>Network interface</td>
<td>One network interface card (NIC) with bandwidth of at least 1 Gbps</td>
<td>Two or more NICs with bandwidth of at least 1 Gbps</td>
</tr>
</tbody>
</table>

For information about x86-based servers that are certified for Oracle Linux with UEK, see the *Hardware Certification List for Oracle Linux and Virtualization*.

For more details about system requirements and known issues with installation, see:

- *Oracle® Linux 7: Release Notes for Oracle Linux 7*.
- *Unbreakable Enterprise Kernel Documentation*.
- *Oracle® Linux 7: Installation Guide*.

**Important**

Oracle does not support Oracle Linux Virtualization Manager on systems where the `ol7_preview`, `ol7_developer`, `ol7_developer_kvm_utils`, or `ol7_developer_EPEL` repositories are enabled, or where software from these repositories is currently installed on the systems where the Manager will run. Even if you follow the instructions in this document, you may render your platform unsupported if these repositories or channels are enabled or software from these channels or repositories is installed on your system.

### 2.2 KVM Host Requirements

The following are the minimum system requirements for Oracle Linux KVM hosts.

- Oracle Linux 7.6 (or later) with **Minimal Install** selected as the base environment for the installation.

**Note**

Oracle Linux 8 is currently not supported for either the Engine host or the KVM host.

- Unbreakable Enterprise Kernel Release 5 Update 1 (or later) or Unbreakable Enterprise Kernel Release 6
- 64-bit dual-core CPU
  - **Recommended**: Multiple CPUs

The CPUs must support either the Intel VT-x or the AMD AMD-V hardware virtualization extensions and the extensions must be enabled in the host's BIOS. The CPUs must also support the No eXecute flag (NX).

- 2 GB RAM
  - **Maximum Tested**: 6 TB

The amount of RAM required varies depending on guest operating system requirements, guest application requirements, and guest memory activity and usage.
2.3 Firewall Requirements

Before you install and configure the Oracle Linux Virtualization Manager engine or any KVM hosts ensure you review the following firewall requirements.

2.3.1 Engine Host Firewall Requirements

When you run the `engine-setup` command to configure Oracle Linux Virtualization Manager, you can have the Setup program automatically configure the firewall ports on the host. Use the following information if you want to manually configure firewalls.

The following ports are the default ports. The Setup program enables you to choose different ports for some of the configuration options, see `Engine Configuration Options` in the Oracle Linux Virtualization Manager: Getting Started Guide.

Table 2.2 Oracle Linux Virtualization Manager Host Firewall Requirements

<table>
<thead>
<tr>
<th>Port</th>
<th>Protocol</th>
<th>Source</th>
<th>Destination</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not applicable</td>
<td>ICMP</td>
<td>Oracle Linux KVM hosts</td>
<td>Manager host</td>
<td>(Optional) Diagnostics</td>
</tr>
</tbody>
</table>

For information about x86-based servers that are certified for Oracle Linux with UEK, see the Hardware Certification List for Oracle Linux and Virtualization.

Warning

Do not install any third-party watchdogs on your Oracle Linux KVM hosts, as they can interfere with the watchdog daemon provided by VDSM.

Do not install any other applications on the Oracle Linux KVM hosts as they may interfere with the operation of the KVM hypervisor.

For more details about system requirements and known issues with installation, see:

- Oracle® Linux 7 Documentation
- Unbreakable Enterprise Kernel Documentation
### Remote Component Firewall Requirements

Some Oracle Linux Virtualization Manager components can run on separate remote hosts. Use the following information to configure the firewall on these hosts.

#### Table 2.3 Remote Component Firewall Requirements

<table>
<thead>
<tr>
<th>Port</th>
<th>Protocol</th>
<th>Source</th>
<th>Destination</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>TCP</td>
<td>External systems</td>
<td>Manager host</td>
<td>(Optional) SSH access to the Manager host for administration and maintenance</td>
</tr>
<tr>
<td>80</td>
<td>TCP</td>
<td>Administration Portal clients</td>
<td>Manager host</td>
<td>HTTP access to the Manager</td>
</tr>
<tr>
<td></td>
<td></td>
<td>VM Portal clients</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Oracle Linux KVM hosts</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>REST API clients</td>
<td></td>
<td></td>
</tr>
<tr>
<td>443</td>
<td>TCP</td>
<td>Administration Portal clients</td>
<td>Manager host</td>
<td>HTTPS access to the Manager</td>
</tr>
<tr>
<td></td>
<td></td>
<td>VM Portal clients</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Oracle Linux KVM hosts</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>REST API clients</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2222</td>
<td>TCP</td>
<td>Clients</td>
<td>Manager host</td>
<td>SSH access to virtual machine serial consoles</td>
</tr>
<tr>
<td>5432</td>
<td>TCP,UDP</td>
<td>Manager host</td>
<td>Manager host</td>
<td>(Optional) Connections to PostgreSQL database server</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Data Warehouse Service</td>
<td></td>
<td>Only required if the Engine database or the Data Warehouse database run on the Manager host</td>
</tr>
<tr>
<td></td>
<td></td>
<td>External systems</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6100</td>
<td>TCP</td>
<td>Administration Portal clients</td>
<td>Manager host</td>
<td>(Optional) WebSocket proxy access to the noVNC or HTML 5 virtual machine consoles</td>
</tr>
<tr>
<td></td>
<td></td>
<td>VM Portal clients</td>
<td></td>
<td>Only required if the WebSocket proxy runs on the Manager host</td>
</tr>
<tr>
<td>7410</td>
<td>UDP</td>
<td>Oracle Linux KVM hosts</td>
<td>Manager host</td>
<td>(Optional) Kdump notifications</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Only required if Kdump is enabled</td>
</tr>
<tr>
<td>54323</td>
<td>TCP</td>
<td>Administration Portal clients</td>
<td>Manager host</td>
<td>(Optional) Image I/O Proxy access to upload images</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Only required if the Image I/O Proxy runs on the Manager host</td>
</tr>
</tbody>
</table>

