Installing and Configuring Oracle VM on Oracle Cloud Infrastructure

ORACLE WHITE PAPER | FEBRUARY 2018
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Revision History

The following revisions have been made to this white paper since its initial publication:

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<th>Revision</th>
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<tr>
<td>February 28, 2018</td>
<td>Two new sections were added to the “Troubleshooting” section:</td>
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<td>• Unable to Reach Oracle VM Virtual Machine Using Oracle Cloud Infrastructure Public IP Address</td>
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<tr>
<td></td>
<td>• vmpinfo3 Command Hangs in &quot;xm debug-keys” during sosreport of Oracle VM Server</td>
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You can find the most recent versions of the Oracle Cloud Infrastructure white papers at https://docs.us-phoenix-1.oraclecloud.com/Content/General/Reference/aqswithepapers.htm.
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Unable to Reach Oracle VM Virtual Machine Using Oracle Cloud Infrastructure Public IP Address  

vmpinfo3 Command Hangs in "xm debug-keys" during sosreport of Oracle VM Server  

Conclusion
Introduction

This document describe items of interest and relevance to the current release of Oracle VM 3.4 running on Oracle Cloud Infrastructure. If you have any questions about Oracle VM on Oracle Cloud Infrastructure, contact us at oraclevm-oci-info_ww_grp@oracle.com.

Oracle Cloud Infrastructure offers prepackaged images for Oracle VM. By instantiating these images, you create an Oracle VM architecture in minutes.

Oracle Cloud Infrastructure offers the following fixed shapes to run *bare metal instances*:

- **Standard – General purpose**, which provides NVMe-based block storage with predictable, consistent, linearly scaling performance at 60 IOPS/GB and 480 KBPS/GB throughput, up to a maximum 25K IOPS and 320 MBPS throughput per volume. This instance type is suitable for a wide range of applications and use cases.
  - 2.3 GHz Intel® Xeon® processor E5-2699 v3 (Haswell) processors with 18 cores (BM.Standard1.36)

- **DenseIO – Large**, which provides high-performance storage with fast NVMe-based SSDs. This instance type has larger local storage and is suitable for large databases and big data workloads, like Apache Spark and Hadoop, which demand fast performance and larger storage.
  - 2.3 GHz Intel Xeon processor E5-2699 v3 (Haswell) processors with 18 cores (BM.DenseIO1.36)
  - High random IO performance
  - High throughput and low latency

Oracle Cloud Infrastructure offers the following fixed shapes to run *virtual machine instances*:

- **Standard – General purpose**, which provides NVMe-based block storage with predictable, consistent, linearly scaling performance at 60 IOPS/GB and 480 KBPS/GB throughput, up to a maximum 25K IOPS and 320 MBPS throughput per volume. This instance type is suitable for a wide range of applications and use cases.
  - 2.3 GHz Intel Xeon processor E5-2699 v3 (Haswell) processors
  - The following shapes are available:

<table>
<thead>
<tr>
<th>Shape</th>
<th>OCPU</th>
<th>Memory (GB)</th>
<th>Local Disk (TB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VM.Standard1.1</td>
<td>1</td>
<td>7</td>
<td>Block Storage only</td>
</tr>
<tr>
<td>VM.Standard1.2</td>
<td>2</td>
<td>14</td>
<td>Block Storage only</td>
</tr>
</tbody>
</table>
### Oracle VM Server for x86

Oracle VM Server for x86 (Oracle VM Server) is a self-contained virtualization environment that provides a lightweight, secure, server-based platform to run virtual machines on x86 hardware. Oracle VM Server is based on an updated version of the underlying Xen hypervisor technology, and includes Oracle VM Agent. It also includes a Linux kernel with support for a broad array of devices and file systems. The Linux kernel is run as Dom0 to manage one or more DomU virtual machines, each of which could be Linux, Oracle Solaris, or Microsoft Windows.

Based on specific computational requirements, all of the bare metal instance shapes listed earlier can be used to guest Oracle VM Server instances.
Oracle VM Manager

Oracle VM Manager is an application that enables you to configure and manage your Oracle VM environment. Oracle VM Manager includes both a command-line interface and a web-based user interface, which is a standard Application Development Framework (ADF) web application. Oracle VM Manager provides virtual machine management facilities, including creating virtual machines from installation media or from templates. It provides features such as powering on, powering off, deleting, importing, deploying, and live-migrating virtual machines. Oracle VM Manager also manages resources, including ISO files, virtual machine templates, and shared virtual disks.

The following Oracle Cloud Infrastructure Virtual Machine shapes are supported to run Oracle VM Manager:

<table>
<thead>
<tr>
<th>Shape</th>
<th>OCPU</th>
<th>Memory (GB)</th>
<th>Local Disk (TB)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VM.Standard1.4</td>
<td>4</td>
<td>28</td>
<td>Block Storage only</td>
</tr>
<tr>
<td>VM.Standard1.8</td>
<td>8</td>
<td>56</td>
<td>Block Storage only</td>
</tr>
<tr>
<td>VM.Standard1.16</td>
<td>16</td>
<td>112</td>
<td>Block Storage only</td>
</tr>
<tr>
<td>VM.DenseIO1.4</td>
<td>4</td>
<td>60</td>
<td>3.2 TB NVMe SSD</td>
</tr>
<tr>
<td>VM.DenseIO1.8</td>
<td>8</td>
<td>120</td>
<td>6.4 TB NVMe SSD</td>
</tr>
<tr>
<td>VM.DenseIO1.16</td>
<td>16</td>
<td>240</td>
<td>12.8 TB NVMe SSD</td>
</tr>
</tbody>
</table>

For more details about Oracle VM Server and Oracle VM Manager, see the [Oracle VM 3.4 documentation library](https://oracle.com).

Latest Images (OCID) for Oracle VM Server

The following images are available for Oracle VM Server, categorized by region.

Phoenix, AZ

- **Region name**: us-phoenix-1
- **Region key**: PHX
- **Image OCID**: ocid1.image.oc1.phx.aaaaaaagh4d7zsayfkerpkvgt4liby67kqsr6xybgs7h4adzbfxcqvznq
Ashburn, VA

- **Region name**: us-ashburn-1
- **Region key**: IAD
- **Image OCID**:
  ocid1.image.oc1.iad.aaaaaaaccgtibik6orp6n4wmj73ilkj464b4dh5ked6fvpln6xc35jsypotq

Frankfurt, Germany

- **Region name**: eu-frankfurt-1
- **Region key**: FRA
- **Image OCID**:
  ocid1.image.oc1.eu-frankfurt-.aaaaaaaajusfj24tw3aipcw5bqhrkguy47l6gtjznfqn5ksvq3o3cevju3eba

Latest Images (OCID) for Oracle VM Manager

The following images are available for Oracle VM Manager, categorized by region.

Phoenix, AZ

- **Region name**: us-phoenix-1
- **Region key**: PHX
- **Image OCID**:
  ocid1.image.oc1.phx.aaaaaae2bbev2kfvndvh43dld7geobcqwrjsdnlfi4i4ghe5t3gxtlæbwq

Ashburn, VA

- **Region name**: us-ashburn-1
- **Region key**: IAD
- **Image OCID**:
  ocid1.image.oc1.iad.aaaaaaafipa57io47qv2wd5vtvlf7cug7hhbeamtzmzrpyxyd2jmz5uhj6q

Frankfurt, Germany

- **Region name**: eu-frankfurt-1
- **Region key**: FRA
- **Image OCID**:
  ocid1.image.oc1.eu-frankfurt-1.aaaaaaaan5p6ithqjlk2w665fv4njzundz4jucv5jd64mkkirdj75lnrpy
Assumptions

This document assumes the following knowledge and environment:

- You have a passing knowledge of Oracle VM and of some core concepts about working with Xen hypervisor.
- You understand how to install an operating system as a guest, and you know how to copy a virtual disk image between systems.
- You have a working knowledge of Linux and Oracle VM system administration and can work in Linux and Oracle VM and edit files.
- You have a working knowledge of Oracle Cloud Infrastructure, including tenancy, compartments, roles, users, network and storage setup, images, and instances.
- You have provisioned (or know how to provision) both an Oracle Cloud Infrastructure Bare Metal Compute instance assigned to Oracle VM Server and one Oracle Cloud Infrastructure Virtual Machine instance assigned to Oracle VM Manager.
- If an Oracle VM clustered server pool is present, at least two block storage devices from the Block Storage service are presented to the Oracle VM Server instance, one as an Oracle VM pool file system and one as an Oracle VM repository.
- Your Oracle VM Manager instance is on a public subnet (one that has outbound access to the internet).
- Your Oracle VM Manager instance relies on an internal subnet to manage and interact with Oracle VM Server instances.
- Oracle VM Server and Oracle VM Manager instances must be deployed from official Oracle images. Launching Oracle VM Server or Oracle VM Manager instances from custom images or from an existing Oracle Cloud Infrastructure instance is not supported.
- The core of communication in the Oracle Cloud Infrastructure environment is the virtual network interface card (VNIC). The VNIC is a tuple that consists of a MAC address, a VLAN ID, and an IP address. Oracle Cloud Infrastructure has the following types of VNICs:
  - A primary VNIC is created automatically when the Oracle VM Server instance is launched. This VNIC is the management interface used by Oracle VM Manager to manage the Oracle VM Server instance.
  - Secondary VNICs are used for Oracle VM virtual machine networks. The MAC/VLAN values are configured in the Cavium card associated with the Oracle VM Server instance to allow traffic to and from an interface with these values. The VLAN ID is used to configure a VLAN on eth0 for the VM network. The MAC address is used for the VM interface and is written to the VM configuration file, and the IP address can be used for the VM interface.
If you are importing a virtual machine image to run on Oracle VM, we assume that the image is compliant with the Open Virtualization Format (OVF). This document does not cover how to perform this conversion. For information about this conversion and further options, see the Oracle VM 3.4 documentation library.

Known Limitations and Requirements When Running Oracle VM on Oracle Cloud Infrastructure

Oracle VM architecture that is built with official Oracle VM 3.4 images on top of Oracle Cloud Infrastructure has the following limitations and requirements.

Oracle VM

- Oracle VM Server and Oracle VM Manager instances have to be connected to subnets of the same Virtual Cloud Network (VCN).
- Oracle VM Server and Oracle VM Manager instances have to be configured with the same time zone and same time source (Oracle Cloud Infrastructure NTP server).
- Oracle VM server pools can be clustered or nonclustered, but the following best practices must be adhered to:
  - Oracle VM clustered server pools can be based only on Oracle Cloud Infrastructure Block Volumes and can support both Oracle Cloud Infrastructure Block Volumes (valid for all bare metal instance shapes) or NVMe storage (valid for DenseIO shapes).
  - Oracle VM nonclustered server pools can rely only on NVMe local storage (valid for DenseIO instance shapes).
- Intelligent Platform Management Interface (IPMI) is not supported.
- Creating clustered Oracle VM pools with more than one Oracle VM Server instance is not supported.
- Virtual machine live-migration is not supported.
- Virtual machine cold-migration is not supported.
- Nonclustered Oracle VM pools require at least one NVMe storage device to operate.
- Server pool policies like Distributed Resource Scheduler (DRS) and Distributed Power Management (DPM) are not supported.
- Repository export functionality is restricted within the Oracle Cloud Infrastructure environment because Oracle VM Server instances are configured with only private IP addresses.
- Oracle Application Cluster on top of Oracle VM deployed on Oracle Cloud Infrastructure is not supported.
Because live-migration is not supported, an Oracle VM Server upgrade requires all Oracle VM virtual machines to be shut down. The server is rebooted as part of the upgrade.

