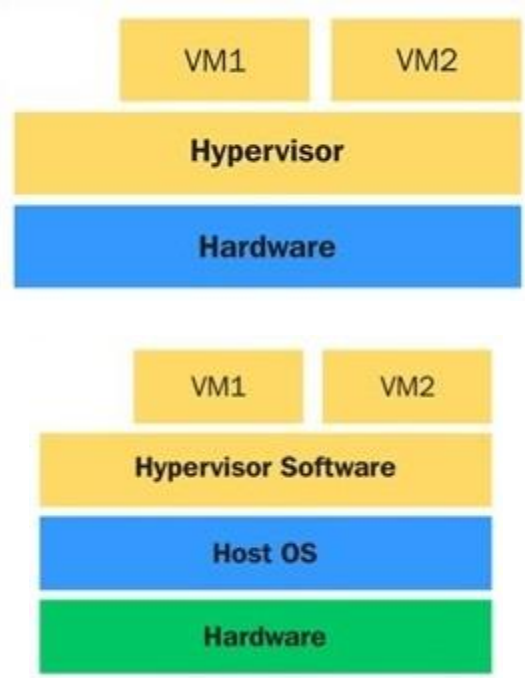
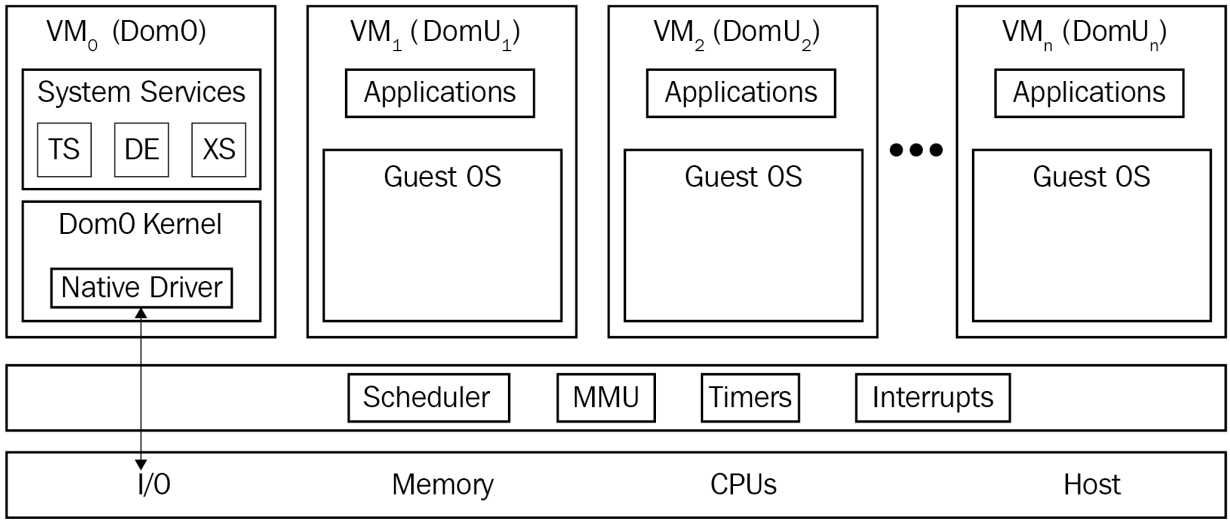
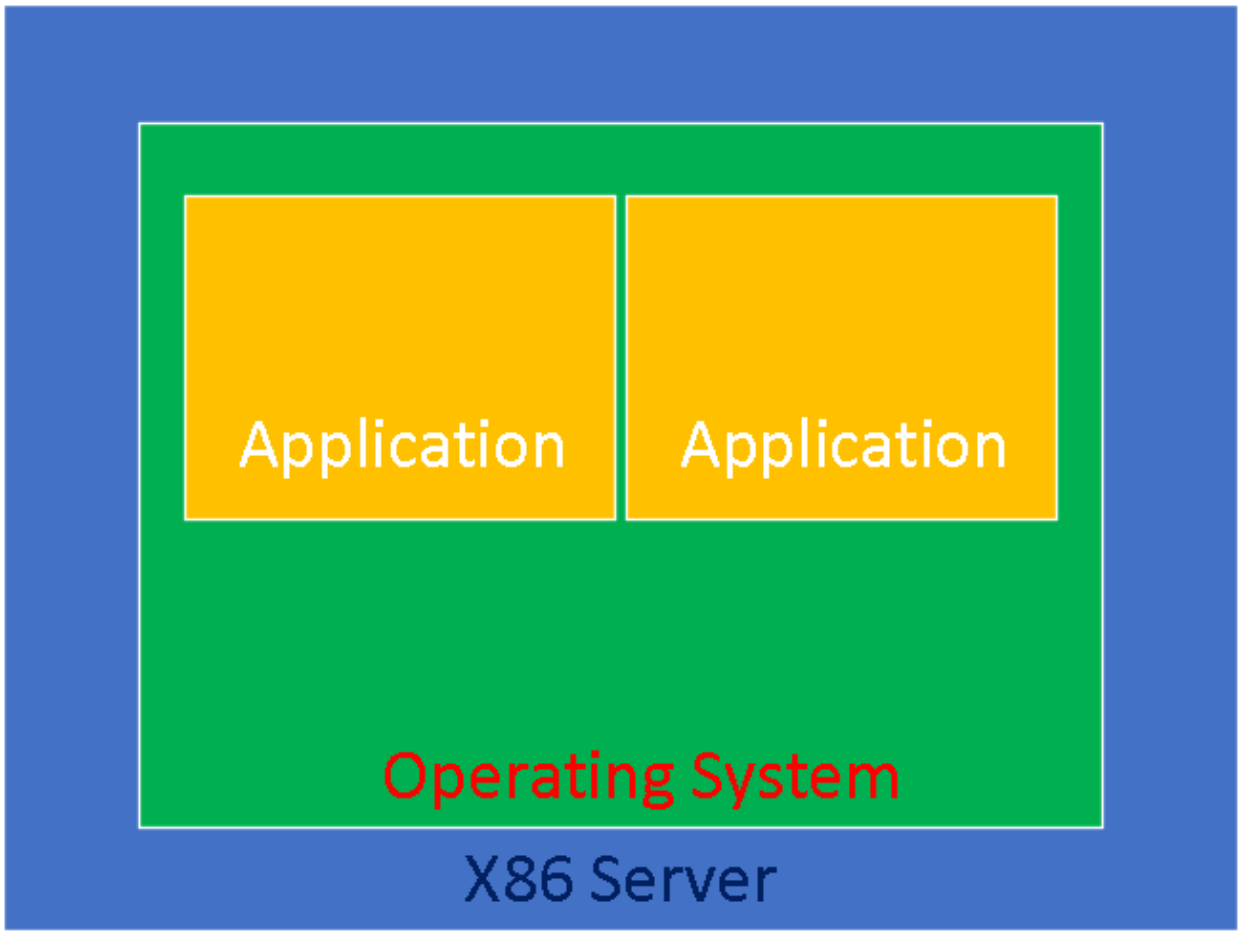
Chapter 1: Understanding Linux Virtualization

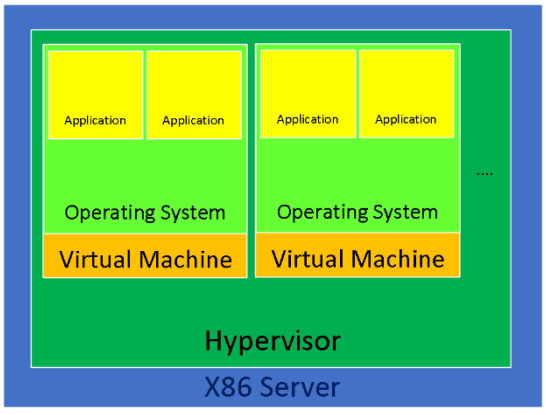


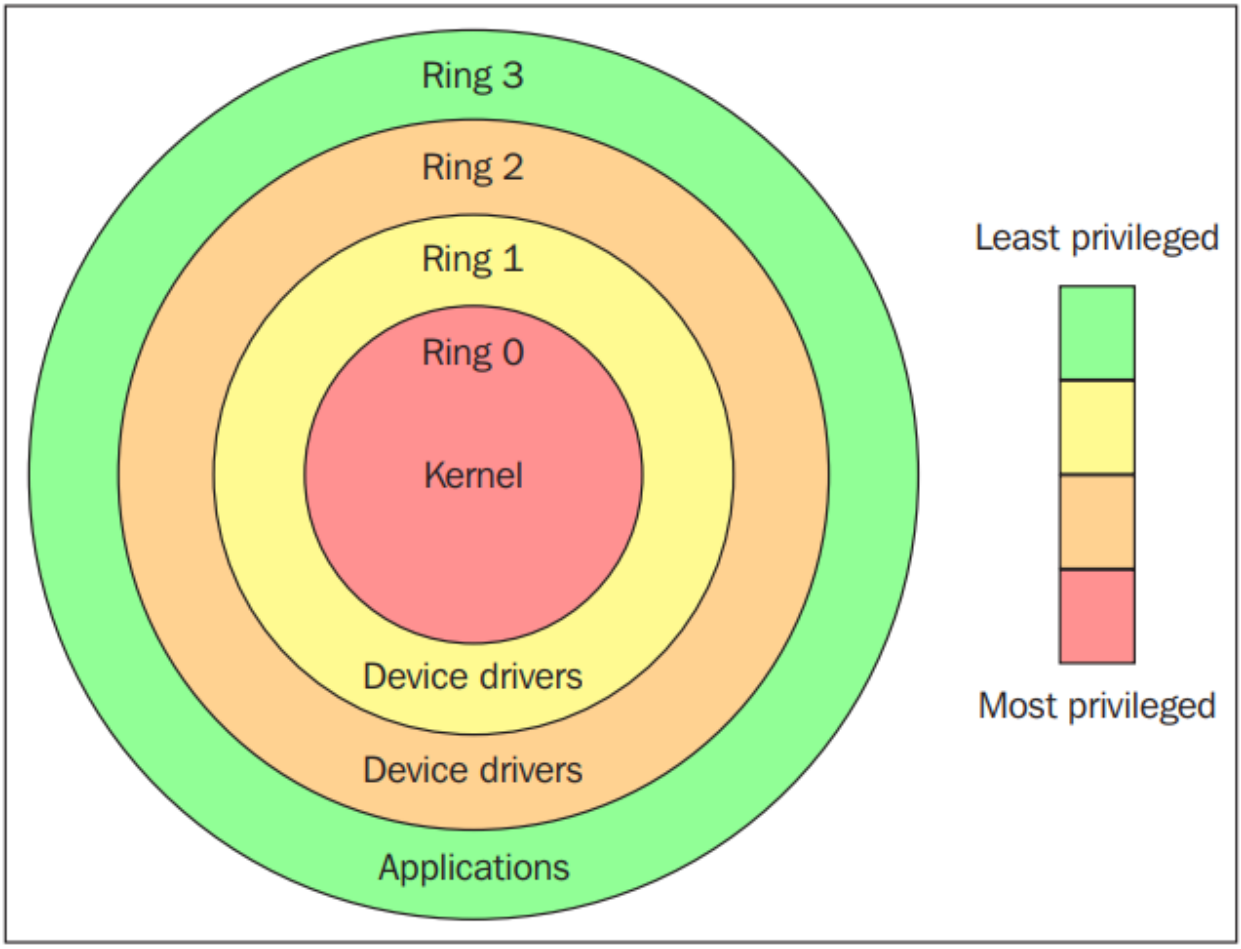
Project	Virtualization type	Project URL
KVM (Kernel-based Virtual Machine)	Full virtualization	http://www.linux-kvm.org/
VirtualBox	Full virtualization	https://www.virtualbox.org/
Xen	Full and paravirtualization	http://www.xenproject.org/
Lguest	Paravirtualization	http://lguest.ozlabs.org/
UML (User Mode Linux)	First	http://user-mode-linux.sourceforge.net/
Linux-VServer	First	http://www.linuxvirtualserver.org/

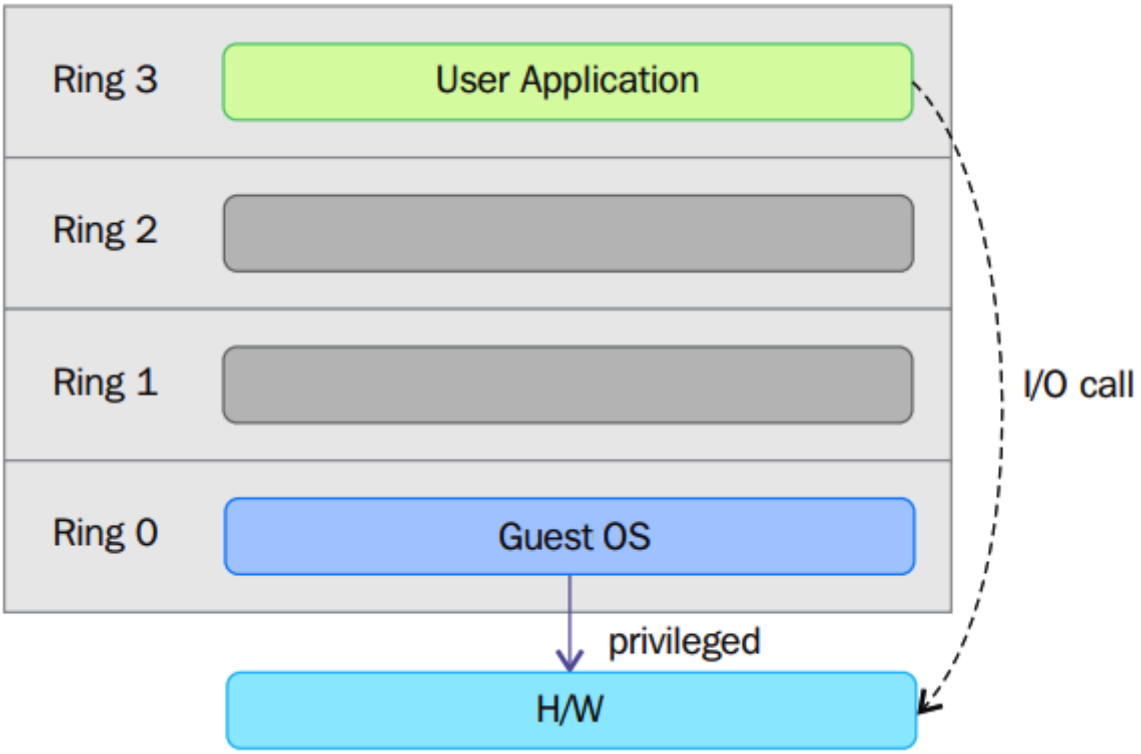

VM0 (Dom0)
System Services
TS
DE
XS
Dom0 Kernel
Native Driver
VM1 (DomU1)
Applications
Guest OS
VM2 (DomU2)
Applications
Guest OS
VMn (DomUn)
Applications
Guest OS
Scheduler
MMU
Timers
Interrupts
I/O
Memory
CPUs
Host

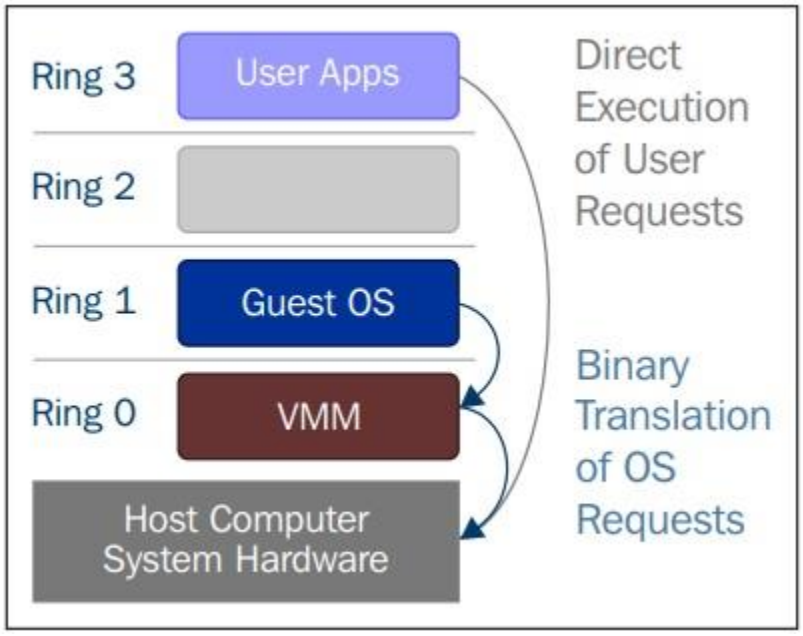
Chapter 2: KVM as a Virtualization Solution

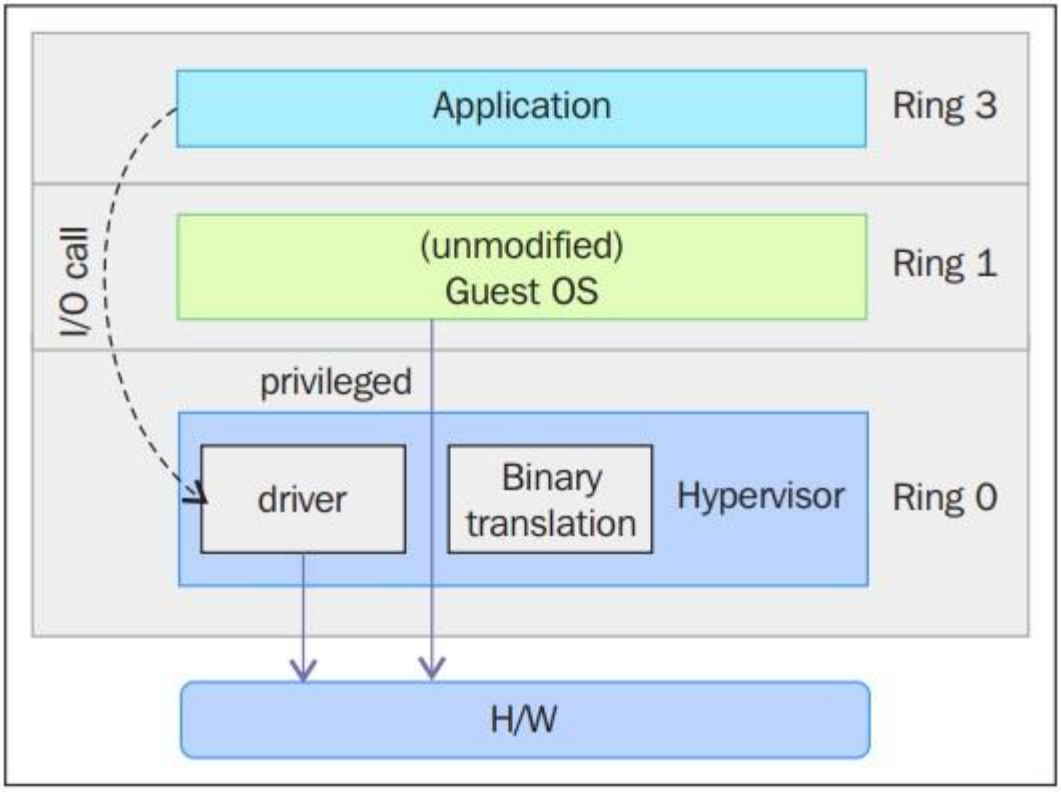


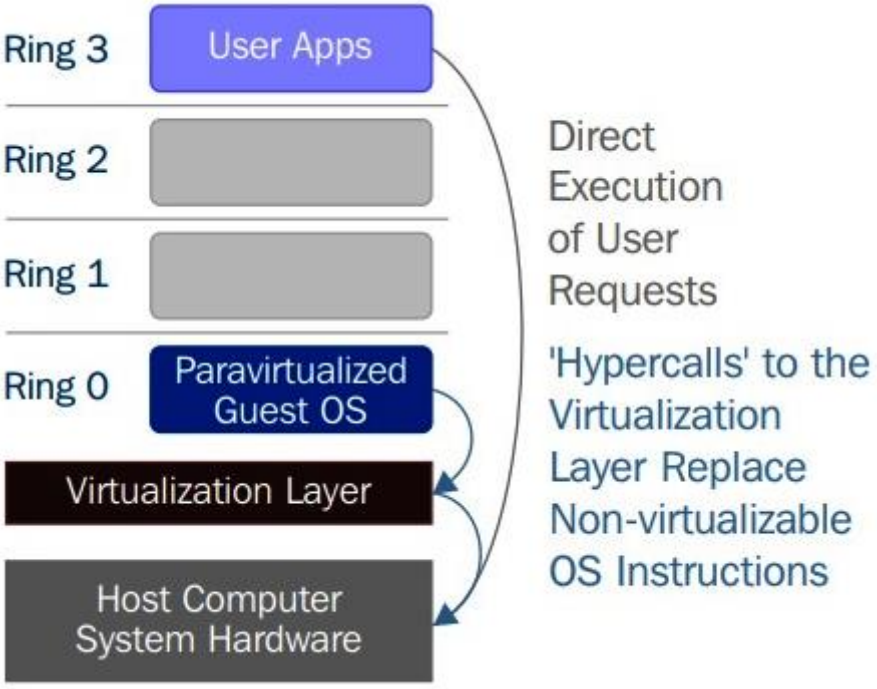


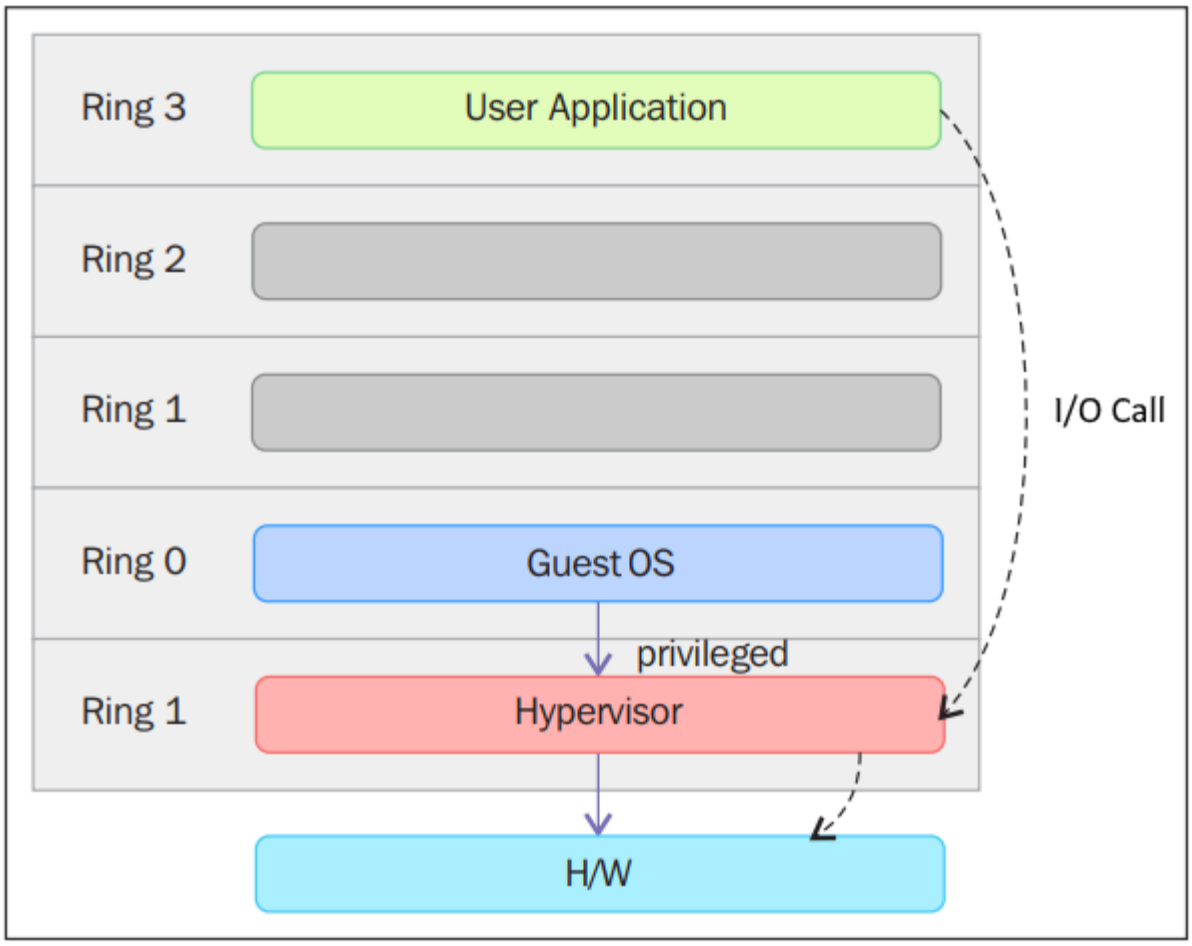

Ring 3
Ring 2
Ring 1
Ring 0
Kernel
Device drivers
Device drivers
Applications
Least privileged
Most privileged


Ring 3
User Application
Ring 2
Ring 1
Ring 0
Guest OS
I/O call
privileged
H/W

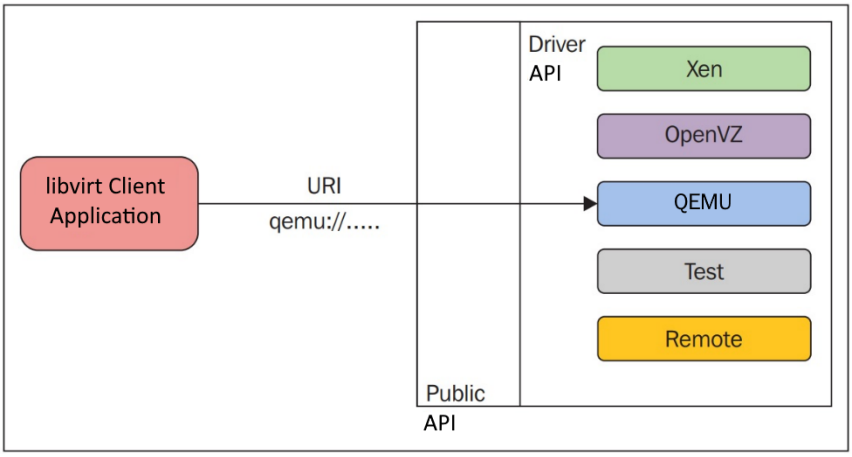

Ring 3
User Apps
Ring 2
Ring 1
Guest OS
Ring 0
VMM
Host Computer
System Hardware
Direct
Execution
of User
Requests
Binary
Translation
of OS
Requests

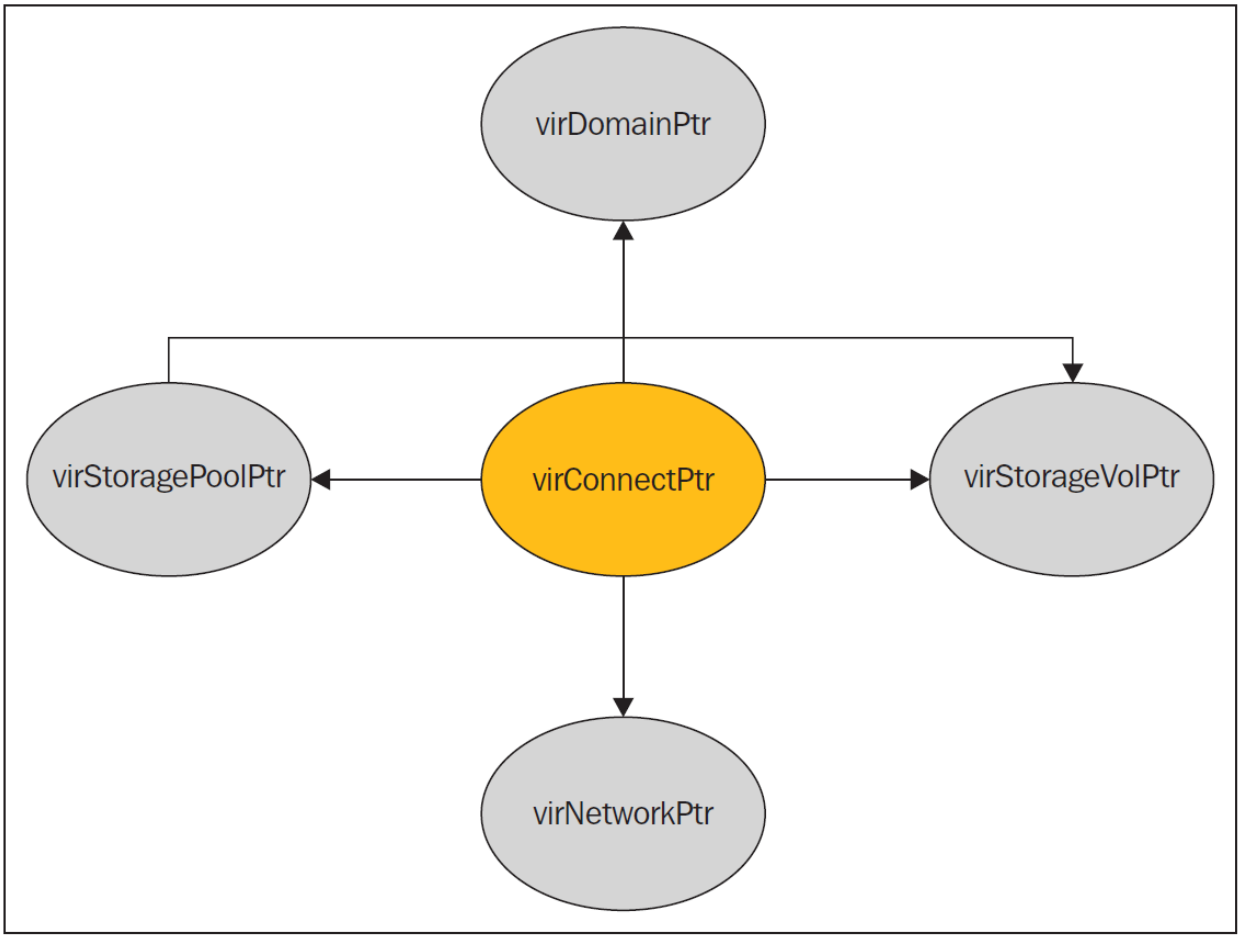

Application
Ring 3
I/O call
(unmodified)
Guest OS
Ring 1
privileged
driver
Binary
translation
Hypervisor
Ring 0
H/W


Ring 3
User Apps
Ring 2
Ring 1
Ring 0
Paravirtualized
Guest OS
Virtualization Layer
Host Computer
System Hardware
Direct
Execution
of User
Requests
'Hypercalls' to the
Virtualization
Layer Replace
Non-virtualizable
OS Instructions

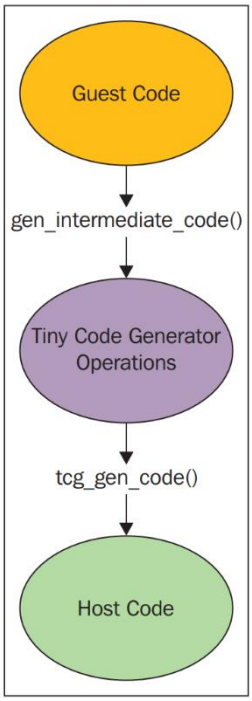

Ring 3
User Application
Ring 2
Ring 1
I/O Call
Ring 0
Guest OS
privileged
Ring 1
Hypervisor
H/W

