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VM

Oracle VM 3:
Migrate Virtual Machines from VMware to Oracle VM

ORACLE TECHNICAL WHITE PAPER | FEBRUARY 2018

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Introduction

This paper explains the best practices to help migrate virtual machines from VMware to Oracle VM. The paper outlines different approaches with pros and cons, and multiple options can be used to accomplish the migration goal.

The Oracle VM virtualization solution is engineered for open cloud infrastructure. It delivers leading performance, scalability and reliability for enterprise SaaS and PaaS workloads as well as traditional enterprise applications. Oracle VM Support offers access to award-winning Oracle support resources and virtualization support specialists, zero-downtime updates using Ksplice, additional management tools such as Oracle Enterprise Manager, and lifetime support, all at a low cost. Oracle VM is easy to download, completely free to use, and free to distribute.

Oracle VM features rapid application deployment, integrated lifecycle management, and active participation in industry trends, thus offers customers more choices by not only delivering standalone x86 virtualization solution, but also fully integrated converged infrastructure such as Oracle Private Cloud Appliance (PCA) and many other Oracle Engineered Systems as well as joint partner offerings as means to on-board traditional datacenters to the cloud.

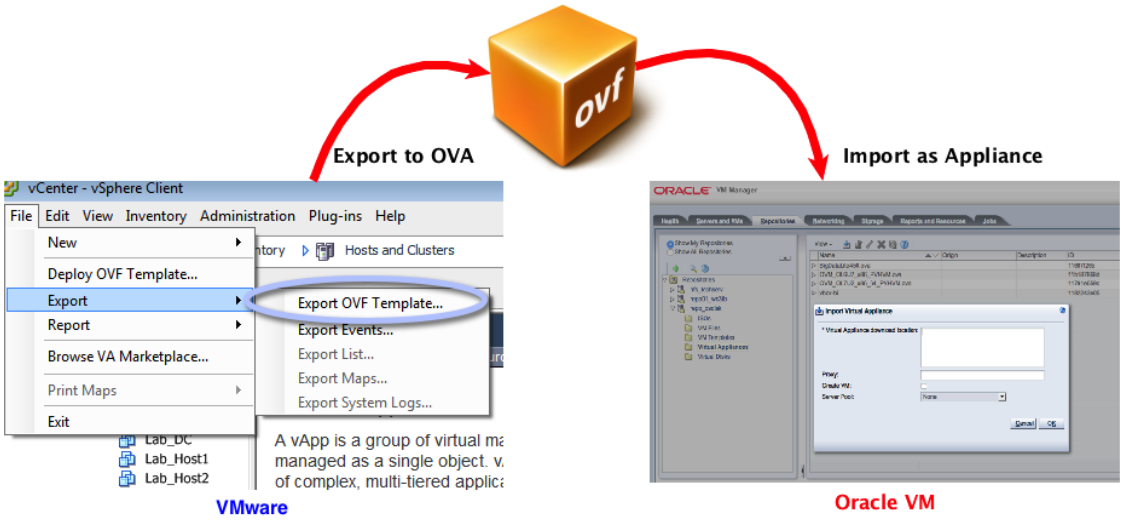

Figure 1: Migration from VMware to Oracle VM

As you can see from the picture above, the most common approach to migrate virtual machines is based on Open Virtualization Format (OVF) which is an open standard for packaging and distributing virtual appliances or, more generally, software to be run in virtual machines. The OVF standard is not tied to any particular hypervisor and provides an open, efficient and extensible format for the packaging and distribution of virtual machines.

With any migration between different technologies, a service outage will need to be factored into the migration; so, it becomes fundamental to identify the correct balance between ease of migration and time of disruption.

A point that reflects on both "**ease of migration**" and "**time of disruption**" is the size of the virtual machine, in terms of disk space used/allocated. Once the "time of disruption" (service outage) requirement has been identified, choosing the migration method will be possible based on the virtual machine size.

In this white paper, each chapter describes a step-by-step approach on how-to migrate from VMWare to Oracle VM and, at the same time, supplies a brief pros/cons table of the method used.

Solution 1: Migration using Open Virtualization Format

Virtual appliances are packages created as a single .ova (Open Virtualization Format Archive) file or a set of .ovf (Open Virutalization Format) and .img (disk image) files. Virtual appliances can contain one or more virtual machines and include the virtual disks and the inter-connectivity between the virtual machines.

To get started with virtual machine conversion, you can always export VMware virtual machine into an OVF based virtual appliance and, after that, import the virtual appliance using Oracle VM Manager web interface.

Pros	Cons
Easiest solution possible	**Service outage depends of virtual machine size; bigger is the size of virtual-disks higher is the outage time.**
Applicable also to all main x86 hypervisor solutions	**OS/Application maintenance cannot be executed simultaneously.**
Based on an open and standard format (OVF)	**Old Operating System could need a particular tweak on the source Virtual Machine before exporting it.**
Applicable to all x86 virtual-machine Operating System	

Example: step-by-step migration from VMware to Oracle VM with OVA

Here the general steps needed to export a VM from VMware and consequently import to Oracle VM using OVA format:

1. Stop the Virtual Machine on VMware ESXi
2. Export VM into OVF Format
    a. select the VM, File, Export, Export OVF Template…
    b. Select .ova file

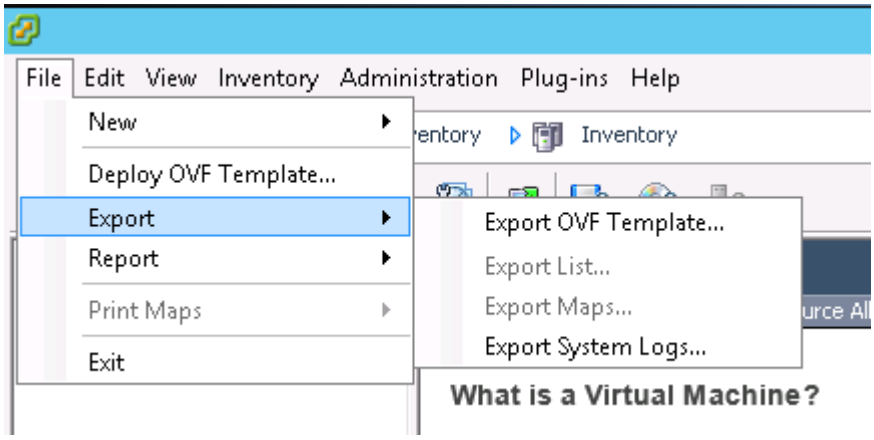

Figure 2: Export the VM into OVA format

3. Import the .ova file to Oracle VM/PCA as a new Assembly / Appliance

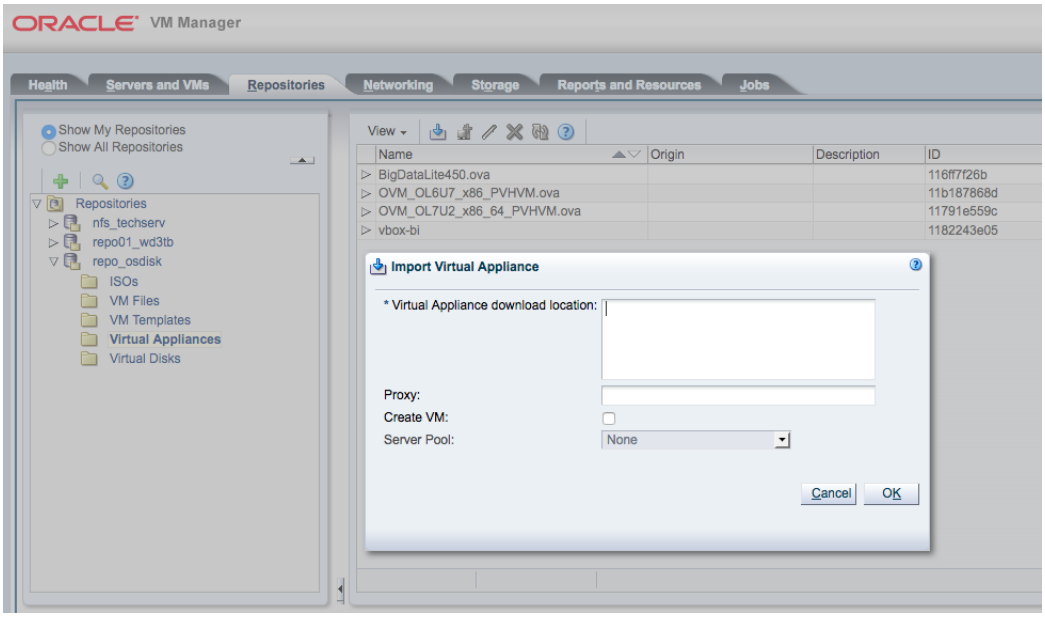

Figure 3: Oracle VM Manager: Import Virtual Appliance

4. Create an Oracle VM Virtual Machine directly from the Virtual Appliance imported.

> **Note**
>
> This option is available starting from Oracle VM 3.4 Release; on previous Oracle VM Releases (as 3.2 or 3.3) it's still needed to initially create an Oracle VM Template from the Virtual Appliance (OVA imported) and then create the Virtual Machine from the Template.

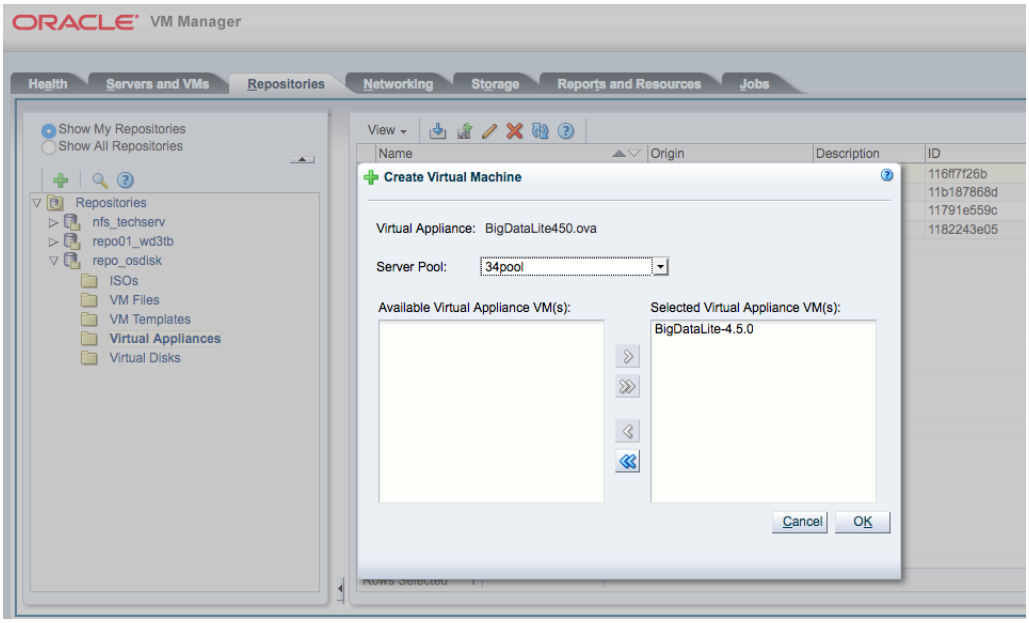

Figure 4: Oracle VM Manager: Create Virtual Machine from Virtual Appliance (OVA)

6. Edit the Virtual Machine created and, optionally, customize it.

    A. *Configuration*: choose **VM Name**, **Operating System** running, **Keymap** for console, **Domain Type**, **Start Policy**, **Memory** options and **CPUs** options.