Oracle VM Server and Oracle VM Manager instances have to be in the same Oracle Cloud Infrastructure region.

Oracle VM Server and Oracle VM Manager instances have to be in the same Oracle Cloud Infrastructure compartment.

Oracle VM Server and Oracle VM Manager instances have to be in the same Oracle Cloud Infrastructure Availability Domain.

Oracle VM pools cannot be distributed on more than one Oracle Cloud Infrastructure Availability Domain.

Cloning an Oracle VM virtual machine with Oracle Cloud Infrastructure VNICs does not create new Oracle Cloud Infrastructure VNICs for the target virtual machine.

Storage

Using a storage type that is different from the block volume or NVMe supplied by the Oracle Cloud Infrastructure service is not supported.

NFS storage is not supported for Oracle VM pool file system or storage repositories.

Using shared block volumes, if they are available, is not supported.

Oracle Cloud Infrastructure Block Volumes can be provisioned from 50 GB to 16 TB, in 1-GB increments.

Network

Oracle VM Manager instances must be configured with a public IP address.

Oracle VM Server instances must be configured with a private IP address. A public IP address is not supported for Oracle VM Server for security reasons.

The number of Oracle Cloud Infrastructure VNICs is limited to 16 for each Bare Metal instance. On Oracle VM Server instances, one VNIC is used for the primary interface and dedicated to Oracle VM Network.

The maximum number of VNICs available for Oracle VM virtual machines is 14.

Oracle Cloud Infrastructure VNICs are configured on the Oracle VM Server instance by using dedicated tools (vnic-add, vnic-delete, and vnic-list) that are available on the Oracle VM Manager instance.

Intra-network, also known as local bridge, VNICs must be created by Oracle VM Manager, just like on-premises Oracle VM local networks.
- Bonding and VLAN overbonded interface is not supported because only one physical interface is available for each Oracle Cloud Infrastructure bare metal instance.
- The default MTU in the Oracle Cloud Infrastructure environment is equal to 9000. In the OVS kickstart post section, “MTU=9000” is added to ifcfg-eth0.
- Gratuitous ARP is not supported in Oracle Cloud Infrastructure environments.
- A VNIC hardware address cannot be migrated from one Oracle VM Server instance to another.
- An Oracle Cloud Infrastructure VNIC cannot be created concurrently; one VNIC creation (vnic-add) at a time has to be executed.

**Prerequisites**

Before you can use Oracle VM, the following prerequisites must be met:

- Using the Oracle Cloud Infrastructure root compartment is not supported. You must create at least one dedicated compartment.
- Provision one or more bare metal instances by using an Oracle VM Server 3.4 ready-to-run image. You can use the following instance shapes for Oracle VM Server instances:
  - BM.Standard, used to create an Oracle VM clustered pool by means of an Oracle Cloud Infrastructure Block Volumes device
  - BM.DenseIO, used to create both an Oracle VM nonclustered and clustered pool
- Only single-server Oracle VM clustered server pools are supported at this time, to take advantage of Oracle Cloud Infrastructure Block Volumes based storage repositories.
- For multiple-server Oracle VM pools, use a server pool that is not clustered.
- For Oracle VM nonclustered pools, only local NVMe-based storage can be used for storage repositories. (Oracle Cloud Infrastructure Block Volumes cannot be used on these servers for storage repositories but only as physical disks for Oracle VM virtual machines).
- For Oracle VM clustered pools, provision at least two block storage devices and attach them to the Oracle VM Server instance that you provisioned. These block storage devices are used for the following requirements:
  - Oracle VM pool file system (minimum of 50 GB)
  - Oracle VM repository (size based on VM requirements, minimum of 100 GB)
- Provision a virtual machine instance by using an Oracle VM Manager 3.4 ready-to-run image. Oracle VM Manager has to run on a minimum shape of VM.Standard1.4. Oracle VM Manager can be hosted also on a bare metal instance, if required.
• Block storage volumes can be used as Oracle VM repositories only on Oracle VM clustered pools.

• Block storage volumes can be used as Oracle VM physical disks for virtual machines on both clustered and nonclustered Oracle VM pools.

• Local NVMe storage can be used as a local Oracle VM repository or directly presented to virtual machines by using Oracle VM Manager.
  o MD RAID (Software RAID) is supported for NVMe disks.
  o RAID devices built on NVMe can be used for repositories and virtual machine disks.

• We recommend that you provision block storage devices for Oracle VM repositories that are larger than your anticipated requirement sizes, so that you have adequate space to store the files required for the virtual machines running on Oracle VM.

• Create a VCN with at least one subnet fully configured, including security lists, an internet gateway, and any appropriate route tables. Ensure that the security list can use SSH to connect to the Oracle VM Manager instance that can also be used as a bastion host for all Oracle VM Server instances. Details about this prerequisite are available in the following section.

Note about Oracle VM Network Bridging: Guests running on Oracle VM require a MAC address that is supplied by the Oracle Cloud Infrastructure configuration management system. Because of this requirement, vnic-add and vnic-delete scripts are the only supported method for configuring VNICs for virtual machines running on Oracle VM VM Server.

Step 1: Prepare the Oracle Cloud Infrastructure Environment

Before you deploy instances for Oracle VM Manager and Oracle VM Server, a proper Oracle Cloud Infrastructure setup is required. This section doesn’t address Oracle Cloud Infrastructure components like groups, users, and privileges. For details about Oracle Cloud Infrastructure configuration options, see the Oracle Cloud Infrastructure documentation.

Create a Compartment

A compartment is a collection of related resources (such as cloud networks, compute instances, or block volumes) that can be accessed only by those groups that have been given permission by an administrator in your organization. For example, one compartment could contain all the servers and storage volumes that make up the production version of your company’s Human Resources system. Only users with permission to that compartment can manage those servers and volumes.
Creating a compartment is the first step in setting up an Oracle VM infrastructure on Oracle Cloud Infrastructure. To create a compartment, perform the following steps:

1. Connect to the Oracle Cloud Infrastructure Console with your account’s tenant name, user name, and password.

2. From the Identity menu, select Compartments.

3. Click Create Compartment.

4. In the Create Compartment dialog box, enter a name and description for the compartment, and then click Create Compartment.
Note: You can always rename a compartment, if required, but you cannot delete it.

5. After the compartment is created, note the compartment ID, which is required in a later step to set up Oracle VM infrastructure VNICs. To view the ID, click Show or Copy.

Create a Virtual Cloud Network with Subnets, Route Rules, Security Lists, and an Internet Gateway

A virtual cloud network (VCN) is a software-defined network that you set up in Oracle data centers. A subnet is a subdivision of a cloud network. For an overview of VCNs, allowed size, default VCN components, and scenarios for using your VCN, see Overview of Networking in the Oracle Cloud Infrastructure documentation.

Create a VCN

For Oracle VM infrastructure, the creation of one VCN that includes subnets, route rules, security lists, and a gateway is required. To start creating these components, perform the following steps:

1. In the Oracle Cloud Infrastructure Console, select Networking > Virtual Cloud Networks.
2. From the **Compartment** menu, select the compartment that you created in the preceding section.

3. Click **Create Virtual Cloud Network**.

4. In the **Create Virtual Cloud Network** dialog box, enter values for the VCN that will be dedicated to Oracle VM infrastructure:
   - For Create In Compartment, select the compartment that you created for the Oracle VM architecture.
   - For Name, enter **OVM-VCN**.
   - Select the **Create Virtual Cloud Network only** option.
   - For CIDR Block, enter **10.0.0.0/16**.
   - Under DNS Resolution, select the **Use DNS Hostnames in this VCN** option.
   - For DNS Label, enter **ovm**.
Create Security Lists for the Oracle VM Manager Instance

On the VCN that you just created, define new security lists that will be dedicated to the Oracle VM Manager instance.

1. In the compartment that you created, select **Networking > Virtual Cloud Network**, and then click the VCN that you created, **OVM-VCN**.

2. In the left-side menu, click **Security Lists**, and then click **Create Security Lists**.

3. Enter the following name for the security list: **Security List for Oracle VM Manager**

4. Create the following rules under **Allow Rules for Ingress**:
   - SSH-Access
     - Source CIDR: **0.0.0.0/0**
     - IP Protocol: **TCP**
     - Source Port Range: **All**
     - Destination Port Range: **22**
   - ICMP on Public
     - Source CIDR: **0.0.0.0/0**
     - IP Protocol: **ICMP**
     - Type and Code: **3, 4**
   - Routing Enabled Internally
     - Source CIDR: **10.0.0.0/16**
     - IP Protocol: **All Protocols**
   - Oracle VM Manager Web Access
     - Source CIDR: **0.0.0.0/0**
     - IP Protocol: **TCP**
o Source Port Range: All
o Destination Port Range: 7002

- Oracle VM Manager CLI Access
  o Source CIDR: 0.0.0.0/0
  o IP Protocol: TCP
  o Source Port Range: All
  o Destination Port Range: 10000

5. Create the following rule under Allow Rules for Egress:
   - No Limits
     o Source CIDR: 0.0.0.0/0
     o IP Protocol: All Protocols

6. Click Create Security List.
Create an Internet Gateway

On the VCN that you created, define a new internet gateway for the Oracle VM Manager instance. This gateway will be used for the following purposes:

- Get SSH access to the Oracle VM Manager instance (port 22) from clients.
- Get Oracle VM Manager Console access (port 7002) from clients on a public IP address.
- Get Oracle VM Manager command-line interface access (port 10000) from clients on a public IP address.
- Use the Oracle VM Manager instance as a bastion host for all Oracle VM Server instances managed by the same.

To create an internet gateway, perform the following steps:

1. In the Oracle Cloud Infrastructure Console, select Networking > Virtual Cloud Network and then select the VCN that you created.
2. On the VCN page, click Internet Gateway on the left-side menu.
3. Click Create Internet Gateway.
4. In the **Create Internet Gateway** dialog box, enter the following name for this virtual gateway: **Internet Gateway for Oracle VM**.

![Create Internet Gateway dialog box](image)

5. Click **Create Internet Gateway**.

Create Route Rules for the Oracle VM Manager Instance

This section provides information related to the Oracle Cloud Infrastructure route table for the Oracle VM Manager instance and, possibly, for all the Oracle Cloud Infrastructure instances that require direct internet access.