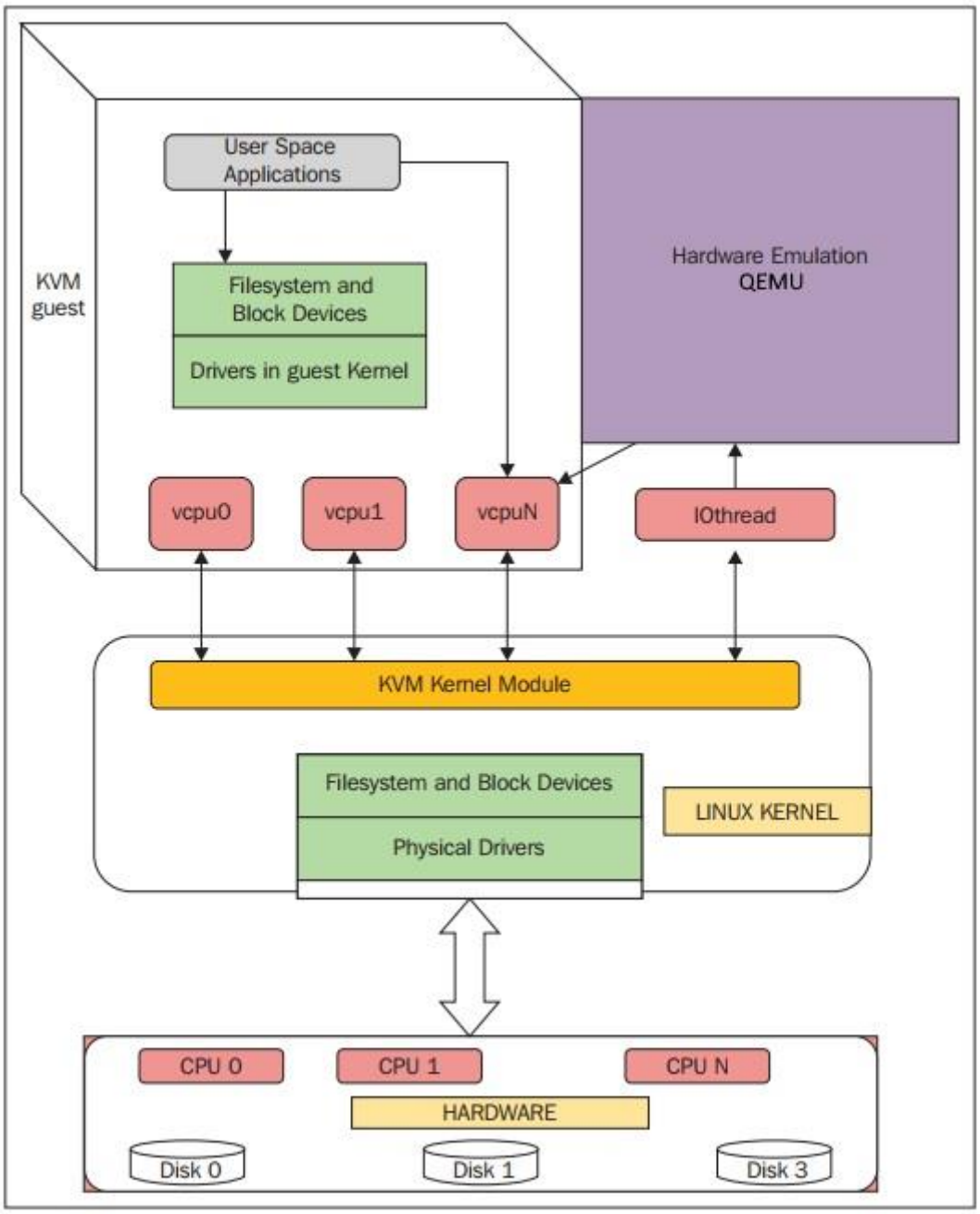
```
[root@kvmsource qemu]# ls
accel               dump                  meson_options.txt       qga
audio               exec.c                migration               qobject
authz               exec-vary.c           module-common.c         qom
backends            fpu                   monitor                 README.rst
block               fsdev                 nbd                     replay
block.c             gdbstub.c             net                     replication.c
blockdev.c          gdb-xml               os-posix.c              replication.h
blockdev-nbd.c      gitdm.config          os-win32.c              roms
blockjob.c          hmp-commands.hx       pc-bios                 rules.mak
bootdevice.c        hmp-commands-info.hx  plugins                 scripts
bsd-user            hw                    po                      scsi
capstone            include               python                  slirp
Changelog           io                    qapi                    softmmu
chardev             iothread.c            qdev-monitor.c          storage-daemon
CODING_STYLE.rst    job.c                 qemu-bridge-helper.c    stubs
configure           job-qmp.c             qemu-edid.c             target
contrib             Kconfig               qemu-img.c              tcg
COPYING             Kconfig.host          qemu-img-cmds.hx        tests
COPYING.LIB         libdecnumber          qemu-io.c               thunk.c
cpus-common.c       LICENSE               qemu-io-cmds.c          tools
crypto              linux-headers         qemu-keymap.c           tpm.c
default-configs     linux-user            qemu-nbd.c              trace
device_tree.c       MAINTAINERS           qemu.nsi                trace-events
disas               Makefile              qemu-options.h          ui
disas.c             Makefile.objs         qemu-options.hx         util
dma-helpers.c       memory_ldst.c.inc     qemu-options-wrapper.h  VERSION
docs                meson                 qemu.sasl               version.rc
dtc                 meson.build           qemu-seccomp.c          version.texi.in
```



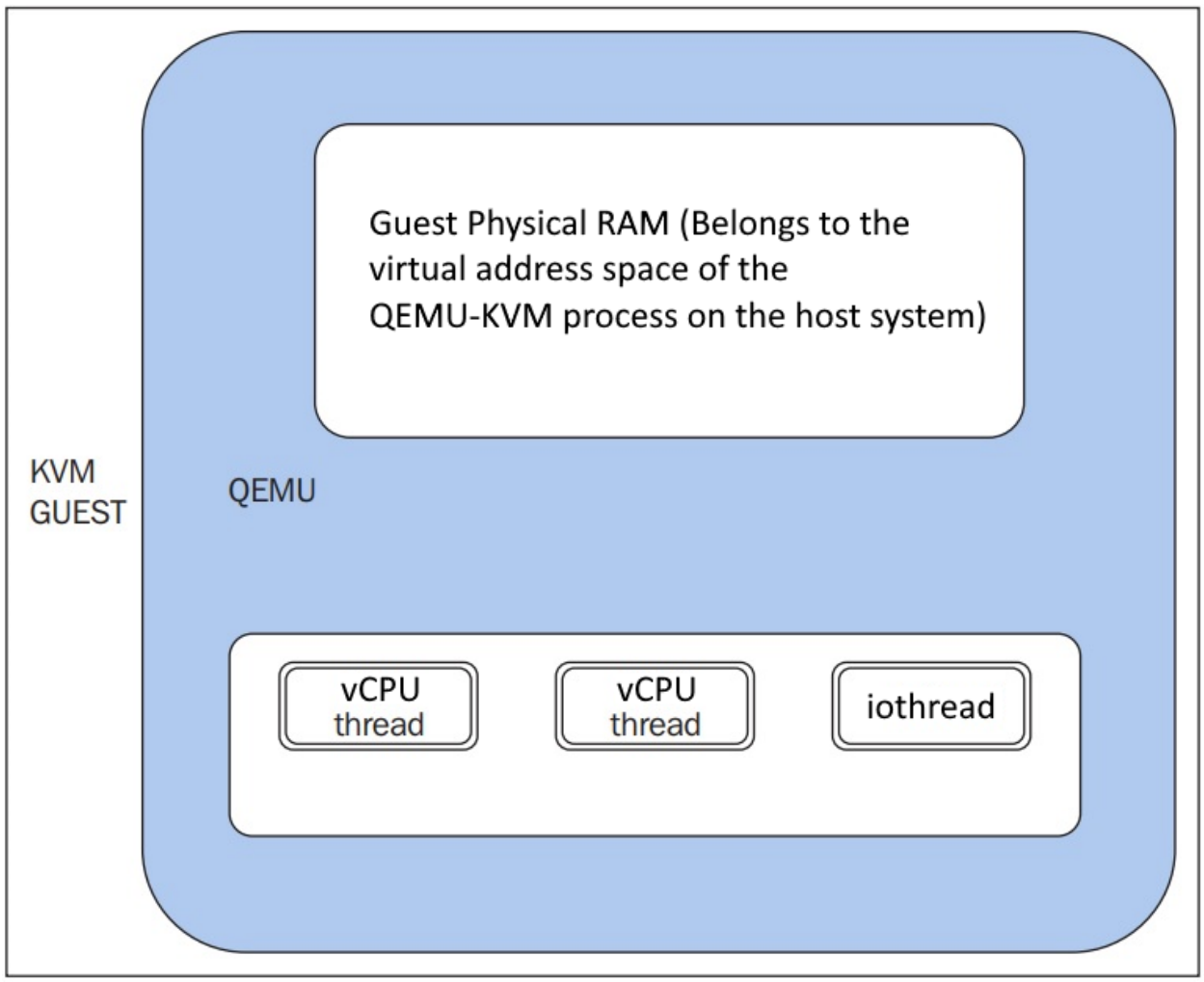



```
root@kvmsource:~/git/libvirt/src/qemu
File  Edit  View  Search  Terminal  Help
[root@kvmsource libvirt]# cd src/qemu/
[root@kvmsource qemu]# ls
EVENTHANDLERS.txt      qemu.conf              qemu_interop_config.h        qemu_security.c
libvirtd_qemu.aug      qemu_conf.c            qemu_migration.c             qemu_security.h
libvirt_qemu_probes.d  qemu_conf.h            qemu_migration_cookie.c      qemu_shim.c
meson.build            qemu_dbus.c            qemu_migration_cookie.h      qemu_slirp.c
MIGRATION.txt          qemu_dbus.h            qemu_migration.h             qemu_slirp.h
qemu_agent.c           qemu_domain_address.c  qemu_migration_params.c      qemu_snapshot.c
qemu_agent.h           qemu_domain_address.h  qemu_migration_params.h      qemu_snapshot.h
qemu_alias.c           qemu_domain.c          qemu_migration_paramspriv.h  qemu_tpm.c
qemu_alias.h           qemu_domain.h          qemu_monitor.c               qemu_tpm.h
qemu_backup.c          qemu_domainjob.c       qemu_monitor.h               qemu_validate.c
qemu_backup.h          qemu_domainjob.h       qemu_monitor_json.c          qemu_validate.h
qemu_block.c           qemu_driver.c          qemu_monitor_json.h          qemu_vhost_user.c
qemu_block.h           qemu_driver.h          qemu_monitor_priv.h          qemu_vhost_user_gpu.c
qemu_blockjob.c        qemu_extdevice.c       qemu_monitor_text.c          qemu_vhost_user_gpu.h
qemu_blockjob.h        qemu_extdevice.h       qemu_monitor_text.h          qemu_vhost_user.h
qemu_capabilities.c    qemu_firmware.c        qemu_namespace.c             qemu_virtiofs.c
qemu_capabilities.h    qemu_firmware.h        qemu_namespace.h             qemu_virtiofs.h
qemu_capspriv.h        qemu_hostdev.c         qemu_process.c               test_libvirtd_qemu.aug.in
qemu_cgroup.c          qemu_hostdev.h         qemu_process.h               THREADS.txt
qemu_cgroup.h          qemu_hotplug.c         qemu_processpriv.h           virtqemud.init.in
qemu_checkpoint.c      qemu_hotplug.h         qemu_qapi.c                  virtqemud.service.in
qemu_checkpoint.h      qemu_interface.c       qemu_qapi.h                  virtqemud.sysconf
qemu_command.c         qemu_interface.h       qemu_saveimage.c
qemu_command.h         qemu_interop_config.c  qemu_saveimage.h
```

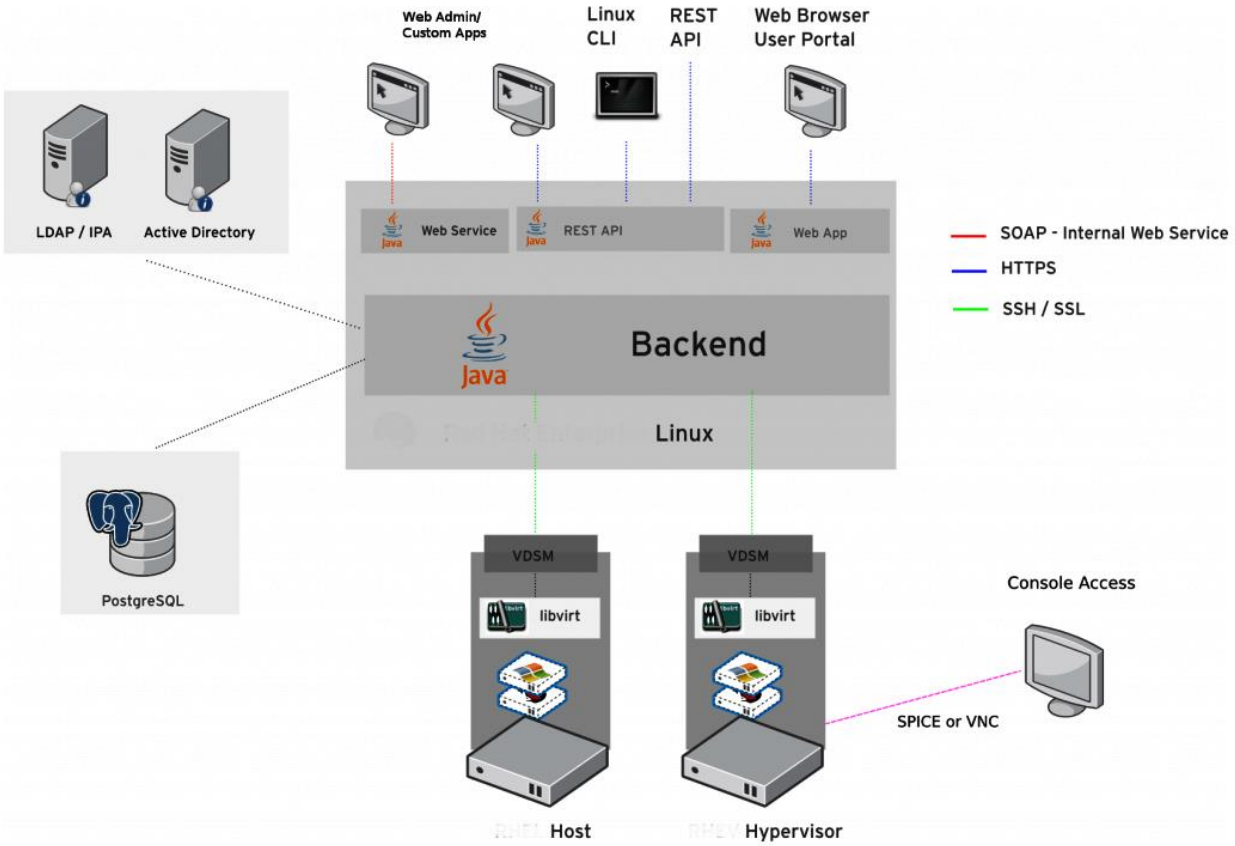

Guest Code
gen_intermediate_code()
Tiny Code Generator Operations
tcg_gen_code()
Host Code


User Space Applications
KVM guest
Filesystem and Block Devices
Drivers in guest Kernel
Hardware Emulation QEMU
vcpu0
vcpu1
vcpuN
IOthread
KVM Kernel Module
Filesystem and Block Devices
Physical Drivers
LINUX KERNEL
CPU 0
CPU 1
CPU N
HARDWARE
Disk 0
Disk 1
Disk 3

```
[root@kvmsource qemu]# ls
accel                dump                  meson_options.txt       qga
audio                exec.c                migration               qobject
authz                exec-vary.c           module-common.c         qom
backends             fpu                   monitor                 README.rst
block                fsdev                 nbd                     replay
block.c              gdbstub.c             net                     replication.c
blockdev.c           gdb-xml               os-posix.c              replication.h
blockdev-nbd.c       gitdm.config          os-win32.c              roms
blockjob.c           hmp-commands.hx       pc-bios                 rules.mak
bootdevice.c         hmp-commands-info.hx  plugins                 scripts
bsd-user             hw                    po                      scsi
capstone             include               python                  slirp
Changelog            io                    qapi                    softmmu
chardev              iothread.c            qdev-monitor.c          storage-daemon
CODING_STYLE.rst     job.c                 qemu-bridge-helper.c    stubs
configure            job-qmp.c             qemu-edid.c             target
contrib              Kconfig               qemu-img.c              tcg
COPYING              Kconfig.host          qemu-img-cmds.hx        tests
COPYING.LIB          libdecnumber          qemu-io.c               thunk.c
cpus-common.c        LICENSE               qemu-io-cmds.c          tools
crypto               linux-headers         qemu-keymap.c           tpm.c
default-configs      linux-user            qemu-nbd.c              trace
device_tree.c        MAINTAINERS           qemu.nsi                trace-events
disas                Makefile              qemu-options.h          ui
disas.c              Makefile.objs         qemu-options.hx         util
dma-helpers.c        memory_ldst.c.inc     qemu-options-wrapper.h  VERSION
docs                 meson                 qemu.sasl               version.rc
dtc                  meson.build           qemu-seccomp.c          version.texi.in
```

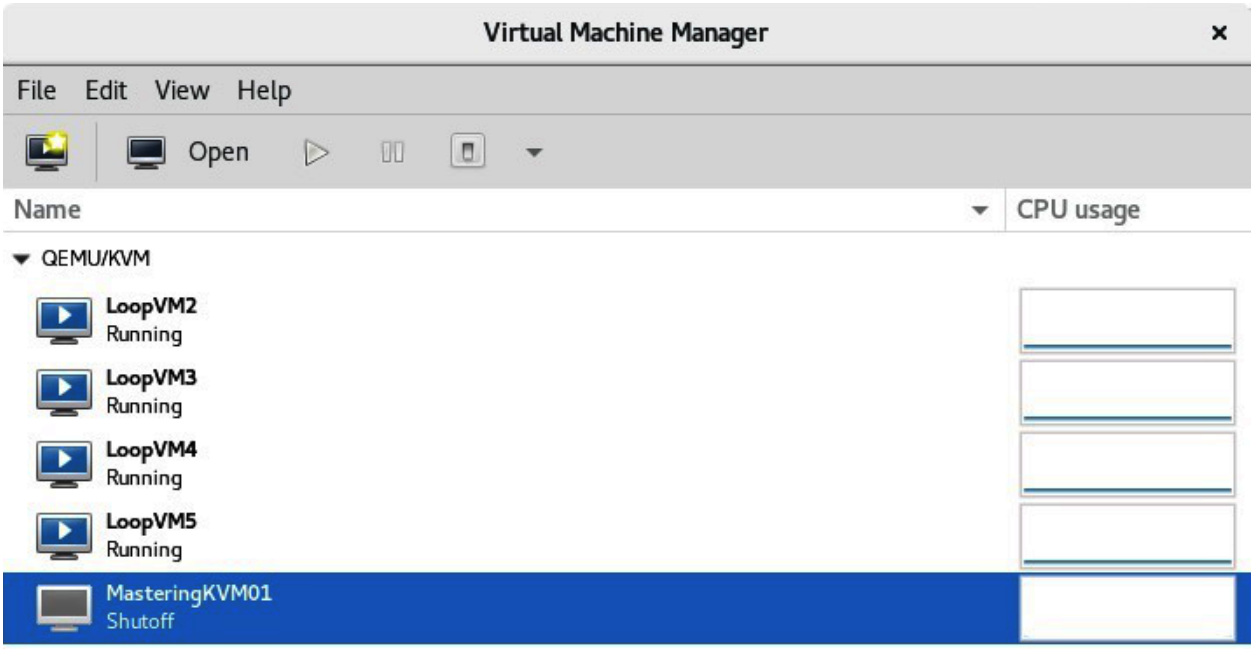

KVM
GUEST
QEMU
Guest Physical RAM (Belongs to the virtual address space of the QEMU-KVM process on the host system)
vCPU thread
vCPU thread
iothread

Chapter 3: Installing KVM Hypervisor, libvirt, and oVirt



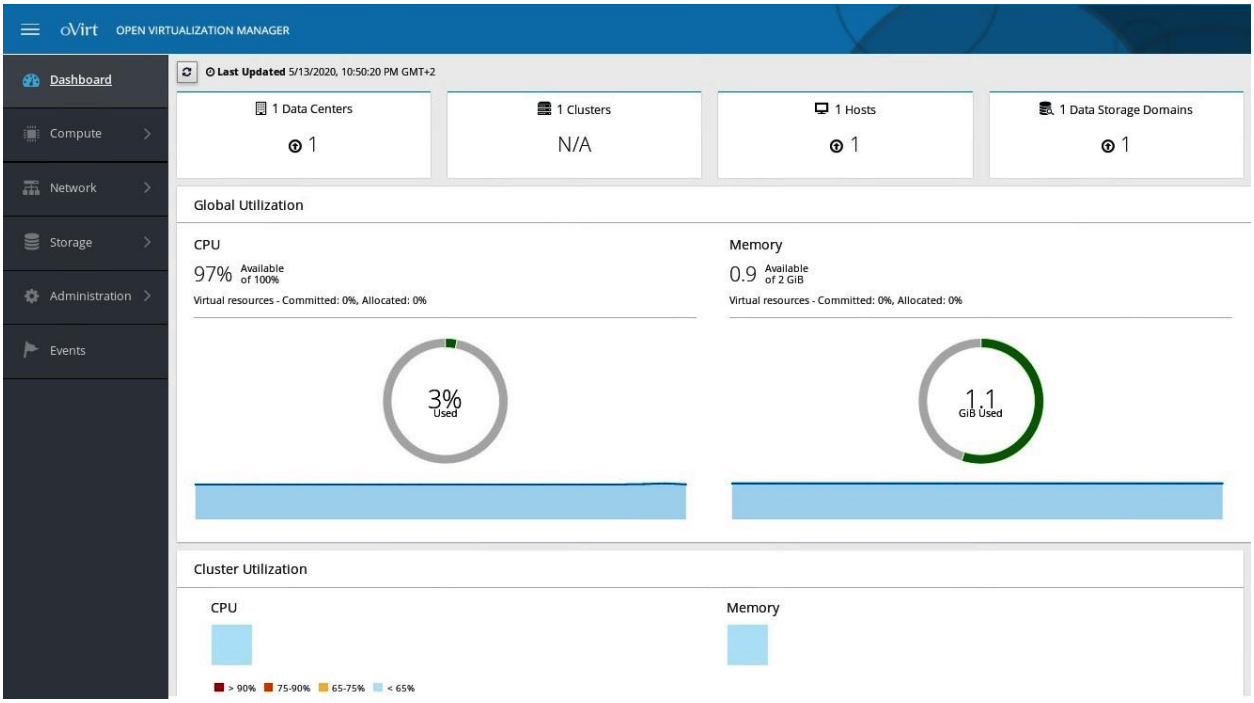

```
[root@packtVM01 ~]# virt-host-validate
  QEMU: Checking for hardware virtualization                 : PASS
  QEMU: Checking if device /dev/kvm exists                   : PASS
  QEMU: Checking if device /dev/kvm is accessible            : PASS
  QEMU: Checking if device /dev/vhost-net exists             : PASS
  QEMU: Checking if device /dev/net/tun exists               : PASS
  QEMU: Checking for cgroup 'memory' controller support      : PASS
  QEMU: Checking for cgroup 'memory' controller mount-point  : PASS
  QEMU: Checking for cgroup 'cpu' controller support         : PASS
  QEMU: Checking for cgroup 'cpu' controller mount-point     : PASS
  QEMU: Checking for cgroup 'cpuacct' controller support     : PASS
  QEMU: Checking for cgroup 'cpuacct' controller mount-point : PASS
  QEMU: Checking for cgroup 'cpuset' controller support      : PASS
  QEMU: Checking for cgroup 'cpuset' controller mount-point  : PASS
  QEMU: Checking for cgroup 'devices' controller support     : PASS
  QEMU: Checking for cgroup 'devices' controller mount-point : PASS
  QEMU: Checking for cgroup 'blkio' controller support       : PASS
  QEMU: Checking for cgroup 'blkio' controller mount-point   : PASS
  QEMU: Checking for device assignment IOMMU support         : PASS
```

```
[root@packtVM01 ~]# virsh net-list
 Name                 State      Autostart     Persistent
----------------------------------------------------------
 default              active     yes           yes

[root@packtVM01 ~]# virsh list
 Id    Name                           State
----------------------------------------------------

[root@packtVM01 ~]#
```




```
Firewall manager                          : firewalld
Update Firewall                           : True
Set up Cinderlib integration              : False
Configure local Engine database           : True
Set application as default page           : True
Configure Apache SSL                      : True
Engine database host                      : localhost
Engine database port                      : 5432
Engine database secured connection        : False
Engine database host name validation      : False
Engine database name                      : engine
Engine database user name                 : engine
Engine installation                       : True
PKI organization                          : Test
Set up ovirt-provider-ovn                 : True
Grafana integration                       : True
DWH database host                         : localhost
DWH database port                         : 5432
DWH database secured connection           : False
DWH database host name validation         : False
DWH database name                         : ovirt_engine_history
Grafana database user name                : ovirt_engine_history_grafana
Configure WebSocket Proxy                 : True
DWH installation                          : True
Configure local DWH database              : True
Configure VMConsole Proxy                 : True
```

```
          --== SUMMARY ==--

[ INFO  ] Restarting httpd
          Please use the user 'admin@internal' and password specified in order to login
          Web access is enabled at:
              http://oVirt:80/ovirt-engine
              https://oVirt:443/ovirt-engine
          Internal CA 71:CC:F5:A2:23:0A:9E:63:0C:CC:AF:A3:96:80:75:C3:56:F7:9F:93
          SSH fingerprint: SHA256:4ZcwRZepbLKKHDva5Ww+TiEonlj5sCdRyezPdZPXaMk
          Web access for grafana is enabled at:
              https://oVirt/ovirt-engine-grafana/
          Please run the following command on the engine machine kvmsource, for SSO to work:
          systemctl restart ovirt-engine

          --== END OF SUMMARY ==--

[ INFO  ] Stage: Clean up
          Log file is located at /var/log/ovirt-engine/setup/ovirt-engine-setup-20200921000112-jld2m
2.log
[ INFO  ] Generating answer file '/var/lib/ovirt-engine/setup/answers/20200921000513-setup.conf'
[ INFO  ] Stage: Pre-termination
[ INFO  ] Stage: Termination
[ INFO  ] Execution of setup completed successfully
```



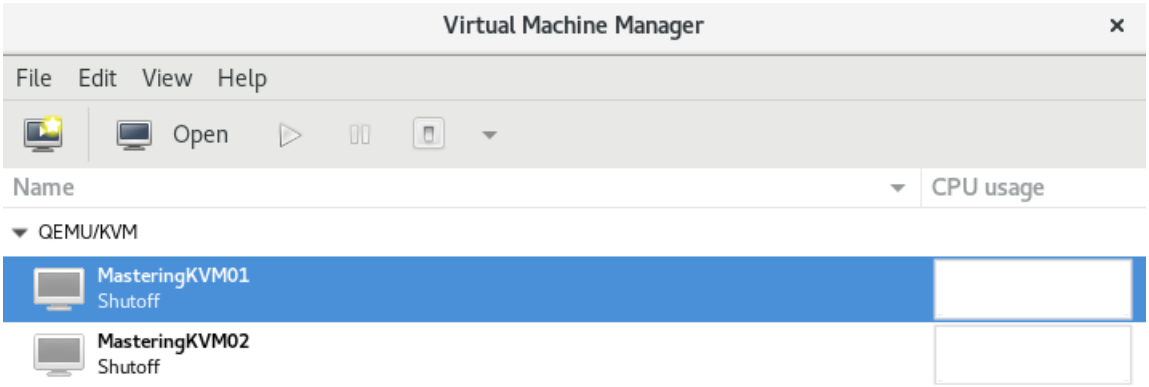

```
[root@packtVM01 ~]# virsh start MasteringKVM01
Domain MasteringKVM01 started

[root@packtVM01 ~]# virsh start MasteringKVM02
Domain MasteringKVM02 started
```

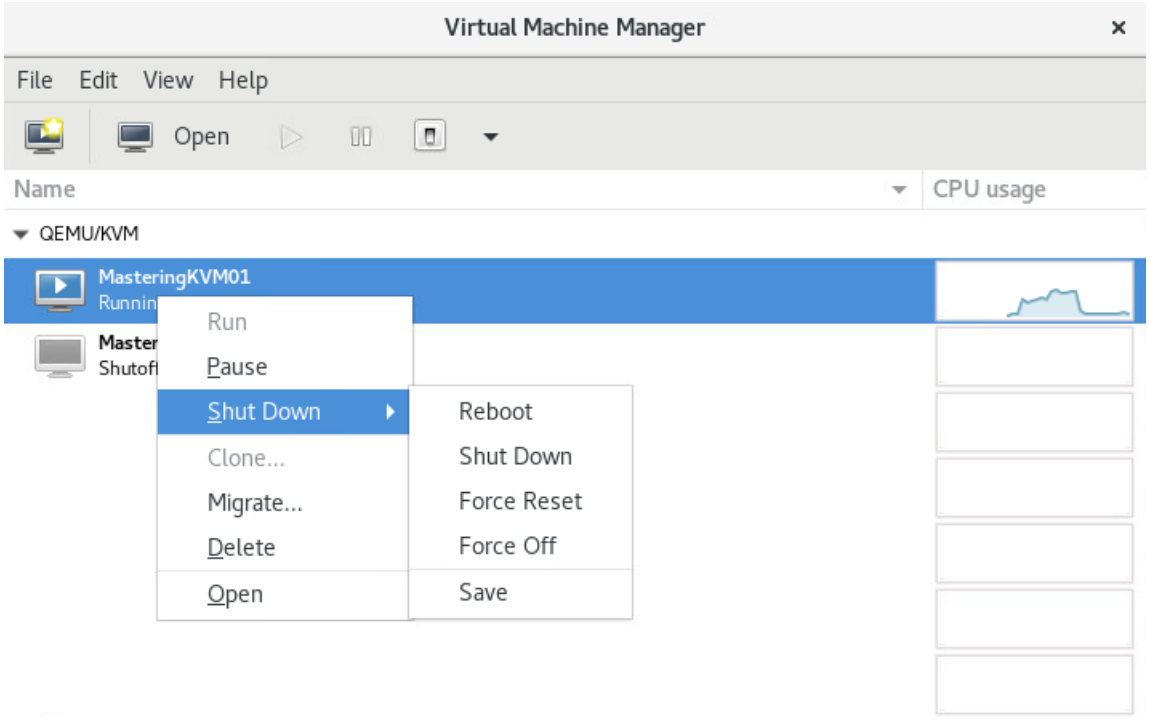
```
[root@packtVM01 ~]# virsh list
 Id    Name                           State
----------------------------------------------------
 45    LoopVM2                        running
 46    LoopVM3                        running
 47    LoopVM4                        running
 48    LoopVM5                        running
 49    LoopVM1                        running
 50    MasteringKVM01                 running
 51    MasteringKVM02                 running
```

```
[root@packtVM01 ~]# virsh shutdown MasteringKVM01
Domain MasteringKVM01 is being shutdown
```