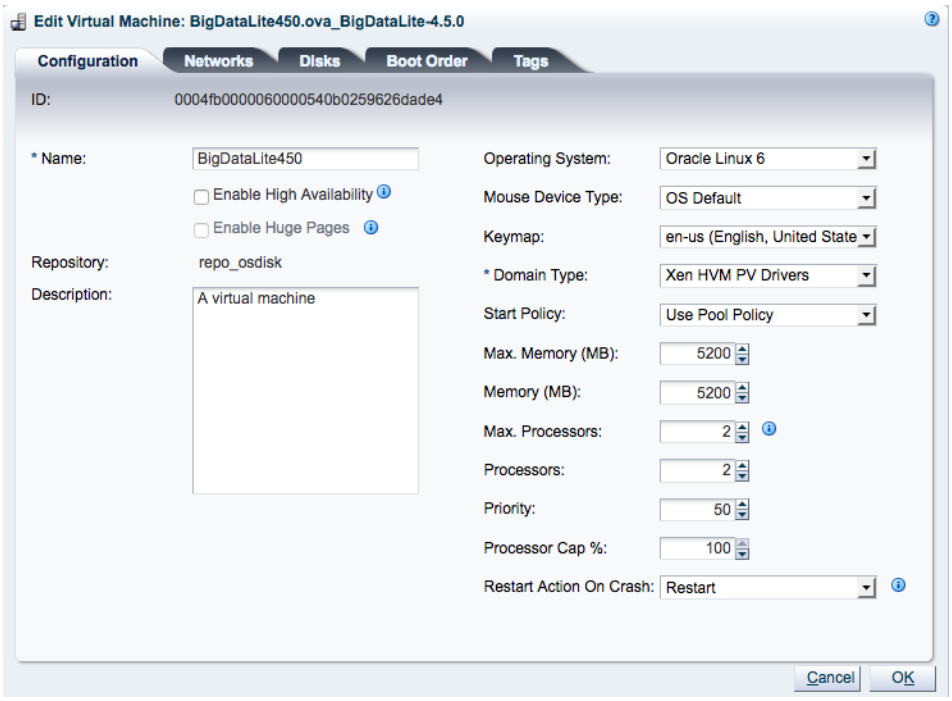

Figure 5: Oracle VM Manager: Edit Virtual Machine Settings (Configuration)

Note

To get further details related to the Virtual Machine Domain Type option refers to the Oracle VM Documentation at the following link:
https://docs.oracle.com/cd/E64076_01/E64081/html/vmcon-vm-modes.html

Note

For systems running **Red Hat Enterprise Linux, CentOS or Oracle Linux**, it's always suggested to install and use UEK kernel on the VM; **UEK is capable to work as HVM, PVM and HVM with PV Drivers**.

B. *Networks*: choose **vNICs** needed and associate them to the VM; if needed you can also specify a **custom MAC Address to the vNIC** (could be the MAC used on the source VM, **helpful while an application license is based on NIC HWADDR**)

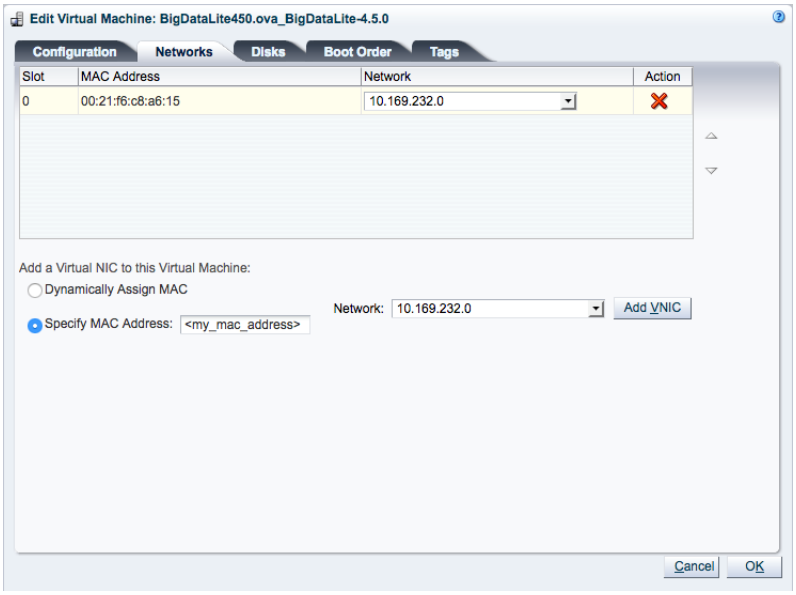

Figure 6: Oracle VM Manager: Edit Virtual Machine Settings (Networks)

Note

The option "**Specify MAC Address**" can be helpful also while the HWADDR is specified into the Operating System Network configuration files (as ifcfg-eth0 on a Linux system or, as default, on Microsoft Windows OS); alternatively it's suggested to leave out the "HWADDR" entry of the NIC into the configuration file on the Virtual Machine operating system.

C. *Disks*: evaluate to add and/or modify existing **virtual/physical disks** to the Virtual Machine.

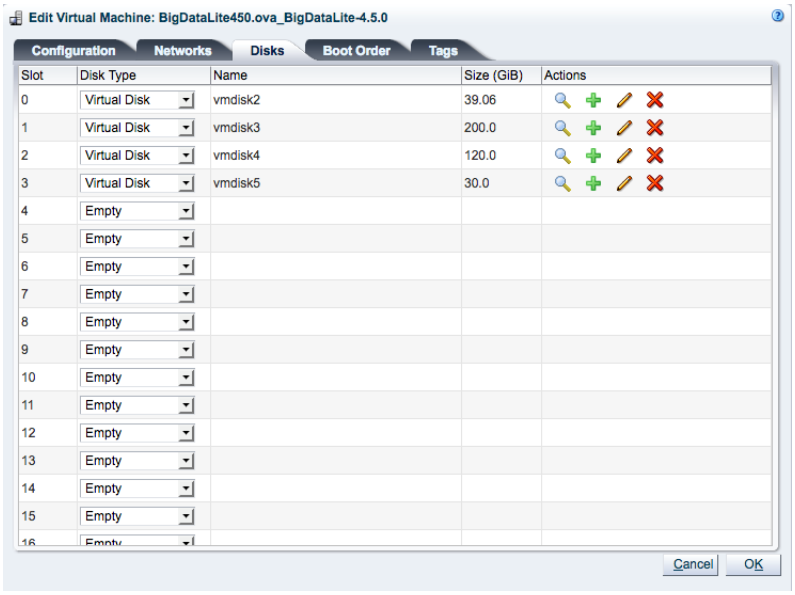

Figure 7: Oracle VM Manager: Edit Virtual Machine Settings (Disks)

D. *Boot Order*: evaluate to change the **boot-order** for the Virtual Machine

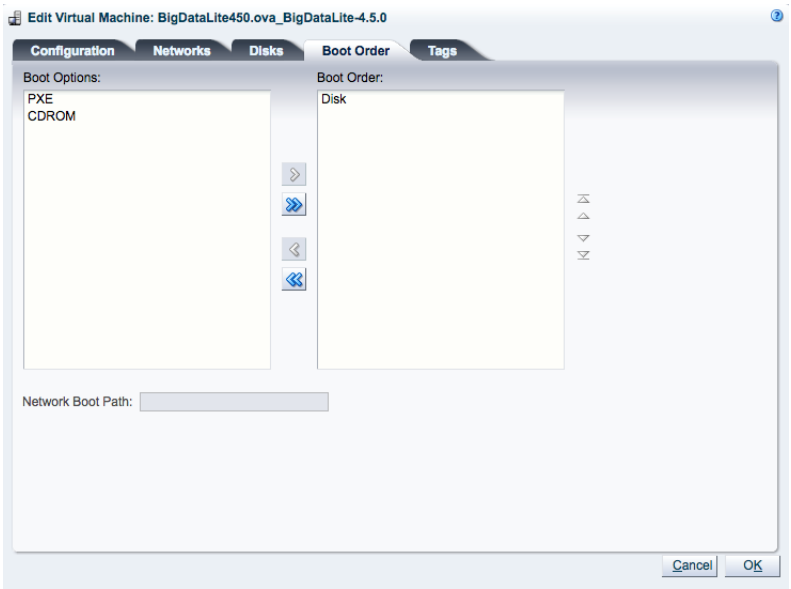

Figure 8: Oracle VM Manager: Edit Virtual Machine Settings (Boot Order)

E. *Tags*: evaluate **optional tags**, helpful while looking for VMs into a huge list

7. Start the VM

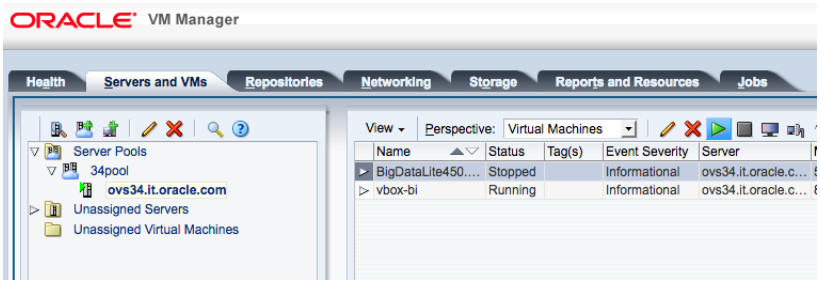

Figure 9: Oracle VM Manager: Start Virtual Machine

8. Uninstall VMware tools from the Virtual Machine
9. On Microsoft Windows Virtual Machine install Oracle VM Paravirtualized Drivers for Microsoft Windows.

> **Note**
>
> Using Oracle VM Manager it's also possible to import raw-image disk images (img); the import process, automatically, will associate one UUID to the virtual disk imported.

Known Issues and possible work-around / solutions: My Oracle Support

Blue Screen on Boot after Migrating VMware Windows Guest Which is Installed on SCSI Disk to Oracle VM (V2V) (Doc ID 754071.1)
Oracle VM 3.x: Import of VMware Oracle Linux 6 Guest conversion from HVM to PVHVM (Doc ID 2033007.1)
Oracle VM: Unable to load X Server inside a Guest VM (Doc ID 2066952.1)

Solution 2: Migration using data replication

A possible migration from one system, virtual or physical, to a new one could also introduce the opportunity to execute software maintenance while migrating; so, while the software layer is upgraded in place on the target system by installing updated OS, Application or Database release, the data will be replicated using Operating System utilities like “rsync” or other storage replication options, both software (like ASM) or hardware (low-level storage replication).

rsync is a fast and extraordinarily versatile file copying tool. It can copy locally, to/from another host over any remote shell, or to/from a remote rsync daemon. It offers a large number of options that control every aspect of its behavior and permit very flexible specification of the set of files to be copied. It is famous for its delta-transfer algorithm, which reduces the amount of data sent over the network by sending only the differences between the source files and the existing files in the destination. Rsync is widely used for backups and mirroring and as an improved copy command for everyday use.

So, using rsync, you can maintain synced two different filesystem on two different virtual machines (or from one physical environment to a virtual machine); this kind of feature can become very interesting also while migrating and/or cloning an entire system.

Applicable to virtual and physical machines	**Not applicable for Microsoft Windows virtual machines; partially available using cygwin and rsync on top.**
Applicable to all x86 hypervisor solutions	**The solution cannot be automated and/or scripted to be repeateable.**
Minimum outage possible (delta sync)	**The solution is based on many manual steps that cannot be automated or can be only partially automated**
Syncronization can be partial (filesystem and/or directories)	
Systems can be tested on target hypervisor before the definitive migration	
OS maintenance can be executed simultaneously	

Note

With this solution a pre-defined target virtual machine has to be created.

Example: step-by-step migration of an Application using data replication

Source Environment (Bare-metal / VMware / KVM)	Target Environment (Oracle VM)
Red Hat Enterprise Linux 5.6 x86-64	Oracle Linux 6.9 x86-64
Oracle Weblogic Server 12c	<rsync_result>
Ext3 as default filesystem type	Btrfs as default filesystem type
Application software installed on "/u01" filesystem	<rsync_result>

Important!

If the target OS is going to differ from source environment, it is necessary to evaluate product certification, support and requirements.