On the VCN that you created, define one new route rule dedicated to the Oracle VM Manager instance. This step is required to specify the internet gateway that you created earlier as the default gateway for Oracle VM Manager.

1. In the Oracle Cloud Infrastructure Console, select **Networking** > **Virtual Cloud Network** and then select the VCN that you created.

2. On the **VCN** page, click **Route Tables** in the left-side menu.

![Route Tables](image)
3. On the **Route Tables** area of the page, select the existing **Default Route Table for OVM-VCN**, which has 0 rules defined.

![Route Tables](image)

4. On the new page, click **Create Route Rule** and enter the following information:
   - **Destination CIDR Block**: 0.0.0.0/0
   - **Target Type**: **Internet Gateway**
   - **Target Compartment**: **OracleVM-Production** (choose your compartment name)
   - **Target Internet Gateway**: **Internet Gateway for Oracle VM**

![Create Route Rule](image)

5. Click **Create**.
Create DHCP Options for the Oracle VM Manager Instance

On the VCN that you created, define a new DHCP option dedicated to the Oracle VM Manager instance.

1. In the Oracle Cloud Infrastructure Console, select Networking > Virtual Cloud Network and select the VCN that you created.

2. On the VCN page, click DHCP Options in the left-side menu.

3. On the DHCP Options area of the page, click Create DHCP Options.

4. In the Create DHCP Options dialog box, enter the following values:
   - Ensure that the correct compartment is selected.
   - For Name, enter DHCP Options for Oracle VM Manager.
   - Select the Internet and VCN resolver option.
   - For Search Domain, enter ovmm.ovm.oraclevcn.com.
5. Click **Create DHCP Options**.

Create a Subnet for the Oracle VM Manager Instance

1. In the Oracle Cloud Infrastructure Console, select **Networking > Virtual Cloud Network** and then select the VCN that you created.

2. On the **VCN** page, click **Subnets** in the left-side menu.

3. On the **Subnets** area of the page, click **Create Subnet**.

<table>
<thead>
<tr>
<th>DHCP Options for Oracle VM Manager</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Name</strong>: DHCP Options for Oracle VM Manager</td>
</tr>
<tr>
<td><strong>Domain</strong>: ovmm.ovmvcn.oraclevcn.com</td>
</tr>
</tbody>
</table>

![Create DHCP Options](image)
4. In the **Create Subnet** dialog box, enter the following values:

- **Name:** OVMM-<availability_domain> (for example, OVMM-AD1). Identify the Availability Domain on which Oracle VM Manager resides.

- **Availability Domain:** Select the Availability Domain that reflects the name used for the subnet name (for example, AD1).

- **CIDR Block:** 10.0.0.0/24

- **Route Table:** **Default Route Table for OVM-VCN**

- **Subnet Access:** Select **Public Subnet**.

- **DNS Resolution:** Select **Use DNS Hostnames in this Subnet**.

- **DNS Label:** ovmm

- The DNS Domain Name field shows `<ROLE>.<VCN>.oraclevcn.com`; for example, ovmm.ovm.oraclevcn.com. You used the same value when you created the DHCP option earlier.

- **DHCP Options:** **DHCP Options for Oracle VM Manager** (DHCP options that you created earlier)

- **Security Lists:** **Security List for Oracle VM Manager** (security list that you created earlier)
Step 2: Launch and Configure the Oracle VM Manager Instance

Now that you have defined a VCN and public subnet, you can launch the Oracle VM Manager instance.

The Oracle VM Manager virtual machine on Oracle Cloud Infrastructure has the following roles:

- Oracle VM Manager
- Default gateway for all Oracle VM Server instances managed that will also grant internet access to them
Launch the Oracle VM Manager Instance

1. On the Oracle Cloud Infrastructure Console, select Compute > Instances.

2. Click Launch Instance and enter the following values:
   - Name: Enter a name for the instance (for example, mgr01).
   - Availability Domain: Select the Availability Domain where you created the subnet (for example, AD1).
   - Image Source: Select IMAGE OCID.
   - Image OCID: Use the appropriate OCID provided in the “Latest Images (OCID) for Oracle VM Manager” section on page 3.
   - Shape Type: Select VIRTUAL MACHINE.
   - Shape: VM.Standard1.4 (minimum required)
   - Virtual Cloud Network: OVM-VCN (VCN that you create in the preceding section)
   - Subnet: OVMM-AD1 (subnet that you created for Oracle VM Server on Availability Domain 1)
   - Private IP Address: Enter your preferred IP address (for example, 10.0.0.2) or leave the field empty to get an IP address assigned by the Oracle Cloud Infrastructure DHCP server.
   - Select the Assign Public IP Address check box.
   - Hostname: Enter a name for the host (for example, mgr01).
   - Fully Qualified Domain Name: This value is derived from different settings and follows the pattern <hostname>.<role_name>.<vcn_name>.oraclevcn.com (for example, mgr01.ovmm.ovm.oraclevcn.com).
   - SSH Keys: Supply your client SSH key to get access to the Oracle VM Manager instance (for example, mykey.pub).

Note: You cannot add more than one VNIC or public IP address to the Oracle VM Manager instance.
3. Click **Launch Instance**.

When the instance is available, the instance icon turns green and says **Running**.
As stated earlier, the Oracle VM Manager instance acts as the default internet gateway for all Oracle VM Servers managed. To accomplish this option, continue with the following steps.

4. Select the new Oracle VM Manager instance by clicking its name.

5. On the instance details page, click **Attached VNICs** in the left-side menu.

6. Click the ... menu on the right side of the **Attached VNICs** area and select **Edit VNIC**.

7. In the **Edit VNIC** dialog box, select the **Skip Source/Destination Check** check box.
Configure the Oracle VM Manager Instance Software

With the Oracle VM Manager instance available, configure the Oracle VM Manager software stack.

1. Connect to the Oracle VM Manager instance by using the public IP address. To get the public IP address, perform the following steps:
   
   A. In the Oracle Cloud Infrastructure Console, select **Compute > Instances**, and then select the Oracle VM Manager instance.
   
   B. Copy the public IP address of the instance.

2. Using SSH, connect to the Oracle VM Manager instance by using the public IP address and SSH key that you supplied when you created the instance.

   ```bash
   # ssh -i /path/to/private_key_file_here opc@<public_ip_address>
   ```


   ```bash
   # sudo ./oci-ovmm-installer.sh
   ```
Wait for the completion of Oracle VM Manager software installation before proceeding to the following steps.

4. Apply the tuning script for the Oracle VM Manager service by running `tune-ovmm.sh` with root permissions and entering the Oracle VM Manager Admin password.

```
# sudo ./tune-ovmm.sh
```

5. Test access to the Oracle VM Manager user interface by opening a browser on your client and entering `https://<OCI_instance_public_IP>:7002/ovm/console`.
6. Test access to the Oracle VM Manager CLI by trying to get an SSH connection on port 10000:

```bash
# ssh admin@<OCI_instance_public_IP>
```

If you are behind a proxy, by the binary `nc`, you can still connect; for example:

```bash
# ssh admin@<OCI_instance_public_IP> -p 10000 -o "ProxyCommand=nc -X connect -x <my_proxy_host>:<my_proxy_port> %h %p"
```

If you want to get SSH access through a proxy without specifying the preceding options each time, you can edit the SSH client configuration file (`~/.ssh/config`) on your local client system from which you will connect to your Oracle VM Manager instance CLI and add the following options to the file (`nc` binary is always required on the client):

```
Host <OCI_instance_public_IP>
ProxyCommand nc -X connect -x <my_proxy_host>:<my_proxy_port> %h %p
ServerAliveInterval 10
```
Step 3: Set Up the Oracle Cloud Infrastructure Environment for Oracle VM Server

Now that you have configured the Oracle VM Manager instance, you can complete the Oracle Cloud Infrastructure setup for Oracle VM Server. Oracle VM Server instances rely on the same VNC that you already created, but you must create separate a security list, subnet, and route table and rules for them.

Create a Security List for Oracle VM Server Instances

1. In the Oracle Cloud Infrastructure Console, select the compartment that you created, select **Networking > Virtual Cloud Network**, and then click the VCN that you created (OVM-VCN).

2. In the left-side menu, click **Security Lists** and then click **Create Security Lists**.

3. Create a security list with the following values:
   - **Security List Name**: **Security List for Oracle VM Server**
   - **Allow Rules for Ingress**: Create a No Limits for VCN Subnet(s) rule with the following values:
     - Source CIDR: **10.0.0.0/16**
     - IP Protocol: **All Protocols**
   - **Allow Rules for Egress**: Create a No Limits rule with the following values:
     - Source CIDR: **0.0.0.0/0**
     - IP Protocol: **All Protocols**
4. Click **Create Security List**.

**Create a Route Table for Oracle VM Server Instances**

On the VCN that you created, define one new route table dedicated to Oracle VM Server instances. This step is required to define the Oracle VM Manager instance that you created as the default gateway for the Oracle VM Server instances.

**Note:** Consider that the Oracle VM Manager instance should be kept alive to grant public traffic to the Oracle VM Server instances.

1. In the Oracle Cloud Infrastructure Console, select **Networking > Virtual Cloud Network** and then click the VCN that you created (OVM-VCN).
2. On the VCN page, click **Route Tables** in the left-side menu.

3. In the **Route Tables** area of the page, click **Create Route Table**.

4. In the **Create Route Table** dialog box, enter the following values:
   - Name: **Route Table for Oracle VM Server**
   - Destination CIDR Block: **0.0.0.0/0**
   - Target Type: **Private IP**
   - Target Selection: Enter the private IP address associated with the Oracle VM Manager instance (for example, **10.0.0.2**).
Create DHCP Options for Oracle VM Server Instances

1. In the Oracle Cloud Infrastructure Console, select Networking > Virtual Cloud Network and then click the VCN that you created (OVM-VCN).

2. On the VCN page, click DHCP Options in the left-side menu.

3. In the DHCP Options area of the page, click Create DHCP Option.

4. In the Create DHCP Options dialog box, enter the following values:
   - Name: DHCP Options for Oracle VM Server
   - DNS Type: Internet and VCN resolver
• Search Domain: **ovs.ovm.oraclevcn.com**

5. Click **Create DHCP Options**.

**Create a Subnet for Oracle VM Server Instances**

1. In the Oracle Cloud Infrastructure Console, select **Networking > Virtual Cloud Network** and then click the VCN that you created (**OVM-VCN**).