#### 2.3.2 Remote Component Firewall Requirements

Some Oracle Linux Virtualization Manager components can run on separate remote hosts. Use the following information to configure the firewall on these hosts.
### 2.3.3 KVM Host Firewall Requirements

When you add an Oracle Linux KVM host to Oracle Linux Virtualization Manager, the existing firewall configuration on the host is overwritten and the required firewall ports are configured automatically.

To disable automatic firewall configuration when adding a KVM host, clear the **Automatically configure host firewall** check box under **Advanced Parameters**. Then use the following information to manually configure the firewall.

#### Table 2.4 Oracle Linux KVM Host Firewall Requirements

<table>
<thead>
<tr>
<th>Port</th>
<th>Protocol</th>
<th>Source</th>
<th>Destination</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td>22</td>
<td>TCP</td>
<td>Manager host</td>
<td>KVM hosts</td>
<td>(Optional) SSH access to KVM hosts</td>
</tr>
<tr>
<td>111</td>
<td>TCP</td>
<td>NFS storage server</td>
<td>KVM hosts</td>
<td>(Optional) NFS connections</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Only required if you use NFS storage</td>
</tr>
<tr>
<td>161</td>
<td>UDP</td>
<td>KVM hosts</td>
<td>Manager host</td>
<td>(Optional) Simple network management protocol (SNMP)</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Only required if you want to send SNMP traps to external SNMP managers</td>
</tr>
<tr>
<td>2223</td>
<td>TCP</td>
<td>Manager host</td>
<td>KVM hosts</td>
<td>SSH access to virtual machine serial consoles</td>
</tr>
<tr>
<td>5900 to</td>
<td>TCP</td>
<td>Administration Portal clients</td>
<td>KVM hosts</td>
<td>Access to virtual machine consoles using VNC or RDP protocols</td>
</tr>
<tr>
<td>6923</td>
<td></td>
<td>VM Portal clients</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5989</td>
<td>TCP,UDP</td>
<td>Common Information Model Object</td>
<td>KVM hosts</td>
<td>(Optional) CIMOM connections</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Manager (CIMOM)</td>
<td></td>
<td>Only required if you use CIMOM to monitor virtual machines running on the host</td>
</tr>
<tr>
<td>6081</td>
<td>UDP</td>
<td>KVM hosts</td>
<td>KVM hosts</td>
<td>(Optional) Open Virtual Network (OVN) connections</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Only required if the OVN network provider is enabled</td>
</tr>
<tr>
<td>9090</td>
<td>TCP</td>
<td>Manager host</td>
<td>KVM hosts</td>
<td>(Optional) Cockpit connections</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Client machines</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16514</td>
<td>TCP</td>
<td>KVM hosts</td>
<td>KVM hosts</td>
<td>Virtual machine migration using <strong>libvirt</strong></td>
</tr>
</tbody>
</table>
### 2.4 Storage Requirements

Before you can create virtual machines, you must provision and attach storage to a data center. You can use Network File System (NFS), Internet Small Computer System Interface (iSCSI), Fibre Channel Protocol (FCP), or Gluster storage. You can also configure local storage attached directly to hosts.

Storage devices in Oracle Linux Virtualization Manager are referred to as **data domains**, which are used to store virtual hard disks, snapshots, ISO files, and templates. Every data center must have at least one data domain. Data domains cannot be shared between data centers.

For more information, see:
- *Storage* in the *Oracle Linux Virtualization Manager: Architecture and Planning Guide*
- *Storage* in the *Oracle Linux Virtualization Manager: Administration Guide*
- *Adding Storage* in the *Oracle Linux Virtualization Manager: Getting Started Guide*

### 2.5 Scalability Limits

The following table shows the limits for the Oracle Linux Virtualization Manager host, Oracle Linux KVM hosts, networks, virtual machines and storage.