Target system will also introduce:

- Snapshot capabilities (thanks to btrfs)
- Possible security patches installed without reboot (see Ksplice implementation)
- Updated release of Linux distribution

To complete the migration based on "**rsync**" utility, proceeed with following step-by-step procedure:

1. Download latest Oracle VM Template/Appliance for Oracle Linux 6 x86-64 and import, using Oracle VM Manager, Appliance downloaded

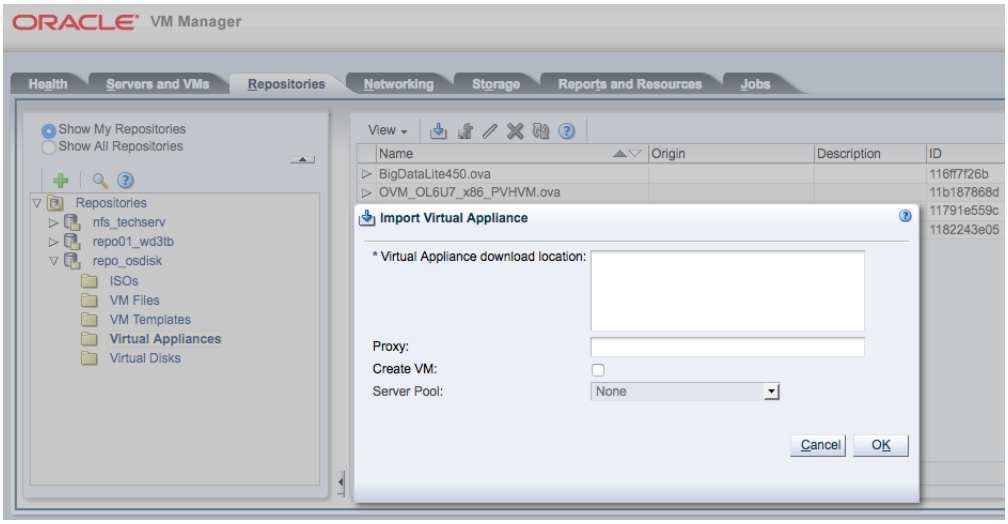

Figure 10: Oracle VM Manager: Import Virtual Appliance

2. Create an Oracle VM Virtual Machine directly from the Oracle Linux 6 Virtual Appliance/Assembly imported.

> **Note**
>
> This option is available starting from Oracle VM 3.4 Release; on previous Oracle VM Releases (as 3.2 or 3.3) it's still needed to initially create an Oracle VM Template from the Virtual Appliance (OVA imported) and then create the Virtual Machine from the Template.

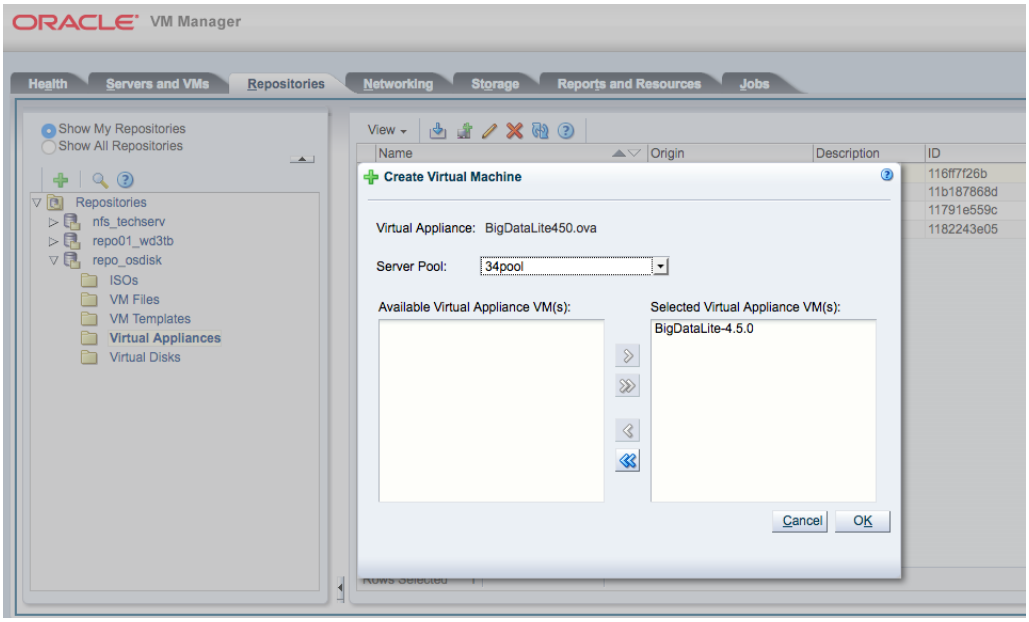

Figure 11: Oracle VM Manager: Create Virtual Machine from Virtual Appliance (OVA)

3. Edit the Virtual Machine created and customize it based on source virtual/physical machine configuration

A. *Configuration*: choose **VM Name**, **Operating System** running, **Keymap** for console, **Domain Type**, **Start Policy**, **Memory** options and **CPUs** options.

Parameters used for this example	
VM Name	ol6weblogic
Operating System Running	Oracle Linux 6
Keymap	Default
Domain Type	HVM with PV Drivers
Memory	<same_value_as_source_vm>
CPUs	<same_value_as_source_vm>

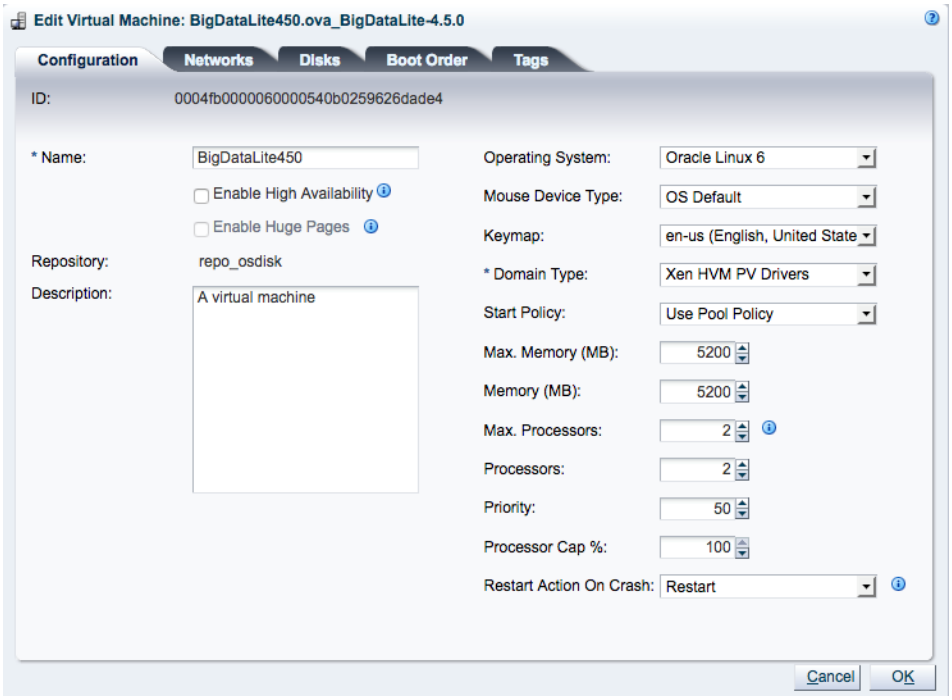

Figure 12: Oracle VM Manager: Virtual Machine Settings (Configuration)

Note

Suggested Domain Type for Oracle Linux 6 with UEK kernel is HVM with PV Drivers

B. *Networks*: choose **vNICs** needed and associate them to the VM.

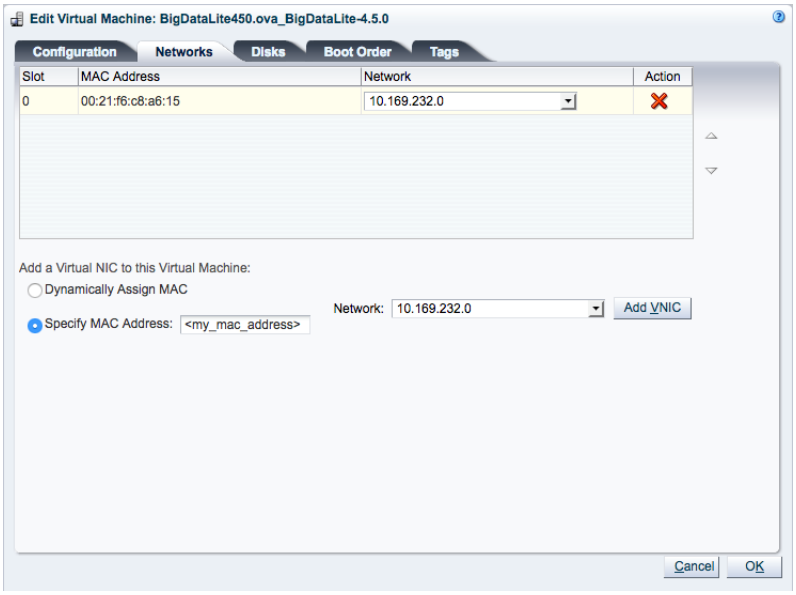

Figure 13: Oracle VM Manager: Edit Virtual Machine Settings (Networks)

Note

Do not use any custom HWADDR/Mac Address for this VM; using the source virtual machine HWADDR is not possible because both virtual machines (source and target) will be active at the same time.

C. *Disks*: add and/or modify existing **virtual/physical disks** to the Virtual Machine based on the source virtual machine configuration.

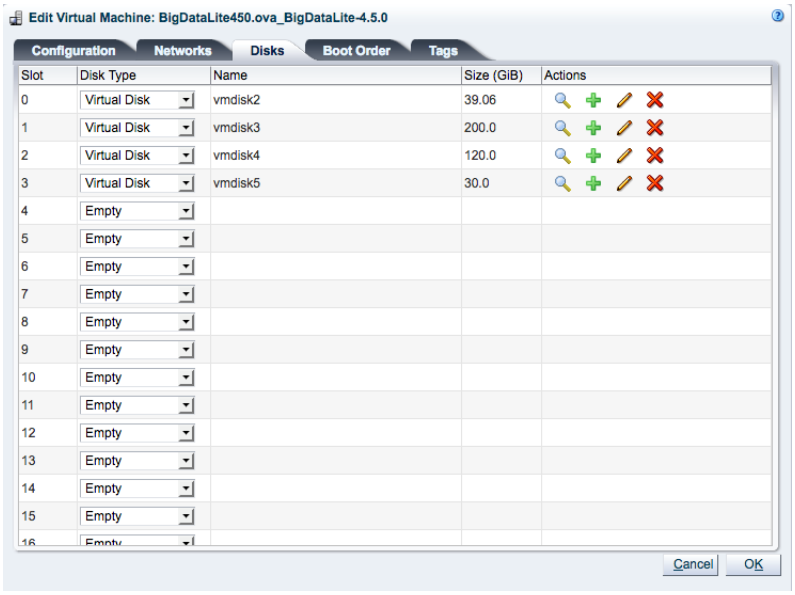

Figure 14: Oracle VM Manager: Edit Virtual Machine Settings (Disks)

4. Start the VM

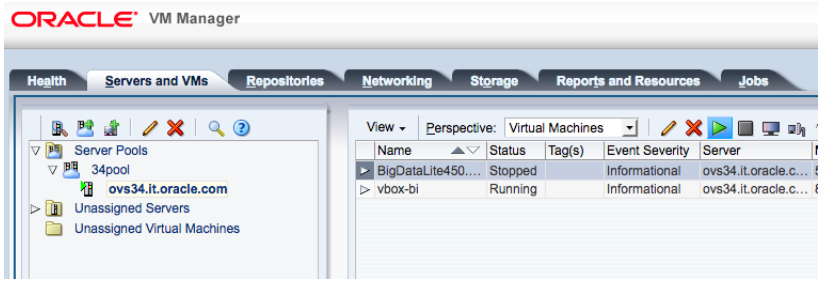

Figure 15: Oracle VM Manager: Start Virtual Machine

5. Configure target Virtual Machine based on source configuration:
    a. Associate to the VM the same hostname of source virtual machine
    b. Associate to the VM a temporary IP address on same subnet of source virtual machine
    c. Add a custom entry to file "/etc/hosts" for temporary IP address associated to hostname
    d. Kernel parameters and limits.conf (as source Virtual Machine)
    e. Linux OS users and password (as source Virtual Machine)
    f. RPMs installed on the system (with updated release on OL6)
    g. SELinux and Firewall configuration (as source Virtual Machine)
    h. Configure virtual disks presented and mount filesystems
    i. Further custom stuff available on source virtual machine
6. Synchronize application filesystem from source virtual/physical machine to the target one (**while the application is still running on the source environment**)

> **Note**
>
> "**rsync**" utility needs to be installed on both source and target environment.
> Initial synchronization will copy all files from source to target virtual machine.