2. On the **VCN** page, click **Subnets** in the left-side menu.

3. In the **Subnets** area of the page, click **Create Subnet**.
4. In the Create Subnet dialog box, enter the following values:
   - Name: OVS-<availability_domain> (for example, OVS-AD1). Identify the Availability Domain on which Oracle VM Manager resides.
   - Availability Domain: Select the Availability Domain that reflects the name used for the subnet name (for example, AD1).
   - CIDR Block: 10.0.1.0/24
   - Route Table: Route Table for Oracle VM Server
   - Subnet Access: Private Subnet
   - DNS Resolution: Select Use DNS Hostnames in this Subnet.
   - DNS Label: ovs
   - The DNS Domain Name field shows <ROLE>.<VCN>.oraclevcn.com; for example, ovs.ovm.oraclevcn.com. You used the same value when you created the DHCP option for Oracle VM Server.
   - DHCP Options: DHCP Options for Oracle VM Server (DHCP options that you created earlier)
   - Security Lists: Security List for Oracle VM Server (security list that you created earlier)
Step 4: Launch the Oracle VM Server Instances

Before you launch the Oracle VM Server instances, you must have the Oracle VM Manager SSH client key. Because Oracle VM Server instances are configured with only private subnet IP addresses, these instances aren't directly reachable from the internet or from any other client that is not part of the VCN. As a result, in this configuration, the Oracle VM Manager instance acts as a bastion host for all Oracle VM Server instances managed.

Get the Oracle VM Manager SSH Client Key

1. Using SSH, connect to the Oracle VM Manager instance by using the public IP address and SSH key that you supplied when you created the instance.

```
# ssh -i /path/to/private_key_file_here opc@<public_ip_address>
```
2. Generate a public SSH key by running the following command:

```
# ssh-keygen -t rsa
```

3. Get the content of the public SSH key and save it for future use (you need it to launch Oracle VM instances).

```
# cat ~/.ssh/id_rsa.pub
```

Launch the Oracle VM Server Instances

1. In the Oracle Cloud Infrastructure Console, select **Compute > Instances**.
2. Click **Launch Instance** and enter the following values:

- **Name**: Enter a name for the instance (for example, **srv01**).
- **Availability Domain**: Select the Availability Domain where you created the subnet (for example, **AD1**).
- **Image Source**: Select **IMAGE OCID**.
- **Image OCID**: Use the appropriate OCID provided in the “Latest Images (OCID) for Oracle VM Server” section on page 2.
- **Shape Type**: Select **BARE METAL MACHINE**.
- **Shape**: **BM.Standard1.36** (minimum required). You can choose **BM.Standard1.36** or **BM.DenseIO1.36**.
- **Virtual Cloud Network**: **OVM-VCN** (VCN that you create earlier)
- **Subnet**: **OVS-AD1** (subnet that you created for Oracle VM Server on Availability Domain 1)
- **Private IP Address**: Enter your preferred IP address (for example, **10.0.1.101**).
- **Hostname**: Enter a name for the host (for example, **srv01**).
- **Fully Qualified Domain Name**: This value is derived from different settings and follows the pattern `<hostname>.<role_name>.<vcn_name>.oraclevcn.com` (for example, `srv01.ovs.ovm.oraclevcn.com`).
- **SSH Keys**: Paste the Oracle VM Manager client SSH key to get access to the Oracle VM Server instance through Oracle VM Manager.
3. Click **Launch Instance**.
4. Repeat the preceding steps to launch as many Oracle VM Server instances as you require. The following Oracle Cloud Infrastructure instance shapes are currently supported for Oracle VM Server:

<table>
<thead>
<tr>
<th>Shape</th>
<th>Local Storage Available</th>
<th>Shared Storage Available</th>
<th>Oracle VM Pool Clustered Support</th>
<th>Oracle VM Pool Nonclustered Support</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td>BM.Standard1.36</td>
<td>No</td>
<td>Yes, Required (Block Volume)</td>
<td>Yes</td>
<td>No</td>
<td>Clustered Oracle VM pools are supported only as single-server pools.</td>
</tr>
<tr>
<td>BM.DenseIO1.36</td>
<td>Yes, NVMe</td>
<td>Yes, Optional (Block Volume)</td>
<td>Yes</td>
<td>Yes</td>
<td>Clustered Oracle VM pools are supported only as single-server pools.</td>
</tr>
</tbody>
</table>

**Discover Oracle VM Servers**

When you add Oracle VM Server instances to your Oracle VM Manager environment, the process is known as *discovering Oracle VM Servers*. The first thing you should do to set up your virtualization environment is to discover your Oracle VM Servers.

2. Log in with user **admin** and the password that you defined during the Oracle VM Manager installation.

3. Click the Discover Servers button to start the discovery process for Oracle VM Servers, and enter the following values:
   - Oracle VM Agent Password: **oracle** (default configured on the Oracle VM Server Oracle Cloud Infrastructure image)
   - IP Addresses/DNS Hostnames: **10.0.1.101** (IP address of Oracle VM Server instances)

For details about the Oracle VM discovery process, see [Oracle VM - Manager Getting Started Guide for Release 3.4](#).

If you want to change the default Oracle VM Server Agent password after the discovery is completed and the Oracle VM pool is created, see [Oracle VM - Manager User's Guide for Release 3.4](#).

**Verify the NTP Server**

After the server discovery process is completed, verify that the NTP server list points to the official Oracle Cloud Infrastructure NTP Server.

1. Using SSH, connect to the Oracle VM Manager instance by using the public IP address and SSH key that you supplied when you create the instance.

```bash
# ssh -i /path/to/private_key_file_here opc@<public_ip_address>
```
2. From the SSH session opened on the Oracle VM Manager instance, connect to the Oracle VM Server instance:

3. Verify the NTP configuration file to check the NTP server list.

---

**Step 5: Set Up the Oracle Cloud Infrastructure Environment for Oracle VM Virtual Machines**

To integrate Oracle VM with an Oracle Cloud Infrastructure environment, the two networking environments must be connected. For an Oracle VM virtual machine to communicate outside of its local server, an Oracle Cloud Infrastructure VNIC must be created in the correct Oracle Cloud Infrastructure subnet, and the Oracle VM virtual machine must communicate by using that Oracle Cloud Infrastructure VNIC. The Oracle Cloud Infrastructure VNIC is attached to an Oracle Cloud Infrastructure instance.

For our purposes, the relevant Oracle Cloud Infrastructure instances will always be Oracle VM Server instances. A particular Oracle Cloud Infrastructure VNIC can't be moved to a different instance. Therefore, an Oracle Cloud Infrastructure VNIC is associated only with that Oracle VM Server instance, until removed.
The hardware address from the Oracle Cloud Infrastructure VNIC must be used as the MAC address for the Oracle VM virtual machine’s VNIC. Because the Oracle Cloud Infrastructure VNIC is associated with only one Oracle VM instance, the Oracle VM virtual machine must be assigned to the Oracle VM Server that is that Oracle Cloud Infrastructure instance.

Create a Security List for Oracle VM Virtual Machines

On the VCN that you created earlier, define a new security list that is dedicated to Oracle VM virtual machines running on the Oracle VM Server instance.

**Note:** The following steps provide one possible security list. However, security lists for virtual machines running on Oracle VM can be customized, so you should define all of the rules that you need based on your security requirements.

1. In the Oracle Cloud Infrastructure Console, select the compartment that you created.

2. Select **Networking > Virtual Cloud Networks**, and then click the VCN that you created (OVM-VCN).

3. In the left-side menu, click **Security Lists** and then click **Create Security Lists**.

4. Enter the following name for the security list: **Security List for Oracle VM Virtual Machine**

5. Create the following rules under **Allow Rules for Ingress**:
   - No Limits for VCN Subnet(s)
     - Source CIDR: **10.0.0.0/16**
     - IP Protocol: **All Protocols**
   - SSH-Access
     - Source CIDR: **0.0.0.0/0**
     - IP Protocol: **TCP**
- Source Port Range: **All**
- Destination Port Range: **22**

- **ICMP on Public**
  - Source CIDR: **0.0.0.0/0**
  - IP Protocol: **ICMP**
  - Type and Code: **3,4**

6. Create the following rule under **Allow Rules for Egress**:

   - **No Limits**
     - Source CIDR: **0.0.0.0/0**
     - IP Protocol: **All Protocols**

7. Click **Create Security List**.
Create a Route Table for Oracle VM Virtual Machines (optional)

For Oracle VM virtual machines, the Oracle Cloud Infrastructure default route table for the VCN that you created (OVM-VCN) can be used unless a different kind of configuration for Oracle VM virtual machines is required. If you need to configure a custom route table and rules, see the Oracle Cloud Infrastructure Networking documentation.

Create DHCP Options for Oracle VM Virtual Machines

1. In the Oracle Cloud Infrastructure Console, select Networking > Virtual Cloud Network and then click the VCN that you created.

2. On the VCN page, click DHCP Options in the left-side menu.

3. In the DHCP Options area of the page, click Create DHCP Options.

4. In the Create DHCP Options dialog box, enter the following values:
   - Name: DHCP Options for Oracle VM Virtual Machine
   - DNS Type: Internet and VCN Resolver
   - Search Domain: vm.ovm.oraclevcn.com
5. Click **Create DHCP Options**.

**Create a Subnet for Oracle VM Virtual Machines**

1. In the Oracle Cloud Infrastructure Console, select **Networking > Virtual Cloud Network** and then click the VCN that you created.

2. On the VCN page, click **Subnets** in the left-side menu.

3. In the Subnets area of the page, click **Create Subnet**.

4. In the **Create Subnet** dialog box, enter the following values:
   - Name: **VM-<availability_domain>** (for example, **VM-AD1**). Identify the Availability Domain on which Oracle VM Manager resides.
- **Availability Domain**: Select the Availability Domain that reflects the name used for the subnet name (for example, AD1).
- **CIDR Block**: 10.0.11.0/24
- **Route Table**: Default Route Table for OVM-VCN
- **Subnet Access**: Public Subnet
- **DNS Resolution**: Select **Use DNS Hostnames in this Subnet**
- **DNS Label**: `vm`
- The DNS Domain Name field shows `<ROLE>.<VCN>.oraclevcn.com`; for example, `vm.ovm.oraclevcn.com`. You used the same value when you create the DHCP option for Oracle VM virtual machines.
- **DHCP Options**: **DHCP Options for Oracle VM Virtual Machine**
- **Security Lists**: **Security List for Oracle VM Virtual Machine**
After you create the subnet, the subnet setup for the VCN should be similar to the following example:

Create Oracle VM Intra-Network and Oracle Cloud Infrastructure Private/Public Network

Oracle VM for Oracle Cloud Infrastructure has the following types of VNICs:

- **Oracle VM Intra-Network VNICs**
  - Created on Oracle VM Infrastructure by using standard interfaces (Oracle VM Manager, CLI, WS-API)
  - Used by virtual machines running on Oracle VM
  - This type of network allows communication between the virtual machines running on a single Oracle VM Server, and does not allow external network traffic.