#### Table 2.5 Manager Host Limits

<table>
<thead>
<tr>
<th>Component</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Servers managed by one engine</td>
<td>128</td>
</tr>
<tr>
<td>VLANs managed by one engine</td>
<td>1024</td>
</tr>
<tr>
<td>Concurrently running virtual machines</td>
<td>5000</td>
</tr>
</tbody>
</table>

#### Table 2.6 Oracle Linux KVM Host Limits

<table>
<thead>
<tr>
<th>Component</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical CPUs (cores)</td>
<td>384</td>
</tr>
<tr>
<td>Memory</td>
<td>6 TB</td>
</tr>
<tr>
<td>Concurrently running virtual machines on a single host</td>
<td>600, depending on the performance of the host</td>
</tr>
</tbody>
</table>

#### Table 2.7 Virtual Machine Limits

<table>
<thead>
<tr>
<th>Component</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virtual CPUs</td>
<td>256</td>
</tr>
</tbody>
</table>
### Guest Operating System Requirements

<table>
<thead>
<tr>
<th>Component</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Virtual RAM</td>
<td>2 TB</td>
</tr>
</tbody>
</table>

Table 2.8 Storage Limits

<table>
<thead>
<tr>
<th>Component</th>
<th>Maximum</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domains</td>
<td>50</td>
</tr>
<tr>
<td>Hosts per domain</td>
<td>Unlimited</td>
</tr>
<tr>
<td>Logical volumes per block domain</td>
<td>1500</td>
</tr>
<tr>
<td>LUNs per block domain</td>
<td>2000</td>
</tr>
<tr>
<td>Disk size</td>
<td>500 TiB (limited to 8 TiB by default)</td>
</tr>
</tbody>
</table>

2.6 Guest Operating System Requirements

There are several guest operating systems you can use to configure a KVM host for use with Oracle Linux Virtualization Manager.

For detailed information on the supported guest operating systems, see the *Oracle® Linux: KVM User’s Guide*. 
Chapter 3 Planning Your Environment

Table of Contents

3.1 Data Centers ........................................................................................................... 17
3.2 Clusters .................................................................................................................. 18
3.3 Hosts ....................................................................................................................... 19
3.4 Virtual Machines ................................................................................................. 20
  3.4.1 Considerations When Using Snapshots ......................................................... 21
  3.4.2 Virtual Machine Consoles ............................................................................. 21
3.5 High Availability and Optimization ....................................................................... 21
3.6 Networks ................................................................................................................ 24
  3.6.1 Logical Networks ........................................................................................... 24
  3.6.2 VLANs ............................................................................................................ 26
  3.6.3 Virtual NICs .................................................................................................... 28
  3.6.4 Bonds ............................................................................................................... 28
  3.6.5 MAC Address Pools ....................................................................................... 29
3.7 Storage .................................................................................................................... 30
  3.7.1 Storage Domains ............................................................................................ 30
  3.7.2 Storage Pool Manager .................................................................................... 30
  3.7.3 Storage Leases ............................................................................................... 31
  3.7.4 Local Storage .................................................................................................. 32
3.8 System Backup and Recovery .............................................................................. 32
3.9 Users, Roles, and Permissions ............................................................................. 32
3.10 System State and History ................................................................................... 33
3.11 Event Logging and Notifications ....................................................................... 33

Before you install Oracle Linux Virtualization Manager, review this section to help you to plan your deployment. For more information about the virtualization management platform, see Chapter 1, Architecture.

3.1 Data Centers

A data center is a high-level logical entity for all physical and logical resources in the environment. You can have multiple data centers and all the data centers are controlled from a single Administration Portal. For more information, see Data Centers in the Oracle Linux Virtualization Manager: Administration Guide.

When you install Oracle Linux Virtualization Manager, a default data center (Default), which you can rename and configure. You can also create and configure additional data centers. To initialize any data center, you must add a cluster, a host, and a storage domain:

• Cluster

A cluster is an association of physical hosts sharing the same storage domains and having compatible processors. Every cluster belongs to a data center; every host belongs to a cluster. A cluster has to have a minimum of one host, and at least one active host is required to connect the system to a storage pool.

• Host

Hosts, or hypervisors, are the physical servers that run virtual machines. You must have at least one host in a cluster.
• **Storage Domain**

Data centers must have at least one data storage domain. Set up the data storage domain of the type required for the data center: NFS, iSCSI, FCP or Local.

**Logical networks** are not required to initialize a data center, but are required for Oracle Linux Virtualization Manager to communicate with all components of a data center. Logical networks are also used for the virtual machines to communicate with hosts and storage, for connecting clients to virtual machine resources, and for migrating virtual machines between the hosts in a cluster.

![Figure 3.1 Data Center](image)

### 3.2 Clusters

A cluster consists of one or more logical grouping of Oracle Linux KVM Kernel-based Virtual Machine (KVM) hosts on which a collection of virtual machines can run. The KVM hosts in a cluster must share the same storage domains and have the same type of CPU (either Intel or AMD).

Each cluster in the environment must belong to a data center and each KVM host must belong to a cluster. During installation, a default cluster is created in the Default data center. For more information, see Clusters in the Oracle Linux Virtualization Manager: Administration Guide.

Virtual machines are dynamically allocated to any KVM host in the cluster and can be migrated between them, according to policies defined on the cluster and settings on the virtual machines. The cluster is the highest level at which power and load-sharing policies can be defined. Since virtual machines are not bound to any specific host in the cluster, virtual machines always start even if one or more of the hosts are unavailable.
3.3 Hosts

In Oracle Linux Virtualization Manager, you install Oracle Linux 7.6 (or later) on a bare metal (physical) server and leverage the Unbreakable Enterprise Kernel Release 5, which allows the server to be used as a KVM hypervisor. When you are running a hypervisor on a server it is referred to as a host meaning it is capable of hosting virtual machines.

The engine host is a separate physical host and provides the administration tools for managing the Oracle Linux Virtualization Manager environment. All hosts in your environment must be Oracle Linux KVM hosts, except for the host running the engine which is an Oracle Linux host.

