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Journey to Oracle Cloud Infrastructure with Oracle VM VirtualBox

Oracle VM VirtualBox Technical Paper

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Public

Purpose statement

This document provides an overview of features and enhancements included in Oracle VM VirtualBox 6 release.

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Introduction

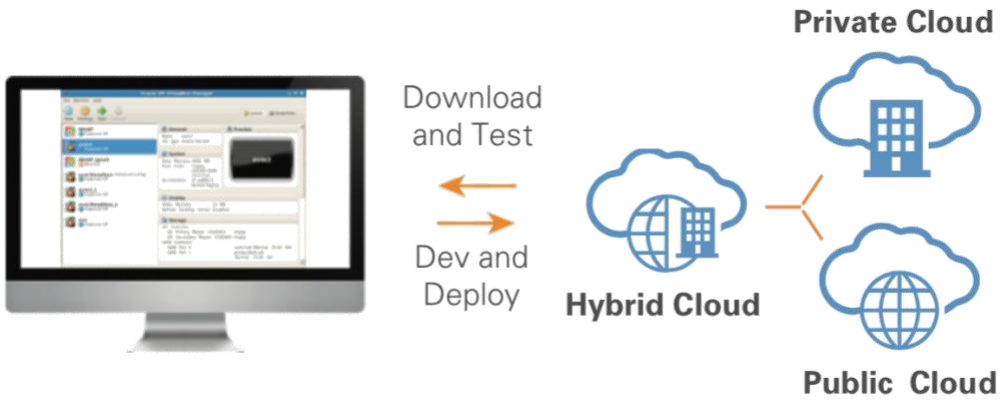
Oracle VM VirtualBox 6 provides tight integration with Oracle Cloud Infrastructure (OCI), enabling organizations and developers to more easily and flexibly create applications on premises and deploy to the cloud with a few clicks.

Requirements:

- Oracle VM VirtualBox 6.1
- Oracle Cloud Infrastructure access

This technical white paper is a guide to the steps required to get local Virtual Machines, running on Oracle VM VirtualBox 6, easily migrated to Oracle Cloud Infrastructure with simple steps. This document includes:

- Required Setup on Oracle Cloud Infrastructure Tenant
- Required Setup on Oracle VM VirtualBox
- Example of Virtual Machine migration from Oracle VM VirtualBox to Oracle Cloud Infrastructure
- Example of Virtual Machine migration from Oracle Cloud Infrastructure to Oracle VM VirtualBox



Oracle Cloud Infrastructure Setup

The steps described in this section show how to setup an Oracle Cloud Infrastructure Compartment for guest Custom Images and how to start Custom Instances.

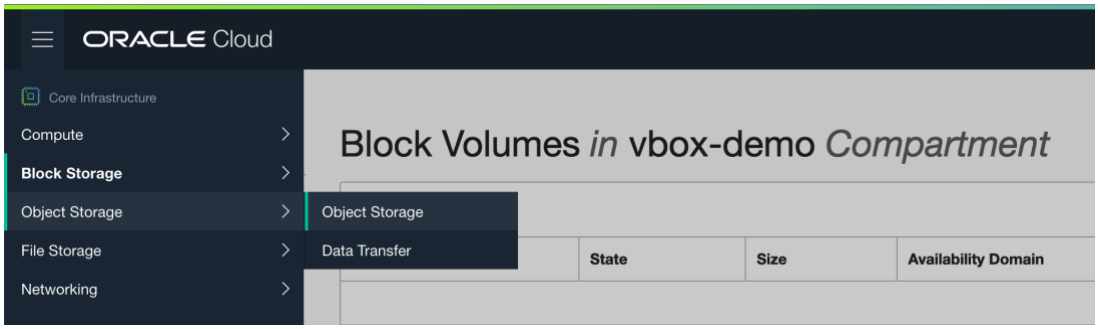
Oracle Cloud Infrastructure Bucket

A Bucket, part of the Oracle Cloud Infrastructure Object Storage service, is a container for storing objects in a compartment within an Object Storage namespace. A bucket is associated with a single compartment.

A Bucket is used by Oracle VM VirtualBox to upload and save the Virtual Machine Image on Oracle Cloud Infrastructure.

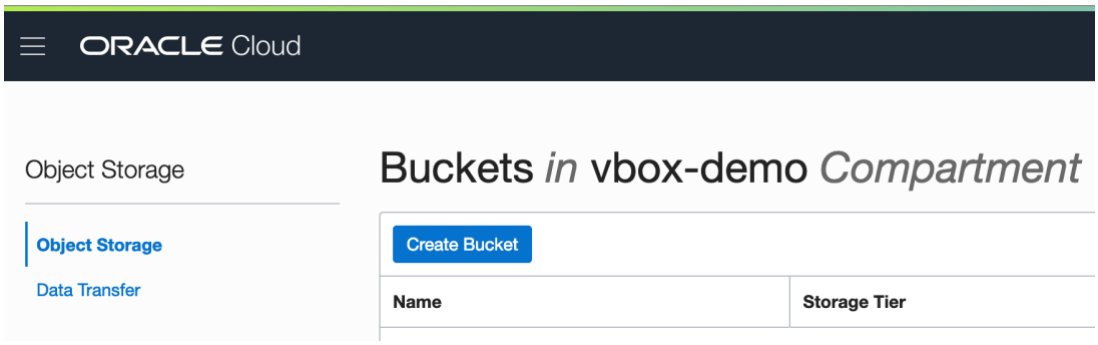
To create the required OCI Bucket, proceed with following steps:

- On the OCI Main Menu click on the "Object Storage" Navigation Tab



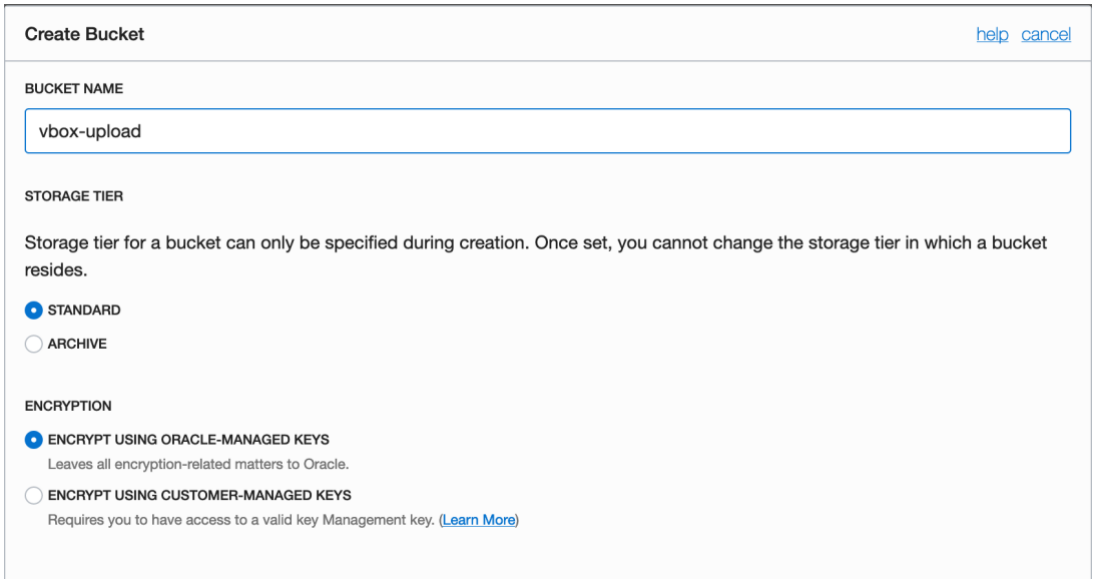
[Bucket] Figure 1. Object Storage

- Click on "Create Bucket" button



[Bucket] Figure 2. Create Bucket

- Choose the desired Bucket name and confirm the Bucket creation



[Bucket] Figure 3. Bucket name and confirmation

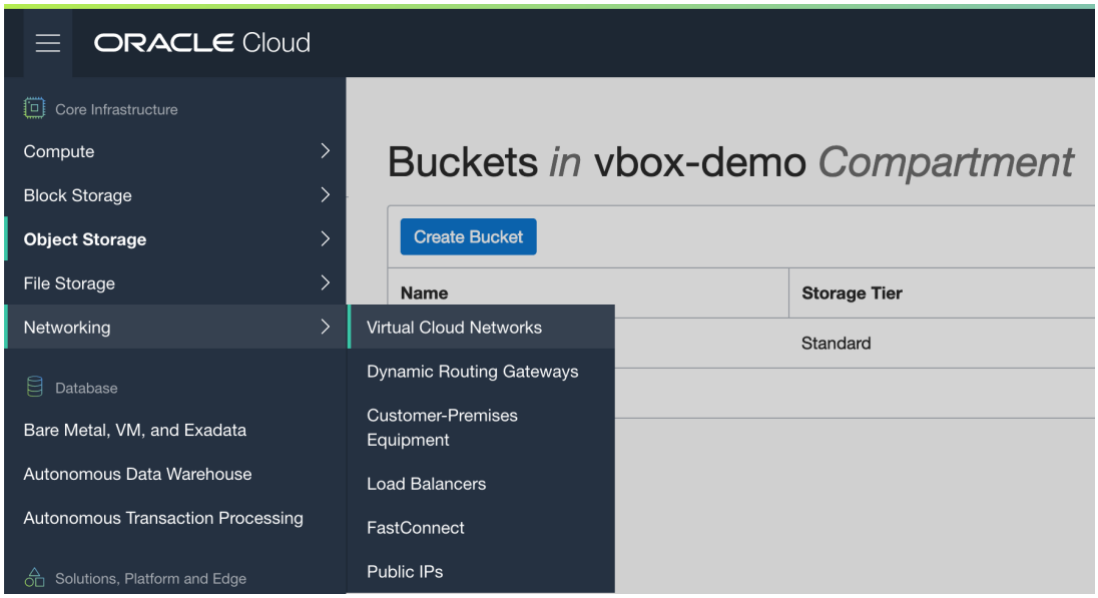
Further details on OCI Buckets are available in OCI Documentation – Managing Buckets.

Oracle Cloud Infrastructure Virtual Cloud Network (VCN)

OCI VCN is a virtual, private network that can be set up in Oracle data centers. It closely resembles a traditional network, with firewall rules and specific types of communication gateways. A VCN resides in a single Oracle Cloud Infrastructure region. Why is a VCN required?

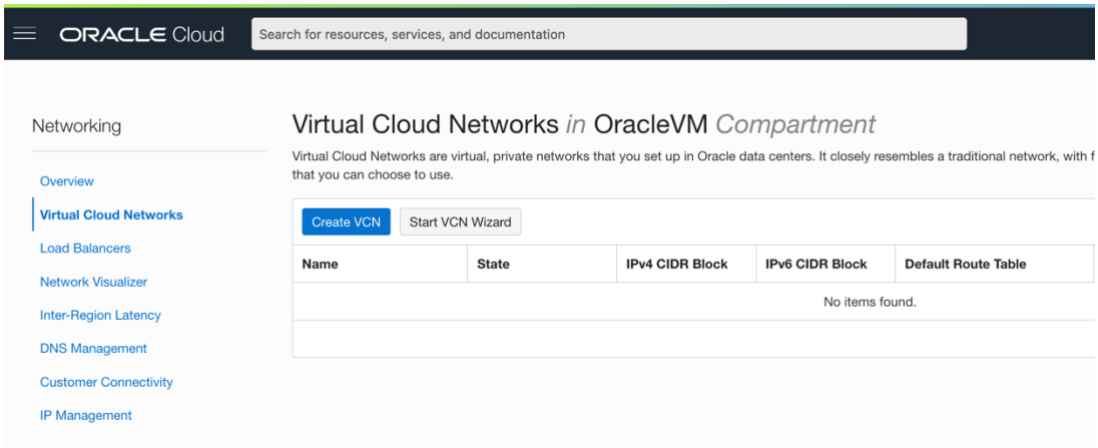
To create the required OCI VCN, proceed with the following steps:

- On the OCI Main Menu click on "Networking" => "Virtual Cloud Networks"



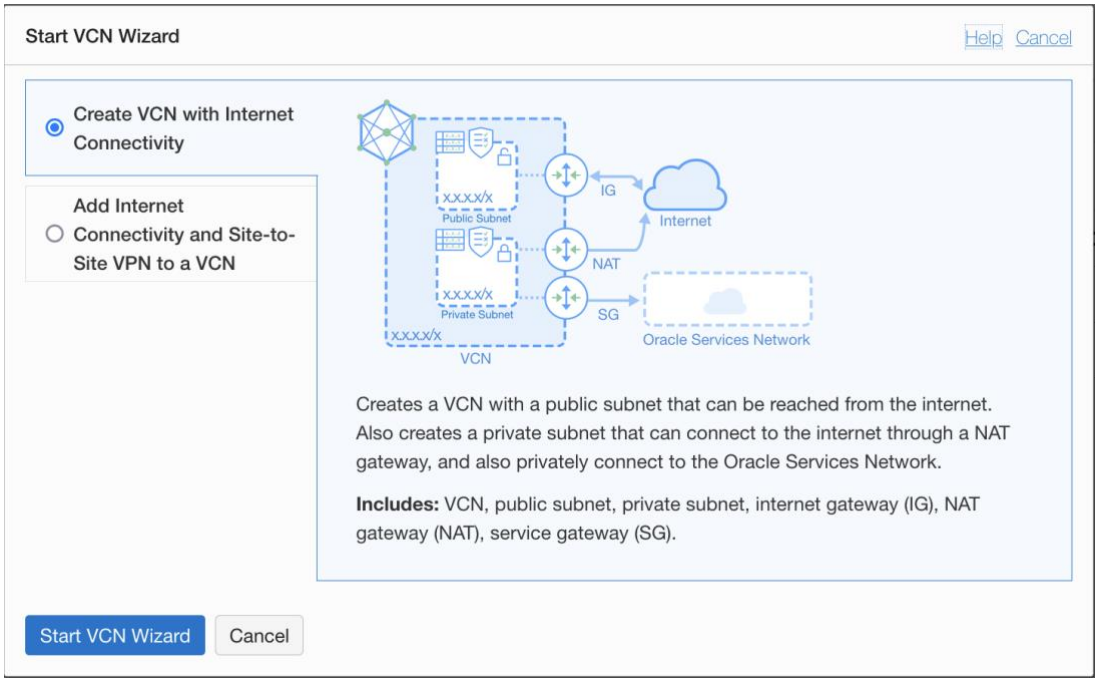
[VCN] Figure 1. Networking

- Click on "Start VCN Wizard" button



[VCN] Figure 2. Create OCI VCN

- Select "**Create VCN with Internet Connectivity**" and follow the VCN Wizard



[VCN] Figure 3. OCI VCN Details

The execution of this operation includes the creation of all the required networking components.