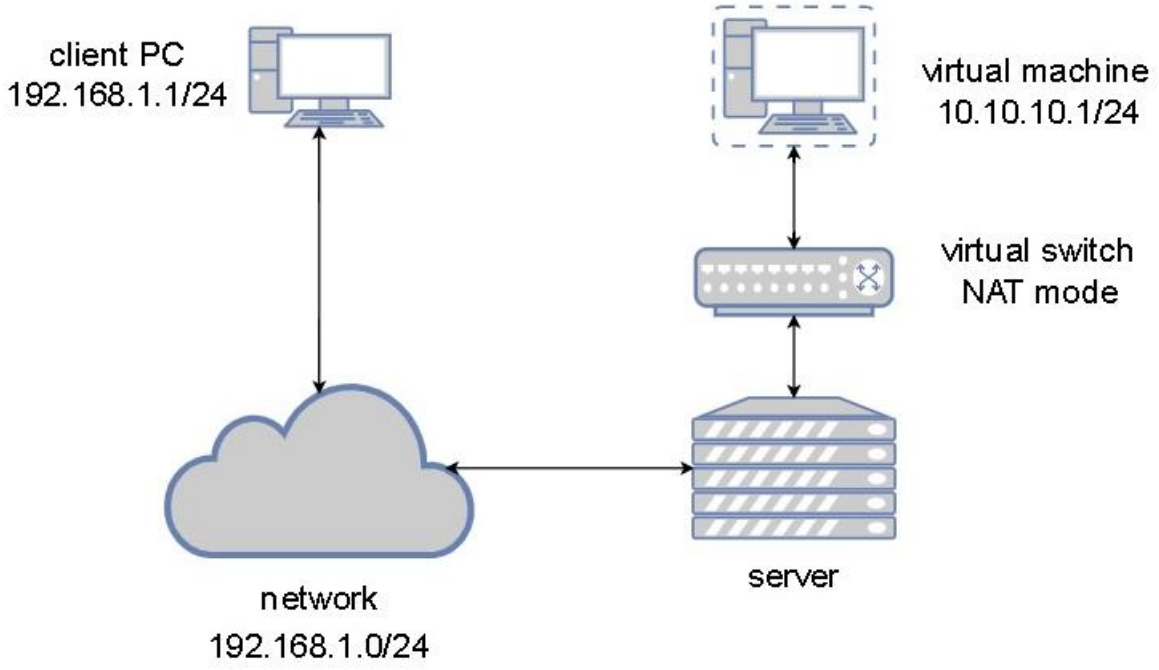
```
[root@packtVM01 ~]# virsh destroy MasteringKVM02
Domain MasteringKVM02 destroyed
```

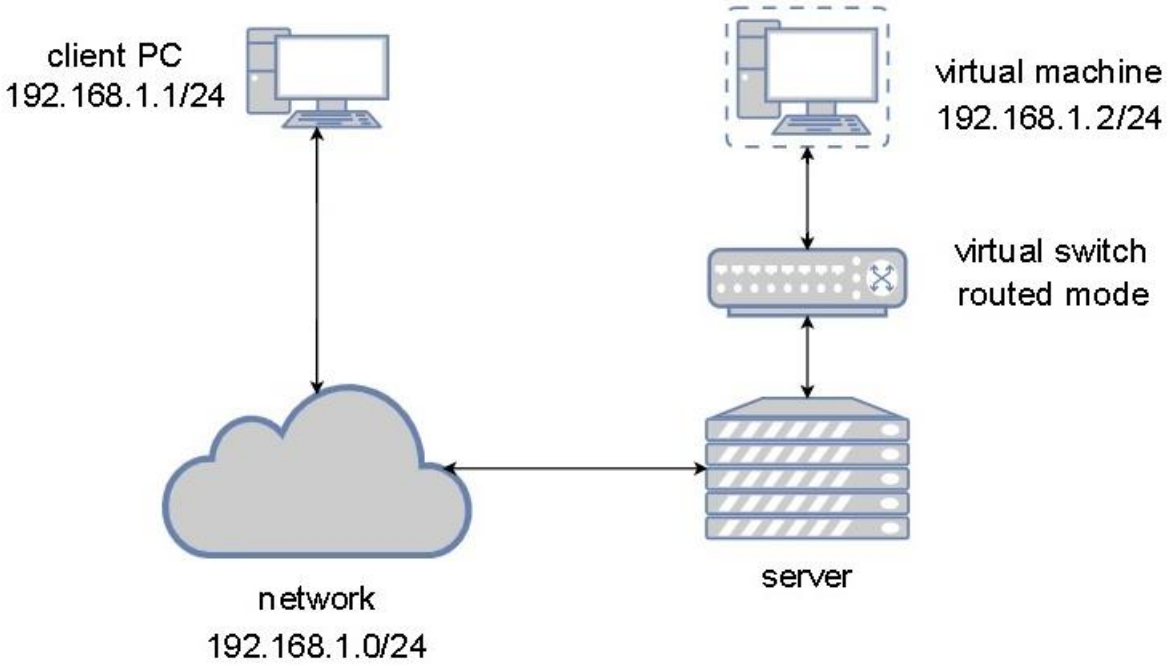
```
[root@packtVM01 ~]# virsh destroy MasteringKVM02
Domain MasteringKVM02 destroyed

[root@packtVM01 ~]# virsh undefine MasteringKVM02
Domain MasteringKVM02 has been undefined
```

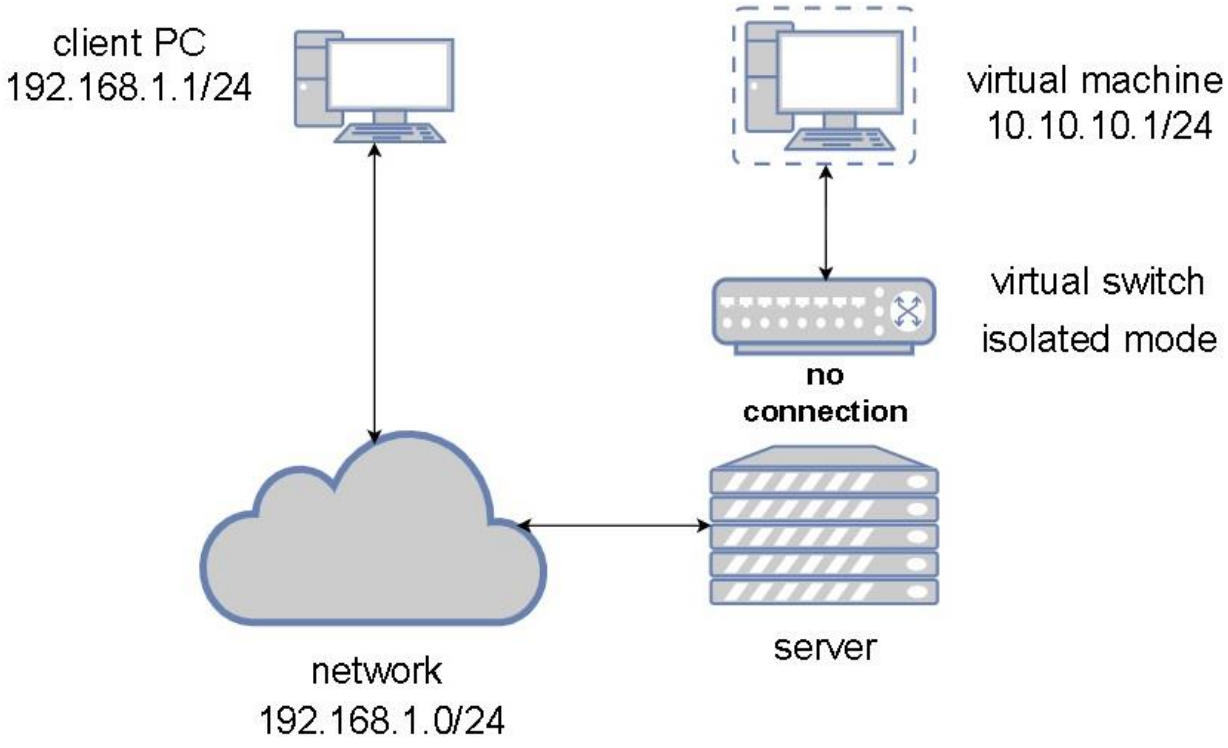


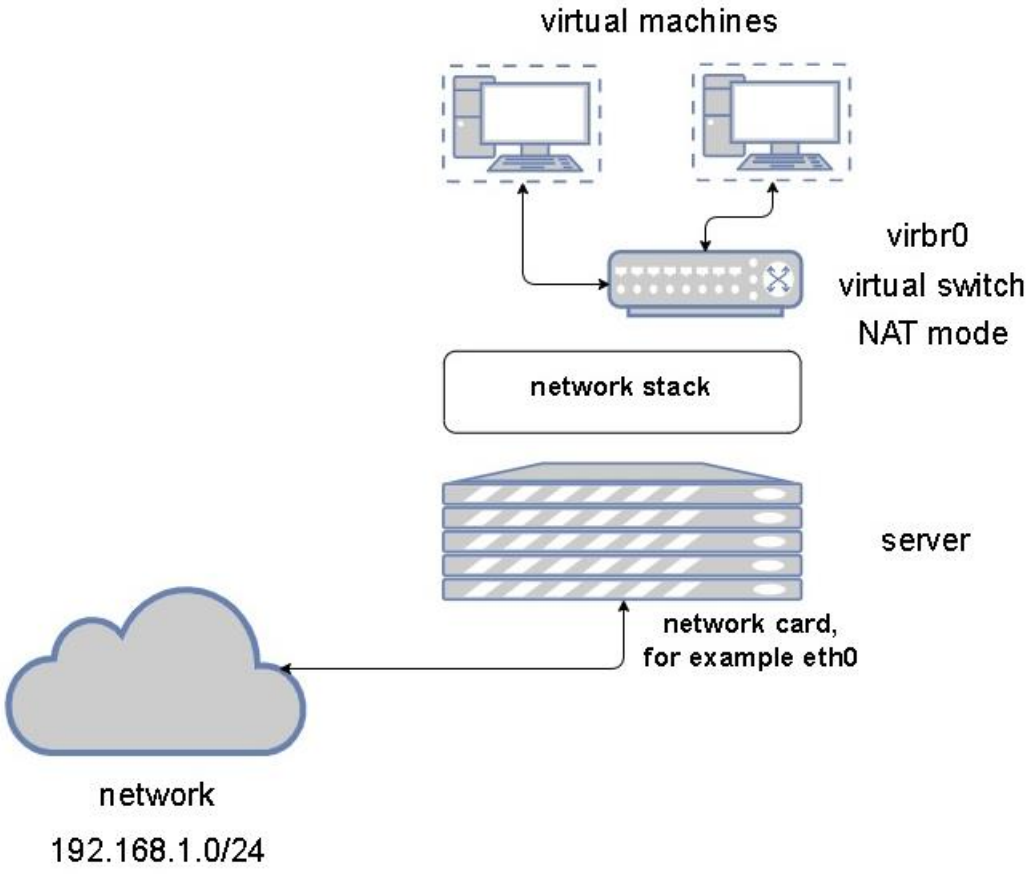

Virtual Machine Manager
File
Edit
View
Help
Open
Name
CPU usage
QEMU/KVM
MasteringKVM01
Runnin
Master
Shutof
Run
Pause
Shut Down
Clone...
Migrate...
Delete
Open
Reboot
Shut Down
Force Reset
Force Off
Save

Chapter 4: Libvirt Networking






client PC
192.168.1.1/24
virtual machine
10.10.10.1/24
virtual switch
isolated mode
no
connection
server
network
192.168.1.0/24


virtual machines
virbr0
virtual switch
NAT mode
network stack
server
network card,
for example eth0
network
192.168.1.0/24

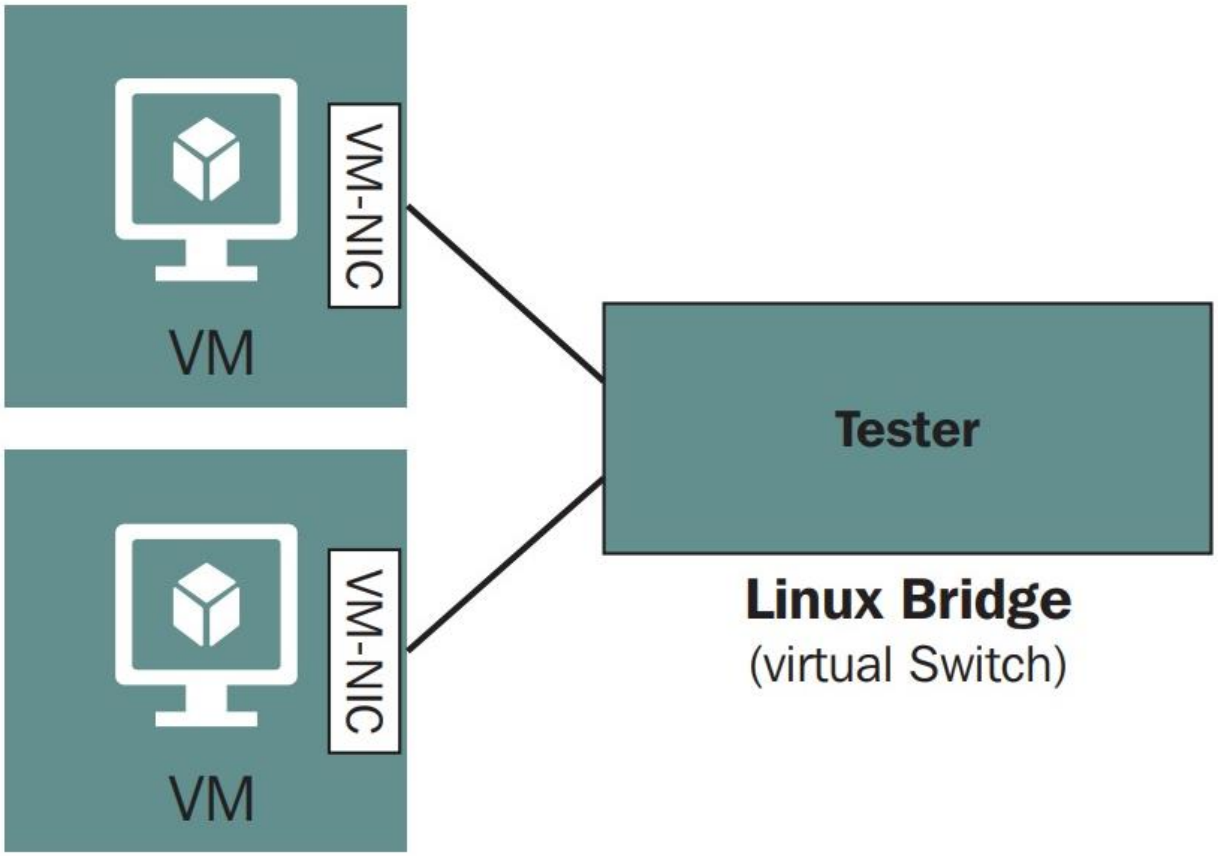
```
[root@packtVM01 ~]# virsh net-dumpxml default > default.xml
[root@packtVM01 ~]# cat default.xml
<network>
  <name>default</name>
  <uuid>bb3fed90-ced1-45ce-ba3e-13c9ec64ff42</uuid>
  <forward mode='nat'>
    <nat>
      <port start='1024' end='65535'/>
    </nat>
  </forward>
  <bridge name='virbr0' stp='on' delay='0'/>
  <mac address='52:54:00:35:55:2d'/>
  <ip address='192.168.122.1' netmask='255.255.255.0'>
    <dhcp>
      <range start='192.168.122.2' end='192.168.122.254'/>
    </dhcp>
  </ip>
</network>
```

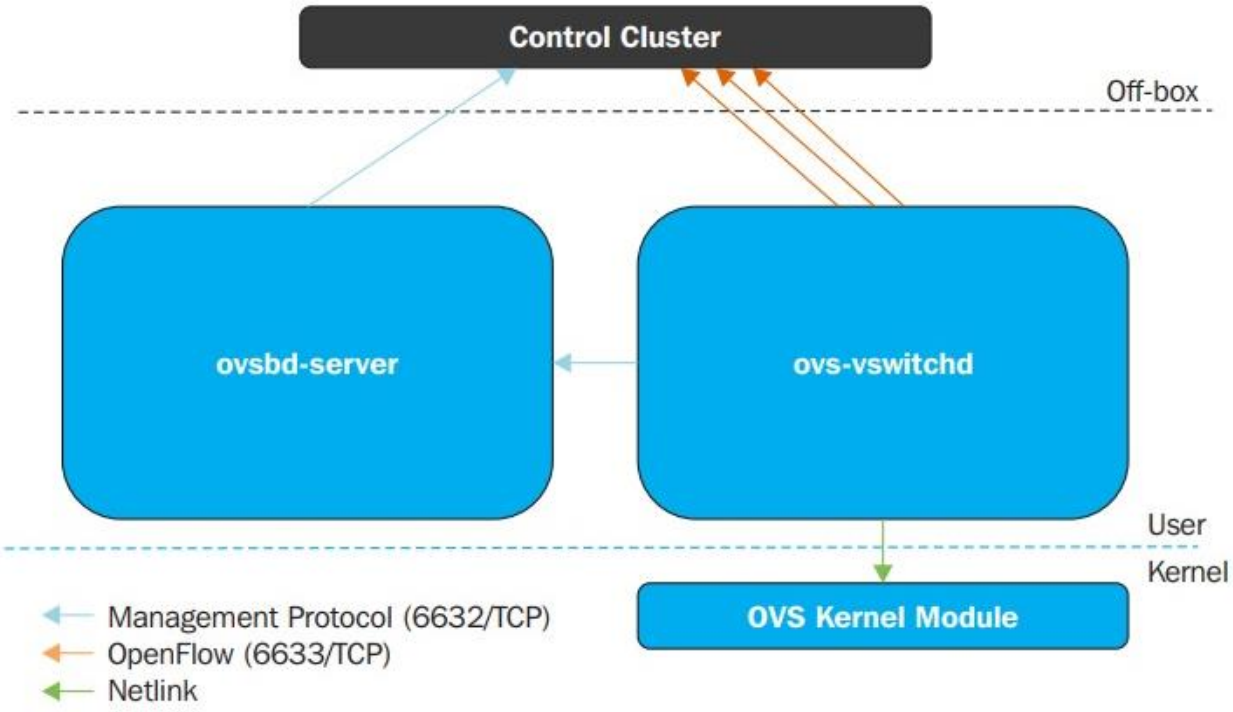
```
<network>
  <name>packtnat</name>
  <uuid>1f9e3fa3-859b-4bab-9598-d01d32336156</uuid>
  <forward mode='nat'>
    <nat>
      <port start='1024' end='65535'/>
    </nat>
  </forward>
  <bridge name='virbr1' stp='on' delay='0'/>
  <mac address='00:16:3e:27:21:c1'/>
  <ip address='192.168.123.1' netmask='255.255.255.0'>
    <dhcp>
      <range start='192.168.123.2' end='192.168.123.254'/>
    </dhcp>
  </ip>
</network>
```

```
[root@packtVM01 ~]# virsh net-list
 Name                 State      Autostart     Persistent
----------------------------------------------------------
 default              active     yes           yes
 packtnat             active     yes           yes
```

```
<network>
  <name>packtro</name>
  <uuid>3cac2e7a-a3fd-4b25-8717-450e665b7103</uuid>
  <forward dev='ens224' mode='route'>
    <interface dev='ens224'/>
  </forward>
  <bridge name='virbr2' stp='on' delay='0'/>
  <mac address='52:54:00:fe:9f:ec'/>
  <domain name='packt'/>
  <ip address='192.168.2.1' netmask='255.255.255.0'>
    <dhcp>
      <range start='192.168.2.100' end='192.168.2.105'/>
    </dhcp>
  </ip>
</network>
```

```
<network>
  <name>packtiso</name>
  <uuid>2b92b03d-acb4-4a23-b205-2095c6a27bd4</uuid>
  <bridge name='virbr3' stp='on' delay='0'>
  <mac address='00:16:3e:0b:5d:85'/>
  </bridge>
  <domain name='packtiso'/>
  <ip address='192.168.3.1' netmask='255.255.255.0'>
    <dhcp>
      <range start='192.168.3.128' end='192.168.3.254'/>
    </dhcp>
  </ip>
</network>
```


VM-NIC
VM
VM-NIC
VM
Tester
Linux Bridge
(virtual Switch)


Control Cluster
Off-box
ovsbd-server
ovs-vswitchd
User
Kernel
OVS Kernel Module
Management Protocol (6632/TCP)
OpenFlow (6633/TCP)
Netlink

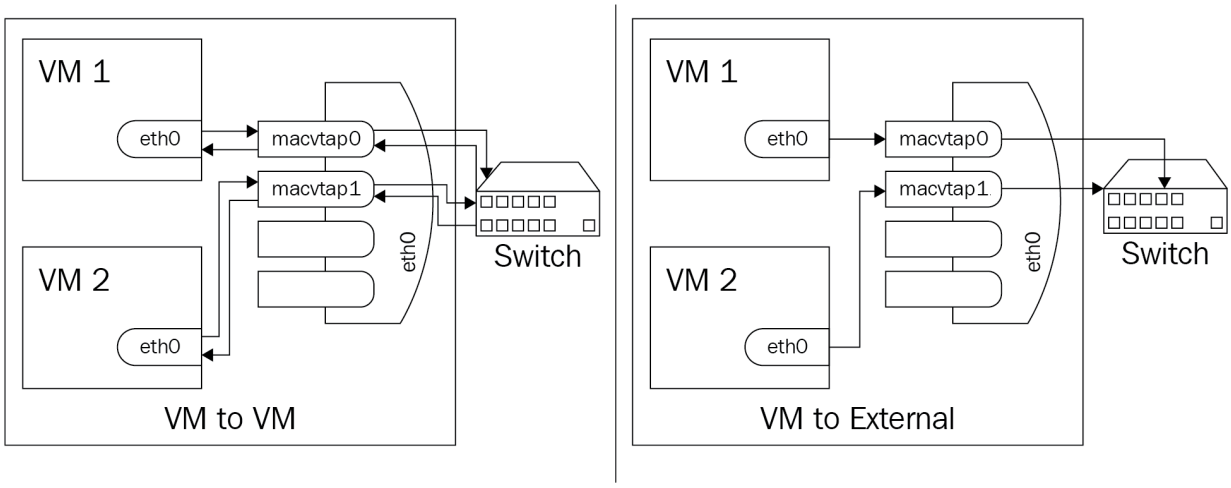
```
 Name                 State      Autostart     Persistent
----------------------------------------------------------
 default              active     yes           yes
 packtiso             active     yes           yes
 packtnat             active     yes           yes
 packtovs             active     yes           yes
 packtro              active     yes           yes
```

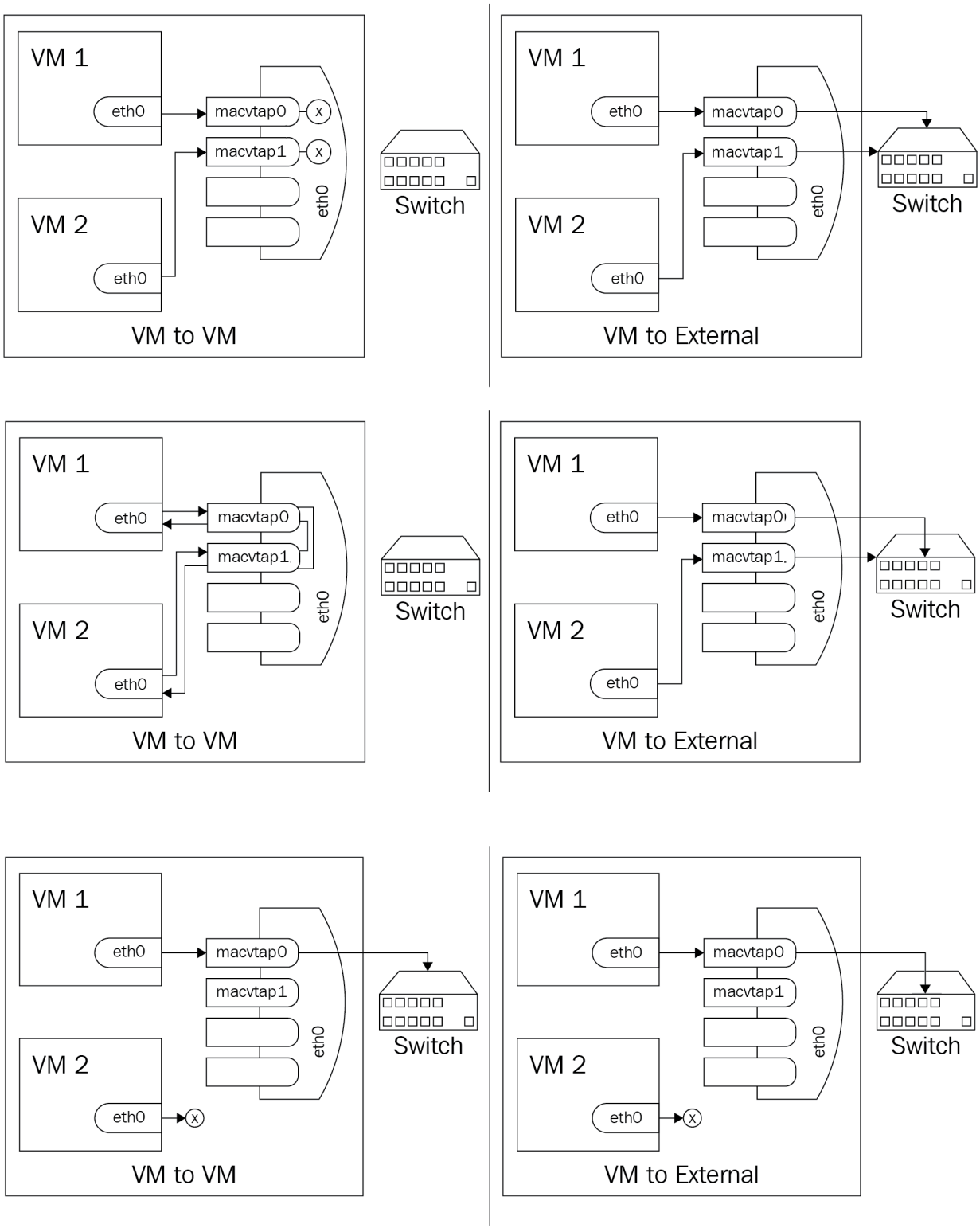
```
[root@packtVM01 ~]# ovs-vsctl show
c64c1381-af64-4b51-8db7-f62e37319a06
    Bridge "ovs-br0"
        Port "ovs-br0"
            Interface "ovs-br0"
                type: internal
        Port "vnet0"
            tag: 0
            Interface "vnet0"
        Port "ens256"
            Interface "ens256"
    ovs_version: "2.11.0"
```

```
root@storage3:~# lspci -s 24:00 -vvv | grep -i Single
        Capabilities: [160 v1] Single Root I/O Virtualization (SR-IOV)
        Capabilities: [160 v1] Single Root I/O Virtualization (SR-IOV)
```

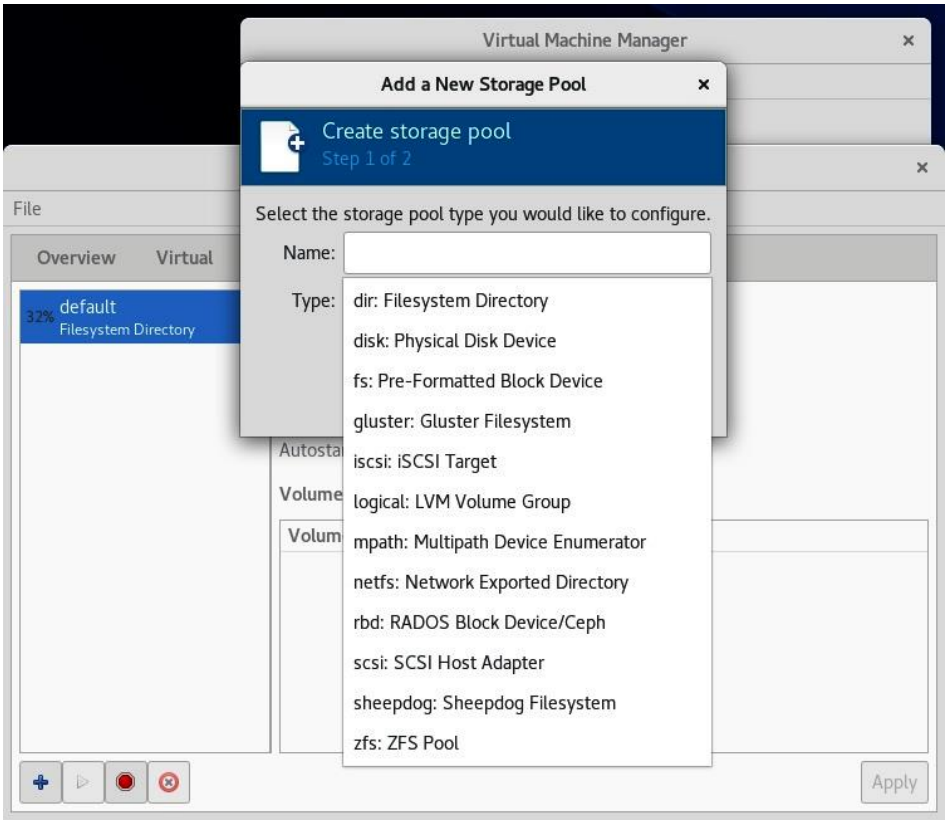
```
[root@PacktPhy01 ~]# lspci -nn | grep "Virtual Function"
04:10.0 Ethernet controller [0200]: Intel Corporation X540 Ethernet Controller Virtual Function [8086:1515] (rev 01)
04:10.1 Ethernet controller [0200]: Intel Corporation X540 Ethernet Controller Virtual Function [8086:1515] (rev 01)
04:10.2 Ethernet controller [0200]: Intel Corporation X540 Ethernet Controller Virtual Function [8086:1515] (rev 01)
04:10.3 Ethernet controller [0200]: Intel Corporation X540 Ethernet Controller Virtual Function [8086:1515] (rev 01)
04:10.4 Ethernet controller [0200]: Intel Corporation X540 Ethernet Controller Virtual Function [8086:1515] (rev 01)
04:10.5 Ethernet controller [0200]: Intel Corporation X540 Ethernet Controller Virtual Function [8086:1515] (rev 01)
04:10.6 Ethernet controller [0200]: Intel Corporation X540 Ethernet Controller Virtual Function [8086:1515] (rev 01)
04:10.7 Ethernet controller [0200]: Intel Corporation X540 Ethernet Controller Virtual Function [8086:1515] (rev 01)
```

```
[root@PacktPhy01 ~]# virsh nodedev-dumpxml pci_0000_04_10_0
<device>
  <name>pci_0000_04_10_0</name>
  <path>/sys/devices/pci0000:00/0000:00:03.0/0000:04:10.0</path>
  <parent>pci_0000_00_03_0</parent>
  <driver>
    <name>ixgbevf</name>
  </driver>
  <capability type='pci'>
    <domain>0</domain>
    <bus>4</bus>
    <slot>16</slot>
    <function>0</function>
    <product id='0x1515'>X540 Ethernet Controller Virtual Function</product>
    <vendor id='0x8086'>Intel Corporation</vendor>
    <capability type='phys_function'>
      <address domain='0x0000' bus='0x04' slot='0x00' function='0x0'/>
    </capability>
    <iommuGroup number='60'>
      <address domain='0x0000' bus='0x04' slot='0x10' function='0x0'/>
    </iommuGroup>
    <numa node='0'/>
    <pci-express>
      <link validity='cap' port='0' speed='5' width='8'/>
      <link validity='sta' width='0'/>
    </pci-express>
  </capability>
</device>
```