Oracle Linux Virtualization Manager can manage many Oracle Linux KVM hosts, each of which can run multiple virtual machines concurrently. Each virtual machine runs as individual Linux processes and threads on the KVM host and can be installed either with a Windows or Linux operating system.
Virtual Machines

Using the Administration Portal you can install, configure and manage your KVM hosts. You can also use the Cockpit web interface to monitor a KVM host’s resources and perform administrative tasks. The Cockpit feature must be installed and enabled separately. You can access a host’s Cockpit web interface from the Administration Portal or by connecting directly to the host.

The Virtual Desktop and Server Manager (VDSM) service is a host agent that runs as a daemon on the KVM hosts and communicates with the engine to:

- manage and monitor physical resources, including storage, memory, and networks.
- manage and monitor the virtual machines running on a host.
- gather statistics and collects logs.

For more information on engine host and virtual machine requirements, see Chapter 2, Requirements and Scalability Limits. For more information, see Section 1.2, “Host Architecture” and Adding a KVM Host to the Manager in the Oracle Linux Virtualization Manager: Getting Started Guide.

3.4 Virtual Machines

Virtual machines can be created for either Linux or Windows operating systems. They can be created to a certain specification or cloned from an existing template in the virtual machine pools. For more information, see Creating a New Virtual Machine and Creating a Template in the Oracle Linux Virtualization Manager: Getting Started Guide. You can also import an Open Virtual Appliance (OVA) file into your environment from any host in the data center. For more information, see oVirt Virtual Machine Management Guide in oVirt Documentation.

- A virtual machine pool is a group of on-demand virtual machines that are all clones of the same template. They are available to any user in a given group.

When accessed from the VM Portal, virtual machines in a pool are stateless, meaning that data is not persistent across reboots. Each virtual machine in a pool uses the same backing read-only image, and uses a temporary copy-on-write image to hold changed and newly generated data. Each time a virtual machine is assigned from a pool, it is allocated in its base state. Users who have been granted permission to access and use virtual machines from a pool receive an available virtual machine based on their position in a queue of requests.

When accessed from the Administration Portal, virtual machines in a pool are not stateless so that administrators can make changes to the disk if needed.

- Guest agents and drivers provide functionality for virtual machines such as the ability to monitor resource usage, shutdown and reboot the virtual machines from the Administration Portal.

- A snapshot captures a virtual machine's operating system and applications on all available disks at a given point in time. Use a snapshot to restore a virtual machine to its previous state. For more information, see

- A template is a copy of a virtual machine that you can use to simplify the subsequent, repeated creation of similar virtual machines. Templates capture the configuration of software, the configuration of hardware, and the software installed on the virtual machine on which the template is based, which is known as the source virtual machine.

Virtual machines that are created based on a template use the same NIC type and driver as the original virtual machine but are assigned separate, unique MAC addresses.
• **Instance types** are pre-defined hardware configuration for a virtual machine. There are several instance types included by default for you to use when creating or editing a virtual machine which automatically fills in the hardware configuration fields. You can configure new instance types at the data center level or modify the default instance types.

• Whether you are using a default or custom instance type, you can create multiple virtual machines with the same hardware configuration without having to manually fill in every field. However, you always have the option of entering a custom configuration when creating or editing a virtual machine that applies only to that virtual machine.

### 3.4.1 Considerations When Using Snapshots

A snapshot is a picture of a virtual machine's state and should not be used as a primary backup process. You take snapshots so you can revert the virtual machine to a specific point if and when required. Before creating snapshots, consider the following:

• Do not shutdown or start a virtual machine that displays an illegal status in the Administration Portal as this might cause data corruption or the virtual machine might fail to start.

• As soon as you revert to a snapshot and it is no longer required, delete the snapshot.

• Taking several snapshots in a row without any cleanup can affect virtual machine and host performance.

• When taking a snapshot, it creates a new copy of the virtual machine disk; so the more data you write to the snapshot, the longer it takes when using it.

• For an I/O intensive virtual machine, when deleting a snapshot remove it while the virtual machine is shut down (cold merge) instead of deleting the snapshot while the virtual machine is up (live merge).

• Ensure you have installed the latest guest agent package on your virtual machine before taking snapshots.

### 3.4.2 Virtual Machine Consoles

You access virtual machine consoles using the **Remote Viewer application** *(virt-viewer)* on Enterprise Linux and Microsoft Windows clients. Remote Viewer allows you to interact with a virtual machine in a similar way to a physical machine. For more information, see Section 1.7, "Consoles".

To download Remote Viewer, click **Console Client Resources** in the **Downloads** section on the Oracle Linux Virtualization Manager Welcome page. You must have Administrator privileges to install the Remote Viewer application.

### 3.5 High Availability and Optimization

You can configure Oracle Linux Virtualization Manager so that your cluster is optimized and your hosts and virtual machine are highly available. You can also enable or disable devices (hot plug) while a virtual machine is running.

**Clusters**

Using the **Optimization** tab when creating or editing a cluster, you can select the memory page sharing threshold for the cluster, and optionally enable CPU thread handling and memory ballooning on the hosts in the cluster. Some of the benefits are:

• Virtual machines run on hosts up to the specified overcommit threshold. Higher values conserve memory at the expense of great CPU usage.
High Availability and Optimization

- Hosts can run virtual machines with a total number of CPU cores greater than the number of cores in the host.