Further details on the above concepts are available in OCI Documentation:

- Oracle Cloud Infrastructure – Managing Compartments
- Oracle Cloud Infrastructure – VNC and Subnets
  - Route Tables
  - Internet Gateway
  - Security Lists
  - DHCP Options

Oracle VM VirtualBox Setup

Oracle VM VirtualBox 6 requires proper configuration to interact with a specific Oracle Cloud Infrastructure environment. All those information will be used by VirtualBox to authenticate, without any user prompt, with Oracle Cloud Infrastructure.

Requirements

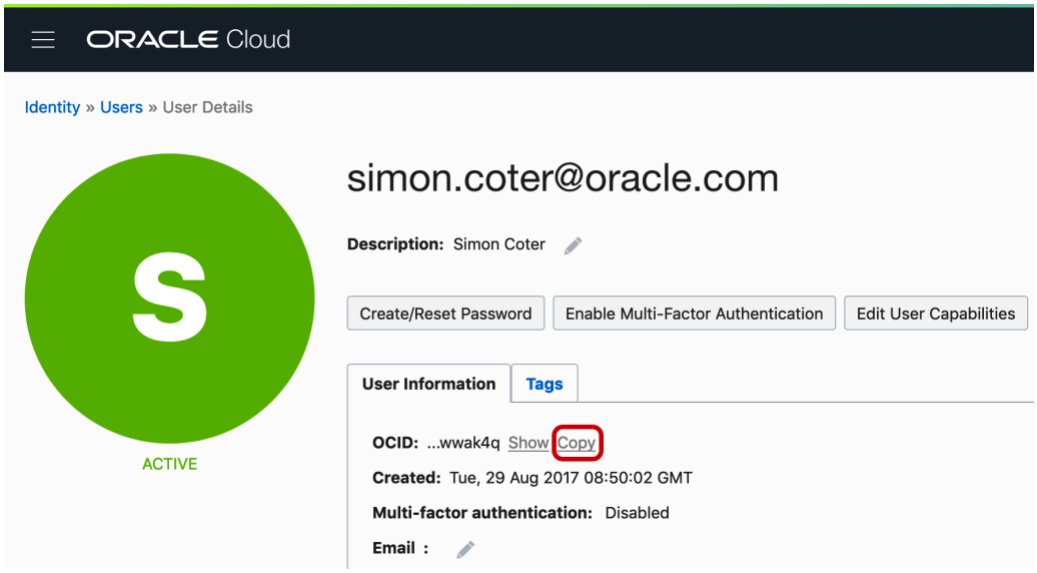
The first step is to collect a list of information, possibly in a text file, from the OCI Console:

- user
- tenancy
- region
- compartment
- key_file and fingerprint

User

The account used to connect to OCI has its own OCID. To collect this information, click on the upper-right side of the OCI console on the icon and select your email address.

In your account window, click on "Copy" to copy your User OCID to the clipboard:



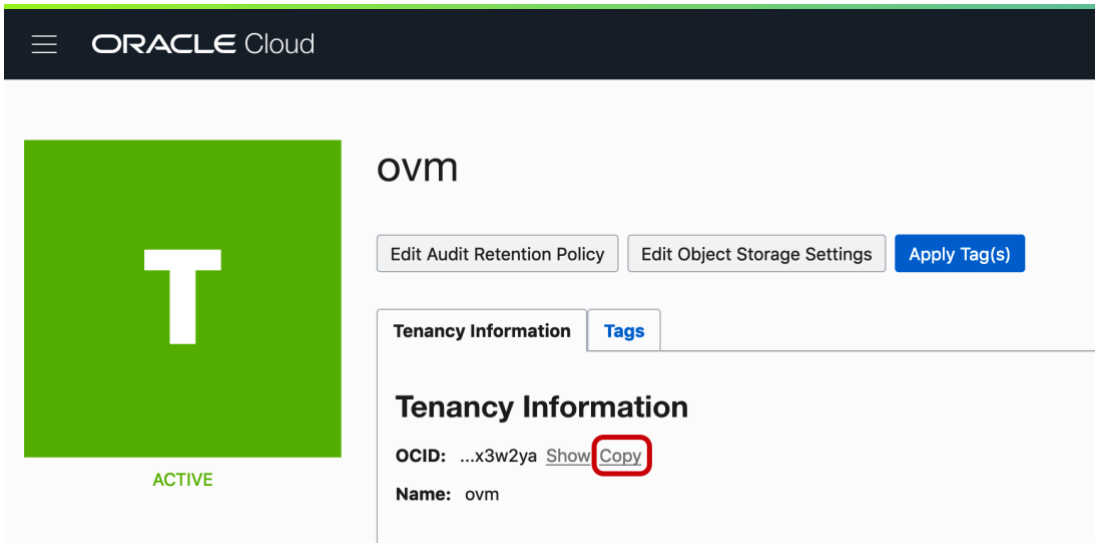
[VirtualBox Setup Requirements] Figure 1. User OCID

Save this User OCID in a temporary text file.

Tenancy

A tenancy is a secure and isolated partition within Oracle Cloud Infrastructure used to create, organize, and administer cloud resources. Each tenancy has its own OCID. To collect this information, click on the "OCI Main Menu" => "Administration" => "Tenancy Details".

In the "Tenancy Information" window, click on "Copy" to copy your Tenancy OCID to the clipboard:

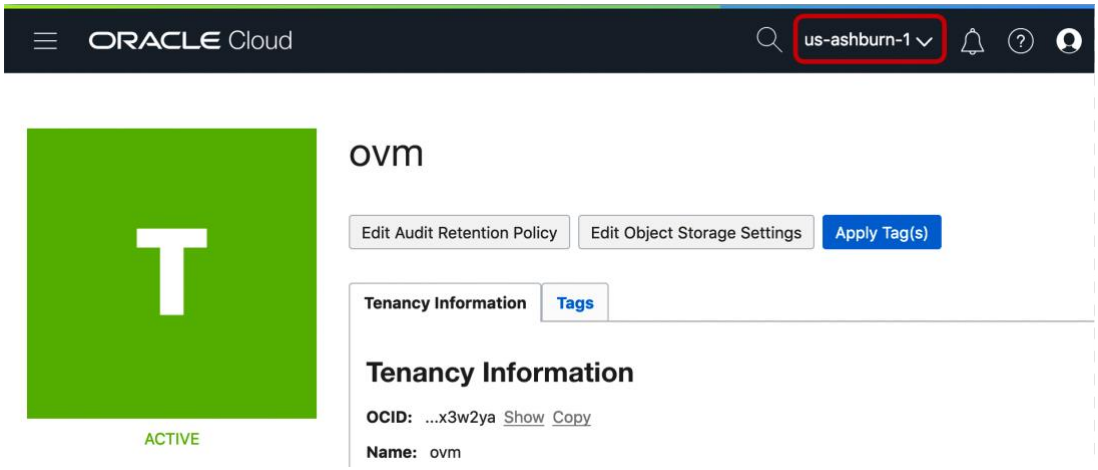


[VirtualBox Setup Requirements] Figure 2. Tenancy OCID

Save this Tenancy OCID in a temporary text file.