- **OCI VNICs**
  - Created on the Oracle Cloud Infrastructure environment by using dedicated scripts
  - Used by virtual machines running on Oracle VM
  - Grant private/public network access

More information about Oracle VM Intra-Network is available in [Oracle VM - Concepts Guide for Release 3.4](#).
The following figure shows a possible architecture of a solution running on Oracle VM on Oracle Cloud Infrastructure:
Create an Oracle VM Intra-Network

To create an Oracle VM Intra-Network, proceed with the following steps:

1. Connect to the Oracle VM Manager user interface at
   https://<OCI_instance_public_IP>:7002/ovm/console and log in with the correct
   user name and password.

2. Click the Networking tab, click the Create New Network button.

3. In the Create Network wizard, click Next.

4. Select Create a Local Network on a single server and then click Next.
5. Enter a name and, optionally, a description for this Oracle VM Intra-Network, and then click **Next**.

![Create Network](image)

6. Select the Oracle VM Server instance running on Oracle Cloud Infrastructure and then click **Finish**.

![Create Network](image)

---

**Create an Oracle Cloud Infrastructure Private/Public Network**

Oracle Cloud Infrastructure private or public VNICS are script-based because of the utilities available on the Oracle VM Manager instance. The set of scripts creates an Oracle VM network with the Virtual Machine role specifically to be used for each Oracle Cloud Infrastructure VNIC. This creates a bridge on the Oracle VM Server to allow traffic from the Oracle VM virtual machine to reach the Oracle Cloud Infrastructure subnet. Each Oracle Cloud Infrastructure VNIC is assigned a VLAN tag. This tag is used to create an VLAN interface on the Oracle VM Server for the Oracle Cloud Infrastructure instance. This Oracle VM VLAN interface will be attached to the Oracle VM Network’s bridge, which allows the routing of traffic from the Oracle VM virtual machine outside of the Oracle Cloud Infrastructure instance. Oracle Cloud Infrastructure prevents any traffic...
from MAC addresses other than the one associated with the Oracle Cloud Infrastructure VNIC. Therefore, only the Oracle VM virtual machine's VNIC with the specific MAC address should be attached to the Oracle VM Network created for this purpose. Although other traffic may be allowed to flow locally between virtual machines on that one Oracle VM Server through the bridge, attaching other virtual machines to this bridge is not suggested. Instead, we recommend creating an Oracle VM local network as the best practice for local traffic between virtual machines on the same Oracle VM Server.

After the environment for Oracle Cloud Infrastructure and Oracle VM integration is ready, the following commands are available:

<table>
<thead>
<tr>
<th>Command</th>
<th>Steps</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>vnic-add</td>
<td>The add process performs the following steps after validating the input parameters:</td>
<td>For details, run # vnic-add -usage. After the add process is completed, the user can start the virtual machine, log in to it, and configure the guest virtual machine's network interface by using the private IP address. The vnic-add script requires the virtual machine to be stopped.</td>
</tr>
<tr>
<td></td>
<td>• Determines the Oracle VM Server and the Oracle Cloud Infrastructure instance</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Creates an Oracle Cloud Infrastructure VNIC</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Creates an Oracle VM VNIC on the virtual machine with the HW-Address assigned to the Oracle Cloud Infrastructure VNIC</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Creates an Oracle VM network with the Virtual Machine role to be used for this particular VNIC traffic</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Creates an Oracle VM VLAN interface with the VLAN tag from the Oracle Cloud Infrastructure VNIC on top of the Oracle VM Server’s primary interface</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Adds the created VLAN interface to the created Oracle VM network</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Adds the created Oracle VM VNIC to the created Oracle VM network</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Outputs the following information for the new VNIC:                                                                hold the input parameters:</td>
<td>For details, run # vnic-delete -usage. The vnic-delete script requires the VM to be stopped.</td>
</tr>
<tr>
<td></td>
<td>o Private IP address from the OCI VNIC</td>
<td></td>
</tr>
<tr>
<td></td>
<td>o MAC address from the OCI VNIC</td>
<td></td>
</tr>
<tr>
<td></td>
<td>o Public IP address, if created, from the Oracle Cloud Infrastructure VNIC</td>
<td></td>
</tr>
<tr>
<td>vnic-delete</td>
<td>The delete process performs the following steps after validating the input parameters:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Determines the Oracle VM Server that owns the VNIC</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Determines the Oracle Cloud Infrastructure instance that owns the VNIC</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Determines the Oracle Cloud Infrastructure VNIC</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Determines the Oracle VM VLAN interface</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Determines the Oracle VM network</td>
<td></td>
</tr>
<tr>
<td></td>
<td>• Deletes the Oracle Cloud Infrastructure VNIC</td>
<td></td>
</tr>
</tbody>
</table>
Command | Steps | Notes
---|---|---
| | • Deletes the Oracle VM VNIC from the Oracle VM virtual machine<br>• Deletes the Oracle VM network group dedicated to this virtual machine<br>• Deletes the Oracle VM VLAN interface from the Oracle VM Server<br>• Outputs the details of the deleted VNIC | For details, run `# vnic-list --usage`.

**vnic-list** <br>The list process performs the following steps after validating the input parameters: <br>• Determines the Oracle VM Server that owns the VNIC<br>• Determines the Oracle VM virtual machine that owns the VNIC<br>• List the VNICs created, based on the parameters supplied

This setup is required to get the automation between Oracle VM and the Oracle Cloud Infrastructure network. After a simple script is run, you can add Oracle Cloud Infrastructure VNICs to or remove them from an Oracle VM virtual machine.

**Requirements**

- SSH access to the Oracle VM Manager instance
- Oracle Cloud Infrastructure user ID
- Oracle Cloud Infrastructure tenant ID
- Oracle Cloud Infrastructure region name

**Steps**

1. Connect to the Oracle VM Manager instance with user `opc`.

2. Activate the Oracle Cloud Infrastructure environment by running the following command:

   ```bash
   # ./.venv-oci/bin/activate
   ```
3. Run the following command to create the Oracle Cloud Infrastructure configuration file and then enter following information:

```
# oci setup config
```

- Enter a location for your config [/home/opc/.oci/config]: <ENTER> (Use the default configuration file path.)
- Enter a user OCID: `ocid1.user.oc1..aaaaaaaaast3d5o4psgedix7u3jx2...........` (Enter your Oracle Cloud Infrastructure user ID.)
- Enter a tenancy OCID: `ocid1.tenancy.oc1..aaaaaaaaaqeq4bzhikdf3br...........` (Enter your Oracle Cloud Infrastructure tenant ID.)
- Enter a region (e.g. eu-frankfurt-1, us-ashburn-1, us-phoenix-1): `us-ashburn-1` (Enter your Oracle Cloud Infrastructure region name.)
- Do you want to generate a new RSA key pair? (If you decline you will be asked to supply the path to an existing key.) [Y/n]: Y
- Enter a directory for your keys to be created [/home/opc/.oci]: <ENTER> (Use the default configuration file path.)
- Enter a name for your key [oci_api_key]: <ENTER> (Use the default name for the key.)
4. As shown in the preceding screenshot, the public key needs to be uploaded to the Oracle Cloud Infrastructure Console. To complete this step, continue with the following steps.

5. Get the content of the Public RSA key generated on the Oracle VM Manager instance and copy it:

   ```bash
   # cat ~/.oci/oci_api_key_public.pem
   ```

6. In the Oracle Cloud Infrastructure Console, select **Identity > Users**, and click the user whose OCID you provided in step 3.

7. On the user details page, click **Add Public Key** and enter the public key content that you copied in step 4.
8. Click Add.

Storage for Oracle VM on Oracle Cloud Infrastructure

You have the following storage options for Oracle VM on Oracle Cloud Infrastructure:

- Block volume
- Local NVMe

Use block volume devices to create Oracle VM clustered pools, and use local NVMe to create Oracle VM nonclustered pools.

The availability of these options is based on the shape that you choose for the bare metal instance (BM – BareMetal):

<table>
<thead>
<tr>
<th>Shape</th>
<th>Block Volume</th>
<th>Local NVMe</th>
</tr>
</thead>
<tbody>
<tr>
<td>BM.Standard*.*</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>BM.DenseIO*.*</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>
As shown in the following diagram, to create an Oracle VM clustered pool, you can choose BM.Standard, BM.DenseIO, or BM.HighIO. However, when creating an Oracle VM nonclustered pool, you need BM.DenseIO.

Following are storage options considerations for Oracle VM on Oracle Cloud Infrastructure:

- Block volume storage can be used to create only Oracle VM clustered repositories.
- Local NVMe storage can be used to create only Oracle VM local repositories.
- Block volumes clone is not supported.
- Because of networking, the Repository Export functionality can only export Oracle VM repositories to the manager instance or to a system that the server can contact. More information about this functionality is available in the Oracle VM Manager User’s Guide for 3.4.

Oracle Cloud Infrastructure block volumes are assigned to an IP address for iSCSI, associated only when the block volume is created. These IP addresses are not specific to the volume but are related to the number of iSCSI block volumes attached to a particular instance and the order in
which they have been attached. So, a block volume attached to instance (A) might be associated with IP address 169.254.2.2, but if that same block volume is detached from instance (A) and attached to instance (B), it might be associated with IP address 169.254.2.4. Therefore, the actual IP address of the iSCSI SAN server is hidden by Oracle Cloud Infrastructure and can change each time the block volume is associated with an instance, in this case, Oracle VM Server.

For example, when attaching Oracle Cloud Infrastructure block volumes to an Oracle Cloud Infrastructure instance, the following pattern of assignment has been observed:

- The first block volume attached to instance (A) is associated with IP address 169.254.2.2.
- The second block volume attached to instance (A) is associated with IP address 169.254.2.3.
- The IP address increments for each block volume associated with instance (A).
- The first block volume attached to instance (B) is associated with IP address 169.254.2.2, even if the same IP address is also used on the first block volume for instance (A).
- The second block volume attached to instance (B) is associated with IP address 169.254.2.3, even if the same IP address is also used on the second block volume for instance (A).
- The IP address increments for each block volume associated with instance (B).

Configure Block Volume Storage in Oracle VM Manager

After you create a block volume in Oracle Cloud Infrastructure and attach it to an Oracle VM Server instance, use the following steps to configure Oracle VM storage.

**Note:** For instructions on how to add and attach block volumes in Oracle Cloud Infrastructure, see the Oracle Cloud Infrastructure documentation.

1. In the Oracle Cloud Infrastructure Console, navigate to the details page for the Oracle VM Server instance (for example, srv01).
2. In the left-side menu, click **Attached Block Volumes**.
3. Click the appropriate block volume associated with this instance.
4. On the block volume details page, select **iSCSI Commands & Information**.
5. Locate and copy the IP address and port for this specific block volume. You will use this information when you set up the access host and port for iSCSI storage in Oracle VM Manager.

6. Connect to the Oracle VM Manager user interface at https://<OCI_instance_public_IP>:7002/ovm/console and log in with the correct user name and password.

7. Click the Storage tab, expand the SAN Servers section in the left-side pane, and click the Discover SAN Server button.