On the target environment execute "rsync" command; see example below:

```
# rsync -avz -e ssh user@source:/path/ /path/
```

7. (Optional) Test Weblogic Application on target virtual machne

> **Important!**
>
> You have to be aware that even if target virtual machine has/works with a temporary IP address, the same can contact/interact with other services!!!

8. Shutdown source Weblogic application (the physical/virtual machine will continue to run)
9. Execute a further "**rsync**" to synchronize delta difference between source and target (same command specified above)

10. Shutdown source physical / virtual machine
11. Change IP address on target virtual machine using source virtual/physical machine IP address
12. Start the Weblogic application on target virtual machine

Example: step-by-step migration of an Oracle Database using data replication

Source Environment (Bare-metal / VMware / KVM)	Target Environment (Oracle VM)
Red Hat Enterprise Linux 5.6 x86-64	Oracle Linux 6.9 x86-64
Oracle Database 12c Release 1	<rsync_result>
Ext3 as default software filesystem / ASM for Database files	Btrfs as default software filesystem / ASM for Database files
Database software installed on "/u01" filesystem	<rsync_result> + post-clone procedure

Important!

If the target OS is going to differ from source environment, it is necessary to evaluate product certification, support and requirements.

Target system will also introduce:

- Snapshot capabilities (thanks to btrfs)
- Security patch installed without reboot (see Ksplice)
- Updated release of Oracle Linux

To complete the migration based on "**rsync**" utility, proceeed with following step-by-step procedure:

13. Download latest Oracle VM Template/Appliance for Oracle Linux 6 x86-64 and import, using Oracle VM Manager, Appliance downloaded

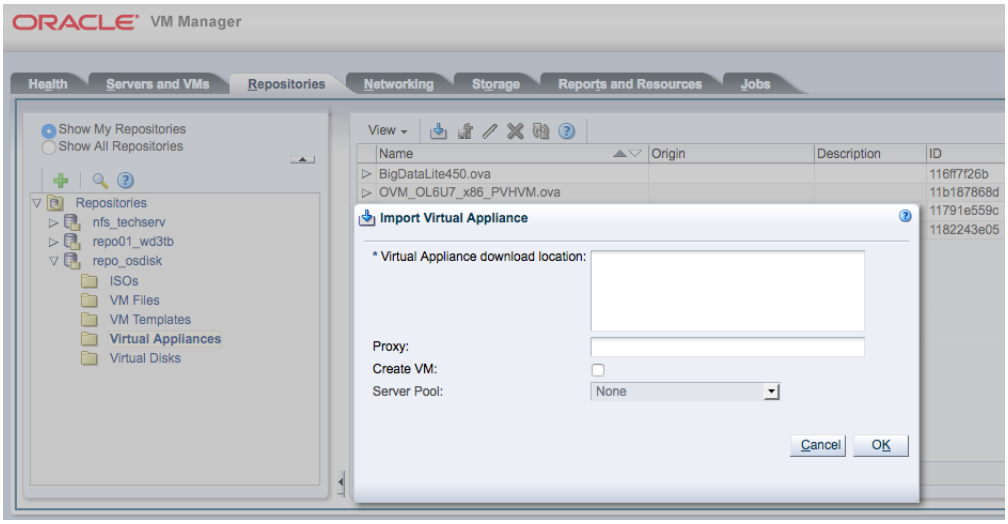

Figure 16: Oracle VM Manager: Import Virtual Appliance

14. Create an Oracle VM Virtual Machine directly from the Oracle Linux 6 Virtual Appliance/Assembly imported.

> **Note**
>
> This option is available starting from Oracle VM 3.4 Release; on previous Oracle VM Releases (as 3.2 or 3.3) it's still needed to initially create an Oracle VM Template from the Virtual Appliance (OVA imported) and then create the Virtual Machine from the Template.

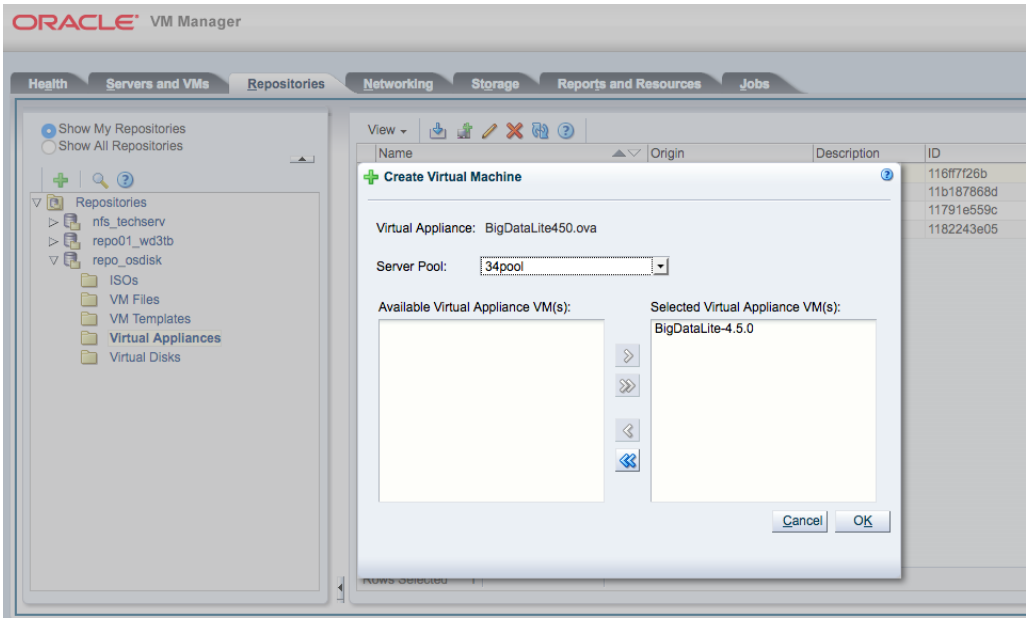

Figure 17: Oracle VM Manager: Create Virtual Machine from Virtual Appliance (OVA)

15. Edit the Virtual Machine created and customize it based on source virtual/physical machine configuration

D. *Configuration*: choose **VM Name**, **Operating System** running, **Keymap** for console, **Domain Type**, **Start Policy**, **Memory** options and **CPUs** options.

Parameters used for this example	
VM Name	ol6database
Operating System Running	Oracle Linux 6
Keymap	Default
Domain Type	HVM with PV Drivers
Memory	<same_value_as_source_vm>
CPUs	<same_value_as_source_vm>

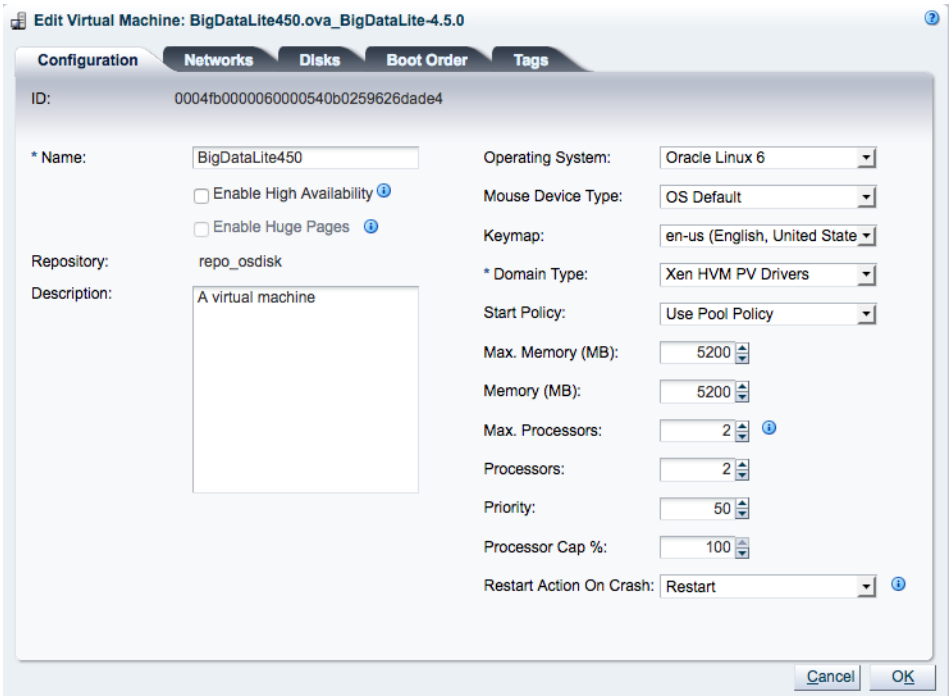

Figure 18: Oracle VM Manager: Virtual Machine Settings (Configuration)

Note

Suggested Domain Type for Oracle Linux 6 with UEK kernel is HVM with PV Drivers

E. *Networks*: choose **vNICs** needed and associate them to the VM.

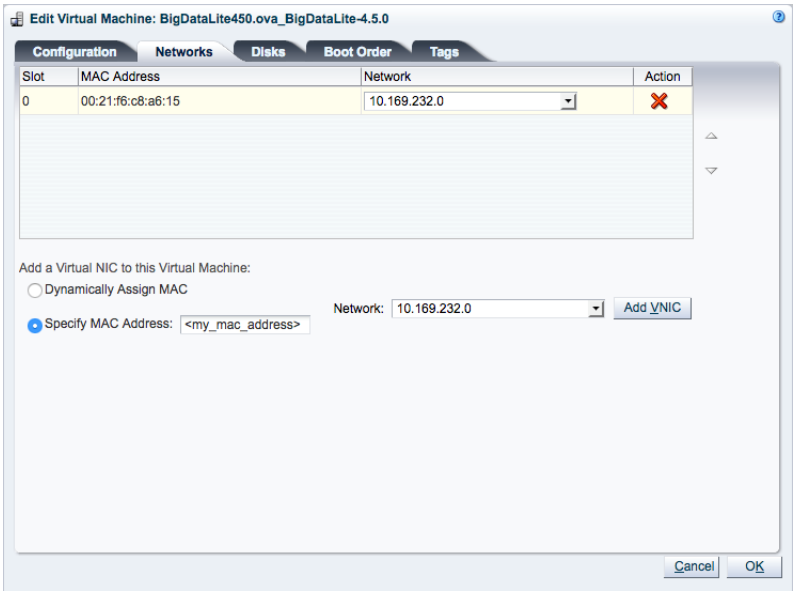

Figure 19: Oracle VM Manager: Edit Virtual Machine Settings (Networks)

Note

Do not use any custom HWADDR/Mac Address for this VM; using the source virtual machine HWADDR is not possible because both virtual machines (source and target) will be active at the same time.

F. *Disks*: add and/or modify existing **virtual/physical disks** to the Virtual Machine based on the source virtual machine configuration.