Region

A region is a specific geographic area. It is composed of one or more availability domains. An availability domain is one or more data centers located within a region. Each region can be identified by an easily recognized name, found in the upper-right corner of the OCI console:



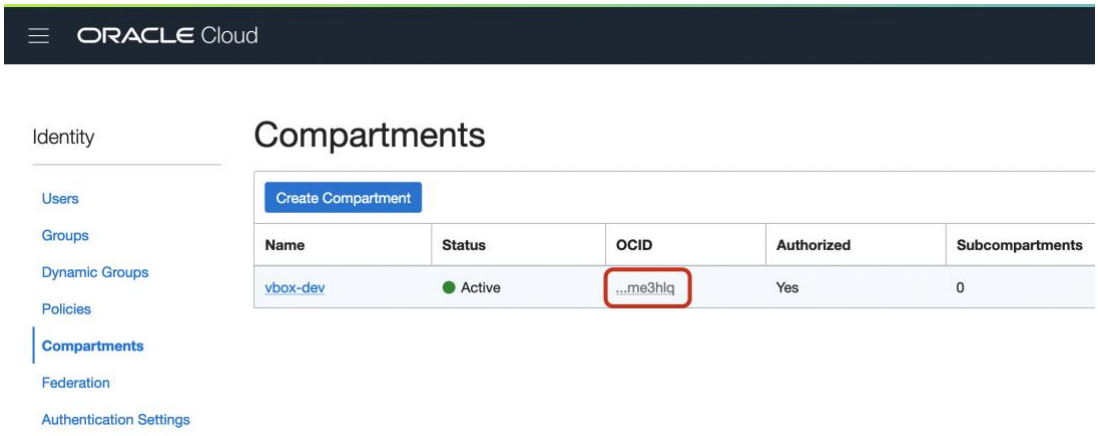
[VirtualBox Setup Requirements] Figure 3. Region

Save the Region name in a temporary text file.

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. Each compartment has its own OCID. To collect this information click on the "OCI Main Menu" => "Identity" => "Compartments".

In the "Compartments" window, click on the Compartment OCID and then on the "Copy" button to copy your Compartment OCID to the clipboard:



[VirtualBox Setup Requirements] Figure 4. Compartment

Save this Compartment OCID in a temporary text file.

Key File and Fingerprint

The "Key File" and "Fingerprint" have to be generated on your own system.

To accomplish this, follow the instructions in the OCI Documentation – Required Keys and OCID, starting at the section "**How to Generate an API Signing Key**".

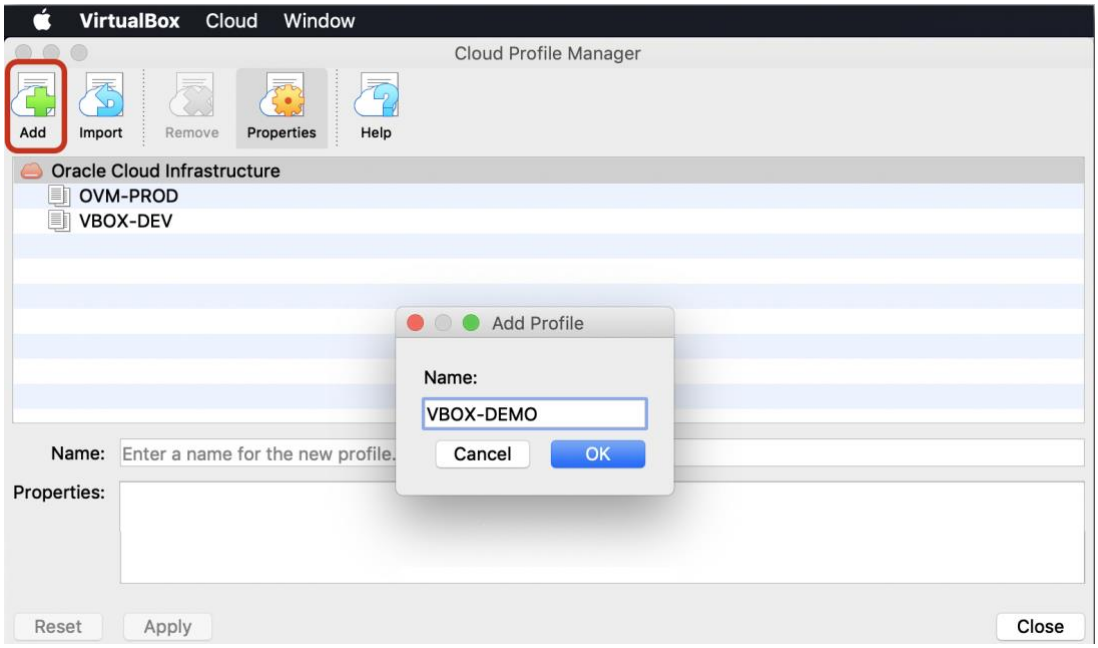
VirtualBox Configuration

Next, configure the OCI profile on Oracle VM VirtualBox.

- Launch the VirtualBox GUI and click on "File" => "Cloud Profile Manager"

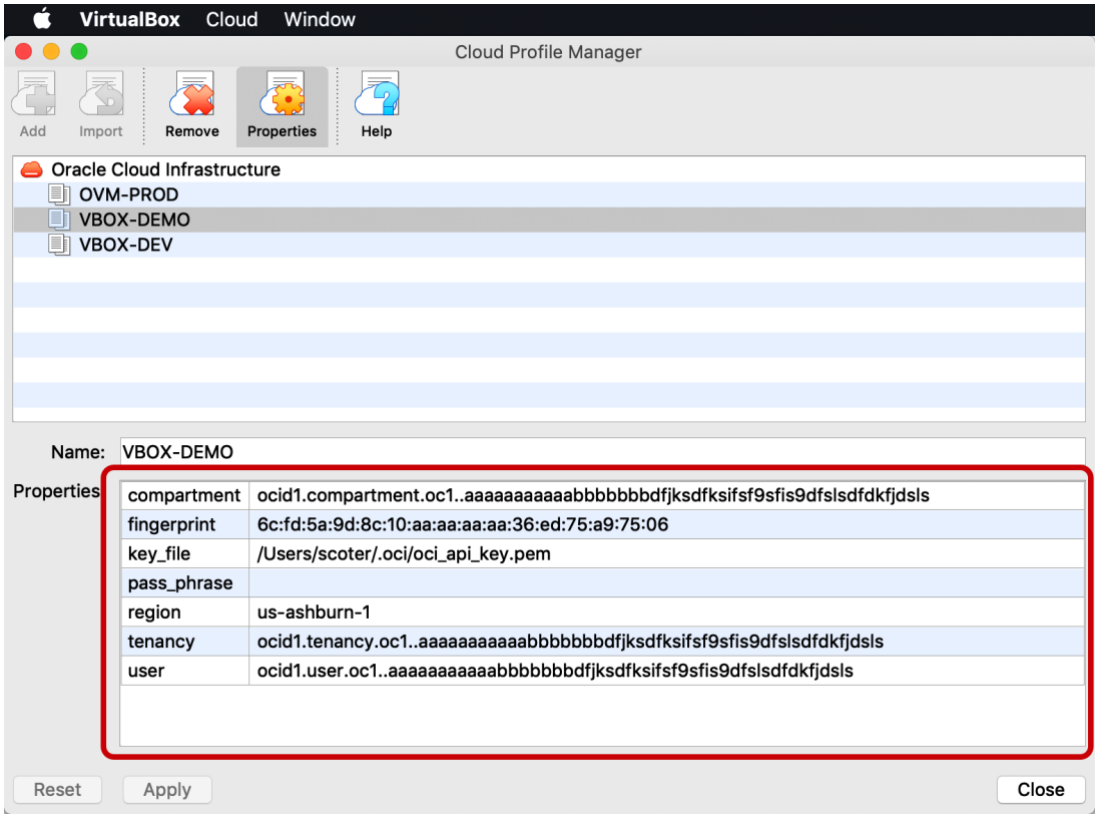
[VirtualBox Configuration] Figure 1. Start Cloud Profile Manager

- Click on the "Add" button and enter a Profile Name



[VirtualBox Configuration] Figure 2. Enter Profile Name

- Insert all the OCI values collected above, as shown in the following window



[VirtualBox Configuration] Figure 3. Enter OCI Configuration values

Virtual Machine Preparation for Oracle Cloud Infrastructure

Oracle Cloud Infrastructure provides the option to import a custom Linux image. Before a VirtualBox image can be exported to Oracle Cloud Infrastructure, the custom image needs to be prepared to ensure that instances launched from the custom image can boot correctly and that network connections will work. This section covers the steps to prepare custom Linux images for export/import.