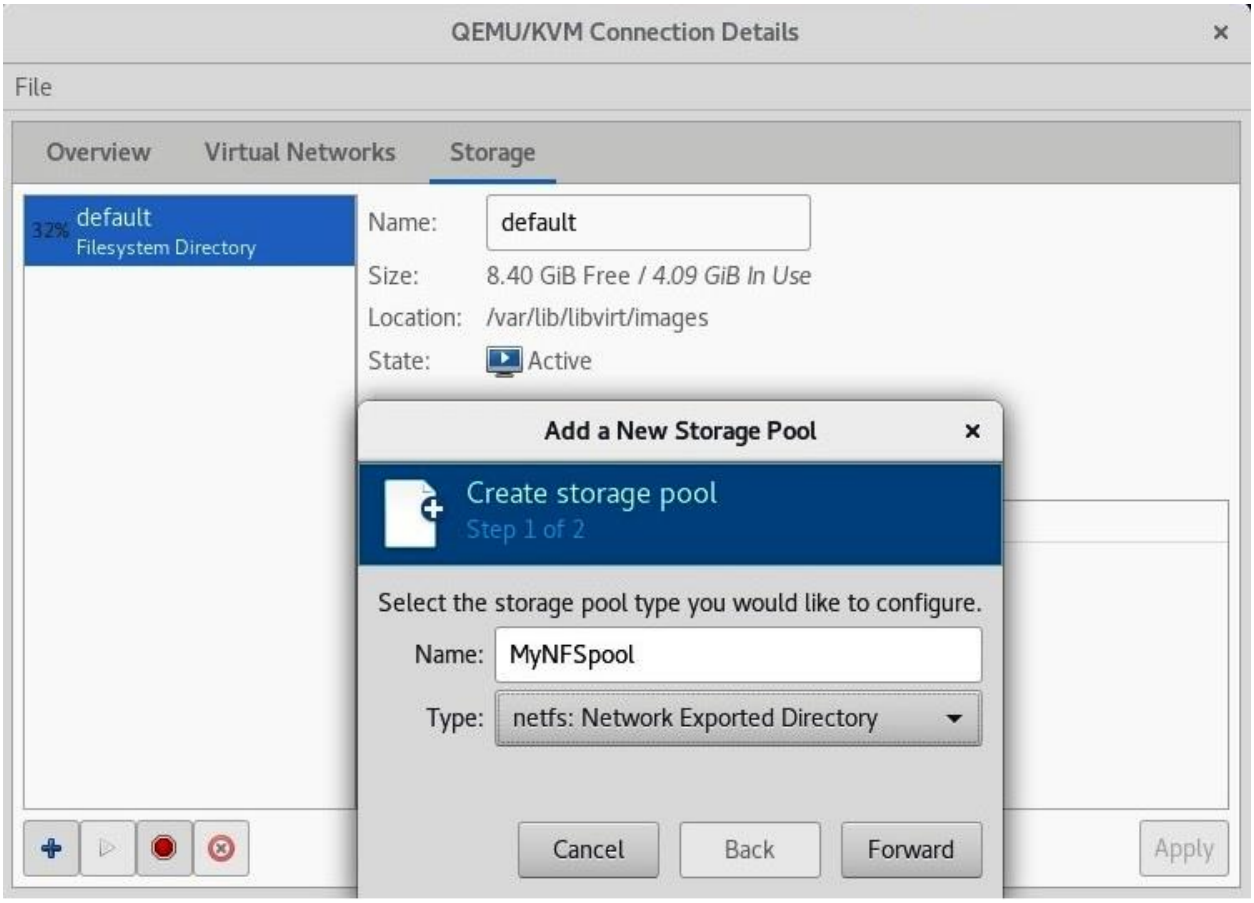



VM 1
eth0
macvtap0
x
macvtap1
x
eth0
VM 2
eth0
VM to VM
Switch
VM 1
eth0
macvtap0
macvtap1
eth0
VM 2
eth0
VM to External
Switch
VM 1
eth0
macvtap0
macvtap1
eth0
VM 2
eth0
VM to VM
Switch
VM 1
eth0
macvtap0
macvtap1
eth0
VM 2
eth0
VM to External
Switch
VM 1
eth0
macvtap0
macvtap1
eth0
VM 2
eth0
x
VM to VM
Switch
VM 1
eth0
macvtap0
macvtap1
eth0
VM 2
eth0
x
VM to External
Switch

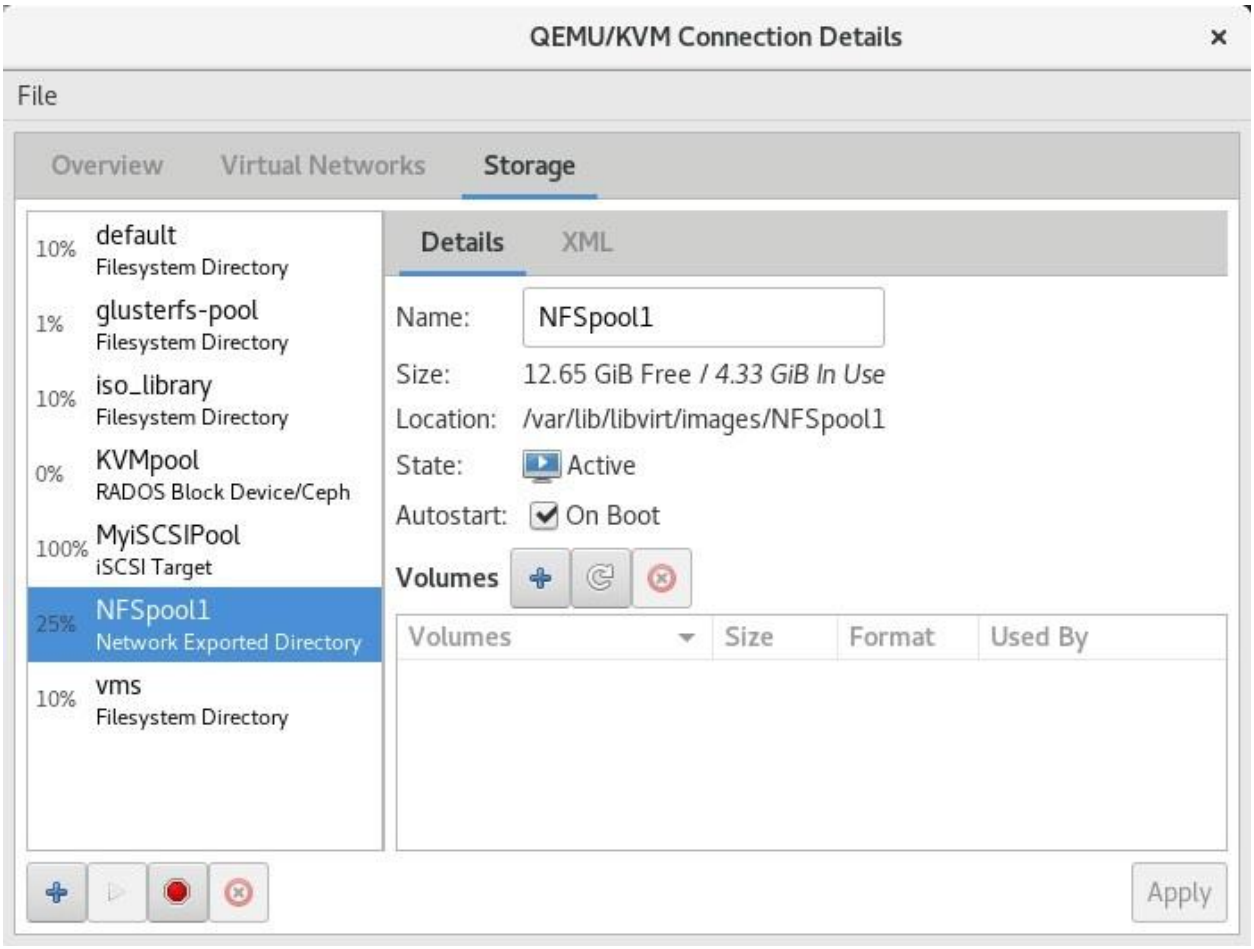
Chapter 5: Libvirt Storage

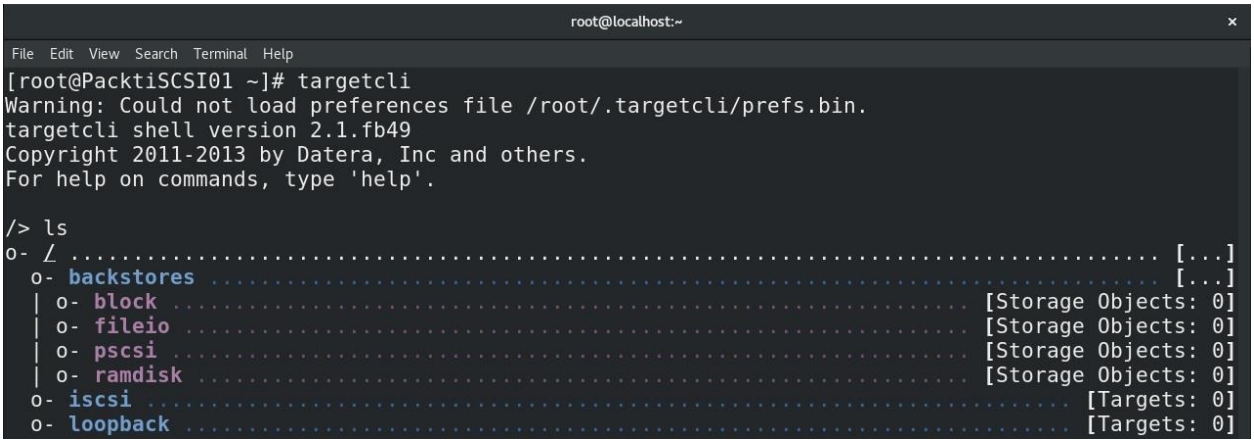


```
<pool type='netfs'>
  <name>NFSpool1</name>
  <source>
    <host name='192.168.159.144'/>
    <dir path='/mnt/packtStratisXFS01'/>
    <format type='auto'/>
  </source>
  <target>
    <path>/var/lib/libvirt/images/NFSpool1</path>
    <permissions>
      <mode>0755</mode>
      <owner>0</owner>
      <group>0</group>
      <label>system_u:object_r:nfs_t:s0</label>
    </permissions>
  </target>
</pool>
```


QEMU/KVM Connection Details
File
Overview
Virtual Networks
Storage
32%
default
Filesystem Directory
Name:
default
Size:
8.40 GiB Free / 4.09 GiB In Use
Location:
/var/lib/libvirt/images
State:
Active
Add a New Storage Pool
Create storage pool
Step 1 of 2
Select the storage pool type you would like to configure.
Name:
MyNFSpool
Type:
netfs: Network Exported Directory
Cancel
Back
Forward
Apply

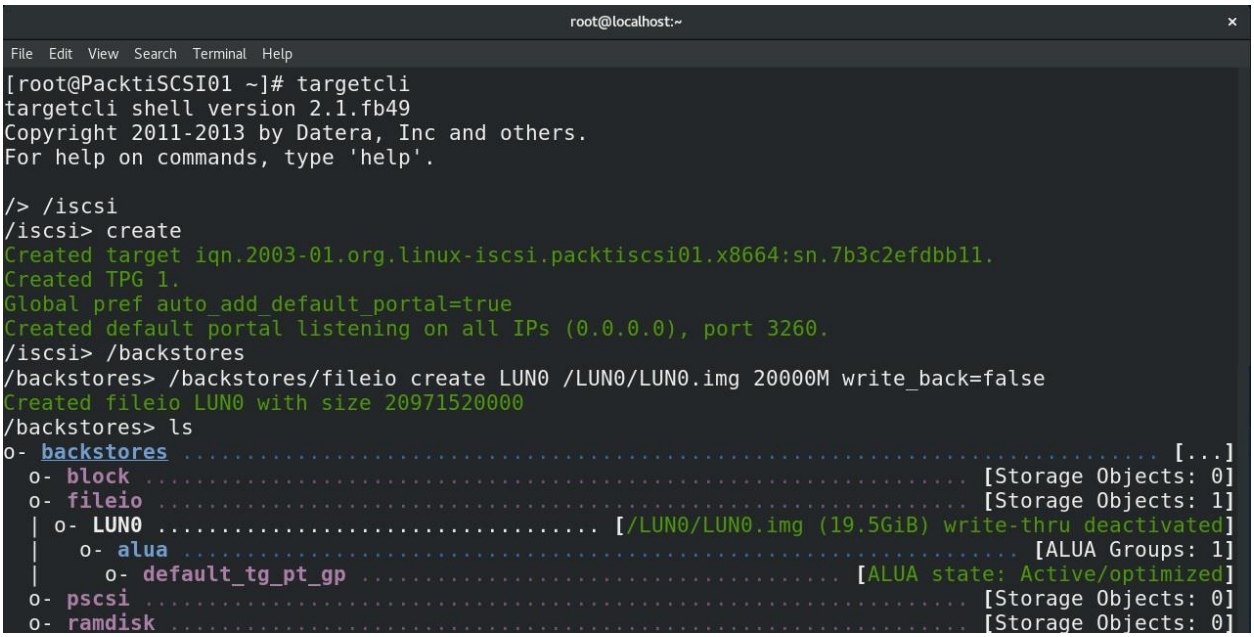

QEMU/KVM Connection Details
File
Overview
Virtual Networks
Storage
32% default
Filesystem Directory
Name: default
Size: 8.40 GiB Free / 4.09 GiB In Use
Location: /var/lib/libvirt/images
Add a New Storage Pool
Create storage pool
Step 2 of 2
Target Path: /var/lib/libvirt/images/MyNFSpc
Browse
Format: auto
Host Name: 192.168.149.144
Source Path: /mnt/PacktStratisXFS01
Browse
Cancel
Back
Finish
Apply

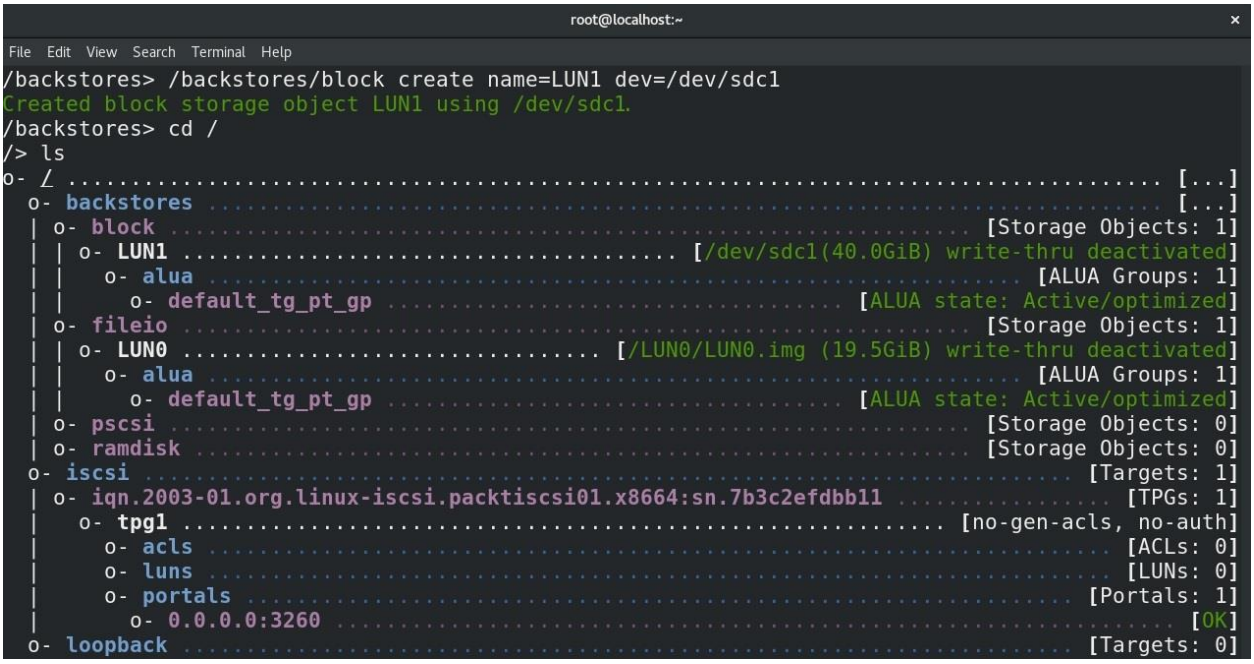

QEMU/KVM Connection Details
File
Overview
Virtual Networks
Storage
10% default
Filesystem Directory
1% glusterfs-pool
Filesystem Directory
10% iso_library
Filesystem Directory
0% KVMpool
RADOS Block Device/Ceph
100% MyiSCSIPool
iSCSI Target
25% NFSpool1
Network Exported Directory
10% vms
Filesystem Directory
Details
XML
Name: NFSpool1
Size: 12.65 GiB Free / 4.33 GiB In Use
Location: /var/lib/libvirt/images/NFSpool1
State: Active
Autostart: On Boot
Volumes
Volumes
Size
Format
Used By
Apply


root@localhost:~
File Edit View Search Terminal Help
[root@PacktiSCSI01 ~]# targetcli
Warning: Could not load preferences file /root/.targetcli/prefs.bin.
targetcli shell version 2.1.fb49
Copyright 2011-2013 by Datera, Inc and others.
For help on commands, type 'help'.
/> ls
o- / ..... [...]
o- backstores ..... [...]
| o- block ..... [Storage Objects: 0]
| o- fileio ..... [Storage Objects: 0]
| o- pscsi ..... [Storage Objects: 0]
| o- ramdisk ..... [Storage Objects: 0]
o- iscsi ..... [Targets: 0]
o- loopback ..... [Targets: 0]

```
root@localhost:~
File  Edit  View  Search  Terminal  Help
[root@PacktiSCSI01 ~]# fdisk /dev/sdb

Welcome to fdisk (util-linux 2.32.1).
Changes will remain in memory only, until you decide to write them.
Be careful before using the write command.


Command (m for help): n
Partition type
   p   primary (0 primary, 0 extended, 4 free)
   e   extended (container for logical partitions)
Select (default p): p
Partition number (1-4, default 1): 1
First sector (2048-41943039, default 2048):
Last sector, +sectors or +size{K,M,G,T,P} (2048-41943039, default 41943039):

Created a new partition 1 of type 'Linux' and of size 20 GiB.

Command (m for help): w
The partition table has been altered.
Calling ioctl() to re-read partition table.
Syncing disks.
```

```
root@localhost:~
File  Edit  View  Search  Terminal  Help
[root@PacktiSCSI01 ~]# mkfs.xfs /dev/sdb1 ; mkdir /LUN0 ; mount /dev/sdb1 /LUN0
meta-data=/dev/sdb1              isize=512    agcount=4, agsize=1310656 blks
         =                       sectsz=512   attr=2, projid32bit=1
         =                       crc=1        finobt=1, sparse=1, rmapbt=0
         =                       reflink=1
data     =                       bsize=4096   blocks=5242624, imaxpct=25
         =                       sunit=0      swidth=0 blks
naming   =version 2              bsize=4096   ascii-ci=0, ftype=1
log      =internal log           bsize=4096   blocks=2560, version=2
         =                       sectsz=512   sunit=0 blks, lazy-count=1
realtime =none                   extsz=4096   blocks=0, rtextents=0
```


root@localhost:~
File Edit View Search Terminal Help
[root@PacktiSCSI01 ~]# targetcli
targetcli shell version 2.1.fb49
Copyright 2011-2013 by Datera, Inc and others.
For help on commands, type 'help'.
/> /iscsi
/iscsi> create
Created target iqn.2003-01.org.linux-iscsi.packtiscsi01.x8664:sn.7b3c2efdbb11.
Created TPG 1.
Global pref auto_add_default_portal=true
Created default portal listening on all IPs (0.0.0.0), port 3260.
/iscsi> /backstores
/backstores> /backstores/fileio create LUN0 /LUN0/LUN0.img 20000M write_back=false
Created fileio LUN0 with size 20971520000
/backstores> ls
o- backstores [...]
o- block [Storage Objects: 0]
o- fileio [Storage Objects: 1]
o- LUN0 [/LUN0/LUN0.img (19.5GiB) write-thru deactivated]
o- alua [ALUA Groups: 1]
o- default_tg_pt_gp [ALUA state: Active/optimized]
o- pscsi [Storage Objects: 0]
o- ramdisk [Storage Objects: 0]


root@localhost:~
File Edit View Search Terminal Help
/backstores> /backstores/block create name=LUN1 dev=/dev/sdc1
Created block storage object LUN1 using /dev/sdc1.
/backstores> cd /
/> ls
o- / [...]
o- backstores [...]
o- block [Storage Objects: 1]
o- LUN1 [/dev/sdc1(40.0GiB) write-thru deactivated]
o- alua [ALUA Groups: 1]
o- default_tg_pt_gp [ALUA state: Active/optimized]
o- fileio [Storage Objects: 1]
o- LUN0 [/LUN0/LUN0.img (19.5GiB) write-thru deactivated]
o- alua [ALUA Groups: 1]
o- default_tg_pt_gp [ALUA state: Active/optimized]
o- pscsi [Storage Objects: 0]
o- ramdisk [Storage Objects: 0]
o- iscsi [Targets: 1]
o- iqn.2003-01.org.linux-iscsi.packtiscsi01.x8664:sn.7b3c2efdbb11 [TPGs: 1]
o- tpg1 [no-gen-acls, no-auth]
o- acls [ACLs: 0]
o- luns [LUNs: 0]
o- portals [Portals: 1]
o- 0.0.0.0:3260 [OK]
o- loopback [Targets: 0]

```
root@localhost:~
File  Edit  View  Search  Terminal  Help
[root@PacktiSCSI01 ~]# pvcreate /dev/sdd ; vgcreate iSCSI01 /dev/sdd ; vgdisplay iSCSI01
  Physical volume "/dev/sdd" successfully created.
  Volume group "iSCSI01" successfully created
  --- Volume group ---
  VG Name               iSCSI01
  System ID
  Format                lvm2
  Metadata Areas        1
  Metadata Sequence No  1
  VG Access             read/write
  VG Status             resizable
  MAX LV                0
  Cur LV                0
  Open LV               0
  Max PV                0
  Cur PV                1
  Act PV                1
  VG Size               <60.00 GiB
  PE Size               4.00 MiB
  Total PE              15359
  Alloc PE / Size       0 / 0
  Free  PE / Size       15359 / <60.00 GiB
  VG UUID               uKqqrm-hsOg-405n-yfCE-aZaP-TtQi-2y8DRL
```

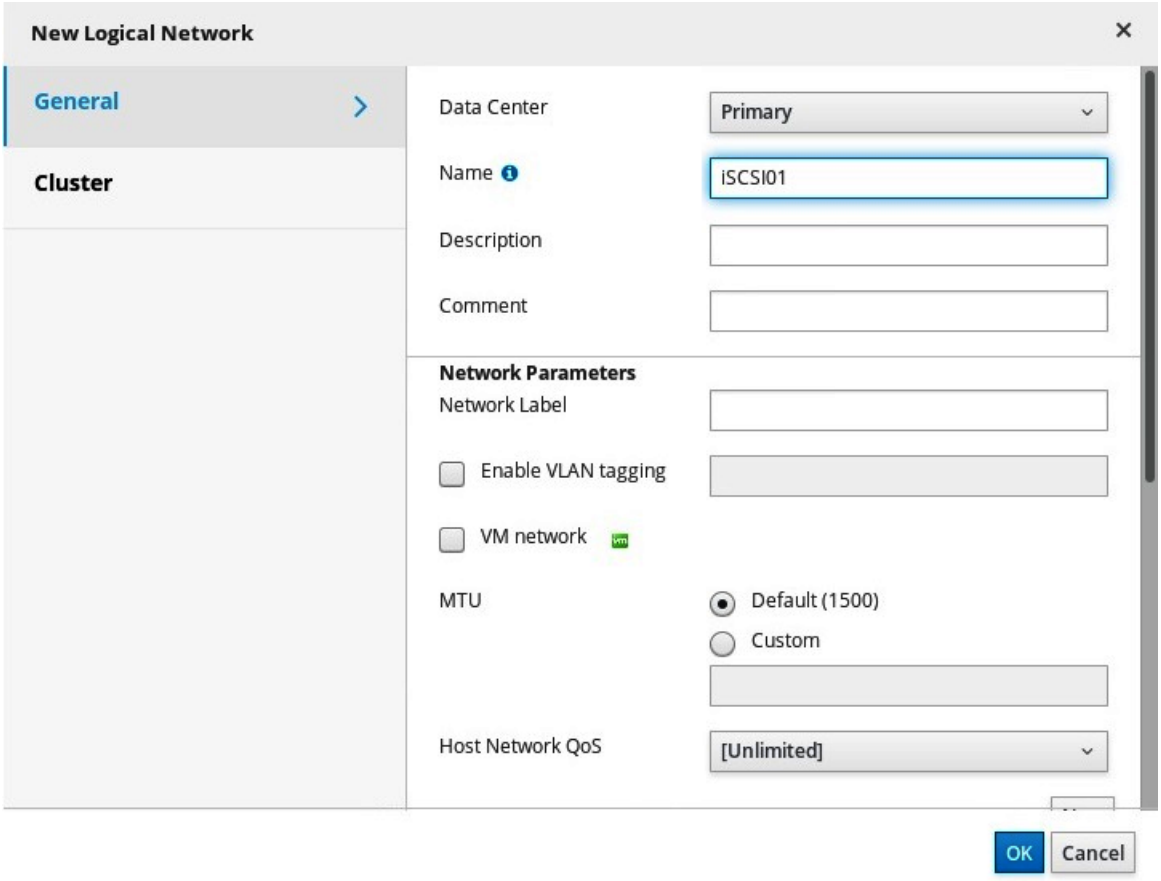
```
root@localhost:~
File  Edit  View  Search  Terminal  Help
/> /backstores/block create name=LUN2 dev=/dev/iSCSI01/LUN2
Created block storage object LUN2 using /dev/iSCSI01/LUN2.
/> cd /
/> ls
o- / ..... [...]
  o- backstores ..... [...]
  | o- block ..... [Storage Objects: 2]
  | | o- LUN1 ..... [/dev/sdc1(40.0GiB) write-thru deactivated]
  | | | o- alua ..... [ALUA Groups: 1]
  | | |   o- default_tg_pt_gp ..... [ALUA state: Active/optimized]
  | | o- LUN2 ..... [/dev/iSCSI01/LUN2 (60.0GiB) write-thru deactivated]
  | |   o- alua ..... [ALUA Groups: 1]
  | |     o- default_tg_pt_gp ..... [ALUA state: Active/optimized]
  | o- fileio ..... [Storage Objects: 1]
  | | o- LUN0 ..... [/LUN0/LUN0.img (19.5GiB) write-thru deactivated]
  | |   o- alua ..... [ALUA Groups: 1]
  | |     o- default_tg_pt_gp ..... [ALUA state: Active/optimized]
  | o- pscsi ..... [Storage Objects: 0]
  | o- ramdisk ..... [Storage Objects: 0]
  o- iscsi ..... [Targets: 1]
  | o- iqn.2003-01.org.linux-iscsi.packtiscsi01.x8664:sn.7b3c2efdbb11 ..... [TPGs: 1]
  |   o- tpg1 ..... [no-gen-acls, no-auth]
  |     o- acls ..... [ACLs: 0]
  |     o- luns ..... [LUNs: 0]
  |     o- portals ..... [Portals: 1]
  |       o- 0.0.0.0:3260 ..... [OK]
  o- loopback ..... [Targets: 0]
/>
```

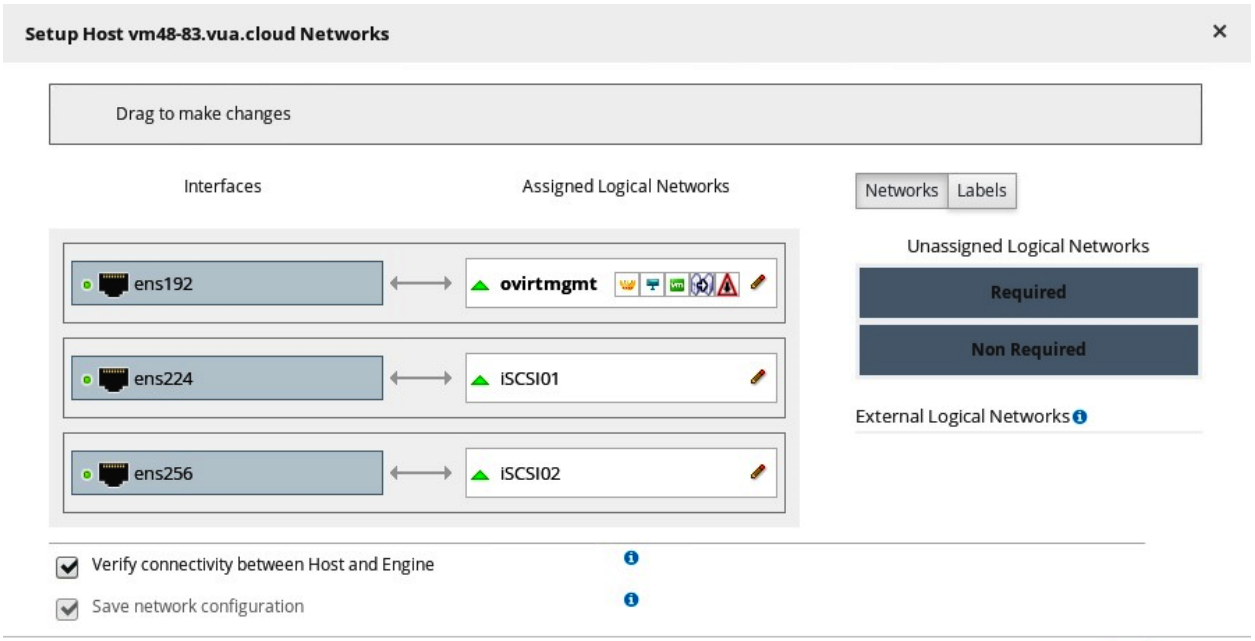
```
root@localhost:~
File  Edit  View  Search  Terminal  Help
/> cd /iscsi/iqn.2003-01.org.linux-iscsi.packtiscsi01.x8664:sn.7b3c2efdbb11/tpg1/
/iscsi/iqn.20...2efdbb11/tpg1> ls
o- tpg1 ..... [no-gen-acls, no-auth]
  o- acls ..... [ACLs: 0]
  o- luns ..... [LUNs: 0]
  o- portals ..... [Portals: 1]
    o- 0.0.0.0:3260 ..... [OK]
/iscsi/iqn.20...2efdbb11/tpg1> cd acls
/iscsi/iqn.20...b11/tpg1/acls> create iqn.2019-12.com.packt:PacktStratis01
Created Node ACL for iqn.2019-12.com.packt:packtstratis01
/iscsi/iqn.20...b11/tpg1/acls>
```