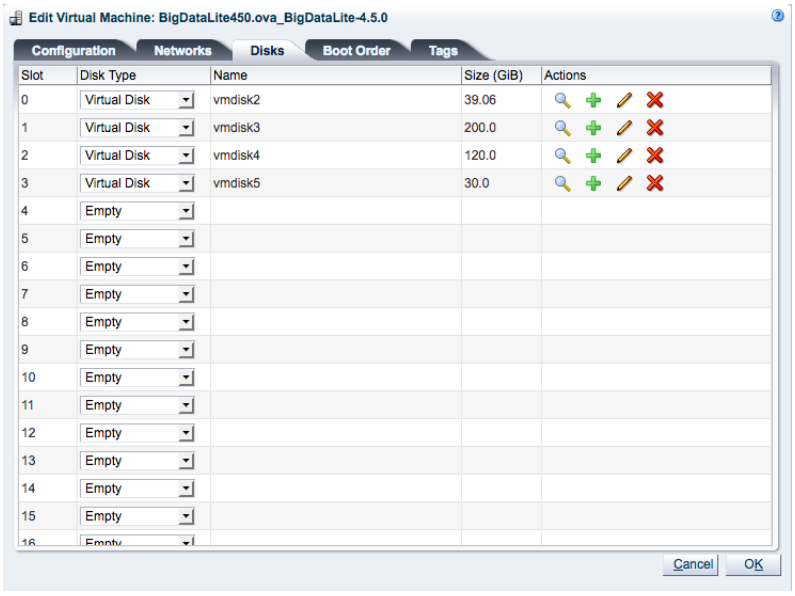

Figure 20: Oracle VM Manager: Edit Virtual Machine Settings (Disks)

16. Start the VM

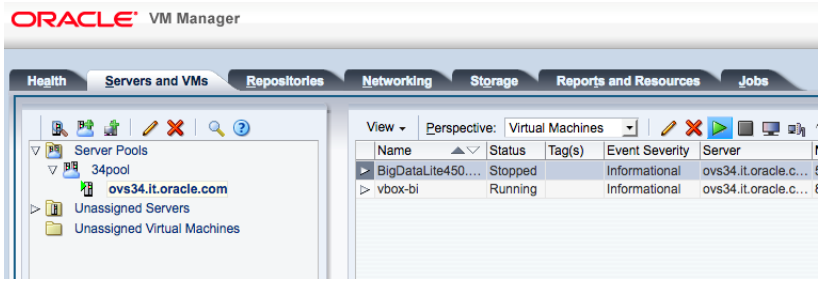

Figure 21: Oracle VM Manager: Start Virtual Machine

17. Configure target Virtual Machine based on source configuration:
    a. Associate to the VM the same hostname of source virtual machine
    b. Associate to the VM a temporary IP address on same subnet of source virtual machine
    c. Add a custom entry to file "/etc/hosts" for temporary IP address associated to hostname
    d. Kernel parameters and limits.conf (as source Virtual Machine)
    e. Linux OS users and password (as source Virtual Machine)
    f. RPMs installed on the system (with updated release on OL6)
    g. SELinux and Firewall configuration (as source Virtual Machine)
    h. Configure virtual disks presented and mount filesystems
    i. Further custom stuff available on source virtual machine
18. Synchronize database software filesystem from source virtual/physical machine to the target one (**while the application is still running on the source environment**)

> **Note**
>
> "**rsync**" utility needs to be installed on both source and target environment.
> Initial synchronization will copy all files from source to target virtual machine.

On the target environment execute "rsync" command; see example below:

```
# rsync -avz -e ssh user@source:/path/ /path/
```

19. Execute Oracle Database software post-clone procedure as described at:

    https://docs.oracle.com/database/121/LADBI/app_cloning.htm#LADBI7852

20. Clone database files: different methods based on storage/filesystem type used.

Source filesystem/storage option	Solution to clone the Oracle Database
ASM	RMAN – duplicate database (need to be executed after step (21))

	ASM functionalities (replace disks in Diskgroup) ***
ACFS	rsync
Standard posix-compliant filesystem	rsync
<ALL>	Use low-level storage replication to clone LUNs and sync them when the source machine has been stopped

Note

*** = using ASM “replace disk” on diskgroups you can easiliy move database files on a new physical-storage while database is still running on the source system; once the “replace disk” procedure has been completed the same LUNs can be presented to Oracle VM Server and so to the Virtual Machine dedicated to the Oracle Database.

21. Shutdown source Oracle Database machine
    a. If on step (20) “rsync” solution has been used, now an other “rsync” command is needed to sync the delta between source and target filesystem.
    b. If on step (20) “ASM” or “low-level storage” solutions have been used, verify that source and target system are synced.
22. Shutdown source physical / virtual machine
23. Change IP address on target virtual machine using source virtual/physical machine IP address
24. Start the Oracle Database on target virtual machine

Solution 3: Conversion using open-source utilities

virt-v2v-copy-to-local converts and copy virtual-disks from a source hypervisor to the raw-image format. It can read Linux and Windows guests running on VMware, Xen, Hyper-V and some other hypervisors, and convert them to the format used by Oracle VM. The same utility also produces an xml descriptor file containing all the information related to the VM exported.

vDisks raw-image format as output	**Service outage depends of virtual machine size; bigger is the size of virtual-disks higher is the outage time.**
Applicable also to all main x86 hypervisor solutions	**OS/Application maintenance cannot be executed simultaneously.**
Applicable to all x86 virtual-machine Operating System	**Old Operating System could need a particular tweak on the source Virtual Machine before exporting it.**
An integration to libvirt and OpenStack is available	**After the vDisks import, the VM has to be created**

Further information on this tool are available here.

Example: step-by-step migration using open-source utilities

This utility uses libvirt to get the libvirt XML (metadata) of the remote guest, essentially equivalent to running virsh dumpxml guest.

It then uses the XML to locate the remote guest disks, which are copied over using a hypervisor-specific method. It uses HTTPS (curl) for remote ESXi hypervisors.

It then modifies the libvirt XML so that it points at the local copies of the guest disks.

The libvirt XML is output to a file called guest.xml (where guest is the name of the guest). The disk(s) are output to file(s) called guest-disk1, guest-disk2 and so on.

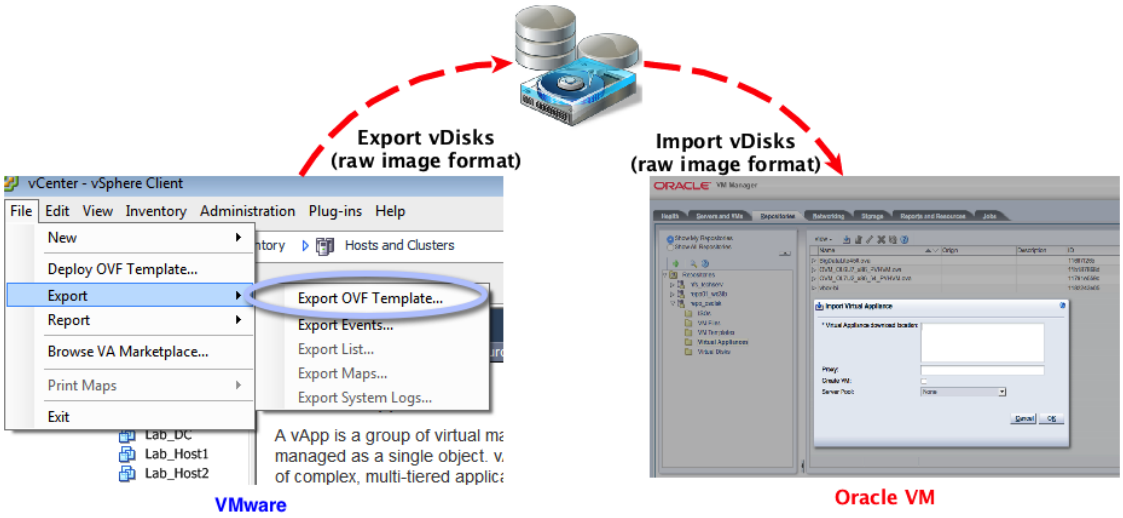

Figure 22: Export vDisks using virt-v2v utility

The libvirt XML file won't be directly used by Oracle VM Manager but can be maintained as a reference for the Virtual Machine we are going to create on Oracle VM.

1. Export the VM from VMware using "**virt-v2v-copy-to-local**" utility

Here a syntax example on how-to use "**virt-v2v-copy-to-local**" utility.

```
[root@host-10-243 images]# virt-v2v-copy-to-local -ic
'esx://root@138.3.9.113?no_verify=1' vm01_ol67
[   0.0] Fetching the remote libvirt XML metadata ...
Enter root's password for 138.3.9.113:

[   4.1] Parsing the remote libvirt XML metadata ...
Enter host password for user 'root':

[   6.0] Copying remote disk 1/1 to vm01_ol67-disk1
 % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left  Speed
100 16.0G  100 16.0G    0     0  38.9M      0  0:07:00  0:07:00 --:--:-- 39.3M
[ 426.4] Writing libvirt XML metadata to vm01_ol67.xml ...
[ 426.4] Finishing off
```

Into the section above you can see that this utility is able to directly connect to VMware vSphere server and download both the virtual machine disks and the configuration file.

Following section shows the result of the command executed above; first component is the virtual (raw-image) virtual disk exported:

```
[root@host-10-243 images]# ll
total 16777224
-rw-r--r-- 1 root root 17179869184 Nov  8 20:40 vm01_ol67-disk1
-rw-r--r-- 1 root root        1305 Nov  8 20:40 vm01_ol67.xml

[root@host-10-243 images]# file vm01_ol67-disk1
vm01_ol67-disk1: DOS/MBR boot sector; GRand Unified Bootloader, stage1 version 0x3,
boot drive 0x80, 1st sector stage2 0x84a00, GRUB version 0.94
```

and then the libvirt XML file with all virtual machine descriptors:

```
[root@host-10-243 images]# cat vm01_ol67.xml
<?xml version="1.0"?>
<domain xmlns:vmware="http://libvirt.org/schemas/domain/vmware/1.0" type="vmware">
 <name>vm01_ol67</name>
 <uuid>564dba84-d545-207a-4062-4192d6ae1421</uuid>
 <memory unit="KiB">4194304</memory>
 <currentMemory unit="KiB">4194304</currentMemory>
 <vcpu placement="static">1</vcpu>
 <os>
   <type arch="x86_64">hvm</type>
 </os>
 <clock offset="utc"/>
 <on_poweroff>destroy</on_poweroff>
 <on_reboot>restart</on_reboot>
 <on_crash>destroy</on_crash>
 <devices>
   <disk type="file" device="disk">
     <source file="vm01_ol67-disk1"/>
     <target dev="sda" bus="scsi"/>
     <address type="drive" controller="0" bus="0" target="0" unit="0"/>
   </disk>
   <disk type="block" device="cdrom">
     <source dev="CD/DVD drive 0"/>
     <target dev="hdc" bus="ide"/>
     <address type="drive" controller="0" bus="1" target="0" unit="0"/>
   </disk>
   <controller type="scsi" index="0" model="vmpvscsi"/>
   <controller type="ide" index="0"/>
   <interface type="bridge">
     <mac address="00:50:56:8e:05:42"/>
     <source bridge="VM Network"/>
     <model type="vmxnet3"/>
   </interface>
   <video>
     <model type="vmvga" vram="8192" primary="yes"/>
   </video>
 </devices>
 <vmware:datacenterpath>ha-datacenter</vmware:datacenterpath>
</domain>
```

So we have both the virtual-disks of the VM and also an XML file that describe its configuration.

2. Import virtual disks file to Oracle VM/PCA as new Virtual Disks (same operation for each vdisk)

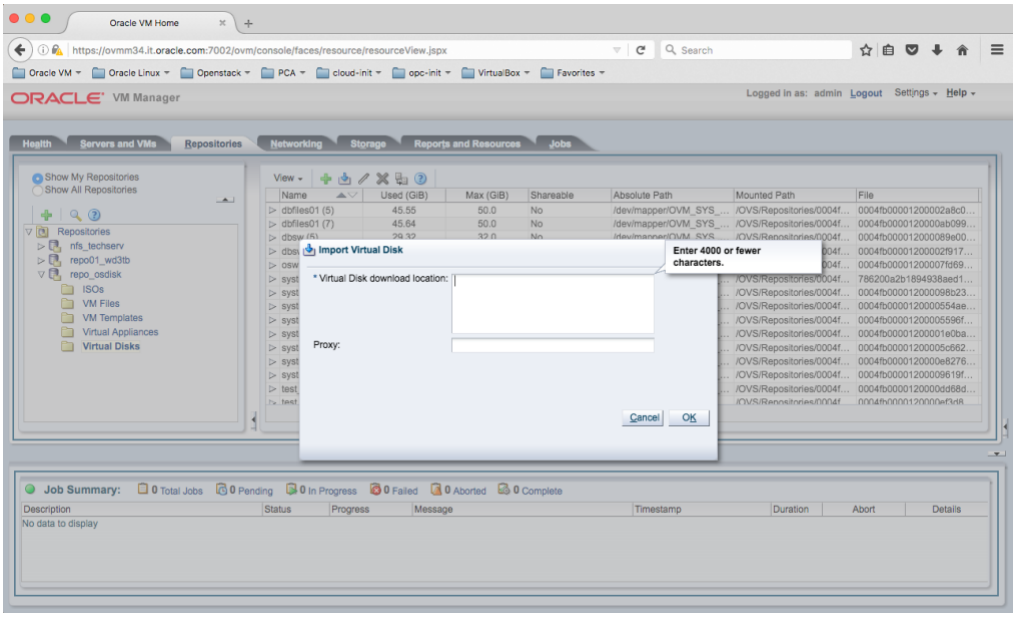

Figure 23: Oracle VM Manager: Import Virtual Disk

3. Create a new Oracle VM Virtual Machine supplying all the details available (see libvirt XML file)

    A. *Configuration*: choose **VM Name**, **Operating System** running, **Keymap** for console, **Domain Type**, **Start Policy**, **Memory** options and **CPUs** options.