VirtualBox has a powerful networking solution and can easily emulate many kinds of networking options. This section suggests some VirtualBox best practices that can help provide the best experience possible while migrating Virtual Machines to Oracle Cloud Infrastructure.

On VirtualBox, it is strongly suggested that a DHCP server be used for Virtual Machines, instead of a static IP address configuration. This configuration allows an IP address to be dynamically assigned for the Virtual Machine running on VirtualBox and, at the same time, assign an IP address for the Instance while running on Oracle Cloud Infrastructure.

The VirtualBox Virtual Machine vNIC will have a:

- different Hardware Address (MAC), compared to the same running on OCI
- different emulated Virtual NIC, compared to the same running on OCI

The following best practices are suggested:

Do not specify the HW-ADDR within the vNIC configuration

Within the vNIC configuration file `(ifcfg-<device-name>)` do not expose the HW-ADDR; example:

```
[root@ol8: /etc/sysconfig/network-scripts]# more ifcfg-eth0

DEVICE="eth0"

BOOTPROTO="DHCP"

ONBOOT="yes"

TYPE="Ethernet"

USERCTL="no"

PEERDNS="yes"
```

Keep consistent vNIC device names between VirtualBox and OCI

The following operations should be considered before exporting a Virtual Machine to OCI:

Oracle Linux 6/7 (grub2)

- Add "`net.ifnames=0 biosdevname=0`" to Grub for your Linux machines.
  Edit "`/etc/sysconfig/grub`" and add the following values to `GRUB_CMDLINE_LINUX` line:

```
# GRUB_CMDLINE_LINUX="net.ifnames=0 biosdevname=0"
```

- Update Grub2 configuration

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

- Verify there's no UDEV rules implemented for vNIC names under */etc/udev/rules.d*
- If an automated UDEV rule is created for net-persistence, evaluate a possible work around like:

```
# cd /etc/udev/rules.d

# rm -f 70-persistent-net.rules

# ln -s /dev/null /etc/udev/rules.d/70-persistent-net.rules
```

Oracle Linux 5/6 (grub)

- Add "`net.ifnames=0 biosdevname=0`" to Grub for your Linux machines.
  Edit "`/boot/grub/grub.conf`" and add following values to the Kernel line:

```
# kernel /vmlinuz-4.1.12-124.16.4.el6uek.x86_64 net.ifnames=0 biosdevname=0
```

- Verify there's no UDEV rules implemented for vNIC names under "`/etc/udev/rules.d`"
  If an automated UDEV rule is created for net-persistence, evaluate a possible work around like:

```
# cd /etc/udev/rules.d

# echo -n > 70-persistent-net.rules
```

Enable Virtual Machine Serial Console

Enable the serial console to possibly troubleshoot the Instance while running on OCI, if required.

1. Edit the `/etc/default/grub` file to update the following values:
   a. Remove `resume=` from the kernel parameters; it slows down boot time significantly.
   b. Replace `GRUB_TERMINAL="gfxterm"` with `GRUB_TERMINAL="console serial"` to use the serial console instead of graphics.
   c. Add `GRUB_SERIAL_COMMAND="serial --unit=0 --speed=115200"` to configure grub's serial connection.
   d. Replace `GRUB_CMDLINE_LINUX=""` with `GRUB_CMDLINE_LINUX="console=tty0 console=ttyS0,115200"` to add the serial console to the Linux kernel boot parameters.
2. Regenerate `initramfs` as follows:

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

3. To verify, reboot the machine, and then run `dmesg` and look for the updated kernel parameters.

```
# dmesg |grep console=ttyS0
```

VirtIO drivers and Paravirtualized option

To run "`Paravirtualized Instances`" on OCI, add paravirtualized device support by building the virtio drivers into the VM's `initrd/initramfs`.

1. Because this action works only on machines with a Linux kernel of version 3.4 or later, check that the system is running a modern kernel:

```
# uname -a
```

2. Rebuild `initrd` with the `dracut` tool, telling it to add the `qemu` module:

```
# dracut --logfile /var/log/Dracut.log --force --add qemu
```

3. Check `lsinitrd` to verify that the `virtio` drivers are now present:

```
# lsinitrd |grep virtio
```

For more information about these requirements, please refer to:

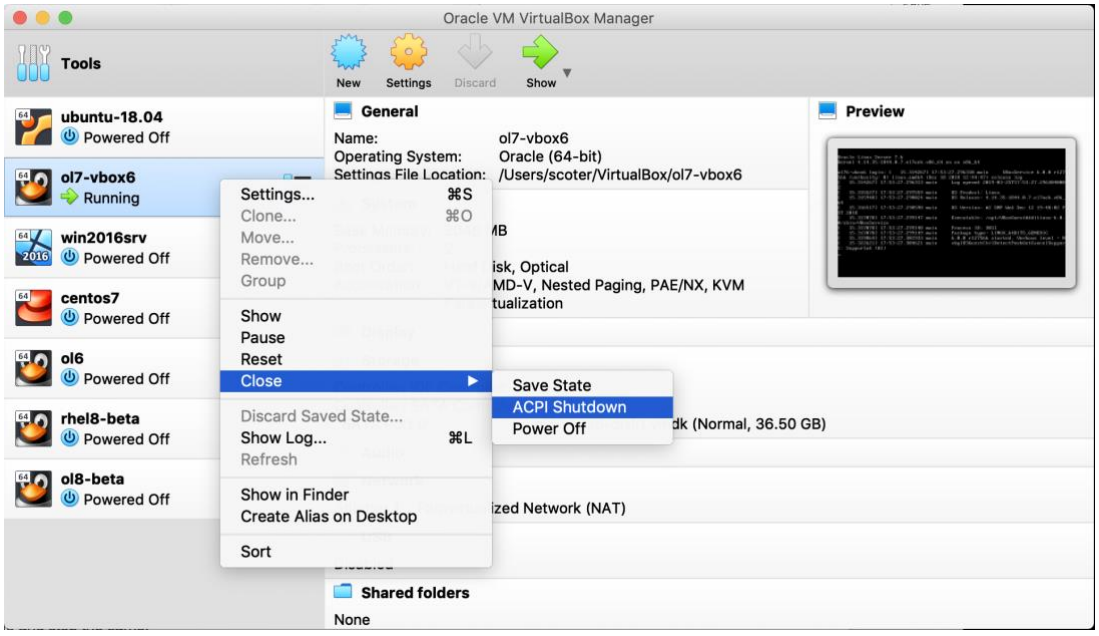
- Oracle Cloud Infrastructure Documentation – Preparing a Custom Linux Image for import
- Oracle Cloud Infrastructure Documentation – Preparing a Customer Windows Image for emulation mode

Virtual Machine Export to Oracle Cloud Infrastructure

Oracle VM VirtualBox 6 introduced the option to migrate a Virtual Machine to Oracle Cloud Infrastructure. All the steps required can be executed through the GUI, following these steps:

- Stop VirtualBox Virtual Machine

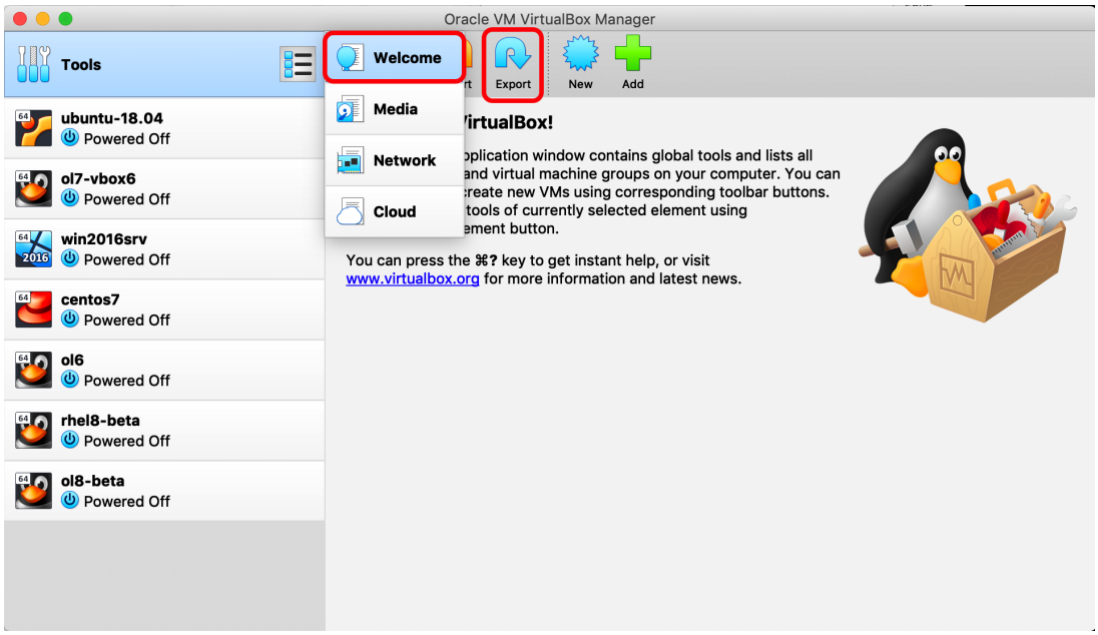
  A Virtual Machine has to be in stopped state to be exported. To accomplish this operation, select the Virtual Machine and stop it with "ACPI Shutdown" option.



[VirtualBox Export to OCI] Figure 1. Stop Virtual Machine

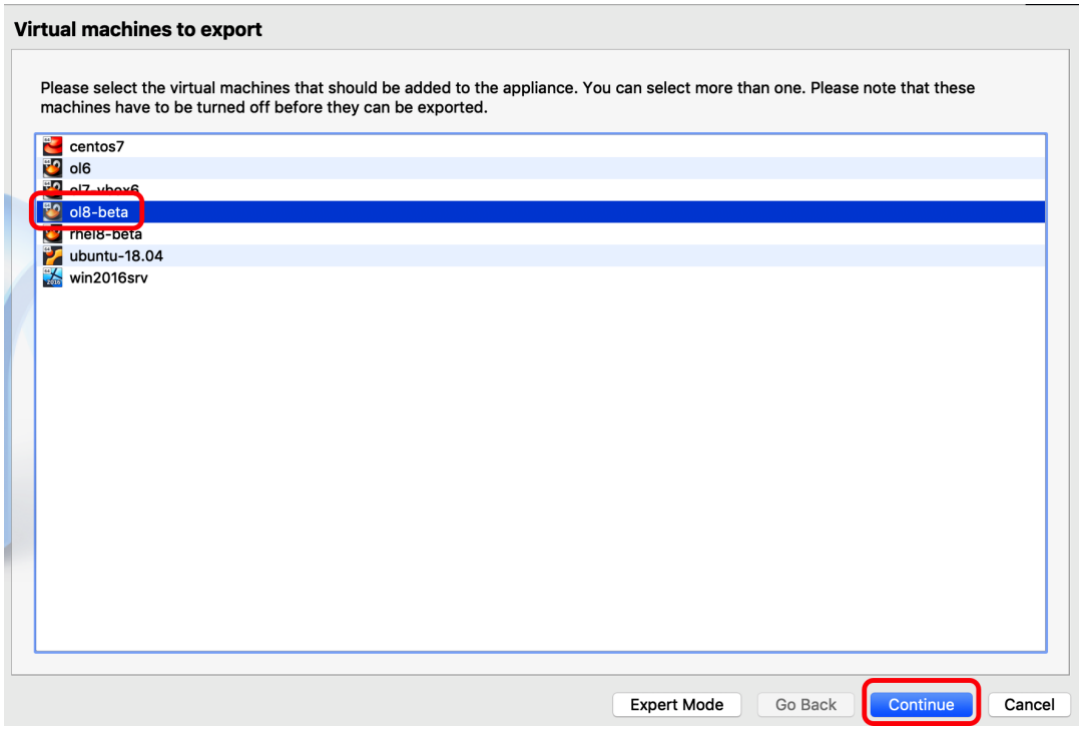
- Start the Export Process

Open the "Welcome" section and click on "Export" button.



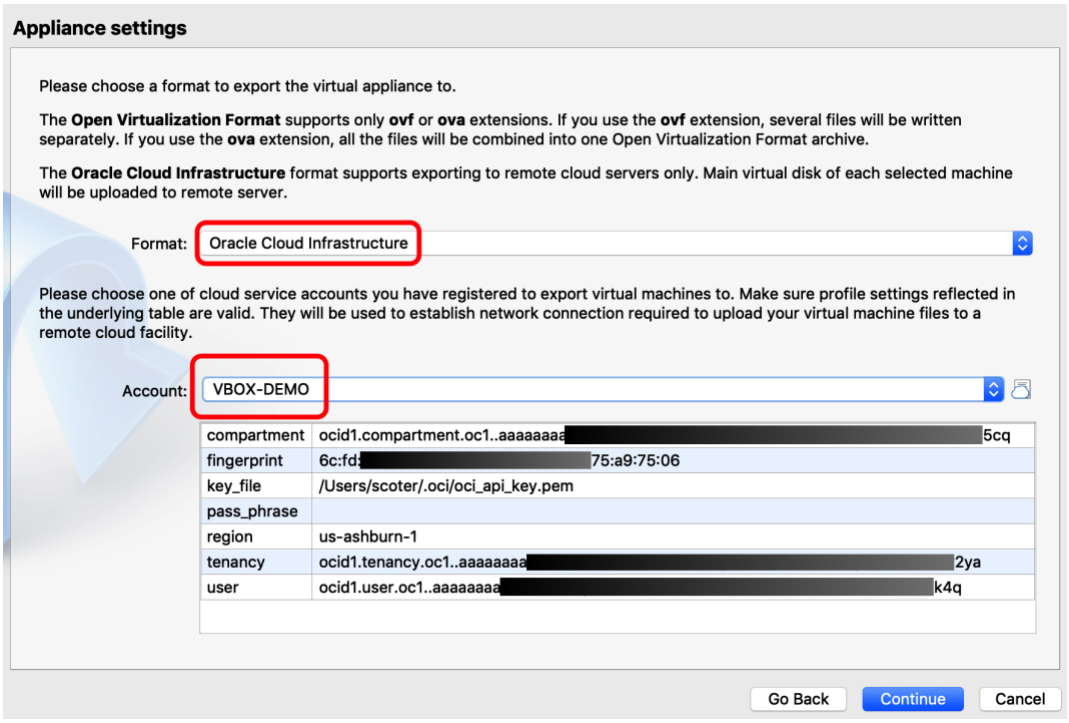
[VirtualBox Export to OCI] Figure 2. Start Export Process