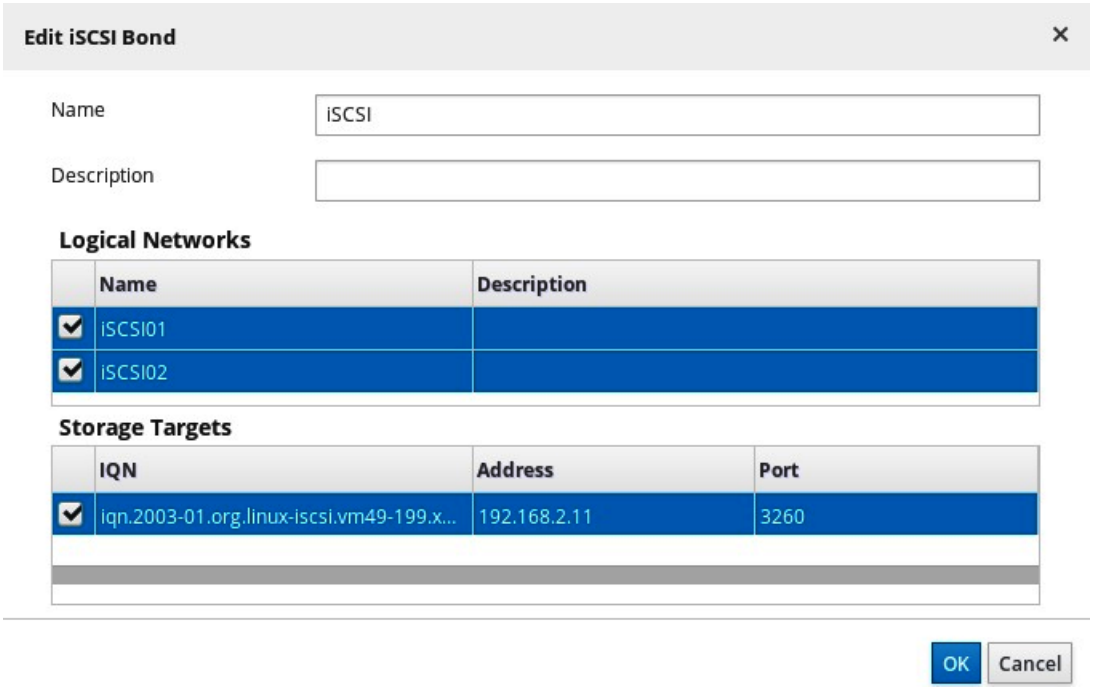
```
/iscsi/iqn.20...b11/tpg1/acls> cd ../luns
/iscsi/iqn.20...b11/tpg1/luns> create /backstores/fileio/LUN0
Created LUN 0.
Created LUN 0->0 mapping in node ACL iqn.2019-12.com.packt:packtstratis01
/iscsi/iqn.20...b11/tpg1/luns> create /backstores/block/LUN1
Created LUN 1.
Created LUN 1->1 mapping in node ACL iqn.2019-12.com.packt:packtstratis01
/iscsi/iqn.20...b11/tpg1/luns> create /backstores/block/LUN2
Created LUN 2.
Created LUN 2->2 mapping in node ACL iqn.2019-12.com.packt:packtstratis01
```

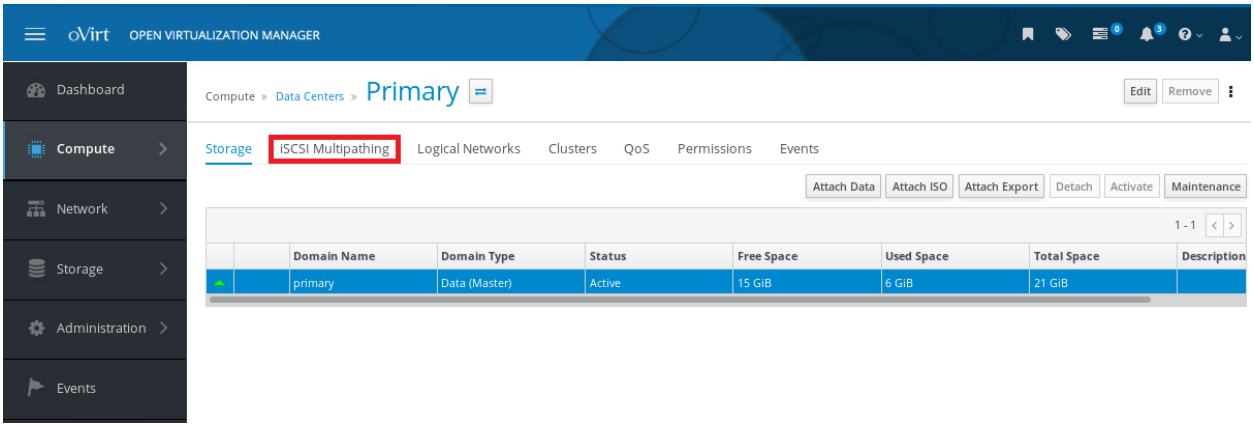
```
root@localhost:~
File  Edit  View  Search  Terminal  Help
/> cd /
/> ls
o- / ..... [...]
  o- backstores ..... [...]
  | o- block ..... [Storage Objects: 2]
  | | o- LUN1 ..... [/dev/sdc1(40.0GiB) write-thru activated]
  | | | o- alua ..... [ALUA Groups: 1]
  | | |   o- default_tg_pt_gp ..... [ALUA state: Active/optimized]
  | | o- LUN2 ..... [/dev/iSCSI01/LUN2 (60.0GiB) write-thru activated]
  | |   o- alua ..... [ALUA Groups: 1]
  | |     o- default_tg_pt_gp ..... [ALUA state: Active/optimized]
  | o- fileio ..... [Storage Objects: 1]
  | | o- LUN0 ..... [/LUN0/LUN0.img (19.5GiB) write-thru activated]
  | |   o- alua ..... [ALUA Groups: 1]
  | |     o- default_tg_pt_gp ..... [ALUA state: Active/optimized]
  | o- pscsi ..... [Storage Objects: 0]
  | o- ramdisk ..... [Storage Objects: 0]
  o- iscsi ..... [Targets: 1]
  | o- iqn.2003-01.org.linux-iscsi.packtiscsi01.x8664:sn.7b3c2efdbb11 ..... [TPGs: 1]
  |   o- tpg1 ..... [no-gen-acls, no-auth]
  |     o- acls ..... [ACLs: 1]
  |     | o- iqn.2019-12.com.packt:packtstratis01 ..... [Mapped LUNs: 3]
  |     |   o- mapped_lun0 ..... [lun0 fileio/LUN0 (rw)]
  |     |   o- mapped_lun1 ..... [lun1 block/LUN1 (rw)]
  |     |   o- mapped_lun2 ..... [lun2 block/LUN2 (rw)]
  |     o- luns ..... [LUNs: 3]
  |     | o- lun0 ..... [fileio/LUN0 (/LUN0/LUN0.img) (default_tg_pt_gp)]
  |     | o- lun1 ..... [block/LUN1 (/dev/sdc1) (default_tg_pt_gp)]
  |     | o- lun2 ..... [block/LUN2 (/dev/iSCSI01/LUN2) (default_tg_pt_gp)]
  |     o- portals ..... [Portals: 1]
  |       o- 0.0.0.0:3260 ..... [OK]
  o- loopback ..... [Targets: 0]
```

```
root@PacktStratis01:~
File  Edit  View  Search  Terminal  Help
[root@PacktStratis01 ~]# virsh vol-list --pool MyiSCSIPool
 Name                 Path
------------------------------------------------------------------------------
 unit:0:0:0           /dev/disk/by-path/ip-192.168.159.145:3260-iscsi-iqn.2003-0
1.org.linux-iscsi.packtiscsi01.x8664:sn.7b3c2efdbb11-lun-0
 unit:0:0:1           /dev/disk/by-path/ip-192.168.159.145:3260-iscsi-iqn.2003-0
1.org.linux-iscsi.packtiscsi01.x8664:sn.7b3c2efdbb11-lun-1
 unit:0:0:2           /dev/disk/by-path/ip-192.168.159.145:3260-iscsi-iqn.2003-0
1.org.linux-iscsi.packtiscsi01.x8664:sn.7b3c2efdbb11-lun-2
```

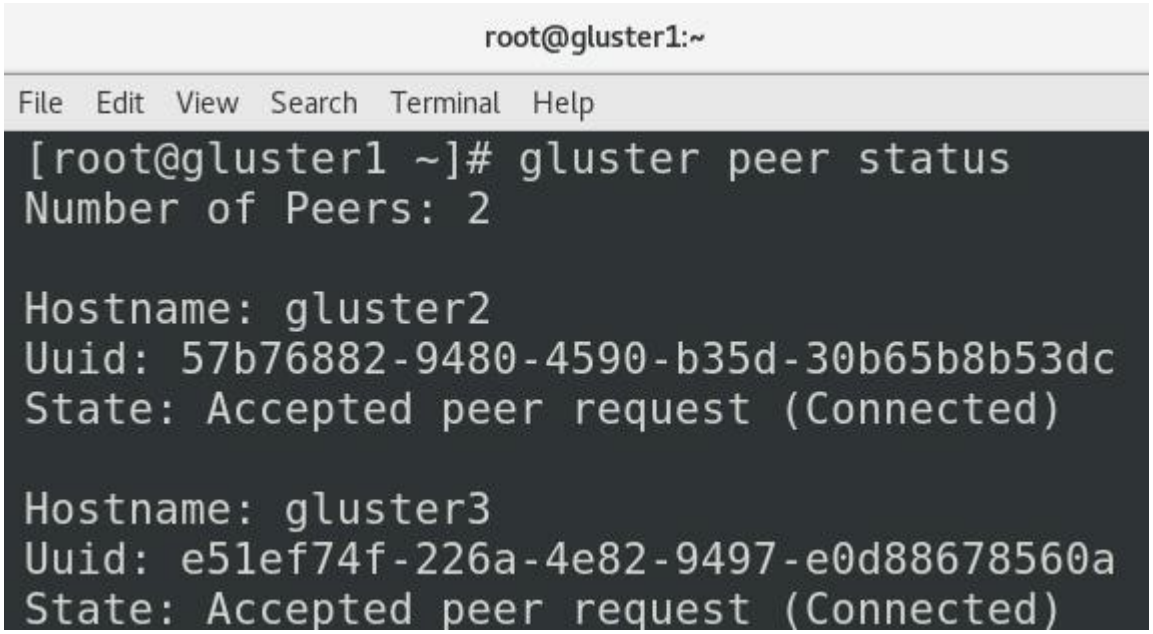



Setup Host vm48-83.vua.cloud Networks
Drag to make changes
Interfaces
Assigned Logical Networks
Networks
Labels
Unassigned Logical Networks
Required
Non Required
External Logical Networks
ens192
ovirtmgmt
ens224
iSCSI01
ens256
iSCSI02
Verify connectivity between Host and Engine
Save network configuration
OK
Cancel


Edit iSCSI Bond
Name
iSCSI
Description
Logical Networks
Name
Description
iSCSI01
iSCSI02
Storage Targets
IQN
Address
Port
iqn.2003-01.org.linux-iscsi.vm49-199.x...
192.168.2.11
3260
OK
Cancel



Hostname	gluster1	gluster2	gluster3
IP	192.168.159.147/24	192.168.159.148/24	192.168.159.149/24
Gluster disk	/dev/sdb (10GB)	/dev/sdb (10GB)	/dev/sdb (10GB)
Gluster local directory	/gluster/bricks/1	/gluster/bricks/1	/gluster/bricks/1

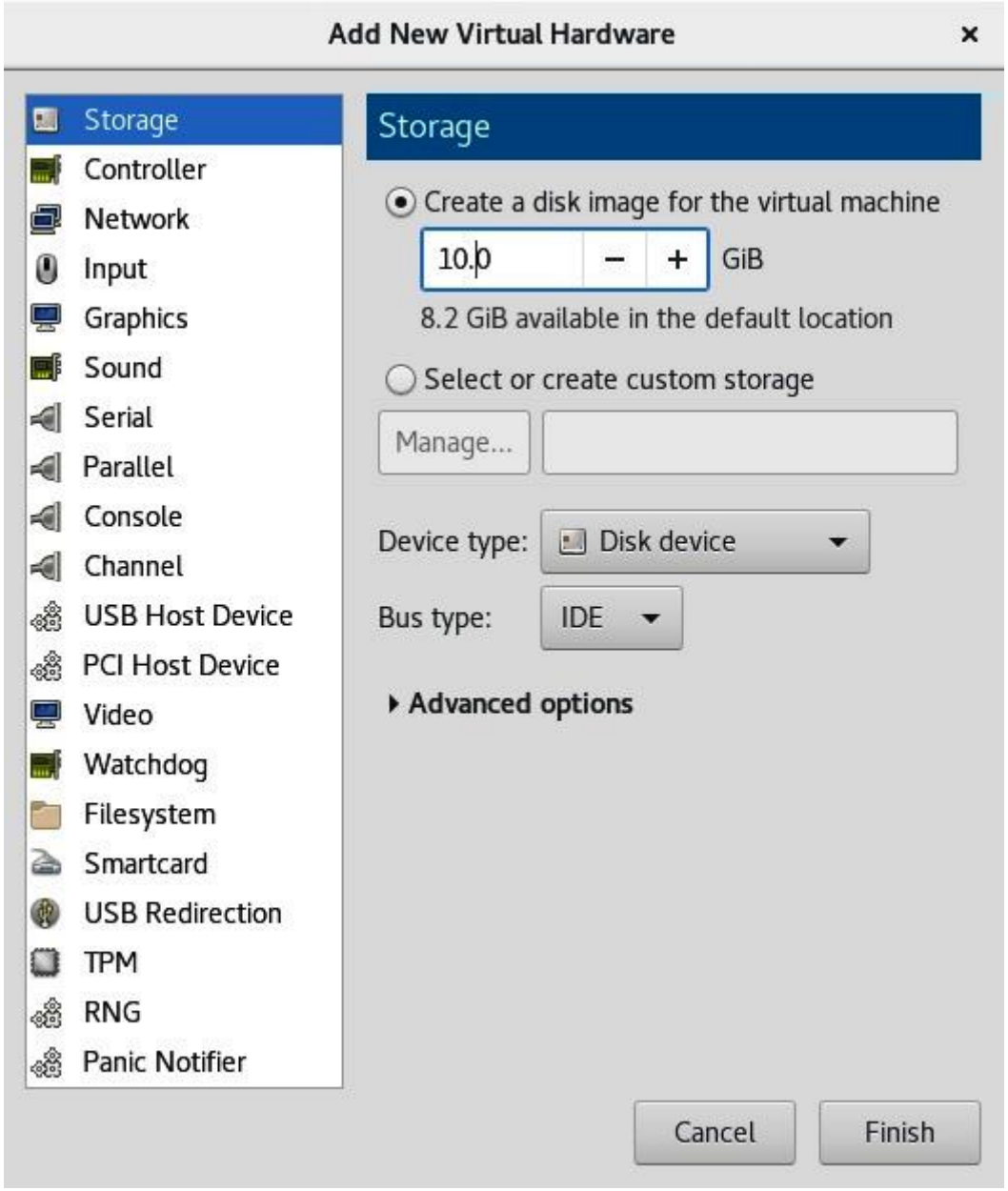


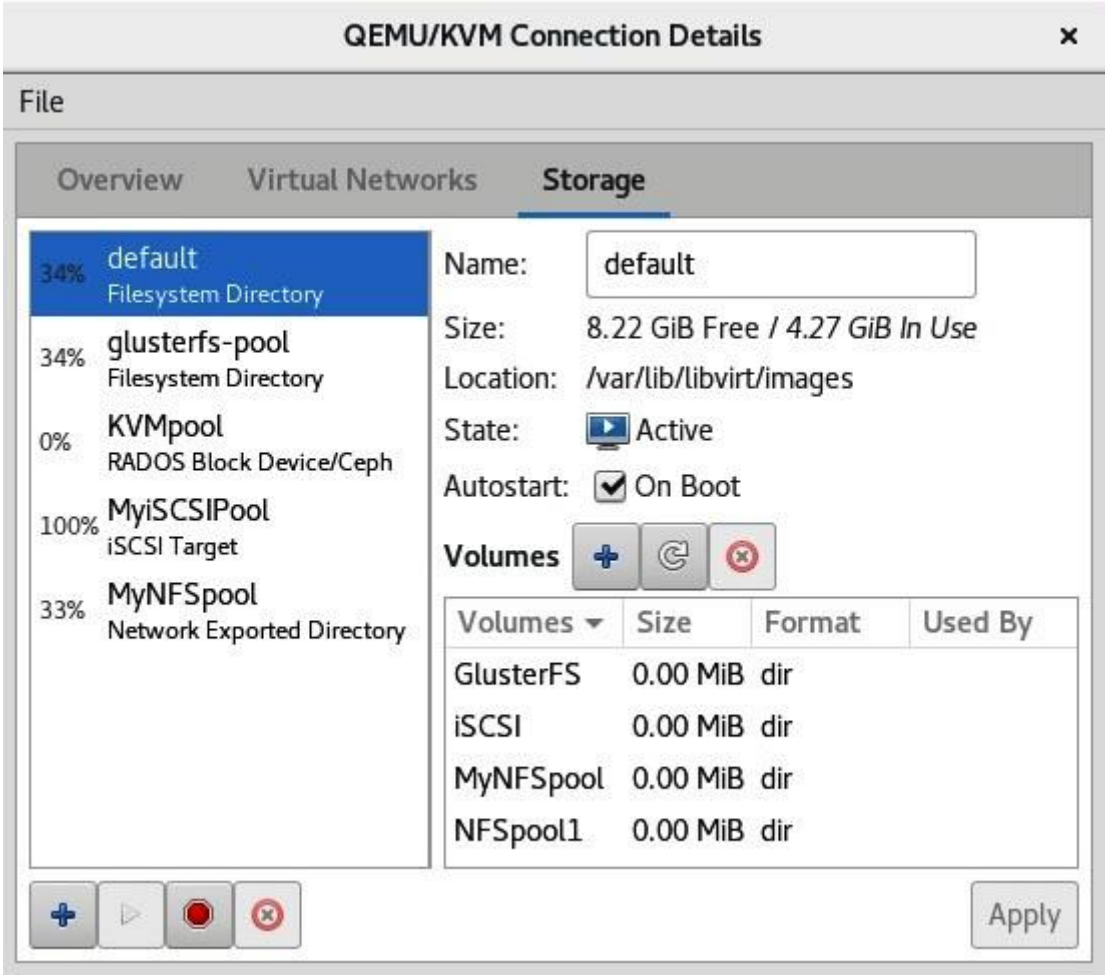
```
root@PacktStratis01:/var/lib/libvirt/images/GlusterFS
File  Edit  View  Search  Terminal  Help
[root@PacktStratis01 GlusterFS]# ping gluster1
PING gluster1 (192.168.159.147) 56(84) bytes of data.
From PacktStratis01 (192.168.159.143) icmp_seq=1 Destination Host Unreachable
From PacktStratis01 (192.168.159.143) icmp_seq=2 Destination Host Unreachable
From PacktStratis01 (192.168.159.143) icmp_seq=3 Destination Host Unreachable
^C
--- gluster1 ping statistics ---
3 packets transmitted, 0 received, +3 errors, 100% packet loss, time 75ms
pipe 3
[root@PacktStratis01 GlusterFS]# cat FailoverFile
This is my file content!
```

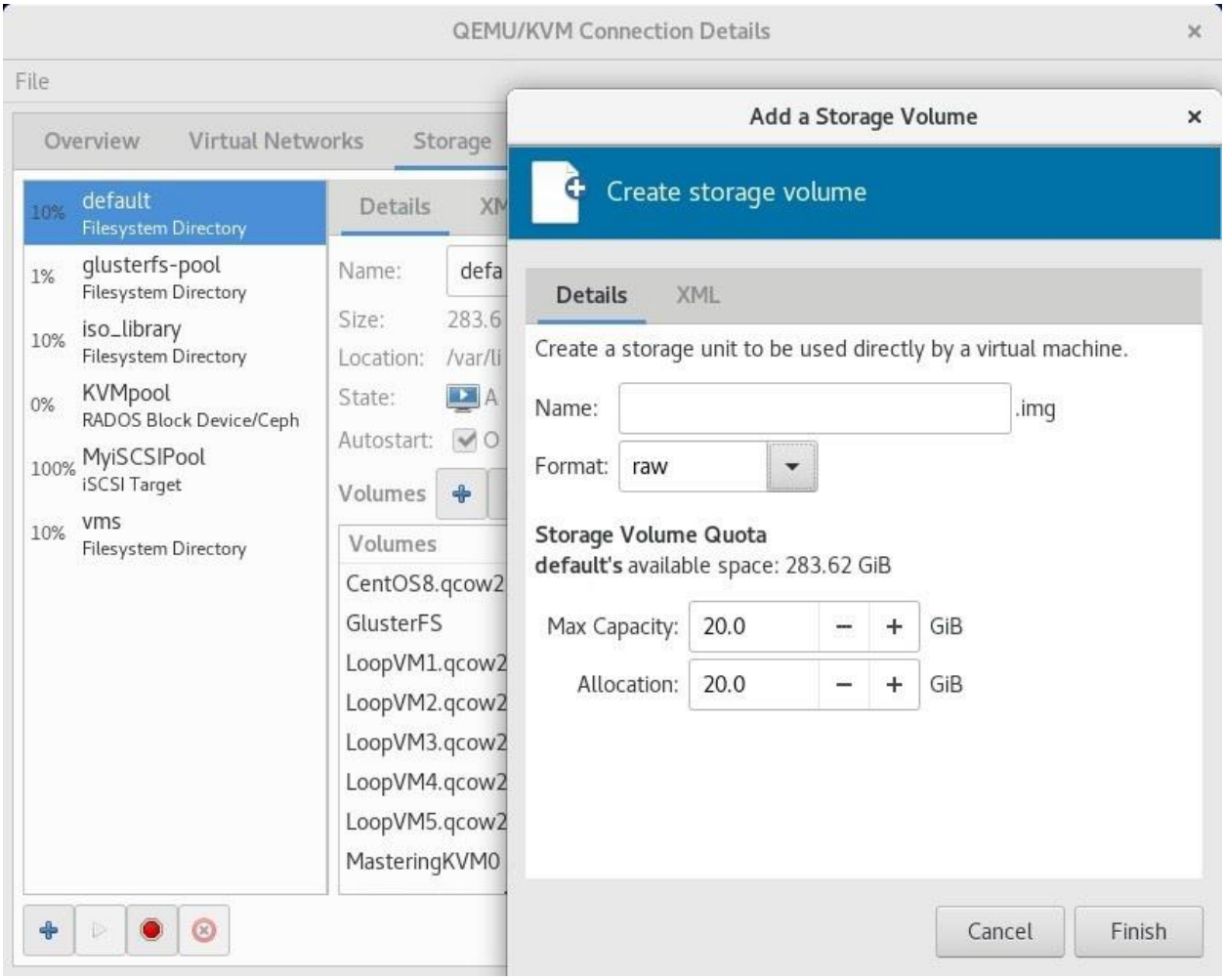
hostname	ceph-admin	ceph-monitor	ceph-osd1	ceph-osd2	ceph-osd3
IP/24	192.168.159.150	192.168.159.151	192.168.159.152	192.168.159.153	192.168.159.154
Ceph disk	/dev/sdb	/dev/sdb	/dev/sdb	/dev/sdb	/dev/sdb

```
root@gluster1:~
File  Edit  View  Search  Terminal  Help
[root@ceph-admin ~]# ssh-keygen
Generating public/private rsa key pair.
Enter file in which to save the key (/root/.ssh/id_rsa):
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /root/.ssh/id_rsa.
Your public key has been saved in /root/.ssh/id_rsa.pub.
The key fingerprint is:
SHA256:pLaJdR+PXYxFHSAr4P1mtSUZjBOuy0cMMCDDkFne/Ro root@ceph-admin
The key's randomart image is:
+---[RSA 2048]----+
| .*+ ..+   o+ooo.|
| o..+ o = .oooo .|
|    . . o.+ o.+.. |
|       o. * .++  |
|      +ESo.*..o  |
|     + ++.== .   |
|    . o. oo.o    |
|          .      |
|                 |
+----[SHA256]-----+
```

```
[root@PacktStratis01 ~]# virsh pool-list --details
 Name            State    Autostart  Persistent    Capacity  Allocation  Available
-------------------------------------------------------------------------------------
 default         running  yes        yes          12.49 GiB    4.26 GiB   8.22 GiB
 glusterfs-pool  running  yes        yes           9.99 GiB  134.61 MiB   9.86 GiB
 KVMpool         running  yes        yes          14.97 GiB      0.00 B  14.65 GiB
 MyiSCSIPool     running  yes        yes         119.53 GiB  119.53 GiB     0.00 B
 MyNFSpool       running  yes        yes          12.49 GiB    4.13 GiB   8.35 GiB
```

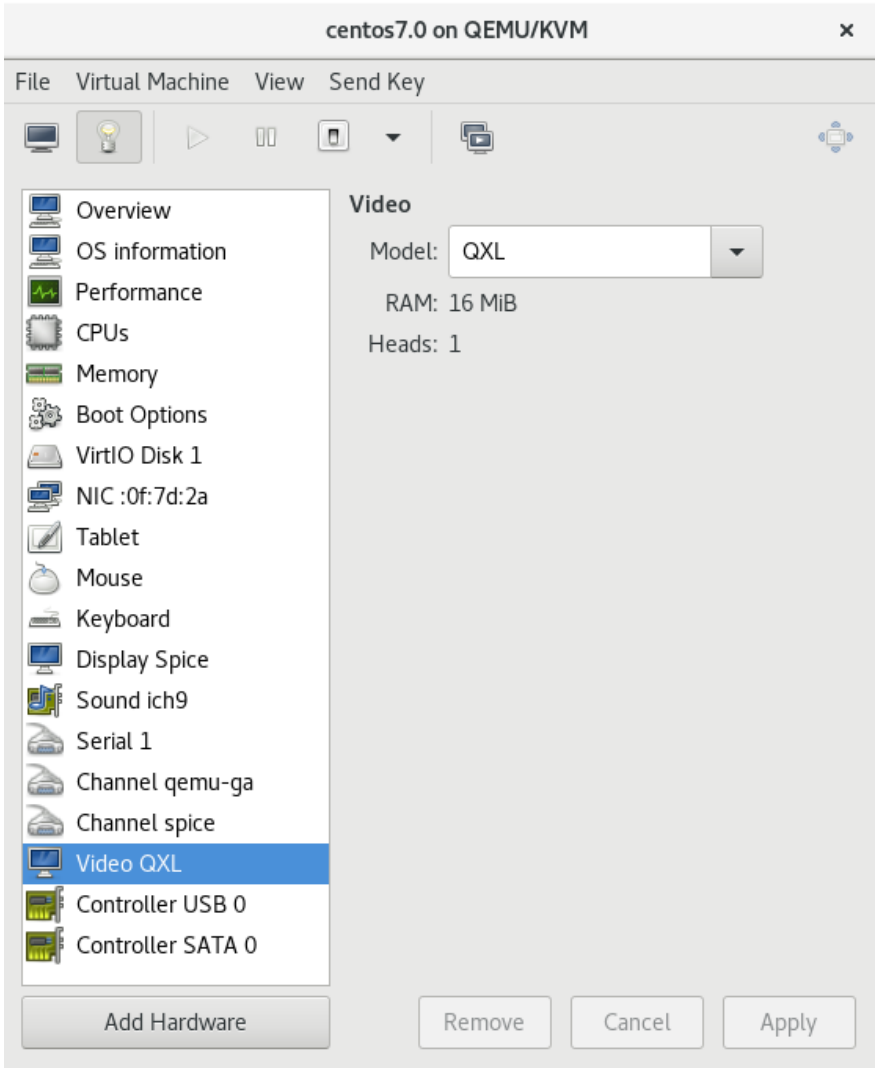

Add New Virtual Hardware
Storage
Controller
Network
Input
Graphics
Sound
Serial
Parallel
Console
Channel
USB Host Device
PCI Host Device
Video
Watchdog
Filesystem
Smartcard
USB Redirection
TPM
RNG
Panic Notifier
Storage
Create a disk image for the virtual machine
10.0
GiB
8.2 GiB available in the default location
Select or create custom storage
Manage...
Device type:
Disk device
Bus type:
IDE
Advanced options
Cancel
Finish

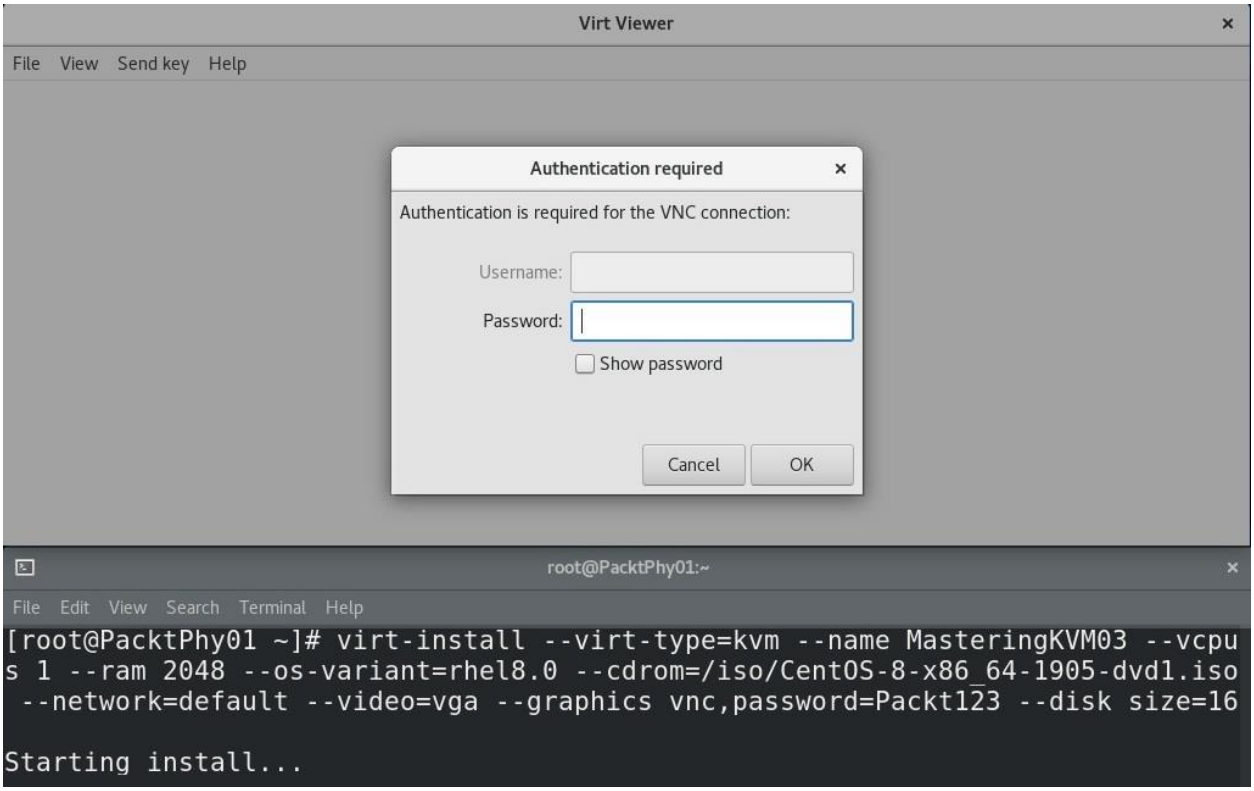

QEMU/KVM Connection Details
File
Overview
Virtual Networks
Storage
34% default
Filesystem Directory
34% glusterfs-pool
Filesystem Directory
0% KVMpool
RADOS Block Device/Ceph
100% MyiSCSIPool
iSCSI Target
33% MyNFSpool
Network Exported Directory
Name: default
Size: 8.22 GiB Free / 4.27 GiB In Use
Location: /var/lib/libvirt/images
State: Active
Autostart: On Boot
Volumes
Volumes
Size
Format
Used By
GlusterFS 0.00 MiB dir
iSCSI 0.00 MiB dir
MyNFSpool 0.00 MiB dir
NFSpool1 0.00 MiB dir
Apply