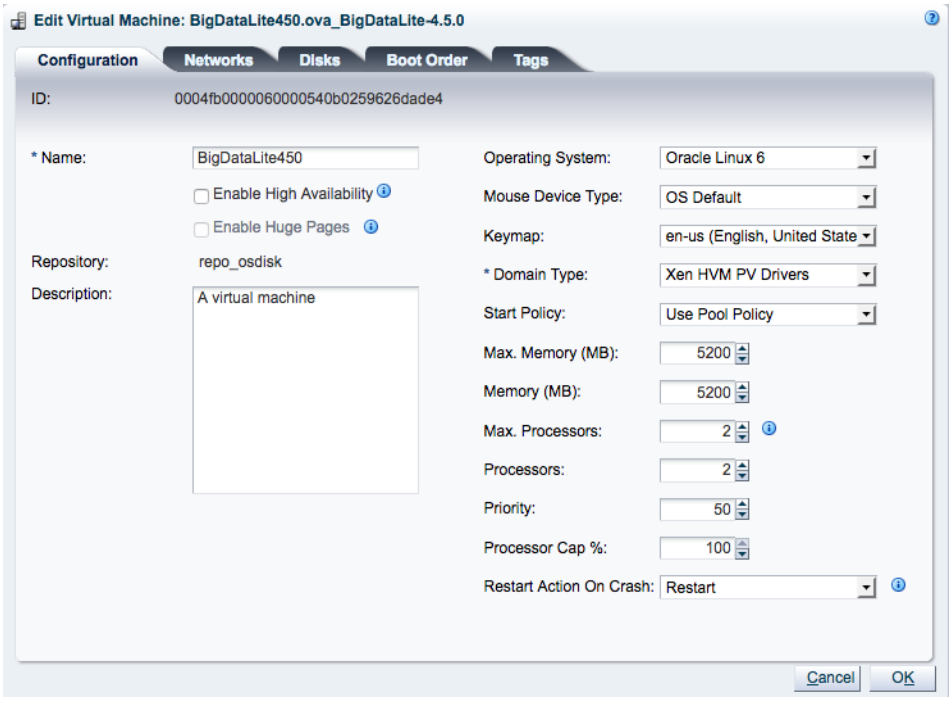

Figure 24: Oracle VM Manager: Edit Virtual Machine Settings (Configuration)

Note

To get further details related to the Virtual Machine Domain Type option refers to the Oracle VM Documentation at the following link:
https://docs.oracle.com/cd/E64076_01/E64081/html/vmcon-vm-modes.html

Note

For Linux systems running **RedHat Enterprise, CentOS or Oracle Linux**, it's always suggested to install and use UEK kernel on the VM; **UEK is capable to work as HVM, PVM and HVM with PV Drivers**.

B. *Networks*: choose **vNICs** needed and associate them to the VM; if needed you can also specify a **custom MAC Address to the vNIC** (could be the MAC used on the source VM, **helpful while an application license is based on NIC HWADDR**)

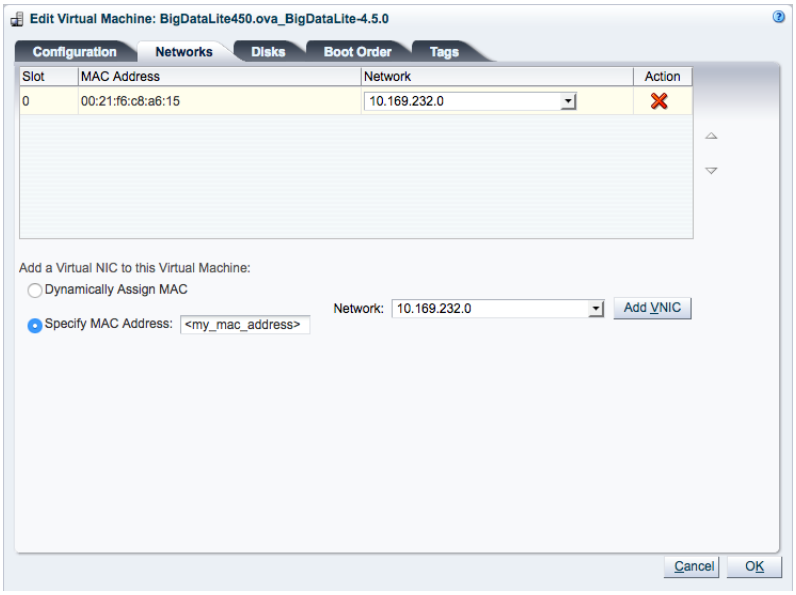

Figure 25: Oracle VM Manager: Edit Virtual Machine Settings (Networks)

Note

The option "**Specify MAC Address**" can be helpful also while the HWADDR is specified into the Operating System Network configuration files (as ifcfg-eth0 on a Linux system or, as default, on Microsoft Windows OS); alternatively it's suggested to leave out the "HWADDR" entry of the NIC into the configuration file on the Virtual Machine operating system.

C. *Disks*: add all virtual disks exported from VMware with the same order (see libvirt XML file for details)

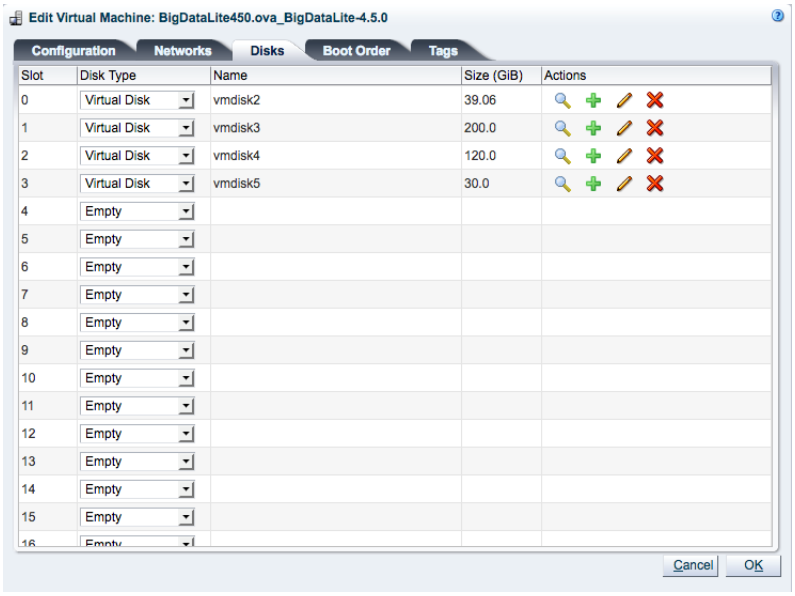

Figure 26: Oracle VM Manager: Edit Virtual Machine Settings (Disks)

D. *Boot Order*: evaluate to change the **boot-order** for the Virtual Machine

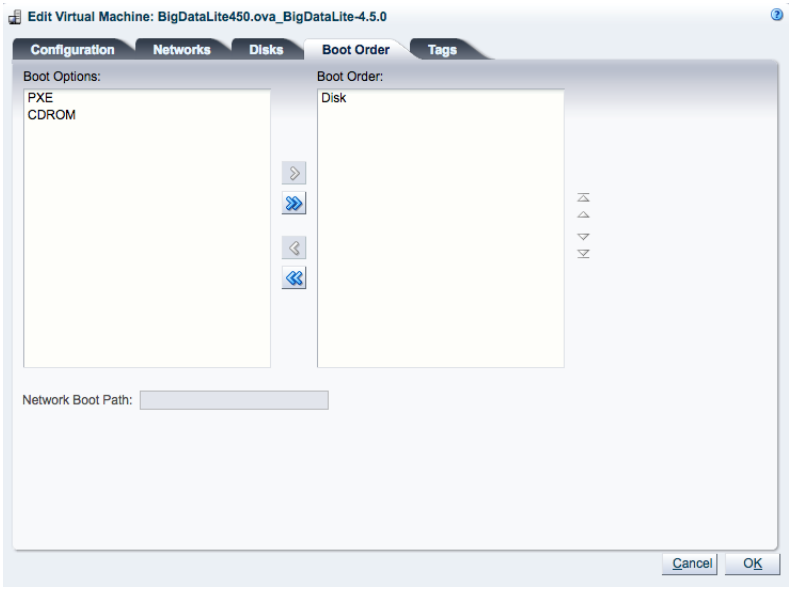

Figure 27: Oracle VM Manager: Edit Virtual Machine Settings (Boot Order)

E. *Tags*: evaluate **optional tags**, helpful while looking for VMs into a huge list

10. Start the VM

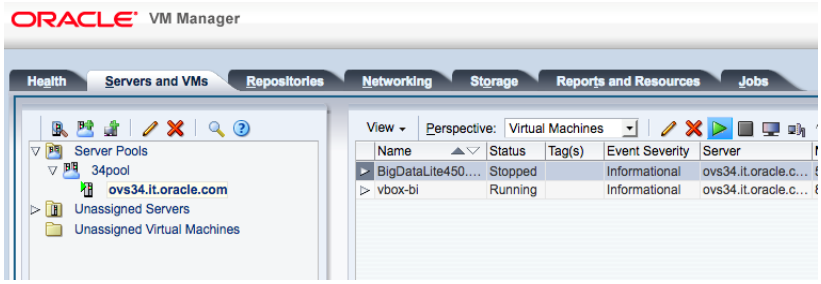

Figure 28: Oracle VM Manager: Start Virtual Machine

11. Uninstall VMware tools from the Virtual Machine
12. On Microsoft Windows Virtual Machine install Oracle VM Paravirtualized Drivers for Microsoft Windows.

Solution 4: Automated migration using CLI interfaces

NB: this utility is available at the following URL:

http://www.oracle.com/technetwork/server-storage/vm/downloads/ovm-tools-3604795.html

ImportFromVMware script helps to automate virtual-machine migration from VMWare vSphere 5/6 to Oracle VM 3.4 using an automated approach based on OVF/OVA format; this solution is based on a script able to automate following steps:

- Interact with VMware CLI interface (vim-cmd)
- Interact with Oracle VM CLI interface (ssh on port 10000)
- Create OVA files from VMware VMs on VMware
- Import OVA files to OVM directly from VMware vSphere server
- Create VM on Oracle VM (from OVA imported)
- Edit VM based on information supplied
- Associate VM vNICs to proper Networks available on Oracle VM
- Keep (or not) vNIC HWADDR used by VMs on VMware
- Start the VM on Oracle VM once configuration is finished

The command "**ImportFromVMware**" can be executed on any machine that can reach:

- Port 10000 (Oracle VM CLI) of Oracle VM Manager
- Port 22 (ssh) of Oracle VM Manager host
- Port 22 (ssh) of VMware vSphere server