- To export, select the "VirtualBox Virtual Machine" and click Continue



[VirtualBox Export to OCI] Figure 3. Select Virtual Machine to export

- Select "Oracle Cloud Infrastructure" format and "OCI Profile" account available, click "Continue"

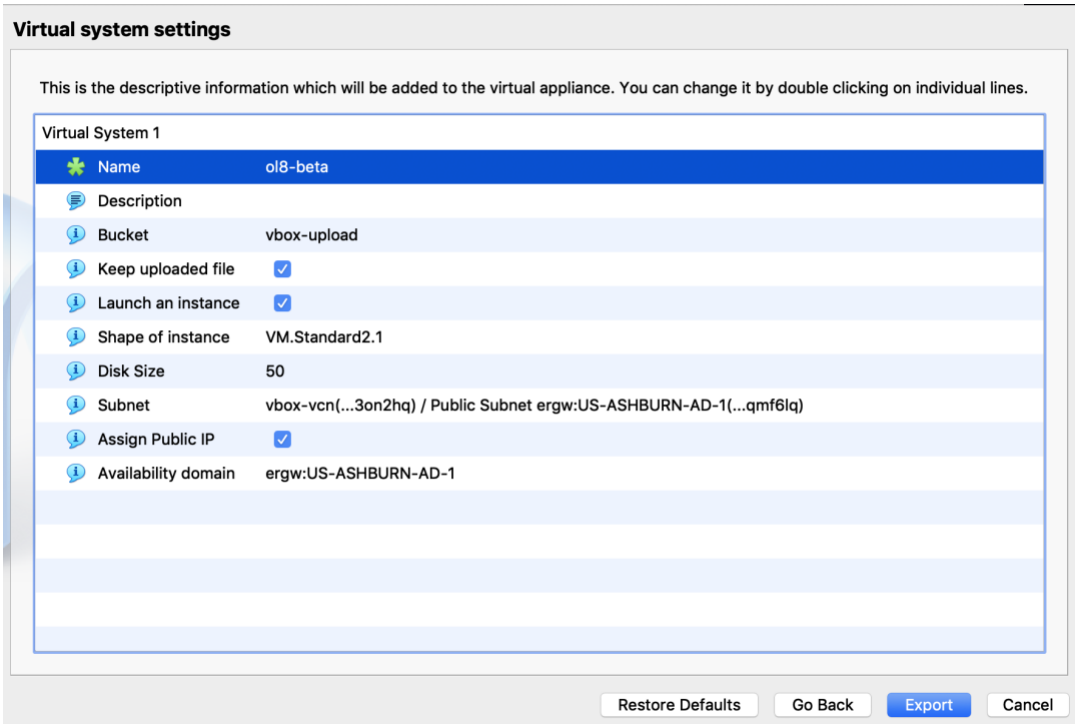


[VirtualBox Export to OCI] Figure 4. Select Format and Account

- Virtual System Settings

OPTION	DESCRIPTION	VALUE (EXAMPLE)
Name	Name of the OCI Instance will be created	**ol8-beta**
Description	[OPTIONAL] Descriptive field for the OCI Instance	**None**
Bucket	Object storage where to upload the image	**vbox-upload**
Keep uploaded file	Keep uploaded file after Instance creation	**Yes**
Launch an Instance	Start the Instance once created	**Yes**
Shape of Instance	VM Shape* used for the Instance	**VM.Standard2.1**
Disk size	Size of the exported disk on OCI (minimum 50 GB)	**50**
Subnet	OCI Subnet for the first vNIC	**Public Subnet AD1**
Assign Public IP	Assign a Public IP address to the Instance	**Yes**
Availability Domain	Availability Domain to run OCI Instance	**AD1**

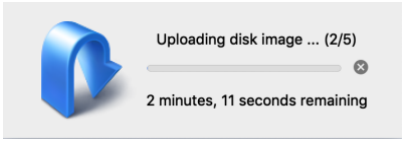
Define the OCI Instance configuration:



[VirtualBox Export to OCI] Figure 4. OCI Instance Configuration

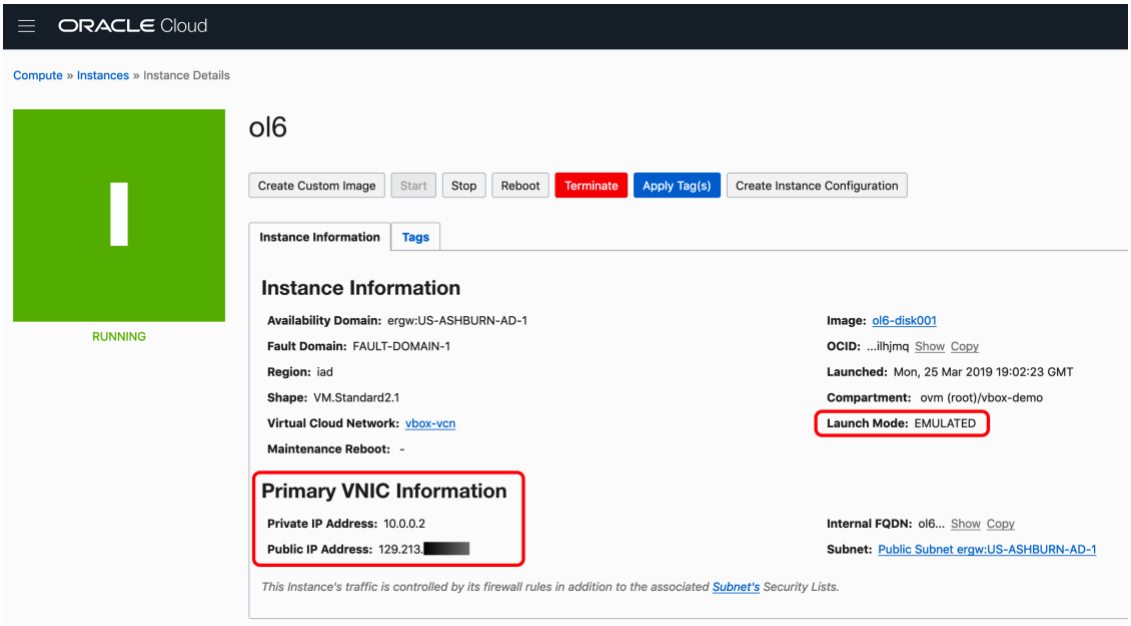
The export process starts and 5 different jobs will be executed:

- Check configuration for OCI Instance defined
- VirtualBox image upload to the OCI Bucket
- Security check on image uploaded
- Create a Boot Volume from the custom image uploaded
- Create and start the OCI Instance



[VirtualBox Export to OCI] Figure 5. OCI Export running – Job 2 of 5

Once all the jobs above have been completed, the OCI Emulated Instance will be up and running and available at the specified Public IP address (if the option had been selected):