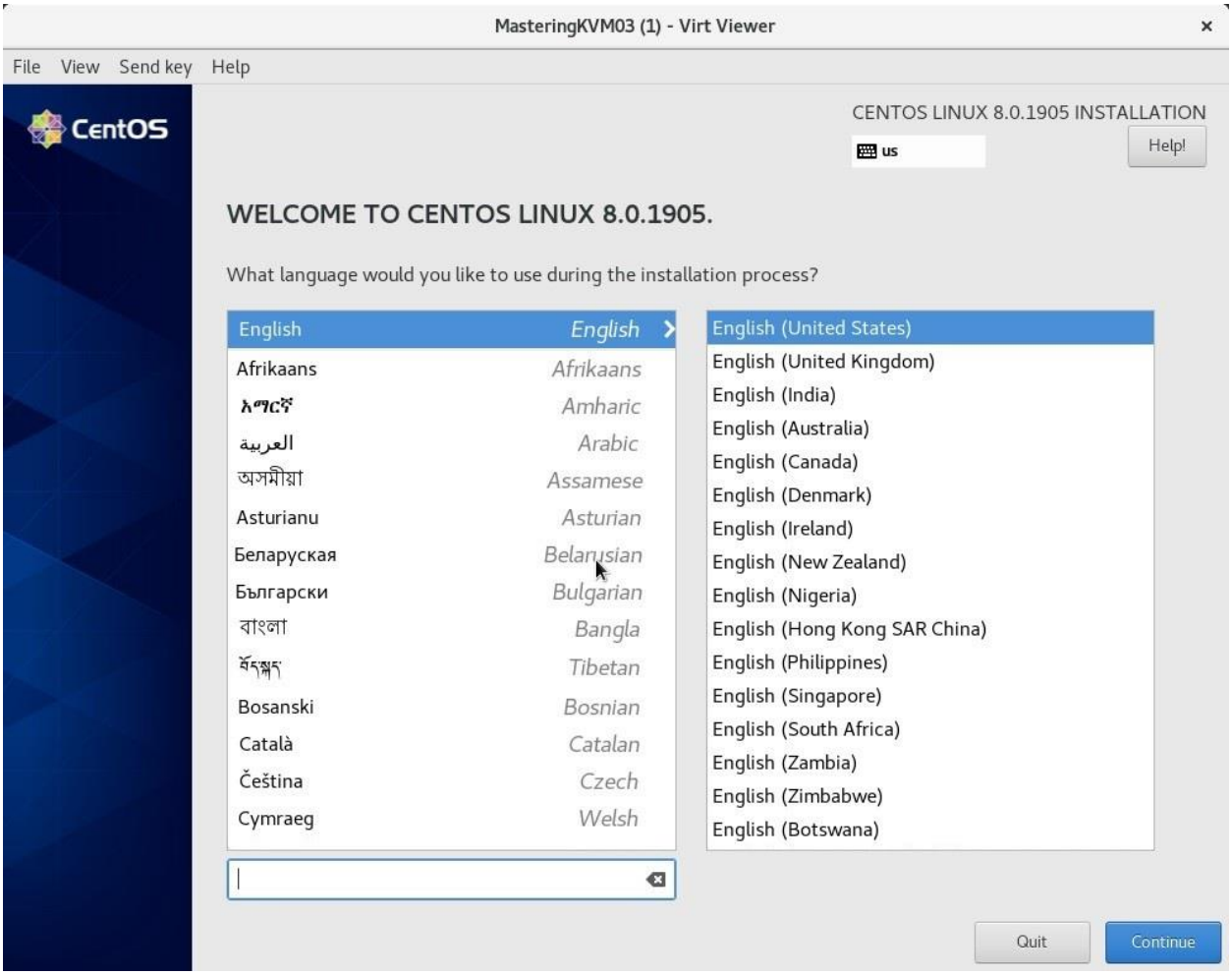

QEMU/KVM Connection Details
File
Overview
Virtual Networks
Storage
10% default
Filesystem Directory
1% glusterfs-pool
Filesystem Directory
10% iso_library
Filesystem Directory
0% KVMpool
RADOS Block Device/Ceph
100% MyiSCSIPool
iSCSI Target
10% vms
Filesystem Directory
Details
Name:
Size:
Location:
State:
Autostart:
Volumes
Volumes
CentOS8.qcow2
GlusterFS
LoopVM1.qcow2
LoopVM2.qcow2
LoopVM3.qcow2
LoopVM4.qcow2
LoopVM5.qcow2
MasteringKVM0
Add a Storage Volume
Create storage volume
Details
XML
Create a storage unit to be used directly by a virtual machine.
Name:
.img
Format:
raw
Storage Volume Quota
default's available space: 283.62 GiB
Max Capacity:
20.0
GiB
Allocation:
20.0
GiB
Cancel
Finish

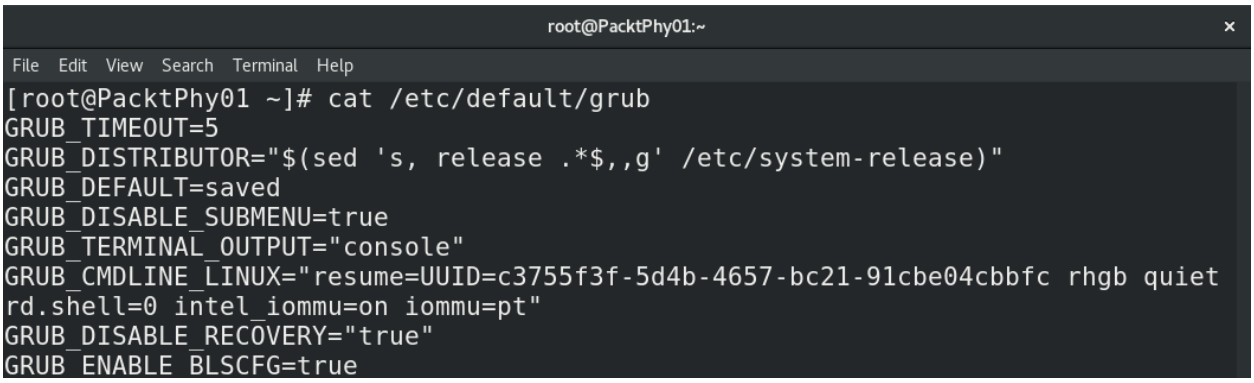

DELL EMC
PowerMax

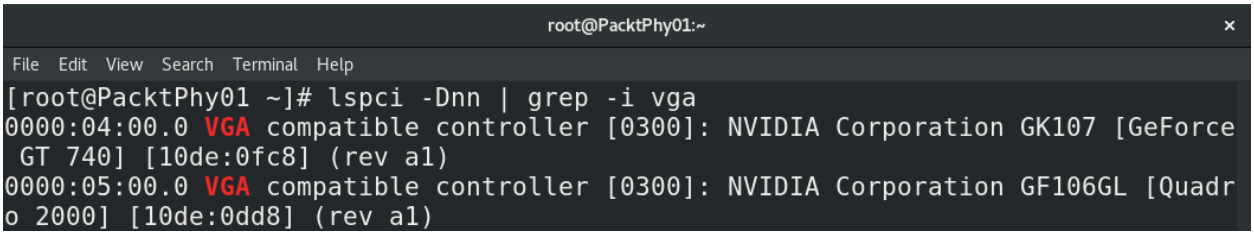
Chapter 6: Virtual Display Devices and Protocols




Virt Viewer
File View Send key Help
Authentication required
Authentication is required for the VNC connection:
Username:
Password:
Show password
Cancel
OK
root@PacktPhy01:~
File Edit View Search Terminal Help
[root@PacktPhy01 ~]# virt-install --virt-type=kvm --name MasteringKVM03 --vcpu
s 1 --ram 2048 --os-variant=rhel8.0 --cdrom=/iso/CentOS-8-x86_64-1905-dvd1.iso
--network=default --video=vga --graphics vnc,password=Packt123 --disk size=16
Starting install...


MasteringKVM03 (1) - Virt Viewer
File View Send key Help
CentOS
CENTOS LINUX 8.0.1905 INSTALLATION
us
Help!
WELCOME TO CENTOS LINUX 8.0.1905.
What language would you like to use during the installation process?
English English
Afrikaans Afrikaans
አማርኛ Amharic
العربية Arabic
অসমীয়া Assamese
Asturianu Asturian
Беларуская Belarusian
Български Bulgarian
বাংলা Bangla
བོད་སྐད་ Tibetan
Bosanski Bosnian
Català Catalan
Čeština Czech
Cymraeg Welsh
English (United States)
English (United Kingdom)
English (India)
English (Australia)
English (Canada)
English (Denmark)
English (Ireland)
English (New Zealand)
English (Nigeria)
English (Hong Kong SAR China)
English (Philippines)
English (Singapore)
English (South Africa)
English (Zambia)
English (Zimbabwe)
English (Botswana)
Quit
Continue


root@PacktPhy01:~
File Edit View Search Terminal Help
[root@PacktPhy01 ~]# cat /etc/default/grub
GRUB_TIMEOUT=5
GRUB_DISTRIBUTOR="$(sed 's, release .*$,,g' /etc/system-release)"
GRUB_DEFAULT=saved
GRUB_DISABLE_SUBMENU=true
GRUB_TERMINAL_OUTPUT="console"
GRUB_CMDLINE_LINUX="resume=UUID=c3755f3f-5d4b-4657-bc21-91cbe04cbbfc rhgb quiet
rd.shell=0 intel_iommu=on iommu=pt"
GRUB_DISABLE_RECOVERY="true"
GRUB_ENABLE_BLSCFG=true


root@PacktPhy01:~
File Edit View Search Terminal Help
[root@PacktPhy01 ~]# lspci -Dnn | grep -i vga
0000:04:00.0 VGA compatible controller [0300]: NVIDIA Corporation GK107 [GeForce
GT 740] [10de:0fc8] (rev a1)
0000:05:00.0 VGA compatible controller [0300]: NVIDIA Corporation GF106GL [Quadr
o 2000] [10de:0dd8] (rev a1)

```
root@PacktPhy01:~
File  Edit  View  Search  Terminal  Help
[root@PacktPhy01 ~]# cat /etc/default/grub
GRUB_TIMEOUT=5
GRUB_DISTRIBUTOR="$(sed 's, release .*$,,g' /etc/system-release)"
GRUB_DEFAULT=saved
GRUB_DISABLE_SUBMENU=true
GRUB_TERMINAL_OUTPUT="console"
GRUB_CMDLINE_LINUX="resume=UUID=c3755f3f-5d4b-4657-bc21-91cbe04cbbfc rhgb quiet
rd.shell=0 intel_iommu=on iommu=pt pci-stub.ids=10de:0dd8"
GRUB_DISABLE_RECOVERY="true"
GRUB_ENABLE_BLSCFG=true
```

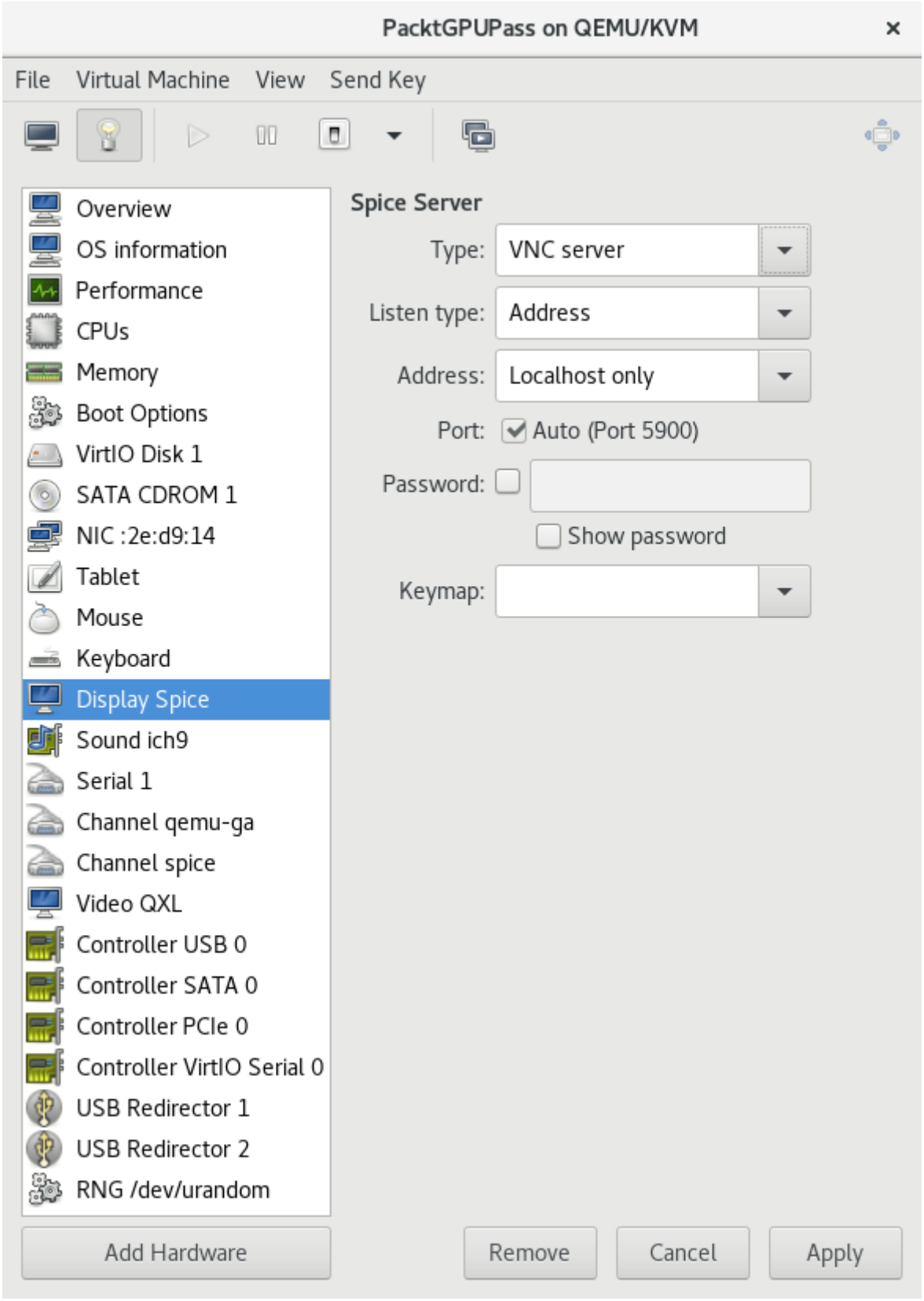
```
root@PacktPhy01:~
File  Edit  View  Search  Terminal  Help
[root@PacktPhy01 ~]# virsh nodedev-dumpxml pci_0000_05_00_0
<device>
  <name>pci_0000_05_00_0</name>
  <path>/sys/devices/pci0000:00/0000:00:02.0/0000:05:00.0</path>
  <parent>pci_0000_00_02_0</parent>
  <driver>
    <name>pci-stub</name>
  </driver>
  <capability type='pci'>
    <domain>0</domain>
    <bus>5</bus>
    <slot>0</slot>
    <function>0</function>
    <product id='0x0dd8'>GF106GL [Quadro 2000]</product>
    <vendor id='0x10de'>NVIDIA Corporation</vendor>
    <iommuGroup number='18'>
      <address domain='0x0000' bus='0x05' slot='0x00' function='0x1'/>
      <address domain='0x0000' bus='0x05' slot='0x00' function='0x0'/>
    </iommuGroup>
    <numa node='0'/>
    <pci-express>
      <link validity='cap' port='0' speed='2.5' width='16'/>
      <link validity='sta' speed='2.5' width='16'/>
    </pci-express>
  </capability>
</device>
```

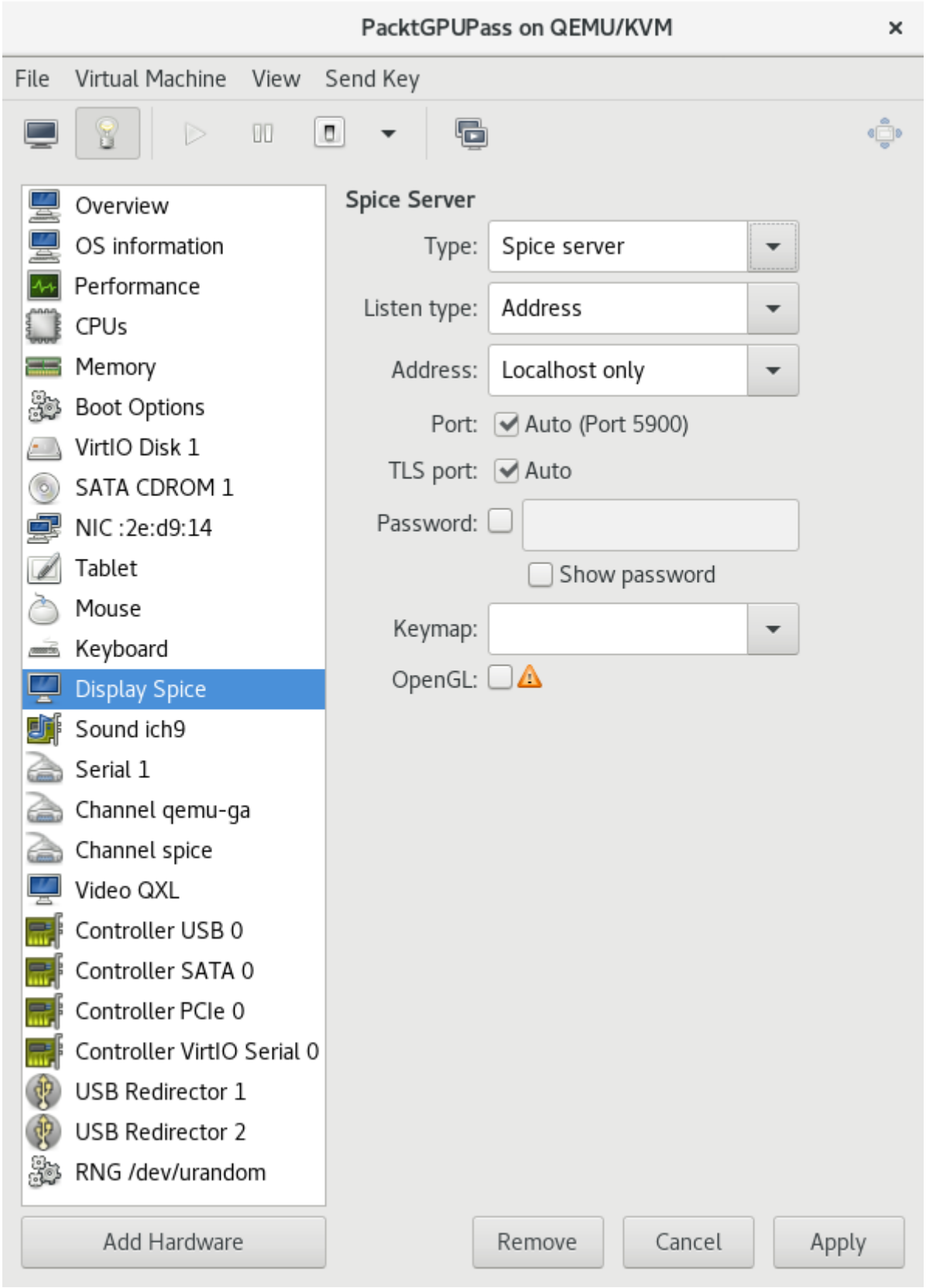
```
root@PacktPhy01:~
File  Edit  View  Search  Terminal  Help
[root@PacktPhy01 ~]# virsh nodedev-detach pci_0000_05_00_1
Device pci_0000_05_00_1 detached
```

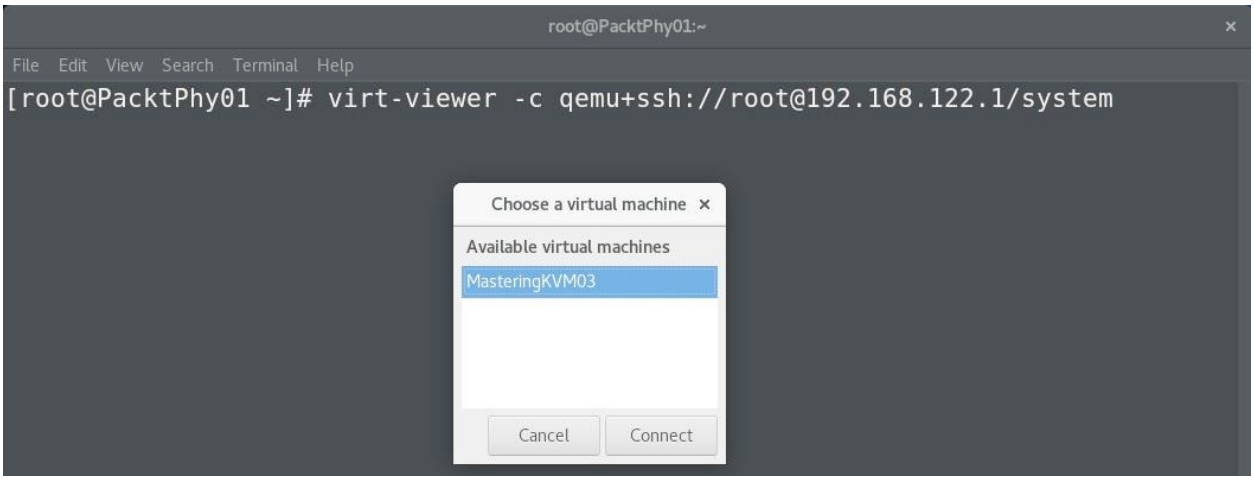
```
root@PacktPhy01:~
File  Edit  View  Search  Terminal  Help
<hostdev mode='subsystem' type='pci' managed='yes'>
        <driver name='vfio'/>
        <source>
        <address domain='0x0000' bus='0x05' function='0x0'/>
        </source>
</hostdev>
```

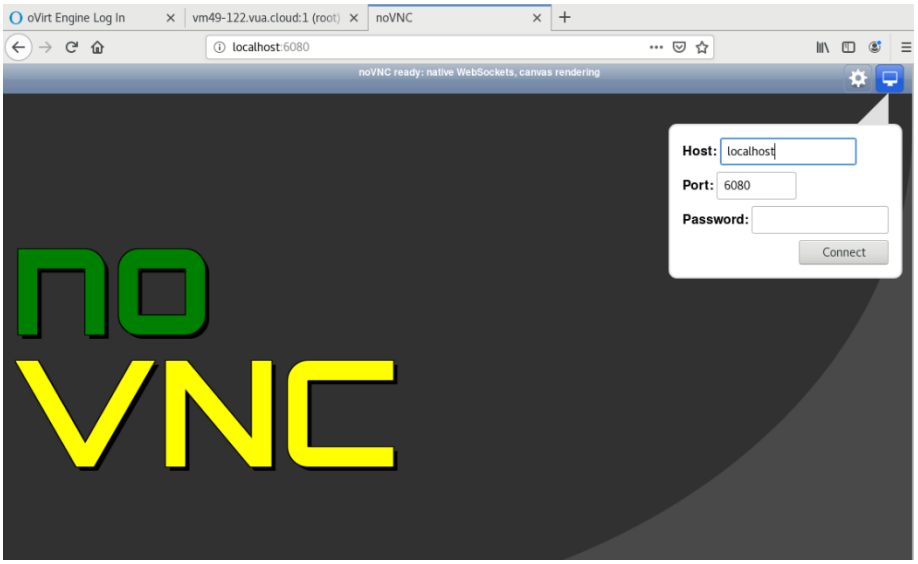
```
root@PacktPhy01:~
File  Edit  View  Search  Terminal  Help
[root@PacktPhy01 ~]# virsh attach-device --domain MasteringKVM03 passthrough.xml
 --persistent
Device attached successfully
```

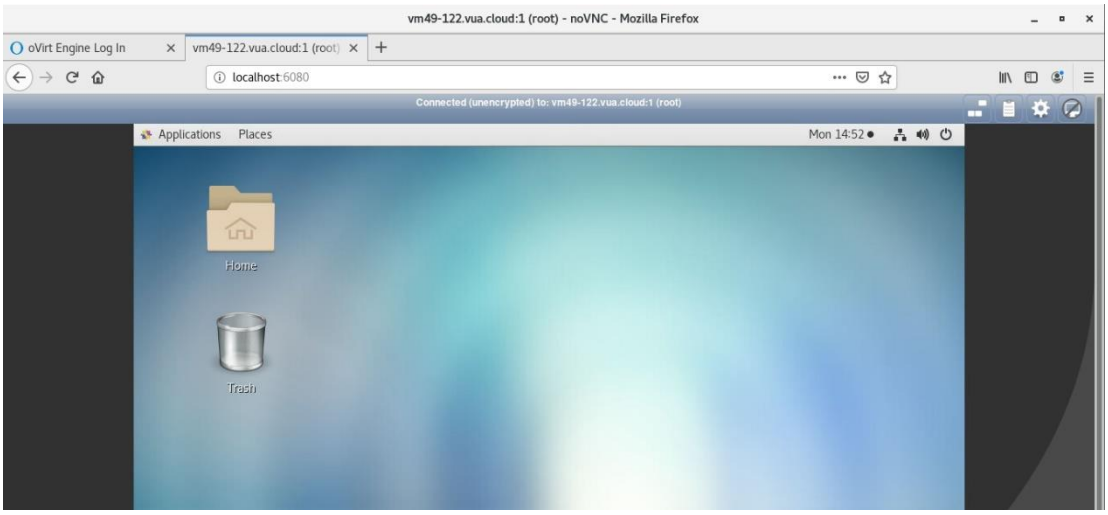
```
root@MasteringKVM03:~
File  Edit  View  Search  Terminal  Help
[root@MasteringKVM03 ~]# lspci | grep -i vga
00:01.0 VGA compatible controller: Red Hat, Inc. QXL paravirtual graphic card (r
ev 04)
08:00.0 VGA compatible controller: NVIDIA Corporation GK104GL [GRID K2] (rev a1)
[root@MasteringKVM03 ~]#
```

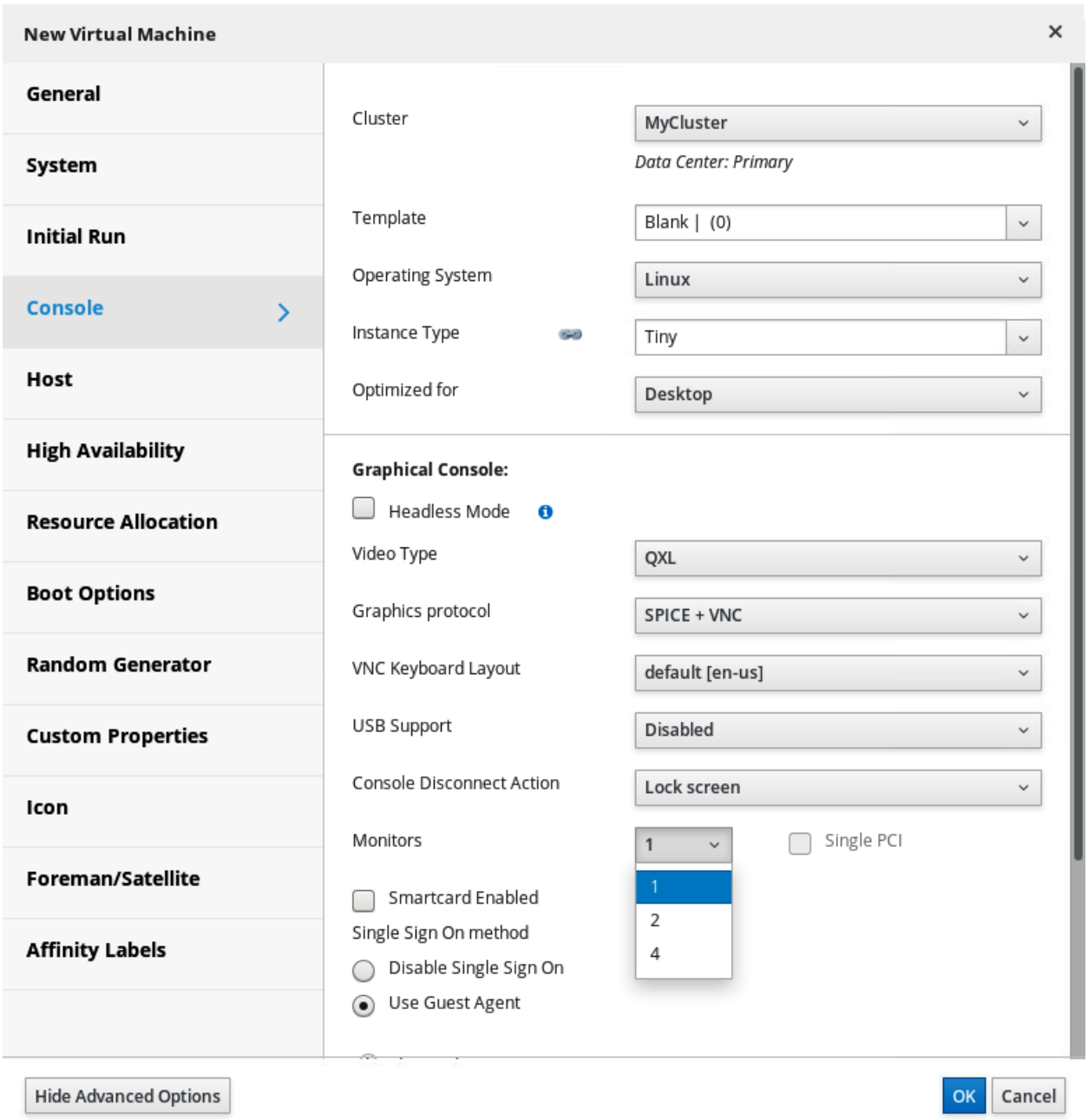

PacktGPUPass on QEMU/KVM
File
Virtual Machine
View
Send Key
Overview
OS information
Performance
CPUs
Memory
Boot Options
VirtIO Disk 1
SATA CDROM 1
NIC :2e:d9:14
Tablet
Mouse
Keyboard
Display Spice
Sound ich9
Serial 1
Channel qemu-ga
Channel spice
Video QXL
Controller USB 0
Controller SATA 0
Controller PCIe 0
Controller VirtIO Serial 0
USB Redirector 1
USB Redirector 2
RNG /dev/urandom
Spice Server
Type:
VNC server
Listen type:
Address
Address:
Localhost only
Port:
Auto (Port 5900)
Password:
Show password
Keymap:
Add Hardware
Remove
Cancel
Apply


PacktGPUPass on QEMU/KVM
File
Virtual Machine
View
Send Key
Overview
OS information
Performance
CPUs
Memory
Boot Options
VirtIO Disk 1
SATA CDROM 1
NIC :2e:d9:14
Tablet
Mouse
Keyboard
Display Spice
Sound ich9
Serial 1
Channel qemu-ga
Channel spice
Video QXL
Controller USB 0
Controller SATA 0
Controller PCIe 0
Controller VirtIO Serial 0
USB Redirector 1
USB Redirector 2
RNG /dev/urandom
Spice Server
Type:
Spice server
Listen type:
Address
Address:
Localhost only
Port:
Auto (Port 5900)
TLS port:
Auto
Password:
Show password
Keymap:
OpenGL:
Add Hardware
Remove
Cancel
Apply