- Memory overcommitment on virtual machines running on the hosts in the cluster.

- Memory Overcommitment Manager (MoM) runs Kernel Same-page Merging (KSM) when it can yield a memory saving benefit. To use KSM, you have to explicitly enable it at the cluster level.

You can set cluster optimization for the MoM to start ballooning where and when possible, with a limitation of the guaranteed memory size of every virtual machine. To have a ballooning running, a virtual machine needs to have a balloon device with relevant drivers. Each virtual machine includes a balloon device unless specifically removed. Each host in the cluster receives a balloon policy update when its status changes to **Up**. If necessary, you can manually update the balloon policy on a KVM host without having to change the status.

**Hosts**

Fencing keeps hosts in a cluster highly available and allows a cluster to react to unexpected host failures and enforce power saving, load balancing, and virtual machine availability policies. To make an Oracle Linux KVM host highly available, power management and fencing must be configured. This enables the engine to keep the hosts in a cluster up and running by reacting to host failures. If a KVM host becomes non-responsive, it is rebooted. If it remains non-responsive manual intervention needs to be taken.

You need at least two KVM hosts in a cluster or data center that are in **Up** or Maintenance status to ensure they are connected to the Manager.

You can select between:

- Any host in the same cluster as the host requiring fencing.

- Any host in the same data center as the host requiring fencing.

If power management is not enabled, you can restart or stop a KVM host from the Administration Portal.

The engine uses a proxy to send power management commands to a host power management device because the engine does not communicate directly with fence agents. The host agent (VDSM) executes power management device actions and another host in the environment is used as a fencing proxy. This is why you must have at least two hosts for power management operations.

After you configure the fencing parameters for your host’s power management device you should test their correctness occasionally.

Each KVM host in a cluster has limited resources. If a KVM host becomes overutilized, there is an adverse impact on the virtual machines that are running on the host. To avoid or mitigate overutilization, you use scheduling, load balancing, and migration policies to ensure the performance of virtual machines. If a KVM host
High Availability and Optimization

becomes overutilized, virtual machines are migrated to another KVM host in the cluster.

Important
If a host runs virtual machines that are highly available, power management must be enabled and configured.

Virtual Machines
A highly available virtual machine automatically migrates to and restarts on another host in the cluster if the host crashes or becomes non-operational. Only virtual machines with high availability are restarted on another available host. If the virtual machine's host is manually shut down, the virtual machine does not automatically migrate to another host.

Note
Virtual machines do not live migrate unless you are using shared storage and have explicitly configured your environment for live migration in the event of host failures. Policies, such as power saving or distribution, as well as maintenance events trigger live migrations of virtual machines.

Using the Resource Allocation tab when creating or editing a virtual machine, you can:

• set the maximum amount of processing capability a virtual machine can access on its host.

• pin a virtual CPU to a specific physical CPU.

• guarantee an amount of memory for the virtual machine.

• enable the memory balloon device for the virtual machine. (Enable Memory Balloon Optimization must also be selected for the cluster.)

• improve the speed of disks that have a VirtIO interface by pinning them to a thread separate from the virtual machine's other functions.

When a KVM host goes into Maintenance mode, all virtual machines are migrated to other servers in the cluster. This means there is no downtime for virtual machines during planned maintenance windows.

If a virtual machine is unexpectedly terminated, it is automatically restarted, either on the same KVM host or another host in the cluster. This is achieved through monitoring of the hosts and storage to detect any hardware failures. If you configure a virtual machine for high availability and its host fails, the virtual machine automatically restarts on another KVM host in the cluster.
Networks

Policies
Load balancing, scheduling, and resiliency policies, enable critical virtual machines to be restarted on another KVM host in the event of hardware failure with three levels of priority.

Scheduling policies enable you to specify the usage and distribution of virtual machines between available hosts. You can define the scheduling policy to enable automatic load balancing across the hosts in a cluster. Regardless of the scheduling policy, a virtual machine does not start on a host with an overloaded CPU. By default, a host’s CPU is considered overloaded if it has a load of more than 80% for 5 minutes, but these values can be changed using scheduling policies.

Migration policies enable you to define the conditions for live migrating virtual machines in the event of KVM host failure. These conditions include the downtime of the virtual machine during migration, network bandwidth, and how the virtual machines are prioritized.

Resilience policies enable you to define how the virtual machines are prioritized in migration.

For more information on policies, see oVirt Documentation.

For more information about high availability and optimization, see Deployment Optimization in the Oracle Linux Virtualization Manager: Administration Guide.

3.6 Networks

The following are general, high-level networking recommendations.

• Use bond network interfaces, especially on production hosts
• Use VLANs to separate different traffic types
• Use 1 GbE networks for management traffic
• Use 10 GbE, 25 GbE, 40 GbE, or 100 GbE for virtual machines and Ethernet-based storage
• When adding physical interfaces to a host for storage use, uncheck VM network so that the VLAN is assigned directly to the physical interface

The Oracle Linux Virtualization Manager host and all Oracle Linux KVM hosts must have a fully qualified domain name (FQDN) as well as forward and reverse name resolution. Oracle recommend using DNS. Alternatively, you can use the /etc/hosts file for name resolution, however, this requires more work and is error-prone.