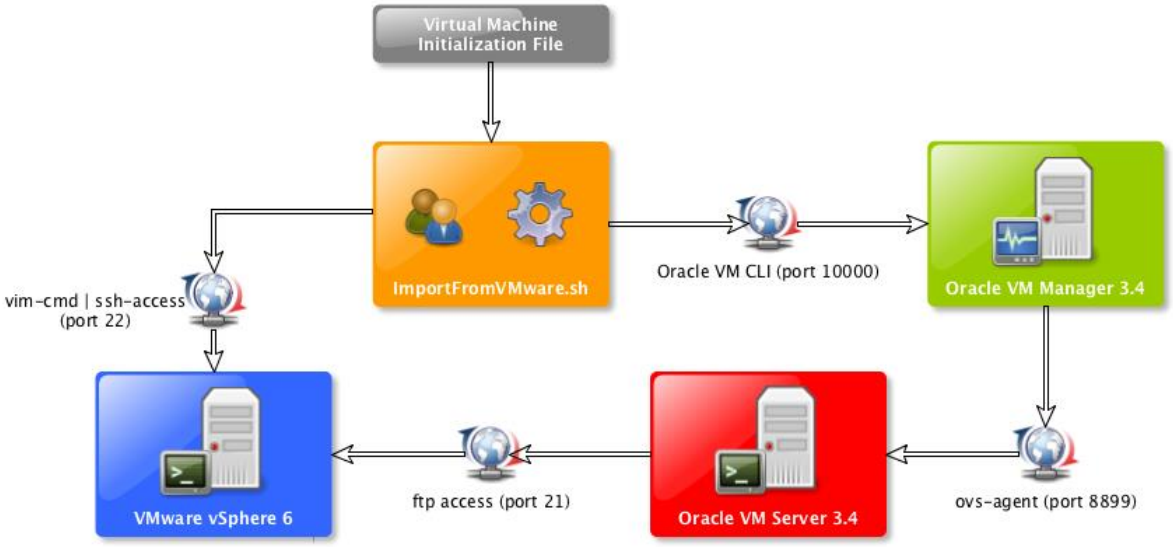

Figure 29: Automated VMware to Oracle VM migration (ImportFromVMware)

Only one step to migrate: from VMware to Oracle VM	**Service outage depends of virtual machine size; bigger is the size of virtual-disks higher is the outage time.**
Applicable to all x86 virtual-machine Operating System	**OS/Application maintenance cannot be executed simultaneously.**
The script is open and can be improved easily	**Old Operating System could need a particular tweak on the source Virtual Machine before exporting it.**
Once configured can be used as a standard method	**Needs proper setup (see requirements)**

Automation Requirements

Before proceeding to use the "**ImportFromVMware**" script, a list of requirements has to be implemented on VMware vSphere server.

Enable SSH access to VMware vSphere Server

Refer to VMware Knowledge Base 2004746

Install and enable ftp service on VMware vSphere Server

FTP service will be used/enabled while Oracle VM Server downloads the OVA file from VMware vSphere. "ImportFromVMware" script will proceed to start the ftp service on VMware before the download from Oracle VM starts and to stop the ftp service once the download is completed.

FTP service is not available as a default component/service of VMware vSphere.

Here the steps to install ProFTPD service on VMware vSphere 6:

1. Download ProFTPD package for VMware vSphere 5.x/6.x here
2. Transfer the file downloaded on VMware vSphere server using ssh-access (scp) on a VMware vSphere datastore (ex. /vmfs/volumes/datastore1/)
3. Install ProFTPD package on VMware vSphere server 5.x/6.x using following syntax:

```
# esxcli software vib install --no-sig-check -d /vmfs/volumes/datastore1/ProFTPD-
1.3.3-8-offline_bundle.zip
```

Install "ovftool" utility on VMware vSphere server

On VMware vSphere server there is no command-line utility able to export a VM into the OVA format. That said, "ovftool" utility is not available for VMware vSphere server 5.x/6.x.

So, the only workaround to this issue is to temporary install the "ovftool" on a Linux machine and, then, copy the installed files to VMware vSphere server.

Here the steps needed to complete the installation:

1. Download "ovftool" utility (release 4.0 and above) from this page (choose version for Linux 64bit) – a free registration to the website is required (if an existing account is not available)
    a. Alternate link to download the utility is available here
2. Install "ovftool" on a temporary Linux-64 machine with following syntax:

```
[root@ovmm33 ~]# sh VMware-ovftool-4.1.0-2459827-lin.x86_64.bundle
Extracting VMware Installer...done.
You must accept the VMware OVF Tool component for Linux End User
License Agreement to continue.  Press Enter to proceed.
...
.....
The product is ready to be installed.  Press Enter to begin
installation or Ctrl-C to cancel.
...
```

```
.....
Installing VMware OVF Tool component for Linux 4.1.0
    Configuring...
[##################################################################] 100%
Installation was successful.
```

3. Clone the "ovftool" utility installation from the Linux temporary machine to VMware vSphere server; the software will be cloned on an VMware datastore.

```
# scp -r /usr/lib/vmware-ovftool root@vsphere01:/vmfs/volumes/datastore1
```

"ovftool" utility path will also have to be specified into the "initialization file" for each vm that will be migrated from VMware to Oracle VM (see following chapter).

Rename fie "icudt44l.dat" due to a known issue

Executing "ovftool" directly on VMware vSphere server terminates always in error due to a problem in character encoding (icu). To apply the workaround to this problem execute following command on VMware vSphere server:

```
# mv /etc/vmware/icu/icudt44l.dat /etc/vmware/icu/icudt44l.dat.old
```

Initialization file

"ImportFromVMware" script needs an initialization file in input; this file contains all information related to the virtual machine that needs to be migrated from VMware to Oracle VM:

- **vm_name** = name of the virtual machine on VMware environment

"**vm_name**" can be idenfitied using VMware client console or "**vim-cmd**" VMware CLI interface like in following example:

```
[root@host-9-113:~] vim-cmd vmsvc/getallvms
Vmid   Name           File         Guest OS                      Version
Annotation
1      vm01_ol67      [datastore1] vm01_ol67/vm01_ol67.vmx       rhel6_64Guest
vmx-11
2      vm02_win2012   [datastore1] vm02_win2012/vm02_win2012.vmx windows8Server
vmx-11
3      vm03_rh6       [datastore1] vm03_rh6/vm03_rh6.vmx         rhel6_64Guest
vmx-11
4      vm04_sol113    [datastore1] vm04_sol113/vm04_sol113.vmx   solaris11_64Guest
vmx-11
[root@host-9-113:~]
```

- **vsphere_host** = VMware vSphere host/ip-address where the virtual machine resides
- **ovmm_host** = Oracle VM Manager host / ip-address
- **ovftool_path** = Full path of "ovftool" utility, installed on VMware vSphere server
- **vmware_poweroff (yes/no)** = Shutdown the virtual machine on VMware if running
- **ovm_repository** = Oracle VM Repository where OVA file will be imported and virtual machine created
- **domain_type** = domain-type to use for the virtual machine that will be created on Oracle VM (XEN_HVM,XEN_HVM_PV_DRIVERS,XEN_PVM)

- **memory_limit** = the maximum memory size the virtual machine can allocate on Oracle VM
- **memory** = this is the memory allocation used when starting the virtual machine. You can change this when editing the virtual machine without restart the virtual machine (valid for PVM and HVMPV on Linux)
- **cpucountlimit** = maximum number of processors the virtual machine can allocate on Oracle VM. This cannot be changed when editing a running virtual machine. To edit this value, you must first stop the virtual machine
- **cpucount =** number of processors the virtual machine allocates on Oracle VM. You can change this when editing a running virtual machine, up to the value of Max. Processors
- **vnic_network_name_association** = for each virtual machine vNic, specify target network-name on Oracle VM
- **vmnet0** (first vnic) = Network-A
- **vmnet1** (second vnic) = Network-B
- **keep_nic_hwaddr** (yes/no) = once enabled (yes) this option will maintain vNic HWADDR used by the VM also on Oracle VM; particularly useful while migrating applications licensed on NIC HWADDR
- **start_vm (yes/no)** = start the virtual machine on Oracle VM once creation/configuration is completed

Initialization file example:

```
# VMware VM name - the same will be used on OVM
# [vm_name]
vm_name=vm01_ol67

# vSphere Host
# [vsphere_host]
vsphere_host=138.3.9.113

# Oracle VM Manager Host
# [ovmm_host]
ovmm_host=138.3.10.243

# ovftool path on VMware vSphere server
# [ovftool_path]
ovftool_path=/vmfs/volumes/datastore1/vmware-ovftool/ovftool

# Poweroff VMware VM if running
# [vmoff_vmware]
vmware_poweroff=yes

# Oracle VM Repository (target destination)
# if repository name contains spaces, please use "
# [repository_name]
ovm_repository="Local Repo"

# possible target domain_type XEN_HVM,XEN_HVM_PV_DRIVERS,XEN_PVM
# domain_type=XEN_HVM does not allow to have more than 4 vdisks!!!
# [ovm_domain_type]
domain_type=XEN_PVM

# specify target vm_max_memory in megabytes
# [ovm_max_memory]
memorylimit=4096

# specify target vm_memory in megabytes
# [ovm_memory]
```

```
memory=4096

# specify target vm_max_cpus
# [max_cpu]
cpucountlimit=4

# specify target vm_cpus
# [cpu]
cpucount=4

# specify target network-name for each vnic
# if a correct association for each vnic won't be specified the VM won't start and
manual intervention is needed
# in case of duplicated network names, the first entry will be configured
# [vnic_network_name_association]
vmnet0=138.3.8.0
#vmnet1=
#vmnet2=

# keep vnic HWADDR - pay attention on this
# [keep_vnic_hwaddr_as_source]
keep_nic_hwaddr=yes

# start vm once import completed
# [start_ovm_vm]
start_vm=yes
```

Steps executed by the script

Executing the script without any option and/or input parameter shows following output:

```
[root@ol7db12c ImportFromVMware]# ./ImportFromVMware

#########################################################################################
#########
 Use ImportFromVMware <Initialization File> <VMware vSphere passowrd> <Oracle VM
Manager Linux User Password>
 Example:
           ImportFromVMware /tmp/vm01_ol67.ini rootpwd oraclepwd
 To evaluate how-to compile the .ini file you can start from demo.ini example file
#########################################################################################
#########

[root@ol7db12c ImportFromVMware]#
```

So the script needs 3 parameters supplied:

- Initialization file: the ".ini" file containing all the information related to the virtual machine that will be migrated from VMware to Oracle VM
- VMware vSphere password: "root" password to access VMware vSphere host by ssh
- Oracle VM Manager Linux User Password: "oracle" password to access Oracle VM Manager host by ssh

Here all the steps executed by "ImportFromVMware" script:

Checks before starting

The script checks that:

- Supplied parameter are 3 (.ini file, root password for vSphere and oracle password for Oracle VM Manager)
- Initialization file supplied exists (.ini)
- Password-less access to VMware vSphere is granted (if not it proceeds to configure it)
- Password-less access to Oracle VM CLI is granted (if not it proceeds to configure it)
- Check that “ovftool” path specified into “.ini” initialization file is available (on VMware vSphere host)
- Check that file “/etc/vmware/icu/icudt44l.dat” has been renamed (to .old for example)
- Check the virtual machine is not running on VMware vSphere (if yes, evaluate the initialization option “vmware_poweroff” to poweroff the running virtual machine)
- Check the OVA file is going to be created does not already exist on VMware Datastore

Steps executed on VMware vSphere host

The script executes following steps on VMware vSphere:

- Get VMware Datastore name on which the virtual machine resides
    - NB: the OVA file will be created on the same VMware Datastore
- Get VMware virtual machine file configuration (in memory, for further analisys, like get the HWADDR of vNics)
- Create the OVA file starting from VMware virtual machine configuration file (.vmx)
- Check OVA file has been created, as expected
- Start ProFTPD service before starting the OVA import from Oracle VM
- Stop ProFTPD service after the OVA has been imported to Oracle VM
- Remove the OVA file created on VMware datastore (once the virtual machine is already running on Oracle VM)

Steps executed on Oracle VM Manager/Server

The script executes following steps on Oracle VM Manager or, using the CLI interface, on Oracle VM Server:

- Get Oracle VM Repository ID using Repository Name specified into the initialization file
- Import OVA file from VMware vSphere host (directly) on repository specified into the initialization file
- Get “Assembly ID” of the OVA file imported
- Get “Assembly VM ID” from the OVA file imported
- Create the virtual machine starting from the OVA file imported (new feature available with Oracle VM 3.4)
- Get virtual machine ID created
- Apply changes, specified into the initialization file, to the virtual machine (cpu, memory, domain-type etc)

- Get vNics presented to the virtual machine created
- Apply Oracle VM Network ID to each vNic specified into the initialization file
- [optional] Apply custom HWADDR to all vNIC (only if keep_nic_hwaddr=yes)
- Move the virtual machine to the Oracle VM Pool that owns/manage the repository on which resides
- Start the virtual machine