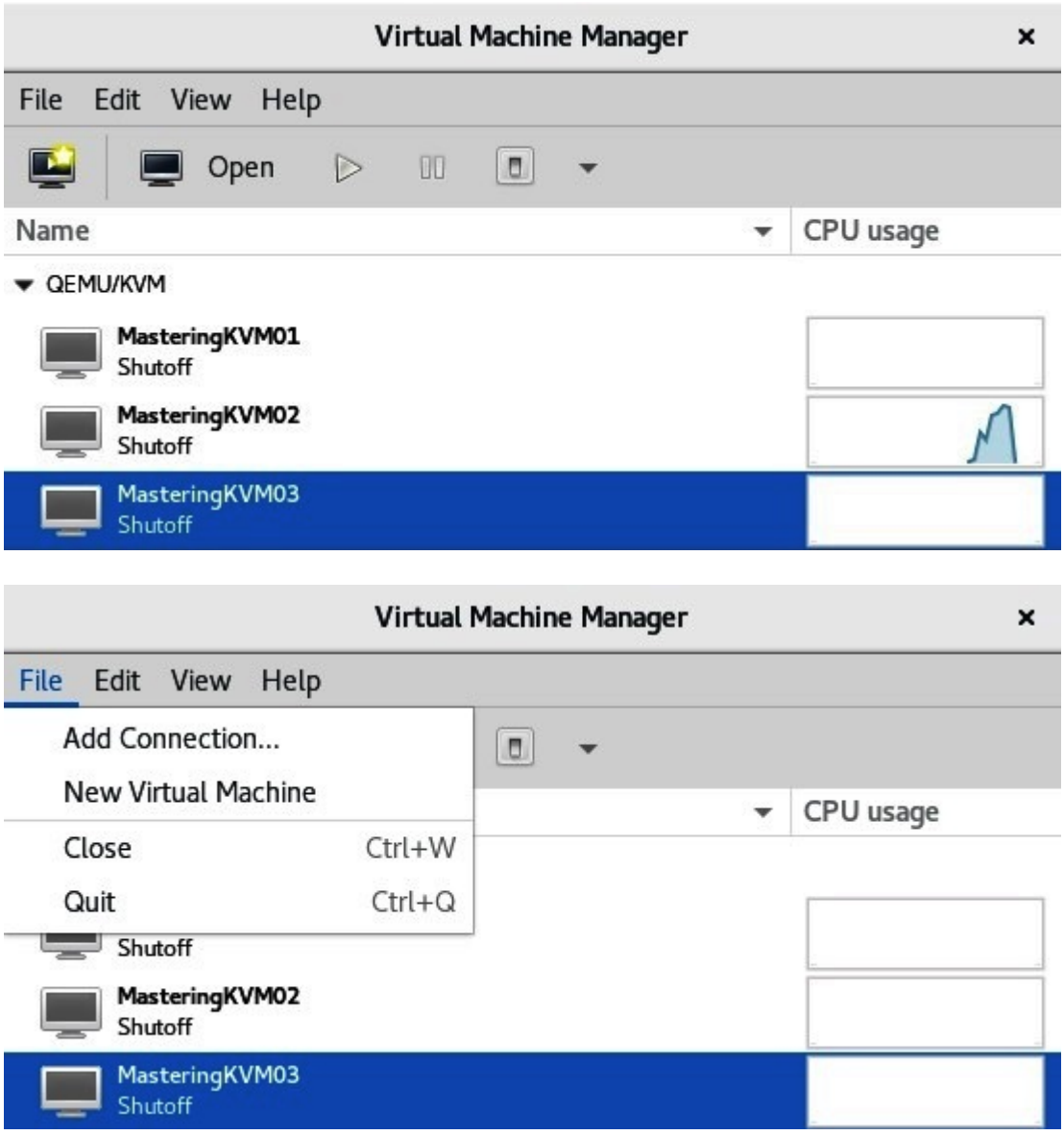

root@PacktPhy01:~
File Edit View Search Terminal Help
[root@PacktPhy01 ~]# virt-viewer -c qemu+ssh://root@192.168.122.1/system
Choose a virtual machine
Available virtual machines
MasteringKVM03
Cancel
Connect

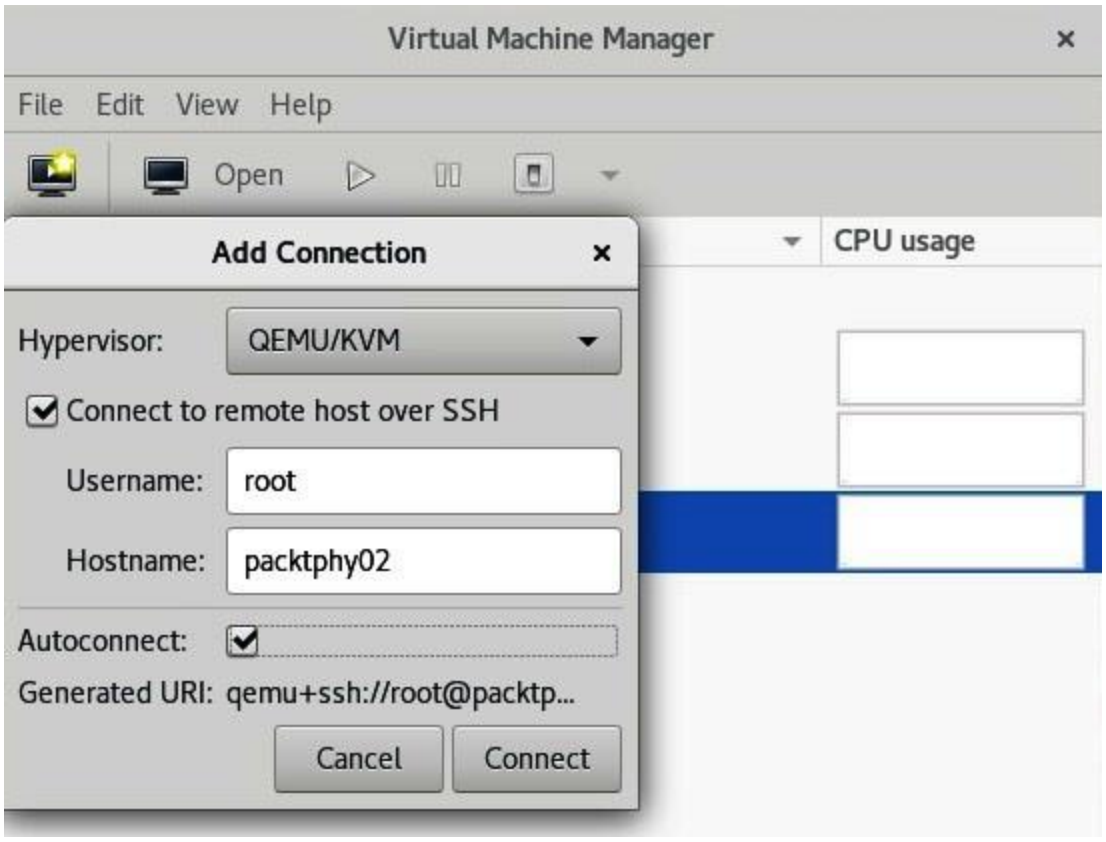

oVirt Engine Log In
vm49-122.vua.cloud:1 (root)
noVNC
localhost:6080
noVNC ready: native WebSockets, canvas rendering
Host: localhost
Port: 6080
Password:
Connect
no
VNC

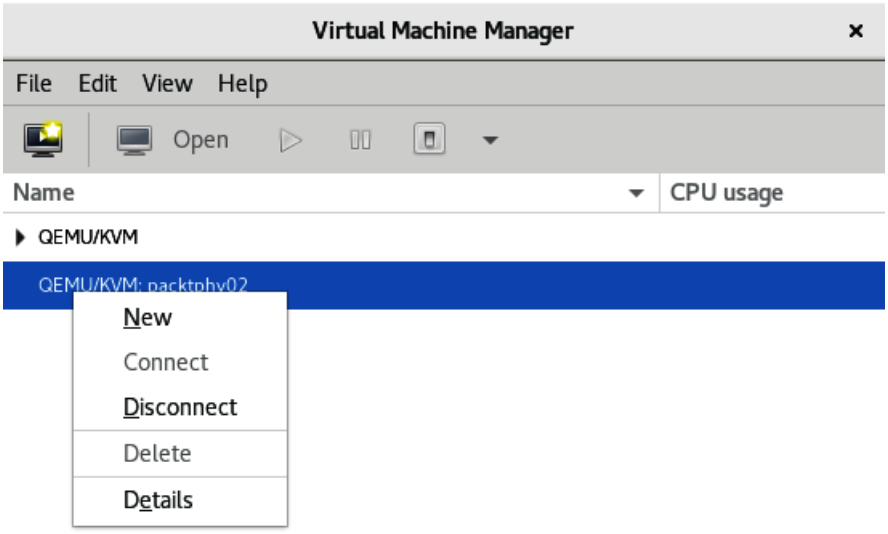

vm49-122.vua.cloud:1 (root) - noVNC - Mozilla Firefox
oVirt Engine Log In
vm49-122.vua.cloud:1 (root)
localhost:6080
Connected (unencrypted) to: vm49-122.vua.cloud:1 (root)
Applications
Places
Mon 14:52
Home
Trash

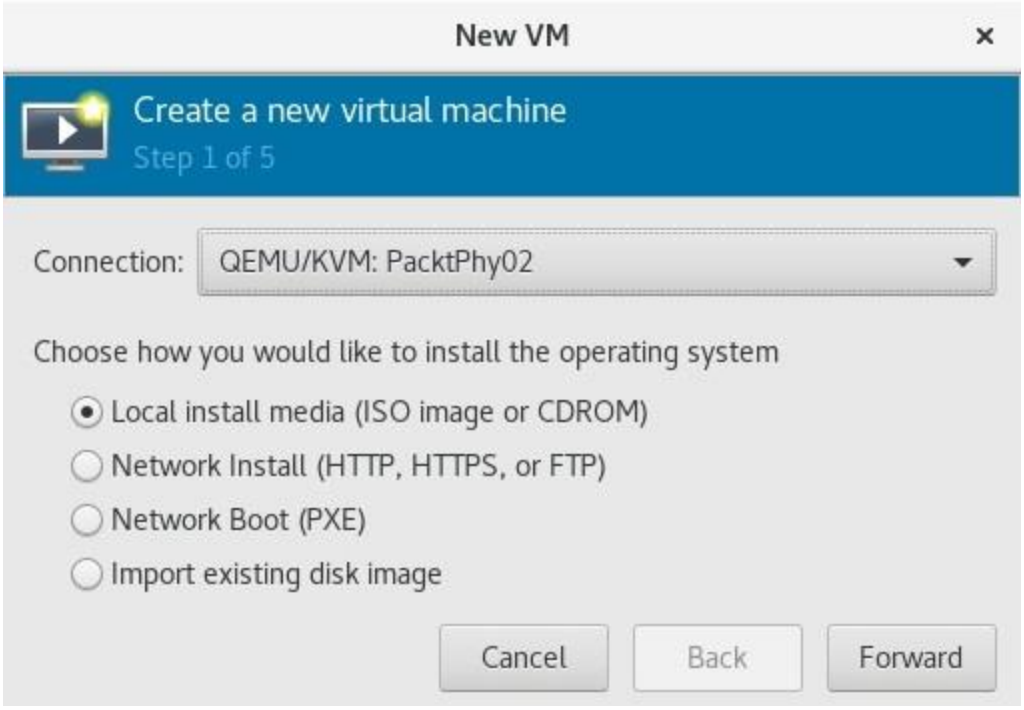

New Virtual Machine
General
System
Initial Run
Console
Host
High Availability
Resource Allocation
Boot Options
Random Generator
Custom Properties
Icon
Foreman/Satellite
Affinity Labels
Cluster
MyCluster
Data Center: Primary
Template
Blank | (0)
Operating System
Linux
Instance Type
Tiny
Optimized for
Desktop
Graphical Console:
Headless Mode
Video Type
QXL
Graphics protocol
SPICE + VNC
VNC Keyboard Layout
default [en-us]
USB Support
Disabled
Console Disconnect Action
Lock screen
Monitors
1
2
4
Single PCI
Smartcard Enabled
Single Sign On method
Disable Single Sign On
Use Guest Agent
Hide Advanced Options
OK
Cancel

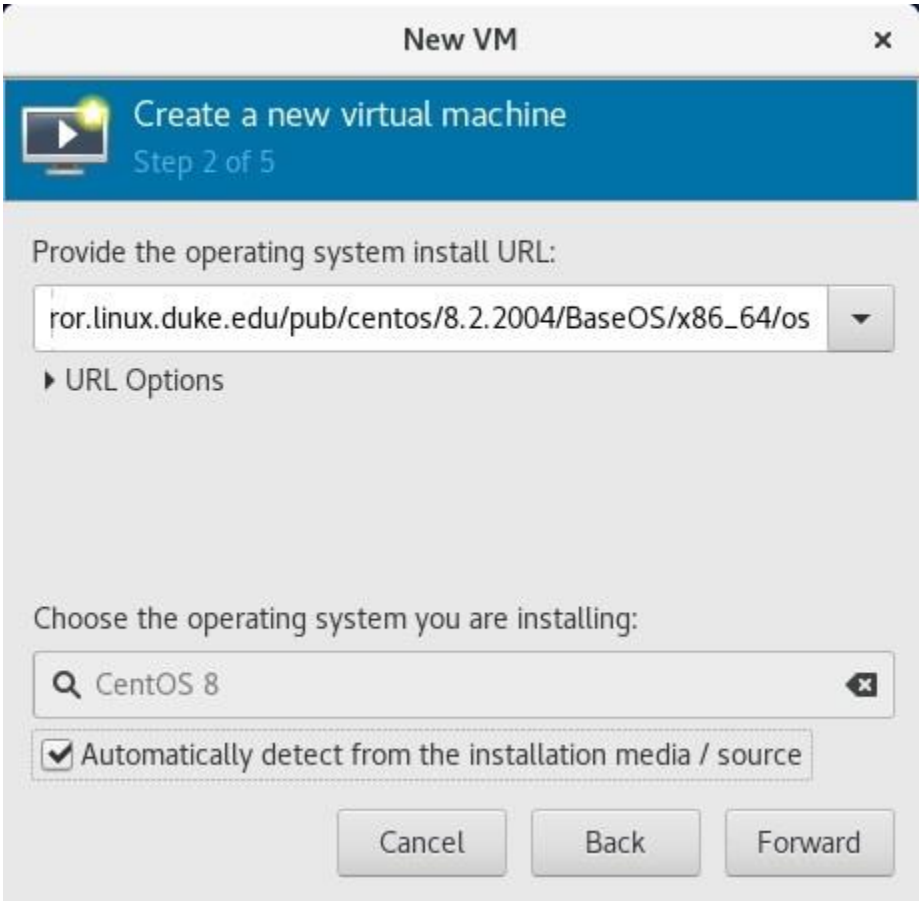
Chapter 7: Virtual Machines: Installation, Confi guration, and Life Cycle Management

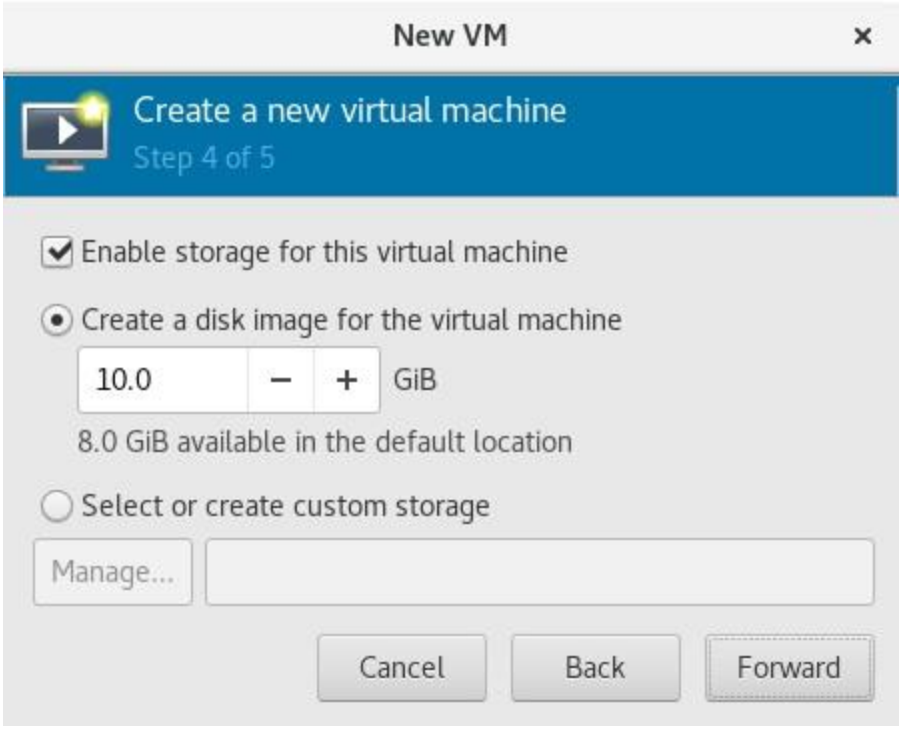


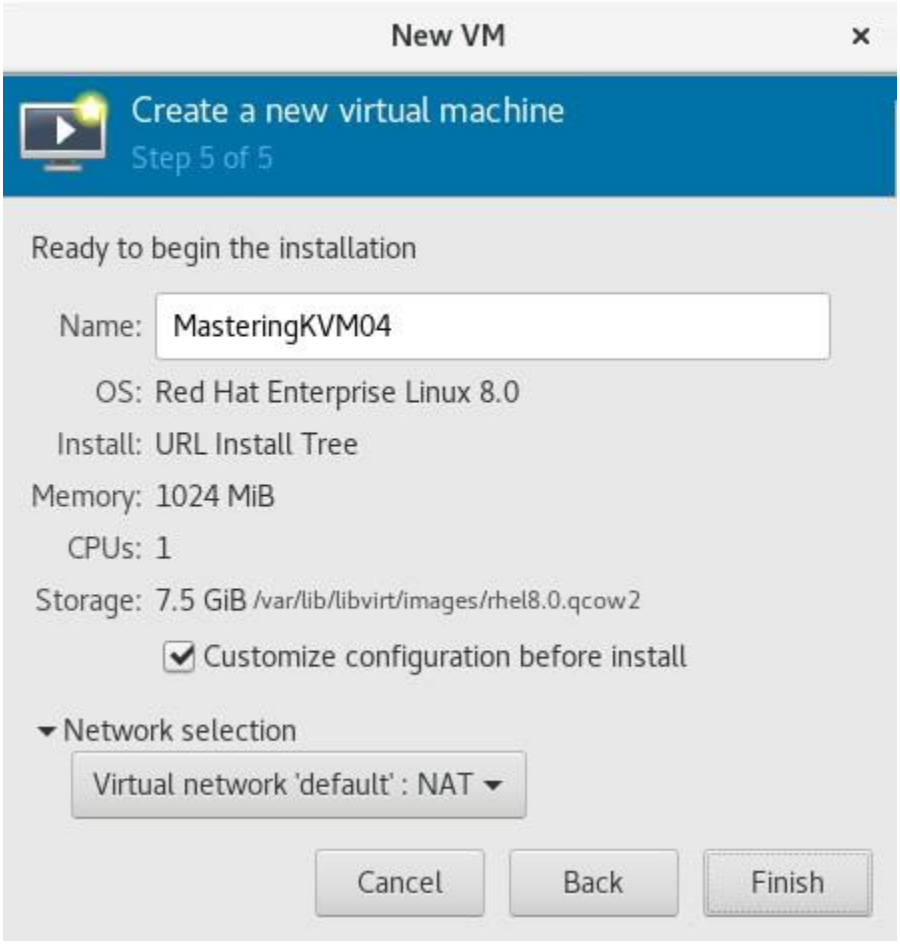

Virtual Machine Manager
File Edit View Help
Open
CPU usage
Add Connection
Hypervisor: QEMU/KVM
Connect to remote host over SSH
Username: root
Hostname: packtphy02
Autoconnect:
Generated URI: qemu+ssh://root@packtp...
Cancel
Connect

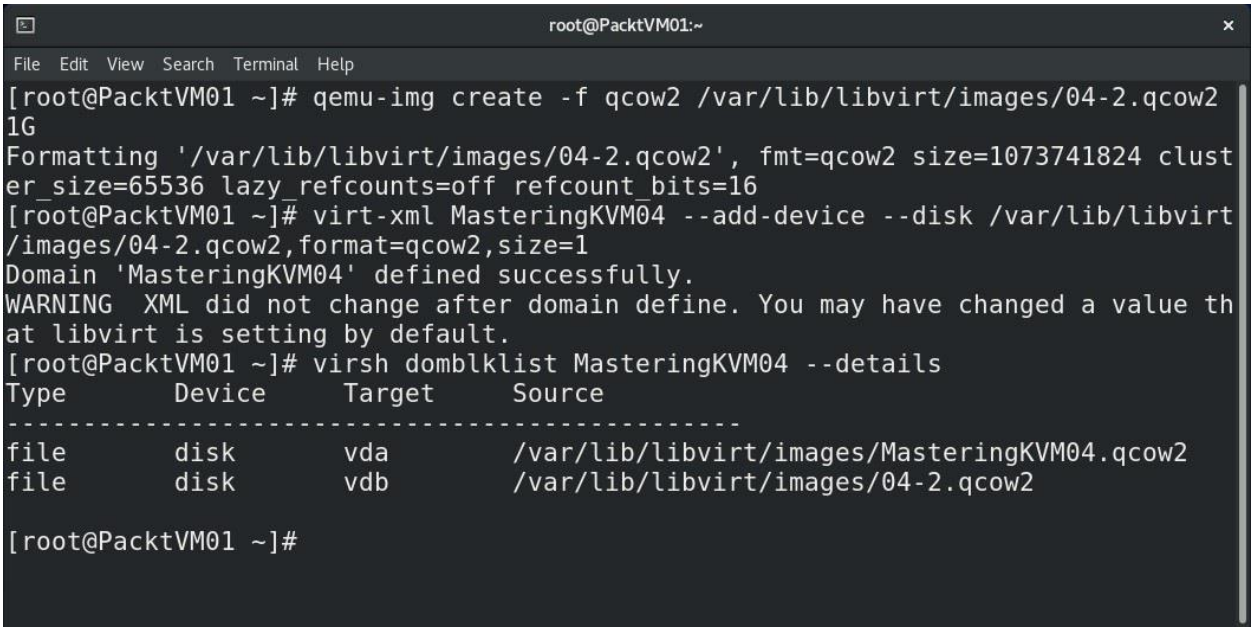

Virtual Machine Manager
File Edit View Help
Open
Name
CPU usage
QEMU/KVM
QEMU/KVM: packtphy02
New
Connect
Disconnect
Delete
Details

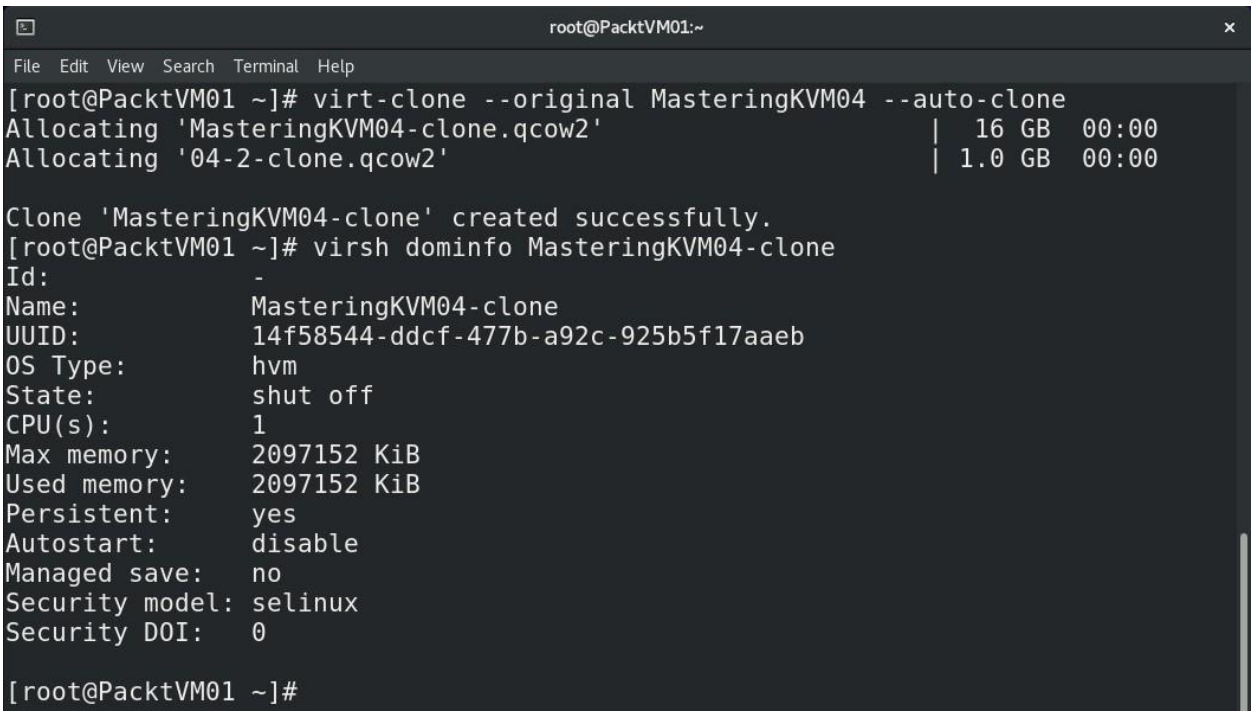

New VM
Create a new virtual machine
Step 1 of 5
Connection:
QEMU/KVM: PacktPhy02
Choose how you would like to install the operating system
Local install media (ISO image or CDROM)
Network Install (HTTP, HTTPS, or FTP)
Network Boot (PXE)
Import existing disk image
Cancel
Back
Forward

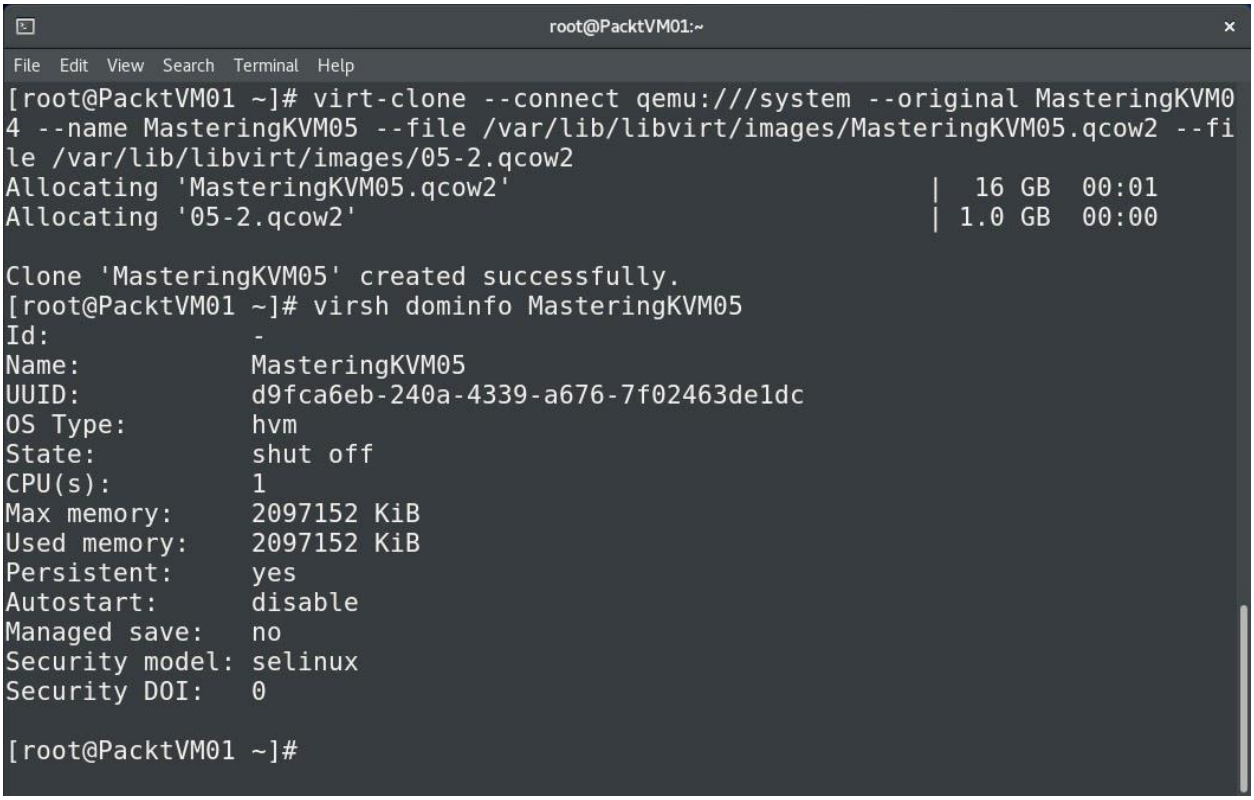

New VM
Create a new virtual machine
Step 2 of 5
Provide the operating system install URL:
ror.linux.duke.edu/pub/centos/8.2.2004/BaseOS/x86_64/os
URL Options
Choose the operating system you are installing:
CentOS 8
Automatically detect from the installation media / source
Cancel
Back
Forward

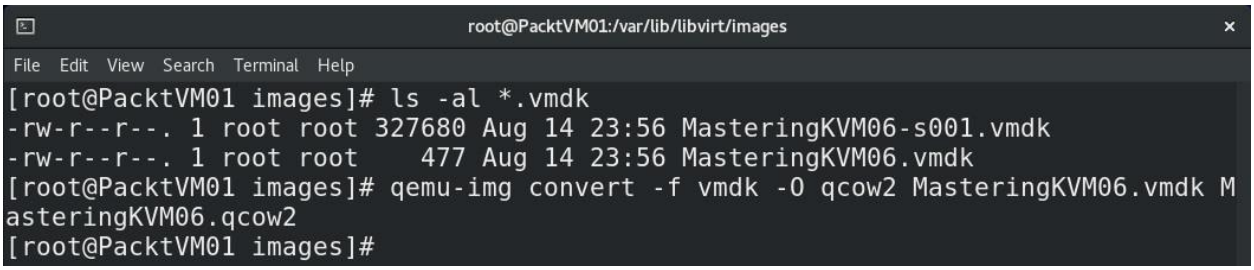

New VM
Create a new virtual machine
Step 4 of 5
Enable storage for this virtual machine
Create a disk image for the virtual machine
10.0
GiB
8.0 GiB available in the default location
Select or create custom storage
Manage...
Cancel
Back
Forward

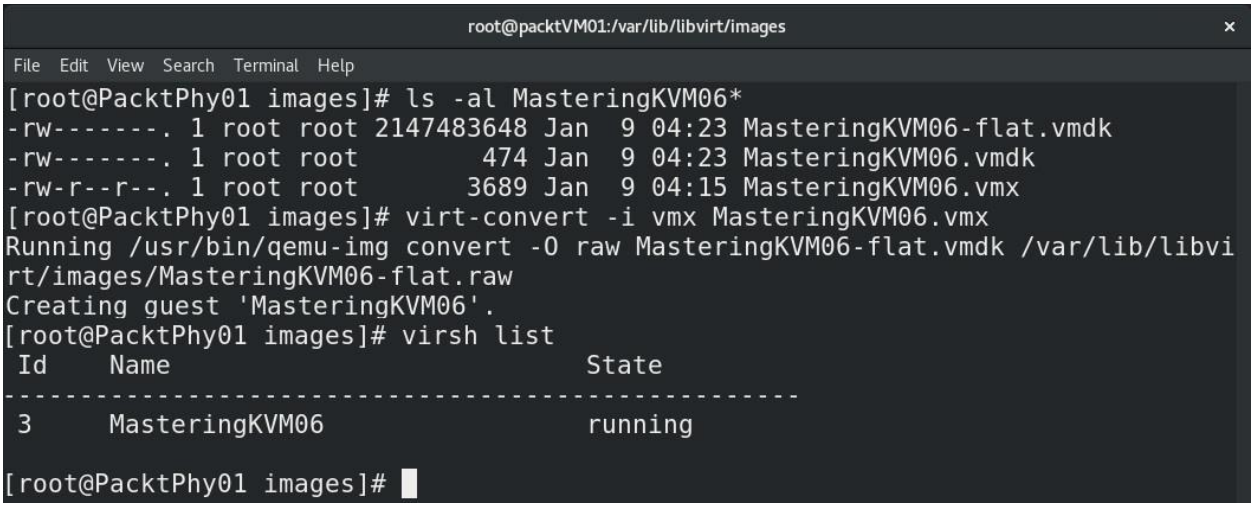

New VM
Create a new virtual machine
Step 5 of 5
Ready to begin the installation
Name: MasteringKVM04
OS: Red Hat Enterprise Linux 8.0
Install: URL Install Tree
Memory: 1024 MiB
CPUs: 1
Storage: 7.5 GiB /var/lib/libvirt/images/rhel8.0.qcow2
Customize configuration before install
Network selection
Virtual network 'default' : NAT
Cancel
Back
Finish