All DNS services used for name resolution must be hosted outside of the environment.

3.6.1 Logical Networks

In Oracle Linux Virtualization Manager, you configure logical networks to represent the resources required to ensure the network connectivity of the Oracle Linux KVM hosts for a specific purpose, for example to indicate that a network interface controller (NIC) is on a management network.

You define a logical network for a data center, apply the network to one or more clusters, and then configure the hosts by assigning the logical networks to the hosts physical interfaces. Once you implement the network on all the hosts in a cluster, the network becomes operational. You perform all these operations from the Administration Portal.
At the cluster level, you can assign one or more network roles to a logical network to specify its purpose:

- A **management network** is used for communication between Oracle Linux Virtualization Manager and the hosts.

- A **VM network** is used for virtual machine communication, a virtual machine’s virtual NIC is attached to a VM network. For more information, see *Creating a Virtual Machine Network* in the *Oracle Linux Virtualization Manager: Getting Started Guide*.

- A **display network** is used to connect clients to virtual machine graphical consoles, using either the VNC or RDP protocols.

- A **migration network** is used to migrate virtual machines between the hosts in a cluster.

By default a single logical network named **ovirtmgmt** is created and this is used for all network communication in a data center. You separate the network traffic according to your needs by defining and applying additional logical networks.

One logical network is configured as the default route for the hosts.

A logical network can be marked as a required network. If a required network ceases to function, any KVM hosts associated with the network become non-operational.

For logical networks that are **not** VM networks, you connect the host directly to the network using either a physical network interface, a VLAN interface, or a bond.

For VM networks, a bridge is created on the host for each logical network. Virtual machine VNICs are connected to the bridges as needed. The bridge is connected to the network using either a physical network interface, a VLAN interface, or a bond.

**Figure 3.4 Bridge Networks**
You can perform most network configuration operations on hosts from the Administration Portal, including:

- Assign a host NIC to logical networks.
- Configure a NIC's boot protocol, IP settings, and DNS settings.
- Create bonds and VLAN interfaces on KVM hosts.

When there are a large number of KVM hosts and logical networks, using network labels enables you to simplify administration. Labels can be applied to logical networks and host interfaces. When you set a label on a network, you to deploy the network on host NICs that have the same label. This requires that the host NICs are configured for DHCP.

### 3.6.2 VLANs

A virtual local area network (VLAN) enables hosts and virtual machines to communicate regardless of their actual physical location on a LAN.

VLANs enable you improve security by segregating network traffic. Broadcasts between devices in the same VLAN are not visible to other devices with a different VLAN, even if they exist on the same switch.

VLANs can also help to compensate for the lack of physical NICs on hosts. A host or virtual machine can be connected to different VLANs using a single physical NIC or bond. This is implemented using VLAN interfaces.

A VLAN is identified by an ID. A VLAN interface attached to a host's NIC or bond is assigned a VLAN ID and handles the traffic for the VLAN. When traffic is routed through the VLAN interface, it is automatically tagged with the VLAN ID configured for that interface, and is then routed through the NIC or bond that the VLAN interface is attached to.

The switch uses the VLAN ID to segregate traffic among the different VLANs operating on the same physical link. In this way, a VLAN functions exactly like a separate physical connection.

You need to configure the VLANs needed to support your logical networks before you can use them. This is usually accomplished using switch trunking. Trunking involves configuring ports on the switch to enable multiple VLAN traffic on these ports, to ensure that packets are correctly transmitted to their final destination. The configuration required depends on the switches you use.

When you create a logical network, you can assign a VLAN ID to the network. When you assign a host NIC or bond to the network, the VLAN interface is automatically created on the host and attached to the selected device.
Figure 3.5 VLANs
3.6.3 Virtual NICs

A virtual machine uses a virtual network interface controller (VNIC) to connect to a logical network.

VNICS are always attached to a bridge on a KVM host. A bridge is a software network device that enables the VNICS to share a physical network connection and to appear as separate physical devices on a logical network.

Oracle Linux Virtualization Manager automatically assigns a MAC address to a VNIC. Each MAC address corresponds to a single VNIC. Because MAC addresses must be unique on a network, the MAC addresses are allocated from a predefined range of addresses, known as a MAC address pool. MAC address pools are defined for a cluster.

Virtual machines are connected to a logical network by their VNICS. The IP address of each VNIC can be set independently, by DHCP or statically, using the tools available in the operating system of the virtual machine. To use DHCP, you need to configure a DHCP server on the logical network.

Virtual machines can communicate with any other machine on the virtual network, and, depending on the configuration of the logical network, with public networks such as the Internet.

For more information, see Customizing vNIC Profiles for Virtual Machines in the Oracle Linux Virtualization Manager: Administration Guide.

3.6.4 Bonds

Bonds bind multiple NICs into a single interface. A bonded network interface combines the transmission capability of all the NICs included in the bond and acts as a single network interface, which can provide
greater transmission speed. Because all network interface cards in the bond must fail for the bond itself to fail, bonding provides increased fault tolerance.

3.6.5 MAC Address Pools

MAC address pools define the range (or ranges) of MAC addresses allocated for each cluster. A MAC address pool is specified for each cluster. By using MAC address pools, the Manager can automatically generate and assign MAC addresses to new virtual network devices, which helps to prevent MAC address duplication. MAC address pools are more memory efficient when all MAC addresses related to a cluster are within the range for the assigned MAC address pool.