8. On the Discover SAN Server page of the wizard, supply following values and then click Next:
   - Name: oci-block-volume
   - Storage Type: iSCSI Storage Server
   - Storage Plugin: Oracle Generic SCSI Plugin
9. On the **Access Information** page, click the add button to create an access host entry, and enter the following values in the Create Access Host dialog box:

- **Access Host:** 169.254.2.2 (the IP address that you copied from the Oracle Cloud Infrastructure Console in step 5)
- **Access Port:** 3260 (the default iSCSI port, which you also copied in step 5)

10. Click **OK**, and on the Access Information page, click **Next**.

11. On the **Add Admin Servers** page, move the Oracle VM Server instance to the **Selected Server(s)** area, and then click **Next**.
12. On the Manage Access Group page, select Default Access Group @ oci-block-volume and then click the edit button.

13. In the Edit Access Group dialog box, click the Storage Initiators tab and move the Oracle VM Server instance IQN under Selected Storage Initiators.

14. Click OK and then click Finish to confirm the new oci-block-volume storage in Oracle VM Manager.

Add New Block Volumes in Oracle VM Manager

When you create a new block volume in Oracle Cloud Infrastructure and then attach it to an Oracle VM Server instance, use the following steps to get Oracle VM Manager to discover the block volume.

1. In the Oracle Cloud Infrastructure Console, navigate to the details page for the Oracle VM Server instance.

2. In the left-side menu, click Attached Block Volumes.

3. Click the appropriate block volume associated with this instance.

4. On the block volume details page, select iSCSI Commands & Information.
5. Locate the IP address and port for this specific block volume.
   - If the IP address and port combination is already configured in your **oci-block-volume** iSCSI storage entry in Oracle VM Manager, no further action is required.
   - If the IP address and port combination is *not* configured in your **oci-block-volume** iSCSI storage entry in Oracle VM Manager, copy the values and proceed with the following steps.

6. Connect to the Oracle VM Manager user interface at https://<OCI_instance_public_IP>:7002/ovm/console and log in with the correct user name and password.

7. Click the **Storage** tab, expand the **SAN Servers** section in the left-side pane, and click the **oci-block-volume** storage entry.

8. Click the edit **edit** button for this storage entry and then click the **Access** tab.

9. Click the add **add** button to enter the IP address and port that you copied from the Oracle Cloud Infrastructure Console in step 5 as the access host and access port.

10. Click **OK**.

    Oracle VM Manager checks whether an iSCSI SAN server exists with the same address. If one does already exist with the same address, an error message such as the following one is displayed:

    *_Job failed on Core: Oracle VMAPI_7272E Either the hostname or IP address: xxx.xxx.xxx.xxx, is invalid, iSCSI storage array: xxxxxxx. Network address: xxx.xxx.xxx.xxx, has an IP Address: 169.254.2.3, already in use on storage server: OCI_169.254.2.3 \[Mon Oct 09 15:10:20 GMT 2017\]_*

    If you see this message, **oci-block-volume** is already configured with this IP address and port combination and no further action is required.
Add New Oracle VM Server Instances to an Existing Oracle VM Manager Storage Definition

If you add one or more Oracle VM Server instances later, you must consider the Oracle VM Manager SAN definition. In fact, each Oracle VM Server instance that is discovered and managed by Oracle VM Manager has to take part to the storage definition.

Follow these steps to get the new Oracle VM Server instance to see the block volumes attached to it.

1. In the Oracle VM Manager user interface, click the **Storage** tab, expand the **SAN Servers** section in the left-side pane, and click the **oci-block-volume** storage entry.

2. Click the edit button to modify the **oci-block-volume** configuration.

3. In the **Edit SAN Server** dialog box, click the **Admin Servers** tab and then move the new Oracle VM Server instance to the **Selected Server(s)** area.

4. Click **OK**.

5. Back on the **Storage** tab, click the **oci-block-volume** storage entry in the left-side pane.
6. In the right-side pane, select **Access Groups** from the **Perspective** menu.

7. Select **Default access group @ oci-block-volume** and then click the edit button.

8. In the Edit Access Group dialog box, click the **Storage Initiators** tab and then move the new Oracle VM Server storage initiator to the **Selected Storage Initiators** area.

9. Click **OK**.
Oracle VM: Pool, Repository, Virtual Machine, and VNIC Examples

This section shows examples of the following operations:

- Oracle VM pool creation
  - Clustered
  - Nonclustered
- Oracle VM repository creation
  - Local on NVMe storage
  - Shared on block volume storage
- Oracle VM virtual machine creation
- Oracle VM VNIC creation
  - Public/Private OCI VNIC
  - Intra-Network VNIC

Oracle VM Pool Creation

An Oracle VM Server pool consists of at least one, but usually multiple, Oracle VM Server instances. On Oracle Cloud Infrastructure, the following Oracle VM pool configurations are supported:

- Single server Oracle VM clustered pool
- Single server or multiple server Oracle VM nonclustered pool

In the Oracle VM Manager user interface, you use the Create Server Pool button on the Servers and VMs tab to open the Create Server Pool wizard, which guides you through the process of creating a server pool.


Create an Oracle VM Clustered Pool

Before you can create a clustered pool, the following requirements must be met:

- One Oracle VM Server must already be discovered by Oracle VM Manager.
- One Oracle Cloud Infrastructure block volume with a minimum size of 50 GB must be attached to the Oracle VM Server instance.

Perform the following steps to create a clustered pool:

1. Connect to Oracle VM Manager user interface at https://<OCI_instance_public_IP>:7002/ovm/console and log in with the correct user name and password.

2. Click the Servers and VMs tab and then click the Create Server Pool button.

3. On the Create Server Pool page of the wizard, enter following values and then click Next:
   - Server Pool Name: Enter a name for the pool (for example, oci-clustered-pool).
   - Virtual IP Address for the Pool: Leave this field blank.
   - Storage for Server Pool: Physical Disk
   - Storage Location: Select your own block volume (for example, ORACLE (1)).
4. On the Add Servers page, add the Oracle VM Server instance (only one can be added) to the Selected Server(s) area.

5. Click Finish to create the pool.

**Note:** No more Oracle VM Server instances can be added to this clustered pool. For more information, see the "Known Limitations and Requirements When Running Oracle VM on Oracle Cloud Infrastructure" section at the beginning of this document.
Create an Oracle VM Nonclustered Pool

Before you can create a nonclustered pool, one Oracle VM Server instance must already be discovered by Oracle VM Manager.

1. Connect to the Oracle VM Manager user interface at https://<OCI_instance_public_IP>:7002/ovm/console and log in with the correct user name and password.

2. Click the Servers and VMs tab and then click the Create Server Pool button.

3. On the Create Server Pool page of the wizard, enter the following values and then click Next:
   - Server Pool Name: Enter a name for the pool (for example, oci-non-clustered-pool).
   - Clear the Clustered Server Pool check box.
4. On the Add Servers page, add the Oracle VM Server instance to the **Selected Server(s)** area.

5. Click **Finish** to create the pool.

**Oracle VM Repository Creation**

A storage repository is essentially logical disk space that is made available through a file system on top of physical storage hardware. If the storage repository is created on a file server (for example, an NFS share), then a file system is already present. If the repository is created on a LUN, an **OCFS2** file system is first created.

---

**Note:** NFS is not an option for Oracle VM on Oracle Cloud Infrastructure.

On Oracle Cloud Infrastructure, Oracle VM repositories can be created on both local NVMe and block volume storage:

- Local NVMe repositories can be used on both a clustered and nonclustered pool
- Block volume repositories can be used only on a clustered pool
Create an Oracle VM Repository

Before you can create a repository, the following requirements must be met:

- One clustered Oracle VM Server pool
- A block volume attached to the Oracle VM Server instance

Perform the following steps to create a repository:

1. Connect to the Oracle VM Manager user interface at https://<OCI_instance_public_IP>:7002/ovm/console and log in with the correct user name and password.

2. Click the Repositories tab, and then click the add button to create one Oracle VM repository.

3. To create a repository on a block volume, enter the following values on the Repository Information page of the Create a Repository wizard, and then click Next:
   - Repository Name: Enter a name for the repository (for example, repo01-bv).
   - Repository Location: Select Physical Disk (NFS storage is not supported).
   - Server Pool: Select your Oracle VM pool (for example, oci-clustered-pool).
• Physical Disk: Select the physical disk on which to create the repository (for example, ORACLE (2)).

• Description: Enter an optional description of the repository (for example, BV Repository).

4. To create a repository on local NVMe, enter the following values on the Repository Information page of the Create a Repository wizard, and then click Next:

• Repository Name: Enter a name for the repository (for example, repo02-NVMe).

• Repository Location: Select Physical Disk (NFS storage is not supported).

• Server Pool: Select your Oracle VM pool (for example, oci-clustered-pool).

• Physical Disk: Select the physical disk on which to create the repository (for example, nvme-S2LHNA0HC05222).

• Description: Enter an optional description of the repository (for example, Local NVMe Repository).
5. On the Present to Servers page, move the Oracle VM Server that owns this repository to the Present to Server(s) area.

6. Click Finish.

Oracle VM Virtual Machine Creation

The purpose of Oracle VM is to provide an infrastructure on which virtual machines can run, and that is easy to manage, configure, and maintain. Multiple virtual machines can run on the same Oracle VM Server. A virtual machine is a guest operating system and its associated application software. For the sake of simplicity, we use the term virtual machine to encompass domain, guest, and virtual machine. They are synonymous with each other and can be used interchangeably.

An operating system installed in a virtual machine is known as a guest operating system. Oracle VM supports a variety of guest operating systems, including Linux, Oracle Solaris, and Microsoft Windows™. For a list of the supported guest operating systems, see the Oracle VM Release Notes. Guest operating system installation is described in Section 7.2, “How is a Guest OS Installed on a Virtual Machine?” of the Oracle VM Concepts Guide.

You can use Oracle VM Manager to create virtual machines with the following methods:

- ISO files in a repository (hardware virtualized only)
- Mounted ISO files on an NFS, HTTP, or FTP server (paravirtualized only)
- Virtual machine templates (by cloning a template)
- An existing virtual machine (by cloning the virtual machine)
- Virtual appliances

This section explains how to create a virtual machine by using a virtual appliance. For information about the other methods, see the Oracle VM documentation.
Create an Oracle VM Virtual Machine by Using a Virtual Appliance

Before you can create a virtual machine by using a virtual appliance, the virtual appliance must already be imported in the Oracle VM repository. For information about how to import virtual appliances, see the Oracle VM Concepts Guide for Release 3.4.

1. Connect to the Oracle VM Manager user interface at https://<OCI_instance_public_IP>:7002/ovm/console and log in with the correct user name and password.

2. Click the Servers and VMs tab and then click the Create Virtual Machine button to create one Oracle VM virtual machine.