Script execution: output example

Execution output with password-less ssh-access not enabled/available.

```
[root@ol7db12c ImportFromVMware]# ./ImportFromVMware vm01_ol67.ini welcome1 oracle
================================================
Executing initialization file vm01_ol67.ini.......
==> Done!
================================================
Permission denied (publickey,keyboard-interactive).
================================================
Preparing passwordless access to vSphere server......
spawn /usr/bin/ssh root@138.3.9.113 mkdir -p /etc/ssh/keys-root; echo "ssh-rsa
AAAAB3NzaC1yc2EAAAADAQABAAABAQC1Iqe3waEUZUqLvPHhBSSjk6xtS8INs6Ev8kWYUbgyscFdxifLr7rdZ
/V1T2B5TKUMu23Y4npwb39gMrpN1DAqkE52HR+GrNP5vDjEJibZ2MeXiKMfxLlSIgC59jt177Z7GFf8cCSh2r
zUIpCPfYscD8YqwuG/zV85c0Eb9X6GC/lxtc4bV+ZGGXnaV4o9lMoEd5Ucb2Q3XxMG5CwzfY8RdZhrp9zvGR6
1L550BKpMKmlXc29Ds3dsAG4d+te6gj3ygwkJikuW2YT+lgYKtItPUSmiY0QJAYnJ9Pyt/rzS9Moo0CKIlafz
ZZ8mmrOatqT5rLfT5AmKK56HW29WbyGX root@ol7db12c.it.oracle.com" >> /etc/ssh/keys-
root/authorized_keys
Password:
Password:
==> Done!
================================================
Permission denied (password,publickey).
================================================
Preparing passwordless access to Oracle VM Manager......
================================================
spawn /usr/bin/ssh oracle@138.3.10.243 mkdir -p /home/oracle/.ssh; echo "ssh-rsa
AAAAB3NzaC1yc2EAAAADAQABAAABAQC1Iqe3waEUZUqLvPHhBSSjk6xtS8INs6Ev8kWYUbgyscFdxifLr7rdZ
/V1T2B5TKUMu23Y4npwb39gMrpN1DAqkE52HR+GrNP5vDjEJibZ2MeXiKMfxLlSIgC59jt177Z7GFf8cCSh2r
zUIpCPfYscD8YqwuG/zV85c0Eb9X6GC/lxtc4bV+ZGGXnaV4o9lMoEd5Ucb2Q3XxMG5CwzfY8RdZhrp9zvGR6
1L550BKpMKmlXc29Ds3dsAG4d+te6gj3ygwkJikuW2YT+lgYKtItPUSmiY0QJAYnJ9Pyt/rzS9Moo0CKIlafz
ZZ8mmrOatqT5rLfT5AmKK56HW29WbyGX root@ol7db12c.it.oracle.com" >>
/home/oracle/.ssh/ovmcli_authorized_keys
oracle@138.3.10.243's password:
Permission denied, please try again.
oracle@138.3.10.243's password:
================================================
==> Done!
================================================
Executing the first passwordless access to Oracle VM Manager......
spawn ssh -l admin 138.3.10.243 -p 10000
OVM> yes - Command 'yes' is not supported.
OVM> ==> Done!
================================================
================================================
VMware ovftool 4.0.0 (build-2301625)
ovftool available on VMware
================================================
================================================
Virtual Machine named vm01_ol67 identified on VMware vSphere.
================================================
```

```
================================================
vm01_ol67 on VMware is stopped.
================================================
================================================
Creating OVA for virtual machine vm01_ol67......
Opening VMX source: /vmfs/volumes/datastore1/vm01_ol67/vm01_ol67.vmx
Opening OVA target: /vmfs/volumes/datastore1/vm01_ol67.ova
Writing OVA package: /vmfs/volumes/datastore1/vm01_ol67.ova
Transfer Completed
Completed successfully
OVA vm01_ol67.ova created!
================================================
================================================
Starting ProFTPD on VMware vSphere server......
==> Done!
================================================
================================================
Importing OVA file from VMware vSphere to Oracle VM......
OVA Import completed!
ProFTPD service closed.
================================================
================================================
Checking OVA file imported......
Virtual Appliance import succeed.
OVA file vm01_ol67.ova imported.
================================================
================================================
Creating vm vm01_ol67 from OVA imported......
==> Done!
================================================
================================================
Editing vm vm01_ol67 parameters like CPUs, Memory, Virtualization Type....
Based on parameters supplied into vm01_ol67.ini
OVM> edit vm id=0004fb0000060000073f3f872589bd4d5 name=vm01_ol67 domaintype=XEN_PVM
Command: edit vm id=0004fb000006000073f3f872589bd4d5 name=vm01_ol67
domaintype=XEN_PVM
Status: Success
Time: 2016-12-02 07:43:22,119 EST
JobId: 1480682601724
OVM> Connection closed.
OVM> edit vm id=0004fb0000060000073f3f872589bd4d5 memoryLimit=4096 memory=4096
cpuCountLimit=4 cpuCount=4
Command: edit vm id=0004fb000006000073f3f872589bd4d5 memoryLimit=4096 memory=4096
cpuCountLimit=4 cpuCount=4
Status: Success
Time: 2016-12-02 07:43:23,424 EST
JobId: 1480682603015
OVM> Connection closed.
==> Done!
================================================
================================================
Applying Network-ID to each vNic......
vNic vmnet0 on network 8a030800 created for vm vm01_ol67!
==> Done!
================================================
================================================
Applying Custom HWADDR to vNics as requested by .ini configuration file......
00:50:56:8e:05:42 correctly associated to vnic 0004fb0000070000bfb8c93d496500ff
==> Done!
================================================
================================================
Virtual Machine vm01_ol67 import/creation completed!
================================================
================================================
Starting Virtual Machine vm01_ol67 on Oracle VM......
OVM> Connection closed.45,751 EST 00073f3f872589bd4d5
```

```
==> Done!
================================================
================================================
Source vSphere OVA file /vmfs/volumes/datastore1/vm01_ol67.ova removed!
================================================
```

Execution output with password-less ssh-access in place.

```
[root@ol7db12c ImportFromVMware]# ./ImportFromVMware vm02_win2012.ini welcome1 oracle
================================================
Executing initialization file vm02_win2012.ini.......
==> Done!
================================================
================================================
Passwordless access to vSphere enabled.
================================================
================================================
Passwordless access to Oracle VM CLI enabled.
================================================
================================================
VMware ovftool 4.0.0 (build-2301625)
ovftool available on VMware
================================================
================================================
Virtual Machine named vm02_win2012 identified on VMware vSphere.
================================================
================================================
vm02_win2012 on VMware is stopped.
================================================
================================================
Creating OVA for virtual machine vm02_win2012......
Opening VMX source: /vmfs/volumes/datastore1/vm02_win2012/vm02_win2012.vmx
Opening OVA target: /vmfs/volumes/datastore1/vm02_win2012.ova
Writing OVA package: /vmfs/volumes/datastore1/vm02_win2012.ova
Transfer Completed
Completed successfully
OVA vm02_win2012.ova created!
================================================
================================================
Starting ProFTPD on VMware vSphere server......
==> Done!
================================================
================================================
Importing OVA file from VMware vSphere to Oracle VM......
OVA Import completed!
ProFTPD service closed.
================================================
================================================
Checking OVA file imported......
Virtual Appliance import succeed.
OVA file vm02_win2012.ova imported.
================================================
================================================
Creating vm vm02_win2012 from OVA imported......
==> Done!
================================================
================================================
Editing vm vm02_win2012 parameters like CPUs, Memory, Virtualization Type....
Based on parameters supplied into vm02_win2012.ini
OVM> edit vm id=0004fb00000600008ad64672df9e1d4f name=vm02_win2012
domaintype=XEN_HVM_PV_DRIVERS
```

```
Command: edit vm id=0004fb00000600008ad64672df9e1d4f name=vm02_win2012
domaintype=XEN_HVM_PV_DRIVERS
Status: Success
Time: 2016-12-02 09:25:44,060 EST
JobId: 1480688743902
OVM> Connection closed.
OVM> edit vm id=0004fb00000600008ad64672df9e1d4f memoryLimit=8192 memory=8192
cpuCountLimit=6 cpuCount=6
Command: edit vm id=0004fb00000600008ad64672df9e1d4f memoryLimit=8192 memory=8192
cpuCountLimit=6 cpuCount=6
Status: Success
Time: 2016-12-02 09:25:45,278 EST
JobId: 1480688745015
OVM> Connection closed.
==> Done!
================================================
================================================
Applying Network-ID to each vNic......
vNic vmnet0 on network 8a030800 created for vm vm02_win2012!
==> Done!
================================================
================================================
Virtual Machine vm02_win2012 import/creation completed!
================================================
================================================
Starting Virtual Machine vm02_win2012 on Oracle VM......
OVM> Connection closed.01,574 EST 0008ad64672df9e1d4f
==> Done!
================================================
================================================
Source vSphere OVA file /vmfs/volumes/datastore1/vm02_win2012.ova removed!
================================================
```

Debug Execution script.

Enable “debug” to the script execution is pretty easy; just edit “ImportFromVMware” and apply following change on firsts lines of the script:

From:

```
#!/bin/bash
# Rel. 0.1 - ImportFromVmware
# S. Coter - simon.coter@oracle.com
# https://blogs.oracle.com/scoter
```

To:

```
#!/bin/bash
set -x
# Rel. 0.1 - ImportFromVmware
# S. Coter - simon.coter@oracle.com
# https://blogs.oracle.com/scoter
```

Once modified, re-execute the script to debug the possible issue.

APPENDIX A – Consideration while migrating

Linux platform migration

All recent Linux releases should work in Xen without any changes in them assuming the VMs are using only UUIDs, volume labels and device mapper designations to identify their disks.

Red Hat based Linux VMs (RHEL, OL and CentOS up to version 7.3) require the following modifications before they can be moved to Xen:

- The xen-blkfront module must be added to initramfs image(s): make sure you have dracut package installed, then run "dracut -f --add-drivers xen-blkfront" as root to add the xen-blkfront module to initramfs image for the currently loaded kernel while running the Virtual Machine in VMWare.
- Interface MAC addresses must be added to configuration files for network interfaces those should keep their configuration in Xen: add the appropriate HWADDR string (like HWADDR="00:00:19:73:AC:DC") to the /etc/sysconfig/network-scripts/ifcfg-* files for the interfaces those you would want to retain in Xen.

It was noted that at least some Red Hat 6-based Virtual Machines are not able to display X-server login screen in Xen if it has a resolution larger than 800x600. VMs those are not running X-server do not have any issues.

Microsoft Windows platform migration

Old Microsoft Windows releases should require the installation of Oracle VM Windows PV Drivers on the source Virtual Machine before exporting for the migration to Oracle VM.

Conclusion

You are offered different approaches to perform virtual machine migration from VMware to Oracle VM. It's important to take the following into consideration when planning the right methods to accomplish your goals:

- Service outage & Migration time
- Possible maintenance while migrating
- Repetitiveness of the migration activity

Following table suggest the correct method based on requirements:

Requirement	Method
Service Outage – Minor disruption possible	rsync / ASM mirroring / Oracle Dataguard
Apply OS/APP maintenance while migrating	rsync / ASM mirroring / Oracle Dataguard
Repetitiveness of the migration activity	OVA / v2v-virt-copy-to-local / ImportFromVMware
Simpleness of the migration activity	OVA / ImportFromVMware

Note

Export/import OVA method can be automated. Based on CLI/API, available for both Oracle VM and VMware, the procedure can be scripted and automated like in the example of "ImportFromVMware" script that can also be improved and integrated with further options.

Get started with Oracle VM by downloading the software. Contact your Oracle representative or visit www.oracle.com/virtualization to learn more.

Oracle Corporation, World Headquarters
500 Oracle Parkway
Redwood Shores, CA 94065, USA

Worldwide Inquiries
Phone: +1.650.506.7000
Fax: +1.650.506.7200

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Hardware and Software, Engineered to Work Together

Oracle VM 3: Migrate Virtual Machines from VMware to Oracle VM
February 2018
Author: Simon Coter
Contributors: Honglin Su
Revision: 1.0

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