The same MAC address pool can be shared by multiple clusters, but each cluster has a single MAC address pool assigned. A default MAC address pool is created by the Manager and is used if another MAC address pool is not assigned.

Note

If more than one cluster shares a network, you should not rely solely on the default MAC address pool because the virtual machines in each cluster attempt to use the same range of MAC addresses, which can lead to conflicts. To avoid MAC address conflicts, check the MAC address pool ranges to ensure that each cluster is assigned a unique MAC address range.

The MAC address pool assigns the next available MAC address after the last address that is returned to the pool. If there are no further addresses left in the range, the search starts again from the beginning of the range. If there are multiple MAC address ranges with available MAC addresses defined in a single
MAC address pool, the ranges take turns in serving incoming requests in a similar manner as when MAC addresses are selected.

3.7 Storage

Oracle Linux Virtualization Manager uses a centralized storage system for virtual machine disk images, ISO files and snapshots. You can use Network File System (NFS), Internet Small Computer System Interface (iSCSI), Fibre Channel Protocol (FCP), or Gluster FS storage. You can also configure local storage attached directly to hosts. For more information, see Storage in the Oracle Linux Virtualization Manager: Administration Guide and Adding Storage in the Oracle Linux Virtualization Manager: Getting Started Guide.

A data center cannot be initialized unless a storage domain is attached to it and activated.

The storage must be located on the same subnet as the Oracle Linux KVM hosts that will use the storage, in order to avoid issues with routing.

Since you need to create, configure, attach and maintain storage, make sure you are familiar with the storage types and their use. Read your storage array manufacturer guides for more information.

3.7.1 Storage Domains

A storage domain is a collection of images that have a common storage interface. A storage domain contains complete images of templates, virtual machines, virtual machine snapshots, or ISO files. Oracle Linux Virtualization Manager supports storage domains that are block devices (SAN - iSCSI or FCP) or a file system (NAS - NFS or Gluster).

On NFS or Gluster, all virtual disks, templates, and snapshots are files. On SAN (iSCSI/FCP), each virtual disk, template or snapshot is a logical volume.

Virtual machines that share the same storage domain can be migrated between hosts that belong to the same cluster.

Storage, also referred to as a data domain, is used to store the virtual hard disks, snapshots, ISO files, and Open Virtualization Format (OVF) files for virtual machines and templates. Every data center must have at least one data domain. Data domains cannot be shared between data centers.

The Administration Portal currently offers options for creating storage domains that are export domains or ISO domains. These options are deprecated.

Detaching a storage domain from a data center stops the association, but does not remove the storage domain from the environment. A detached storage domain can be attached to another data center. And, the data, such as virtual machines and templates, remains attached to the storage domain.

3.7.2 Storage Pool Manager

The Storage Pool Manager (SPM) is a management role assigned to one of the hosts in a data center enabling it to manage the storage domains of the data center. Any host in the data center can run the SPM entity, which is assigned by the engine. SPM controls access to storage by coordinating the metadata across the storage domains. This includes creating, deleting, and manipulating virtual disks (images), snapshots, and templates, and allocating storage for sparse block devices (on SAN).

The host running as SPM can still host virtual resources. The SPM priority setting for hosts enables you to prioritize which host is assigned the SPM role. Since the SPM role uses some of the host's available resources, it is important to prioritize hosts that can afford the resources.
Because the SPM must always be available, the engine assigns the SPM role to another host if the SPM host becomes unavailable. A host with higher SPM priority is assigned the SPM role before a host with lower SPM priority.

### 3.7.2.1 Virtual Machine Storage

The Storage Pool Manager (SPM) is responsible for creating and deleting virtual disks, as well as snapshots, and templates. In addition it allocates storage for sparse block devices.

- If you are using NFS or local storage, the SPM creates a thin provisioned virtual disk by default.

- If you are using iSCSI storage or other block-based devices, Logical Unit Numbers (LUNs) are provided to the SPM. Then, a volume group on top of the LUNs and logical volumes for use as virtual machine disks are created and the SPM preallocates the space by default.

- If a virtual disk is thinly-provisioned, a 1 GB logical volume is created with a QCOW2 format. Use thin provisioning for virtual machines with low I/O requirements.

- The virtual machine's host continuously monitors the logical volume used for its virtual disk. You can set a threshold so that when the disk usage nears the threshold the host notifies the SPM and extends the logical volume by 1 GB.

- If the storage in a pool starts to become exhausted, a new LUN can be added to the volume group. The SPM automatically distributes the additional storage to logical volumes that need it.

- If a virtual disk is preallocated, a logical volume of the specified size in GB and a virtual disk of RAW format is created. Use preallocated disks for virtual machines with high levels of I/O. Preallocated disks cannot be enlarged.

- If an application requires storage to be shared between virtual machines, use **Shareable** virtual disks which can be attached to multiple virtual machines concurrently.

QCOW2 format virtual disks cannot be shareable. You cannot take a snapshot of a shared disk and virtual disks that have snapshots that cannot be marked shareable. You cannot live migrate a shared disk.

If the virtual machines are not cluster-aware, mark shareable disks as read-only to avoid data corruption.