3. In the Create Virtual Machine wizard, select Clone from an existing Virtual Appliance, and then click Next.
4. On the next page of the wizard, enter the following values:
   - Repository: Select the Oracle VM repository where the virtual appliance resides (for example, repo01-bv).
   - Virtual Appliance: Select the virtual appliance source to use to create the virtual machine (for example, ol7u3_pvhvm).
   - Server Pool: Select the Oracle VM pool to which to deploy the virtual machine (for example, oci-clustered-pool).

5. Click **Finish** to confirm the virtual machine creation.

   **Note:** After the virtual machine is created, you must configure one or more VNICs before starting the virtual machine. Usually a virtual machine created from an Oracle VM template or appliance, or a clone virtual machine, already has one VNIC configured. In such cases, we recommend that you perform one of the following steps:
   - Delete the existing VNIC if you want to add an Oracle Cloud Infrastructure VNIC
   - Configure the existing VNIC to point to the configured local bridge

**Oracle VM VNIC Creation**

This section describes how to create, list, and delete an Oracle Cloud Infrastructure VNIC, and how to create an Oracle VM Intra-Network VNIC.

**Create an Oracle Cloud Infrastructure VNIC**

Before you can create a VNIC, the following requirements must be met:

- The **vnic-add** script must be run with the user **opc**.
- If the virtual machine has been created by using an Oracle VM template or appliance and the VNIC to the Oracle VM local bridge, remove the VNIC by using the Oracle VM Manager user interface.
- The Oracle VM virtual machine is stopped.
You must have the following information:

- Oracle VM Manager user ID and password
- Oracle VM virtual machine UUID (see the following example)
- Oracle Cloud Infrastructure subnet ID (the subnet created for virtual machines, as shown in the following example)
- Oracle Cloud Infrastructure compartment ID (see the following example)

Note: The script uses the compartment ID to help identify the instance, not as the compartment in which to place the VNIC.
Oracle Cloud Infrastructure instance ID (for the Oracle VM Server with which the VNIC needs to be associated)

Steps

1. Connect to the Oracle VM Manager instance with user opc.

2. Activate the Oracle Cloud Infrastructure environment by running the following command:

```bash
# ./.env-oci/bin/activate
```
3. Run the following command to create the VNIC and associate it with the virtual machine.

```
# cd ovm-oci
# ./vnic-add
```

**Note:** The virtual machine must be stopped.

The script output reports the IP address that must be used within the Oracle VM virtual machine (private IP address) and the public IP address.

4. Verify that the VNIC was created and associated with the virtual machine:
   - In the Oracle VM Manager user interface, check the MAC address associated with the VNIC.
   - In the Oracle Cloud Infrastructure Console, verify that the VNIC was created and associated with the Oracle VM Server instance. You can also verify the private IP address that must be configured within the Oracle VM virtual machine and the public IP address that will allow direct access.
List Oracle Cloud Infrastructure VNICs

Use the `vnic-list` command to get the list of Oracle Cloud Infrastructure VNICs associated with an Oracle VM virtual machine.

Before you can list the VNICs, you must run the `vnic-list` script with the user `opc`.

1. Connect to the Oracle VM Manager instance with the user `opc`.

2. Activate the Oracle Cloud Infrastructure environment by running the following command:

   ```bash
   # ./venv-oci/bin/activate
   ```

3. Run the following command to list the Oracle Cloud Infrastructure VNICs for the virtual machine:

   ```bash
   # cd ovm-oci
   # ./vnic-list
   ```
Delete an Oracle Cloud Infrastructure VNIC

Before you can delete an Oracle Cloud Infrastructure VNIC, the following requirements must be met:

- The `vnic-delete` script must be run with the user `opc`.
- The Oracle VM virtual machine is stopped.
- You must have the following information:
  - Oracle VM Manager user ID and password
  - Oracle Cloud Infrastructure compartment ID (For an example, see the requirements in “Create an Oracle Cloud Infrastructure VNIC.”)
  - Oracle Cloud Infrastructure instance ID (For an example, see the requirements in “Create an Oracle Cloud Infrastructure VNIC.”)
  - Oracle VM Manager VNIC ID (for the VNIC that needs to be removed) associated with the virtual machine (See the following example.)

Steps

1. Connect to the Oracle VM Manager instance with the user `opc`. 
2. Activate the Oracle Cloud Infrastructure environment by running the following command:

```
# ./.venv-oci/bin/activate
```

3. Run the following command to delete the VNIC.

```
# cd ovm-oci
# ./vnic-delete
```

**Note:** The virtual machine must be stopped

4. Verify that the VNIC is deleted on both the Oracle VM Manager user interface and the Oracle Cloud Infrastructure Console.
   - In the Oracle VM Manager user interface, check the **Networks** tab for the server instance.
In the Oracle Cloud Infrastructure Console, check the Attached VINCs section of the server instance page.

Create an Oracle VM Intra-Network VNIC

You can create Oracle VM Intra-Network VNICs by using the Oracle VM Manager user interface. Before you create the VNIC, the Oracle VM Intra-Network must have been set up.

1. Connect to the Oracle VM Manager user interface.
2. On the **Servers and VMs** tab, click the Oracle VM virtual machine, and then click the Edit button in the right-side pane.
3. In the **Edit Virtual Machine** dialog box, click the **Networks** tab and specify the following values:

- To get a random HW-ADDR for the VNIC, select **Dynamically Assign MAC Address**.
- To specify a custom HW-ADDR for the VNIC, select **Specify MAC Address** and then enter the address.
- In the **Network** menu, select the Oracle VM Intra-Network that is available on the Oracle VM Server instance (for example, **Intra-Network for srv01**).

4. Click **Add VNIC** and then click **OK** to create the VNIC.

### Backup Options for Oracle VM on Oracle Cloud Infrastructure

This section discusses backup options for Oracle VM Manager, Oracle VM Server, and Oracle VM virtual machines running in an Oracle Cloud Infrastructure environment.

#### Oracle VM Manager

Although Oracle VM Manager is used for day-to-day monitoring and management of the environment, it is not critical to the successful continuation of your Oracle VM environment (model) in the event of disaster or the loss of the instance where Oracle VM Manager is installed. The Oracle VM Server instances and virtual machines will continue to function for short or extended periods of time during the temporary loss of Oracle VM Manager. However, because the Oracle VM Manager instance acts as an internet gateway for all the Oracle VM Server instances managed, without it the Oracle VM Server instances can’t execute operations that actively work with external resources (for example, YUM repositories).
The Oracle VM Manager database should be backed up daily, or even more frequently if many changes are being made. The Oracle VM Manager database is the only data store in which all of the information about every aspect of the model is maintained. In particular, simple names and descriptions of physical and virtual disks, elements of the network infrastructure, Oracle VM Servers, and guests are maintained only in the Oracle VM Manager database. In addition, information about the storage arrays, access groups, and other relationships between objects is maintained only there.

Critical Oracle VM Manager Files and Directories

Oracle VM Manager is built on top of Oracle WebLogic Server. Almost everything about the product is contained in a single directory with a few exceptions.

- **Oracle VM Manager application**: Everything about Oracle VM Manager, including the WebLogic binaries, JAR files, WAR files, and scripts, is contained within the `/u01` directory structure. The only pieces of Oracle VM Manager that are contained outside of `/u01` are the Oracle VM Manager configuration file and the MySQL Enterprise Backup product.

- **Oracle VM Manager data files**: All data related to the Oracle VM model is contained in the `/u01` directory structure. The specific location of the data files is `/u01/app/oracle/mysql/data`.

- **Oracle VM Manager configuration file for database**: The `/u01/app/oracle/ovm-manager-3/.config` file is created during the installation process by `runInstaller.sh` and contains key information about accessing the database and the core product being managed by the WebLogic server. This file is removed when you uninstall Oracle VM Manager.

- **Oracle VM Manager configuration file for backups**: The `/etc/sysconfig/ovmm` file is created by the initial installation. It contains persistent information about the Oracle VM Manager UUID and information required by the MySQL Enterprise Backup to perform the daily automated backup of the Oracle VM database when MySQL is used. This file remains in place if you uninstall Oracle VM Manager. It is used by the installation script if you reinstall Oracle VM Manager to ensure that the product is reinstalled using the UUID from a previous installation.

Critical Oracle VM Automated Backup Files and Directories

Oracle VM Manager performs daily full automated hot backups of the Oracle VM database by using the MySQL Enterprise Backup application, which is included in the Oracle VM Manager installation. The automated backups are rotated daily and have a retention period of 15 days. For the latest information about automated backups for Oracle VM, see the *Oracle VM 3 Installation and Upgrade Guide*.
MySQL backup data: The default location for each backup on the Oracle VM management server is `/u01/app/oracle/mysql/dbbackup`. Each daily backup is completely self-contained under `.../dbbackup/AutoFullBackup-<date>-<time>`. The daily backups are the key to a successful recovery and are the only data that should be backed up and saved to a secure location. Everything else about the Oracle VM Manager can be reinstalled easily from scratch, but the data contained in the individual backups is critical for a full and painless recovery. Each backup includes all of the data and transaction logs needed to accomplish a full restore.

MySQL backup product: The automated daily backups are accomplished using MySQL Enterprise Backup, which resides in `/opt/mysql/meb*`.

OCI Block Volume and Oracle VM Manager Backup Location

Everything in the `/u01` directory is deleted when you uninstall Oracle VM Manager. Changing the location for the backup directory protects the daily backups from being inadvertently deleted if Oracle VM Manager is uninstalled and then reinstalled. To change the default location for the automated backups, edit the `/etc/sysconfig/ovmm` file and change `DBBACKUP=/u01/app/oracle/mysql/dbbackup` to use a new path that points to a new Oracle Cloud Infrastructure block volume attached to the Oracle VM Manager instance.

Oracle recommends that MySQL Enterprise Backup write all backups to another storage device, mounted to the default backup directory specified in the `/etc/sysconfig/ovmm` file. If you decide to use such a solution, then the file system should be sized to accommodate a rotation of 15 daily backups, plus some space for additional growth and periodic, ad hoc backups.

For more information about backup options for Oracle VM Manager, see the Oracle VM 3: Backup and Recovery Best Practices Guide white paper.

Oracle VM Server

An Oracle VM Server instance is composed of the Xen hypervisor and privileged domain (Dom0) that is installed on physical, bare metal instances. The server instances constitute the entire runtime platform for Oracle VM guests and provide processing power and other resources such as memory, access to networks, access to storage, and cluster capabilities for high availability of Oracle VM guests. Oracle VM Server instances that belong to nonclustered server pools using local disk must be backed up because all critical data about the Oracle VM guests resides on local disk as opposed to shared storage. Oracle VM Server instances that belong to clustered and nonclustered server pools using shared disk should also be backed up.