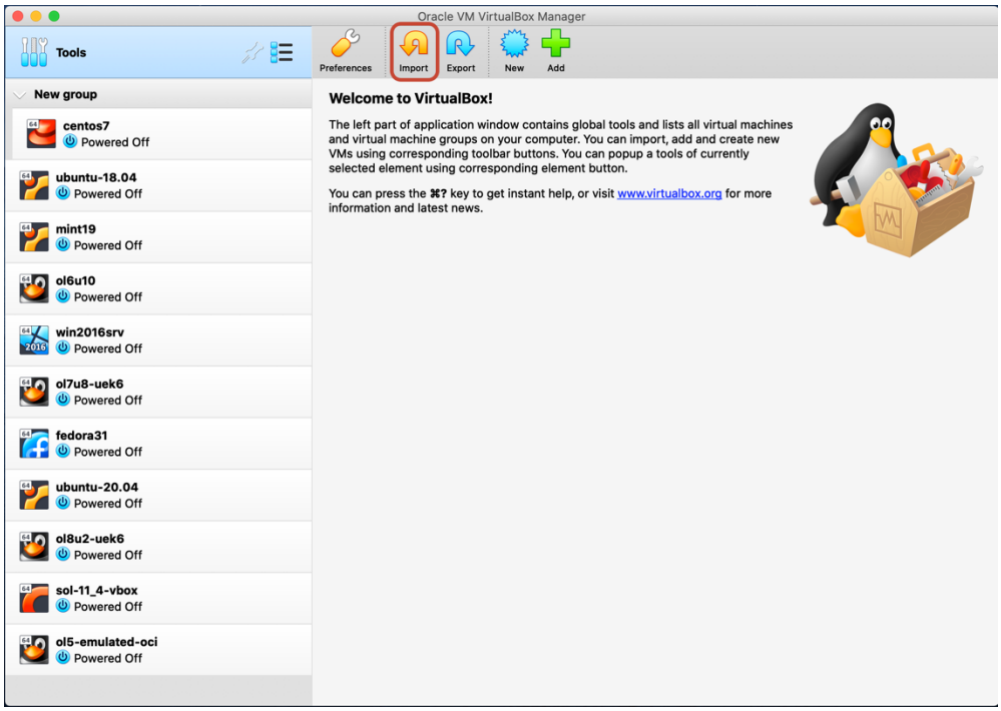
[VirtualBox Export to OCI] Figure 6. OCI Instance running

Virtual Machine Import from Oracle Cloud Infrastructure

Oracle VM VirtualBox 6.1 introduced the option to migrate a Virtual Machine from Oracle Cloud Infrastructure. All the steps required can be executed through the GUI, following these steps:

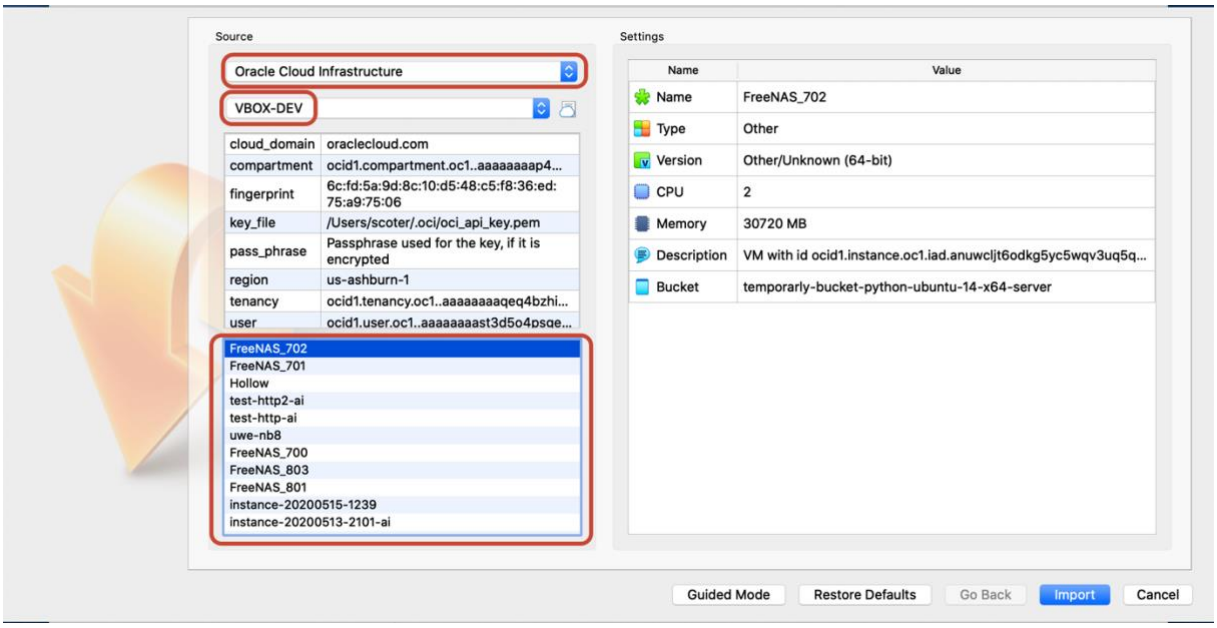
- Start the Export Process

Open the "Welcome" section and click on "Import" button.



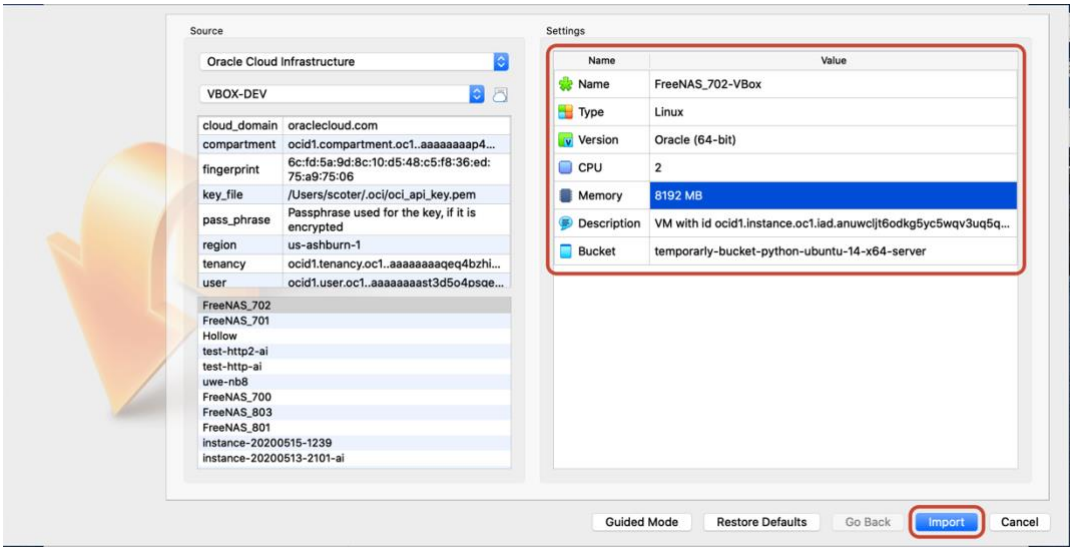
[VirtualBox Import to OCI] Figure 2. Start Import Process

- To start the import process, select the "Oracle Cloud Infrastructure" as "Source" and select your "Oracle Cloud Infrastructure Profile" to see the list of OCI Instances available.



[VirtualBox Import to OCI] Figure 3. Select Virtual Machine to import

- Select the "OCI Instance" to import and define the configuration this instance will have on local VirtualBox Installation; when ready, click on "Import" button to start the import process.



[VirtualBox Import to OCI] Figure 4. Select VirtualBox VM configuration

Conclusion

Oracle VM VirtualBox is cross-platform virtualization software that allows an existing computer to run multiple operating systems at the same time. Oracle VM VirtualBox runs on Windows, Mac OS X, Linux, and Oracle Solaris operating systems and is ideal for testing, developing, demonstrating, and deploying solutions across multiple platforms on one machine.

Oracle VM VirtualBox is an exceptional DevOps solution for creating a reliable and reproducible building process for development environments. Once established, Oracle VM VirtualBox enables the same environment to easily migrate and run on Oracle Cloud Infrastructure for production services.

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