- Use direct LUN to enable virtual machines to directly access RAW block-based storage devices on the host bus adapter (HBA). The mapping of the direct LUN to the host causes the storage to be emulated as file-based storage to virtual machines. This removes a layer of abstraction between virtual machines and their data as the virtual machine is being granted direct access to block-based storage LUNs.

### 3.7.3 Storage Leases

When you add a storage domain to Oracle Linux Virtualization Manager, a special volume is created called **xleases**. Virtual machines are able to acquire a lease on this special volume, which enables the virtual machine to start on another host even if the original host loses power.

A storage lease is configured automatically for the virtual machine when you select a storage domain to hold the VM lease. (See *Configuring a Highly Available Virtual Machine* in the *Oracle Linux Virtualization Manager: Administration Guide.*) This triggers a **create a new lease** request to the engine which then send the request to the SPM. The SPM creates a lease and a lease id for the virtual machine on the xreleases volume. VDSM creates the sanlock which is used to acquire an exclusive lock on a virtual disk.

The lease id and other information is then sent from the SPM to the engine. The engine then updates the virtual machine's device list with the lease information.
3.7.4 Local Storage

Local storage is storage that is attached directly to an Oracle Linux KVM host, such as a local physical disk or a locally attached SAN. When a KVM host is configured to use local storage, it is automatically added to a cluster where it is the only host. This is because clusters with multiple hosts must have shared storage domains accessible to all hosts.

When you use local storage, features such as live migration, scheduling, and fencing are not available.

For more information, see Configuring a KVM Host to Use Local Storage in the Oracle Linux Virtualization Manager: Administration Guide.

3.8 System Backup and Recovery

You use the engine-backup tool to take regular backups of the Oracle Linux Virtualization Manager. The tool backs up the engine database and configuration files into a single file and can be run without interrupting the ovirt-engine service.

You also use the engine-backup tool to restore a backup. However, the steps you need to take can be more involved depending on your restoration destination. For example, the engine-backup tool can be used to restore backups to fresh installations of Oracle Linux Virtualization Manager, on top of existing installations of Oracle Linux Virtualization Manager, and using local or remote databases.

If you restore a backup to a fresh installation of Oracle Linux Virtualization Manager, you do not run the engine-setup command to configure the Manager.

You can also use data center recovery if the data in your primary data domain gets corrupted. This enables you to replace the primary data domain of a data center with a new primary data domain.

Reinitializing a data center enables you to restore all other resources associated with the data center, including clusters, hosts, and storage domains. You can import any backup or exported virtual machines or templates into the new primary data domain.

For more information, see Backing Up and Restoring the Manager in the Oracle Linux Virtualization Manager: Getting Started Guide.

3.9 Users, Roles, and Permissions

In Oracle Linux Virtualization Manager, there are two types of user domains: local domain and external domain. During the installation of the Manager, a default local domain called the internal domain is created with a default admin@internal user. 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 command utility. For more information about creating users, see Administering User and Group Accounts from the Command Line in the Oracle Linux Virtualization Manager: Administration Guide.

User properties consist of the roles and permissions assigned to a user. The security roles for all actions and objects in the platform are granular, inheritable, and provide for multi-level administration.

Roles are sets of permissions defined in the Administration Portal and are used to specify permissions to resources in the environment. There are two types of roles:

- Administrator Role
3.10 System State and History

When you install and configure Oracle Linux Virtualization Manager, you are prompted to install and configure the engine and data warehouse PostgreSQL databases. See Engine Configuration Options in the Oracle Linux Virtualization Manager: Getting Started Guide.

- The engine database (engine) stores information about the state of the Oracle Linux Virtualization Manager environment and its configuration and performance.

- The data warehouse database is a management history database (ovirt_engine_history) that can be used by any application to retrieve historical configuration information and statistical metrics for data centers, clusters, and hosts.

The data warehouse service (ovirt-engine-dwd) extracts data from the engine database and loads it into the ovirt_engine_history database. This is commonly known as ETL (extract, transform, load).

Both the history and engine databases can run on a remote host to reduce the load on the Manager host. Running these databases on a remote host is a technology preview feature, see Technology Preview in the Oracle Linux Virtualization Manager: Release Notes.

For more information, see Section 1.4, “Data Warehouse and Databases”.

3.11 Event Logging and Notifications

Oracle Linux Virtualization Manager captures events in the following log files:

- /var/log/ovirt-engine/engine.log contains all Oracle Linux Virtualization Manager UI crashes, Active Directory lookups, database issues, and other events.
• /var/log/vdsm/vdsm.log is the log file for VDSM, the engine’s agent on the virtualization host(s), and contains host-related events.

Within the Administration Portal, you can also view Alerts and Events in the Notification Drawer, which you can access by clicking Bell icon in the upper-right corner.

The ovirt-log-collector tool enables you to collect relevant logs from across the environment. To use the tool, you must log into the Oracle Linux Virtualization Manager host as the root user and log into the Administration Portal with administration credentials.

The tool collects all logs from the Manager host, the Oracle Linux KVM hosts it manages, and the database.

Oracle Linux Virtualization Manager provides event notification services that allow you to configure the Engine to notify designated users by email when certain events occur or to send Simple Network Management Protocol (SNMP) traps to one or more external SNMP manager with system event information to monitor your virtualization environment.

For more information about configuring event notifications, see Section 3.11, “Event Logging and Notifications”.