For more information about backup options for Oracle VM Server, see the Oracle VM 3: Backup and Recovery Best Practices Guide white paper.
Oracle VM Virtual Machines

Oracle VM guests are virtual machines that host the guest operating systems, databases, and applications that make up various business systems within your Oracle VM environment. All the main parts of each Oracle VM virtual machine are part of the storage repositories. This distinction is important because although the virtual machines run in Oracle VM Server instances, all the configuration files and virtual disks for each Oracle VM guest reside in the storage repository. Backups and recoveries of Oracle VM guests can be complex because any possible Oracle Cloud Infrastructure block volumes directly associated with guest operating systems are artifacts of the Oracle VM Server instances and are not part of the storage repositories. In addition, your deployment architecture might include applications and data files that are presented to guest operating systems from NFS exports being served from many different NFS servers instead of residing on virtual disks within storage repositories.

For more information, see the Oracle VM 3: Backup and Recovery Best Practices Guide white paper.

Maintenance and Upgrade of Oracle VM on Oracle Cloud Infrastructure

Oracle VM images for Oracle Cloud Infrastructure will be maintained as Oracle already maintains standard software releases. That said, the upgrade of existing Oracle VM instances can be managed by using the following guidelines.

Upgrade Oracle VM Manager

Oracle VM Manager is installed on top of an Oracle Linux 7 instance. This instance can be managed, upgraded, and maintained by following best practices for Oracle Linux. For details, see Getting Started: Oracle Linux for Oracle Cloud Infrastructure.

Oracle VM Manager upgrade is required only when a new major/minor release is available.

The first component that must be upgraded is Oracle VM Manager. To upgrade Oracle VM Manager, proceed with the following steps:

1. Download the updated release of Oracle VM Manager (ISO format) and copy it to the Oracle VM Manager instance.
2. Verify that the Oracle VM Manager service is running:

   ```
   # sudo systemctl status ovmm.service
   ```
3. Mount the Oracle VM Manager ISO file by a loop device:

```
# sudo mount -o loop <iso_file> /mnt
```

4. As root, start the Oracle VM Manager upgrade script (`runInstaller.sh`) and follow the upgrade wizard by selecting the **2: Upgrade** option.

Oracle VM Server

Oracle VM Server instance upgrades and maintenance can be of two different types:

- Major/minor release upgrade. For example, upgrade from Oracle VM Server 3.4.4 to Oracle VM Server 3.4.5.
- Server maintenance because of bugs, security holes, and enhancements.
For major/minor release upgrades, the upgrade process must be managed by following the instructions in the Oracle VM Installation and Upgrade Guide for Release 3.4. Server maintenance can be applied by using the Yum package manager.

Perform Server Maintenance for Oracle VM Server Instances

To configure the server maintenance, perform the following steps.

**Note:** The Oracle VM Server instance requires a system reboot to upgrade.

1. Connect to the Oracle VM Manager user interface at https://<OCI_Instance_Public_IP>:7002/ovm/console and log in with the correct user name and password.

2. Click the Reports and Resources tab, click Server Update Groups, and then click GlobalX86ServerUpdateConfiguration in the left-side pane.
3. Click the add button to add the Server Update Repository for Oracle VM 3.4, and enter the following values:
   - Name: **Oracle VM 3.4 Latest**
   - Repository Name: **ovm_34_latest**
   - Enabled: Select the check box.
   - Package Signature Type: **GPG**
   - Package Signature Key: **http://yum.oracle.com/RPM-GPG-KEY-oracle-ol6**

4. Click **OK**.

After it is configured, the Yum configuration is available for all Oracle VM Server instances that are managed by the Oracle VM Manager instance.

To upgrade one Oracle VM Server instance, perform the following steps in the Oracle VM Manager user interface:

1. Click the **Servers and VMs** tab, expand **Server Pools** in the left-side pane, and click the Oracle VM Server instance that you want to upgrade (for example, **srv01**).

2. From the **Perspective** menu, select **Virtual Machines** and verify that no virtual machines are running on this server.
3. In the left-side pane, right-click on the server instance and select **Update** from the menu.

![Image of Oracle VM Manager interface]

4. In the Confirmation dialog box, click **OK** to confirm that you want to install all the updates available for the server instance.

An Oracle VM Manager job starts.

![Image of job summary]

Wait for the upgrade process to complete before proceeding with other Oracle VM Server update processes.

**Troubleshooting**

This section describes how to resolve some common issues that you might encounter when running Oracle VM on Oracle Cloud Infrastructure.

**Oracle VM Manager Service Must Be Reinstalled**

Oracle VM Manager identifies itself by one unique ID (UUID), and this ID is required to reinstall Oracle VM Manager.
The Oracle VM Manager installation process evaluates whether the `/etc/sysconfig/ovmm` configuration file with software definitions is available. The solution described here uses this file to properly reinstall Oracle VM Manager by using the original UUID.

The following image shows an example of the `/etc/sysconfig/ovmm` file:

![Example of `/etc/sysconfig/ovmm` file](image)

To reinstall Oracle VM Manager on an existing Oracle Cloud Infrastructure instance, perform the following steps:

1. As the `opc` user, back up the existing Oracle VM Manager `sysconfig` configuration file:

   ```bash
   # sudo cp /etc/sysconfig/ovmm /home/opc/ovmm.original
   ```

2. As the `opc` user, uninstall the existing Oracle VM Manager service:

   ```bash
   # sudo mount -o loop /home/opc/ovmm-3.4.4-installer-OracleLinux-b1722.iso /mnt (refer to the proper Oracle VM Manager ISO)
   # sudo /mnt/runInstaller.sh -i Uninstall
   ```
3. Confirm with 1 to proceed with the Oracle VM Manager software uninstallation.

4. After the uninstallation process is complete, unmount the Oracle VM Manager software ISO:

   ```
   # sudo umount /mnt
   ```

5. Copy back the Oracle VM Manager `sysconfig` configuration file by running the following command:

   ```
   # sudo cp -f /home/opc/ovmm.original /etc/sysconfig/ovmm
   ```

6. Reinstall the Oracle VM Manager software by using the procedure described earlier in this document.

Oracle Cloud Infrastructure VNIC Can’t Be Deleted if the Oracle VM Virtual Machine Does Not Exist

One Oracle VM virtual machine, still configured with an Oracle Cloud Infrastructure VNIC, has been deleted by Oracle VM Manager, and the `vnic-delete` script can’t properly delete the Oracle Cloud Infrastructure VNIC that was associated with the virtual machine.
The `vnic-delete` script must have access to the virtual machine to properly delete a VNIC associated with it. If the virtual machine is not available anymore, the only solution is to remove the VNIC by using the Oracle Cloud Infrastructure Console.

You must identify the VNIC by evaluating the list of Oracle Cloud Infrastructure VNICs attached to the Oracle VM Server instance.

**Debug the Oracle Cloud Infrastructure VNIC Scripts**

The scripts dedicated to Oracle Cloud Infrastructure VNIC management could require higher log levels to be analyzed. To debug script execution, use the `--log-level` option:

```
# vnic-add --log-level debug
# vnic-delete --log-level debug
# vnic-list --log-level debug
```

**Oracle Cloud Infrastructure VNIC Creation Fails with "data" from the Command Execution**

When you are running the `vnic-add` script to create and associate an Oracle Cloud Infrastructure VNIC with an Oracle VM virtual machine, you get the output 'data' and the VNIC creation fails. For example:

```
[opc@jia-ovm]$ ./vnic-add
Enter your OVM Manager username: admin
Enter your OVM Manager password:
Enter OVM VM id: 0004fb0000064327978a799c8c5944b
Enter OCI subnet id: ocid1.subnet.oc1.iad.babababakda37tnafg6i72qaky7wuzon7okye4pgyvcxwyw6azdsurb2a
Enter OCI compartment id: ocid1.compartment.oc1..aaaaaaaaphra62tbimbajtr31rwkp6amdihy704fdr3a5q1h23tx1mjibtpa
'data'
```

The workaround is to specify the instance ID when adding the VNIC. For example:

```
[opc@jia-ovm]$ ./vnic-add --vm-id 0004fb0000064327978a799c8c5944b --subnet-id ocid1.subnet.oc1.iad.babababakda37tnafg6i72qaky7wuzon7okye4pgyvcxwyw6azdsurb2a --compartment-id ocid1.compartment.oc1..aaaaaaaaphra62tbimbajtr31rwkp6amdihy704fdr3a5q1h23tx1mjibtpa --instance-id ocid1.instance.oc1.iad.abuwcljrr1ajwlpwyzxzn3lc6rvximf17uia2bvg544wu2ym1234563zf2ia
Enter your OVM Manager username: admin
Enter your OVM Manager password:
Successfully created new VNIC on VM vm3.1
Private IP address: 10.0.100.6
MAC address: 02:00:17:00:35:59
OVM VNIC Id: 0004fb00000000000333fd0ee0581231b6
```
Unable to Reach Oracle VM Virtual Machine Using Oracle Cloud Infrastructure Public IP Address

The Oracle VM virtual machine has been configured with an Oracle Cloud Infrastructure VNIC and associated with a public IP address associated, but the virtual machine same can't be reached by using the Oracle Cloud Infrastructure public IP address. Following are possible causes:

- The security list for the virtual machine is not properly configured. Verify that required ports (like 22) have been configured on the security list for the virtual machine.
- The Oracle VM virtual machine network configuration is not correct. Verify the VNIC configuration within the virtual machine. For example:
  - IP address: 10.0.11.10 (IP address on the Oracle VM virtual machine subnet)
  - Netmask: 255.255.255.0 (/24 or what you’ve configured on Oracle Cloud Infrastructure)
  - Gateway: 10.0.11.1 (first IP address available within the subnet defined)
  - DNS: 169.254.169.254 (default DNS for Oracle Cloud Infrastructure)

vmpinfo3 Command Hangs in "xm debug-keys" during sosreport of Oracle VM Server

The vmpinfo3 command may hang in "xm debug-keys" during sosreport collection of Oracle VM Server as per the following logs from the /var/log/messages file:

```
Sep 29 12:17:32 hostx kernel: [60381.630022] qla2xxx [0000:09:00.0]-1915:2: host status: 0x40050011, flags:0x0, intr ctrl reg:0x8, intr status:0x0
Sep 29 12:23:55 hostx kernel: [60764.236736] INFO: rcu_sched detected stalls on CPUs/tasks: {
Sep 29 12:23:55 hostx kernel: [60764.236742] NMI watchdog: BUG: soft lockup - CPU#5 stuck for 89s! [swapper/5:0]
```

See KM Note 2336239.1 to get a resolution for this issue.
Conclusion

You have successfully deployed Oracle VM on Oracle Cloud Infrastructure, a solution that has the following benefits:

- Enables rapid enterprise application deployment, such as Oracle Database, Middleware, and Applications, as well as many non-Oracle applications
- Supports Oracle Linux, Microsoft Windows, Oracle Solaris, and many other Linux distributions
- Does not have any compatibility or installation issues, because of the Oracle VM images
- Enables the application of existing Oracle VM on-premises knowledge, practices, tools, and support while running on Oracle Cloud Infrastructure
- Introduces the option to easily migrate workloads from on-premises to Oracle Cloud Infrastructure
- Introduces the option to create your required shape for virtual machines