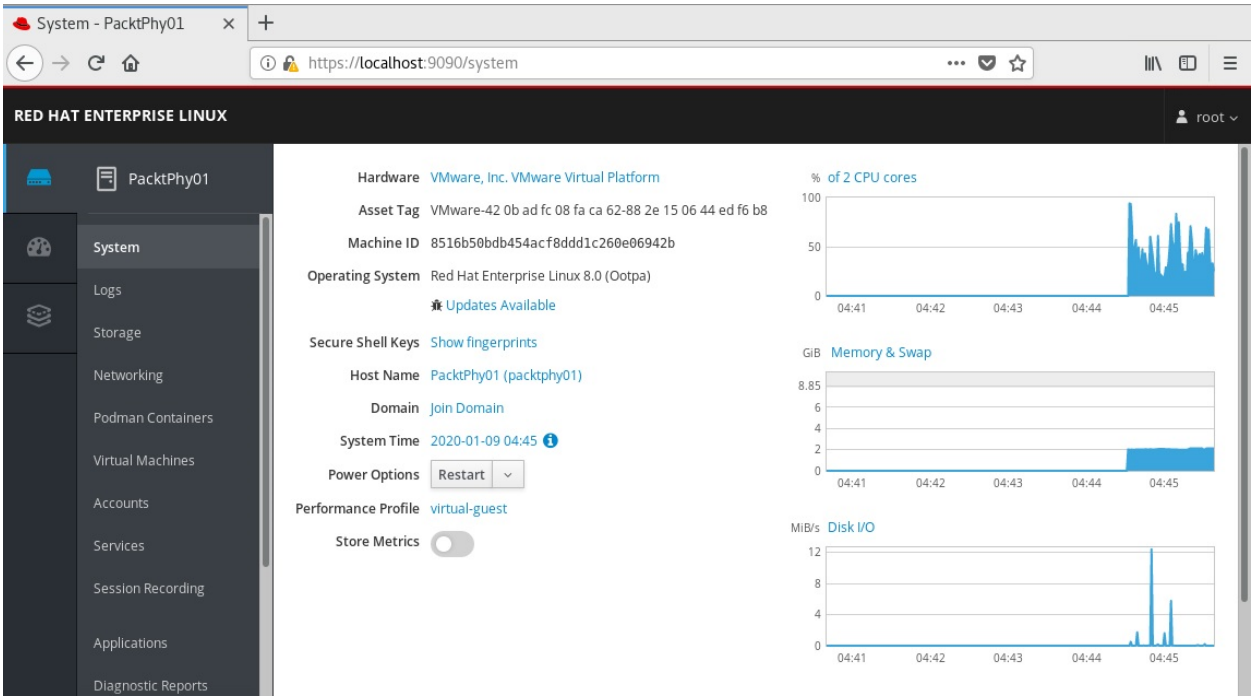

root@PacktVM01:~
File Edit View Search Terminal Help
[root@PacktVM01 ~]# qemu-img create -f qcow2 /var/lib/libvirt/images/04-2.qcow2 1G
Formatting '/var/lib/libvirt/images/04-2.qcow2', fmt=qcow2 size=1073741824 cluster_size=65536 lazy_refcounts=off refcount_bits=16
[root@PacktVM01 ~]# virt-xml MasteringKVM04 --add-device --disk /var/lib/libvirt/images/04-2.qcow2,format=qcow2,size=1
Domain 'MasteringKVM04' defined successfully.
WARNING XML did not change after domain define. You may have changed a value that libvirt is setting by default.
[root@PacktVM01 ~]# virsh domblklist MasteringKVM04 --details
Type Device Target Source
file disk vda /var/lib/libvirt/images/MasteringKVM04.qcow2
file disk vdb /var/lib/libvirt/images/04-2.qcow2
[root@PacktVM01 ~]#

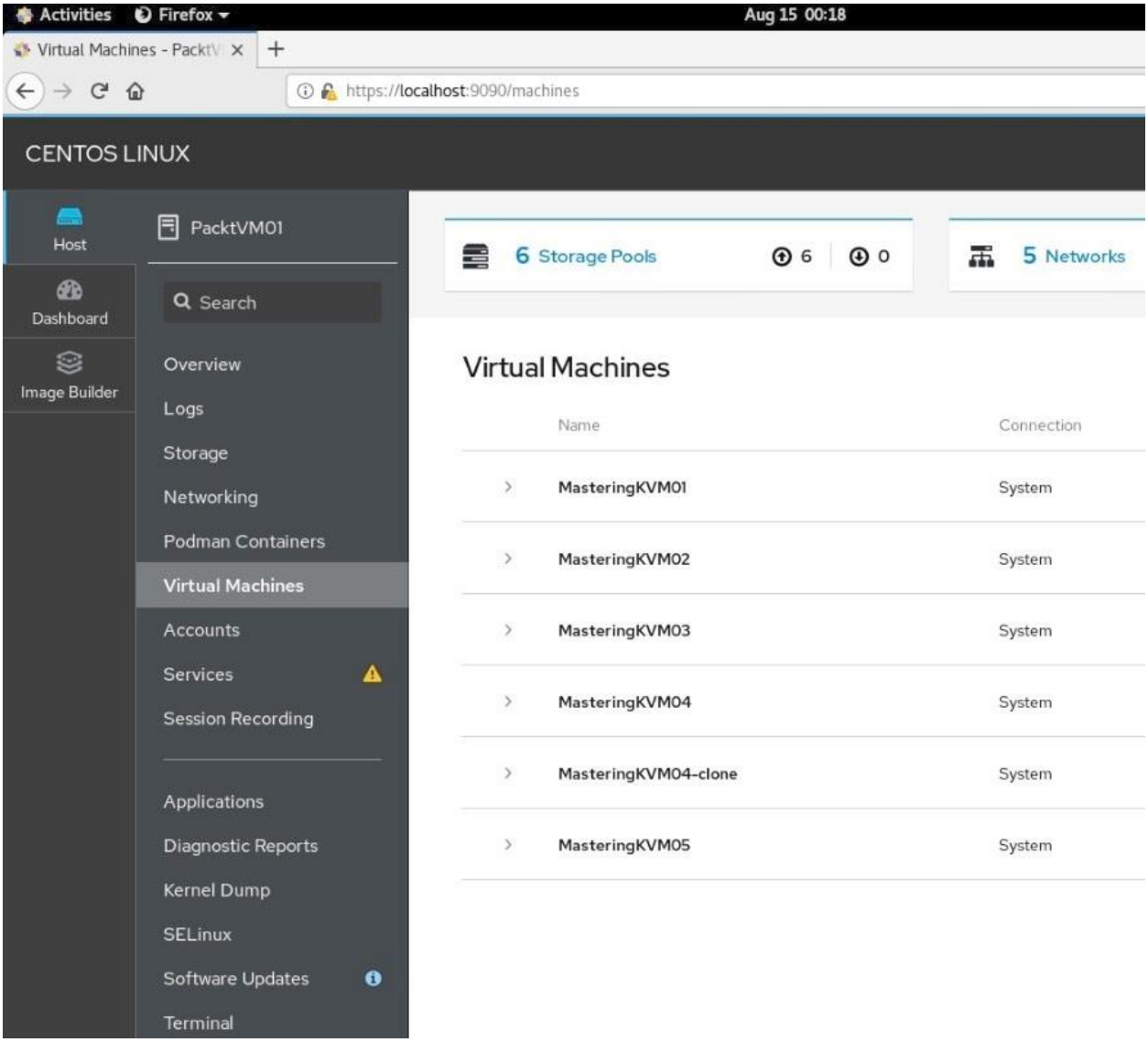

root@PacktVM01:~
File Edit View Search Terminal Help
[root@PacktVM01 ~]# virt-clone --original MasteringKVM04 --auto-clone
Allocating 'MasteringKVM04-clone.qcow2' | 16 GB 00:00
Allocating '04-2-clone.qcow2' | 1.0 GB 00:00
Clone 'MasteringKVM04-clone' created successfully.
[root@PacktVM01 ~]# virsh dominfo MasteringKVM04-clone
Id: -
Name: MasteringKVM04-clone
UUID: 14f58544-ddcf-477b-a92c-925b5f17aaeb
OS Type: hvm
State: shut off
CPU(s): 1
Max memory: 2097152 KiB
Used memory: 2097152 KiB
Persistent: yes
Autostart: disable
Managed save: no
Security model: selinux
Security DOI: 0
[root@PacktVM01 ~]#

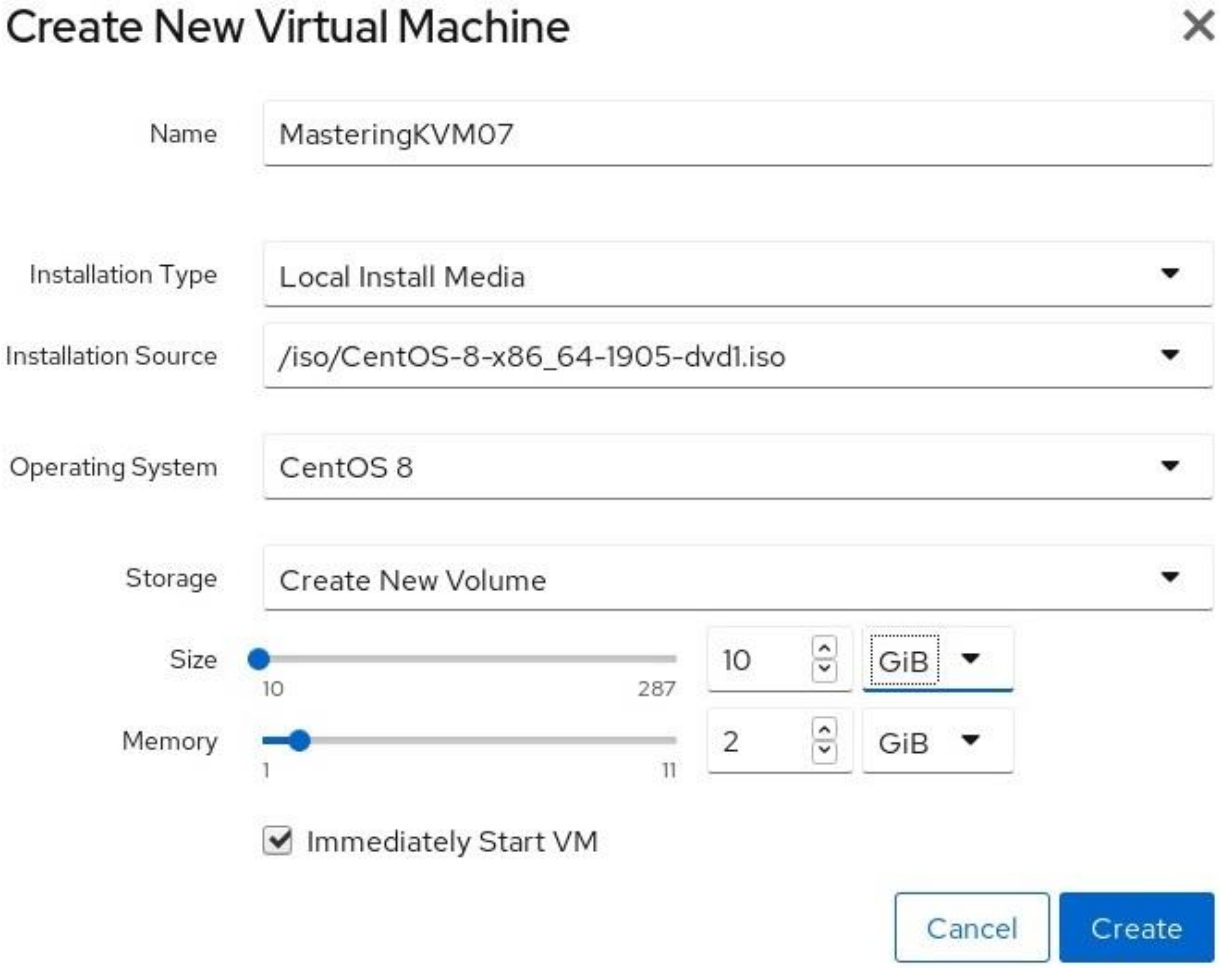

root@PacktVM01:~
File Edit View Search Terminal Help
[root@PacktVM01 ~]# virt-clone --connect qemu:///system --original MasteringKVM0
4 --name MasteringKVM05 --file /var/lib/libvirt/images/MasteringKVM05.qcow2 --fi
le /var/lib/libvirt/images/05-2.qcow2
Allocating 'MasteringKVM05.qcow2' | 16 GB 00:01
Allocating '05-2.qcow2' | 1.0 GB 00:00
Clone 'MasteringKVM05' created successfully.
[root@PacktVM01 ~]# virsh dominfo MasteringKVM05
Id: -
Name: MasteringKVM05
UUID: d9fca6eb-240a-4339-a676-7f02463de1dc
OS Type: hvm
State: shut off
CPU(s): 1
Max memory: 2097152 KiB
Used memory: 2097152 KiB
Persistent: yes
Autostart: disable
Managed save: no
Security model: selinux
Security DOI: 0
[root@PacktVM01 ~]#

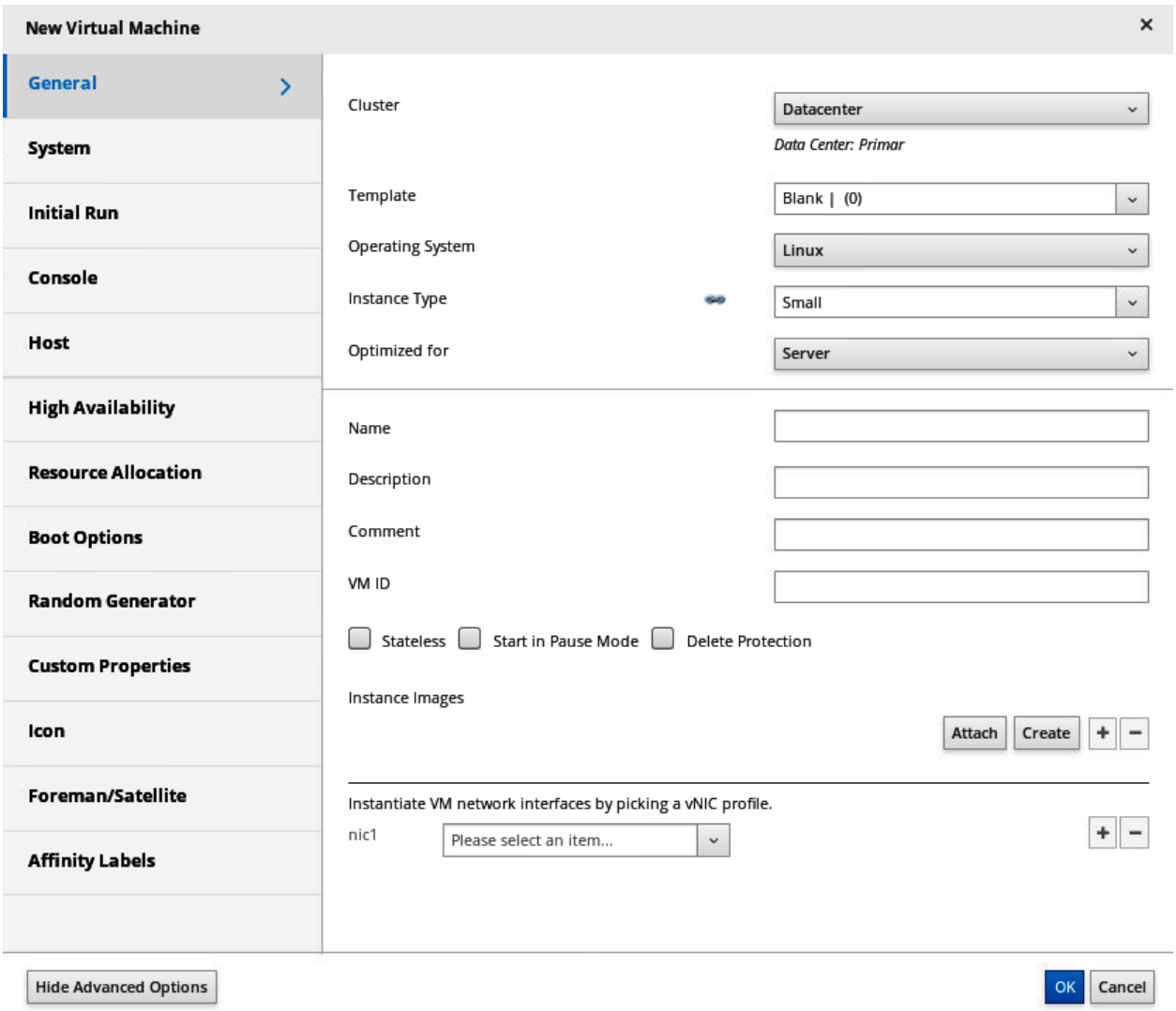

root@PacktVM01:/var/lib/libvirt/images
File Edit View Search Terminal Help
[root@PacktVM01 images]# ls -al *.vmdk
-rw-r--r--. 1 root root 327680 Aug 14 23:56 MasteringKVM06-s001.vmdk
-rw-r--r--. 1 root root 477 Aug 14 23:56 MasteringKVM06.vmdk
[root@PacktVM01 images]# qemu-img convert -f vmdk -O qcow2 MasteringKVM06.vmdk M
asteringKVM06.qcow2
[root@PacktVM01 images]#

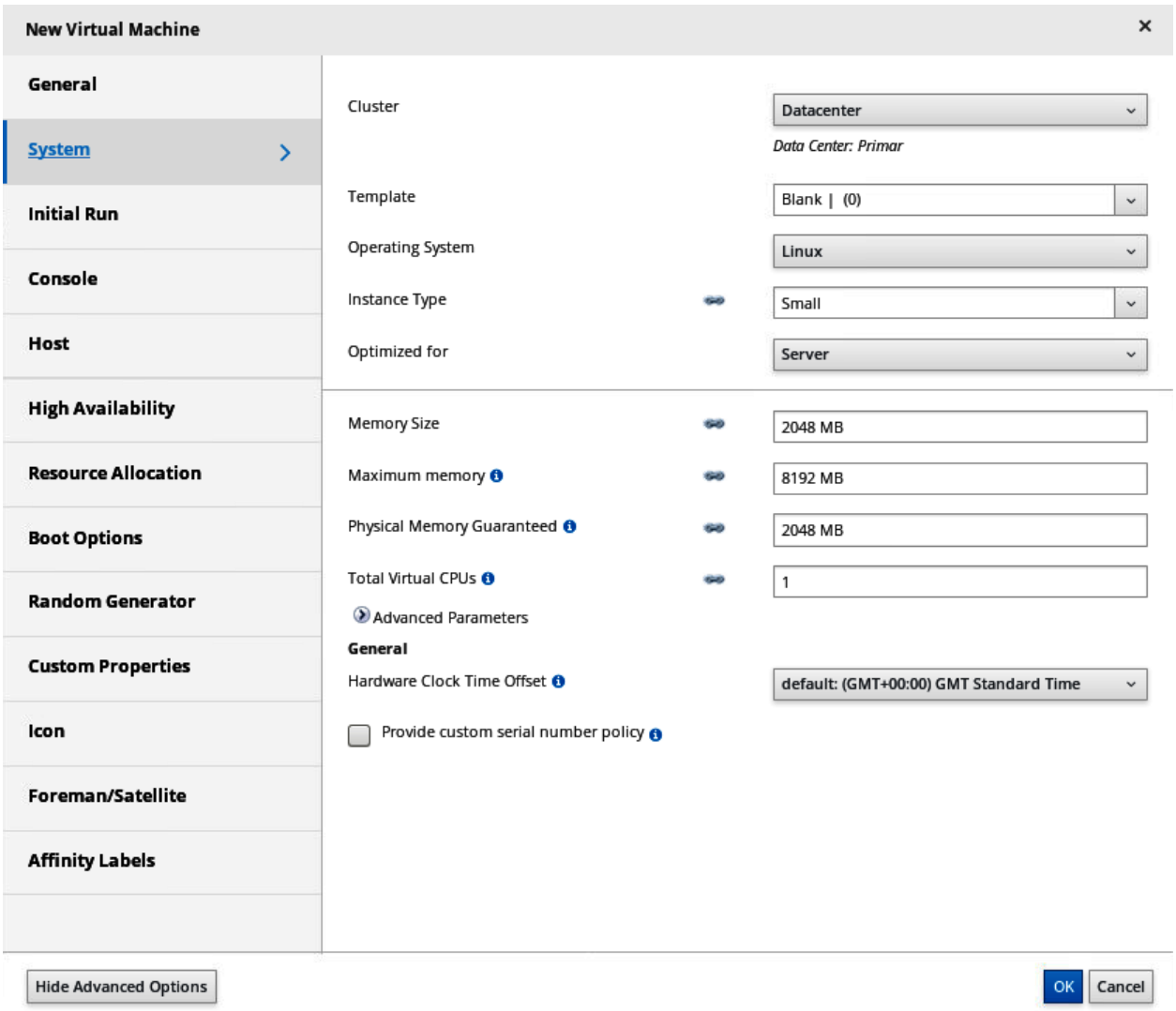

root@packtVM01:/var/lib/libvirt/images
File Edit View Search Terminal Help
[root@PacktPhy01 images]# ls -al MasteringKVM06*
-rw-------. 1 root root 2147483648 Jan 9 04:23 MasteringKVM06-flat.vmdk
-rw-------. 1 root root 474 Jan 9 04:23 MasteringKVM06.vmdk
-rw-r--r--. 1 root root 3689 Jan 9 04:15 MasteringKVM06.vmx
[root@PacktPhy01 images]# virt-convert -i vmx MasteringKVM06.vmx
Running /usr/bin/qemu-img convert -O raw MasteringKVM06-flat.vmdk /var/lib/libvi
rt/images/MasteringKVM06-flat.raw
Creating guest 'MasteringKVM06'.
[root@PacktPhy01 images]# virsh list
Id Name State
3 MasteringKVM06 running
[root@PacktPhy01 images]#

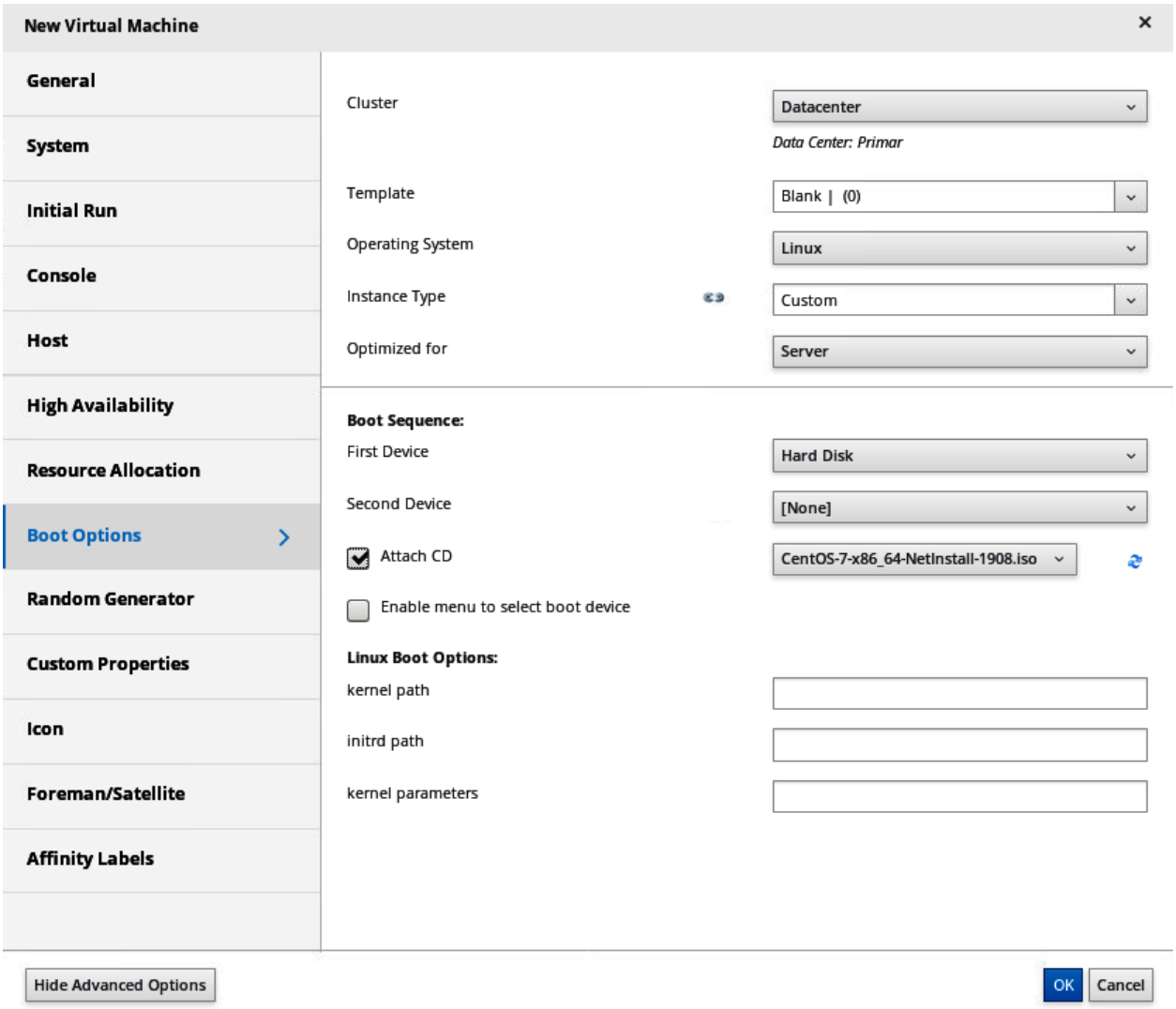

System - PacktPhy01
https://localhost:9090/system
RED HAT ENTERPRISE LINUX
root
PacktPhy01
System
Logs
Storage
Networking
Podman Containers
Virtual Machines
Accounts
Services
Session Recording
Applications
Diagnostic Reports
Hardware VMware, Inc. VMware Virtual Platform
Asset Tag VMware-42 0b ad fc 08 fa ca 62-88 2e 15 06 44 ed f6 b8
Machine ID 8516b50bdb454acf8ddd1c260e06942b
Operating System Red Hat Enterprise Linux 8.0 (Ootpa)
Updates Available
Secure Shell Keys Show fingerprints
Host Name PacktPhy01 (packtphy01)
Domain Join Domain
System Time 2020-01-09 04:45
Power Options Restart
Performance Profile virtual-guest
Store Metrics
% of 2 CPU cores
100
50
0
04:41
04:42
04:43
04:44
04:45
GiB Memory & Swap
8.85
6
4
2
0
MiB/s Disk I/O
12
8
4
0

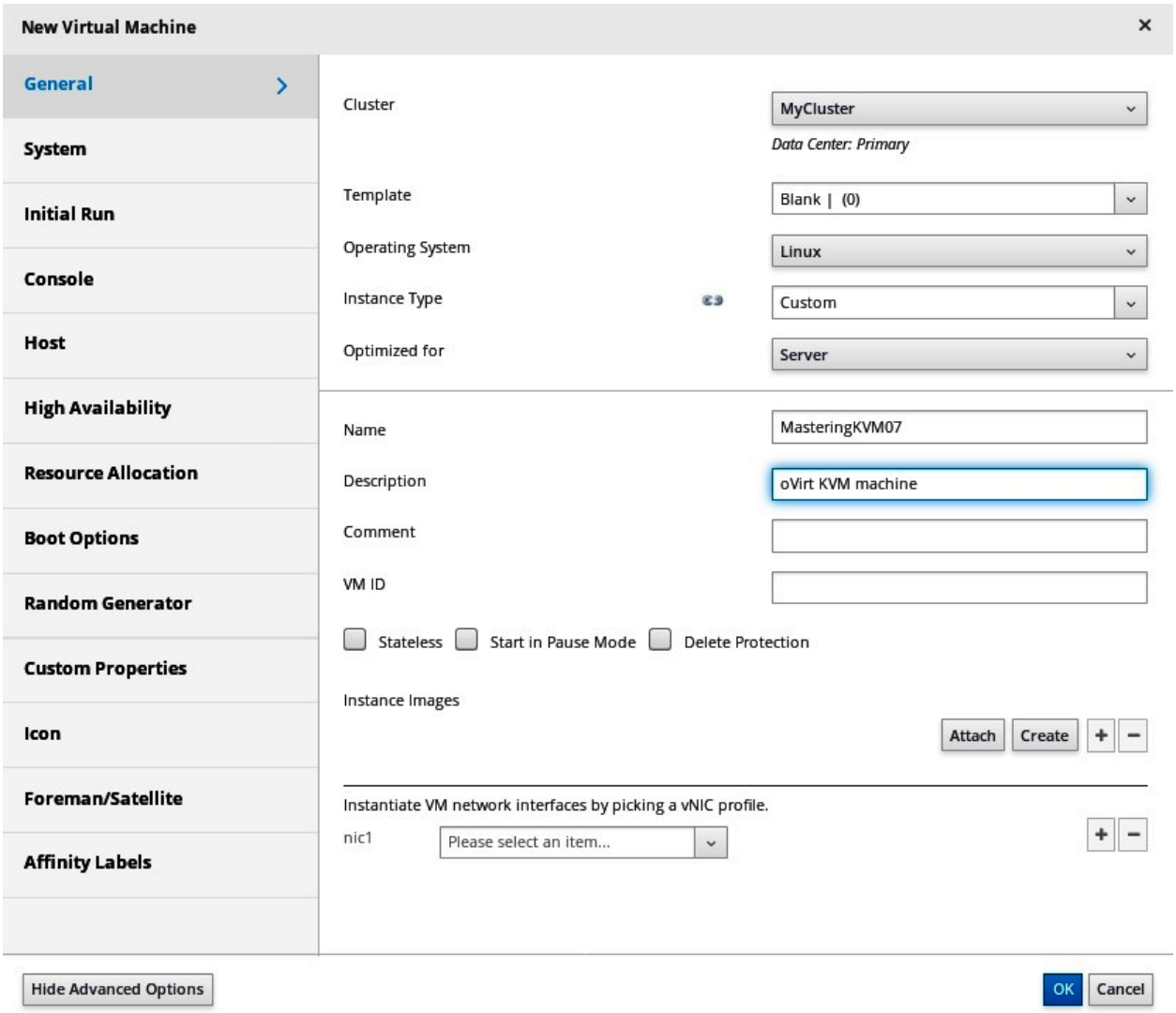

Activities
Firefox
Aug 15 00:18
Virtual Machines - PacktV
https://localhost:9090/machines
CENTOS LINUX
Host
PacktVM01
Dashboard
Image Builder
Search
Overview
Logs
Storage
Networking
Podman Containers
Virtual Machines
Accounts
Services
Session Recording
Applications
Diagnostic Reports
Kernel Dump
SELinux
Software Updates
Terminal
6 Storage Pools
6
0
5 Networks
Virtual Machines
Name
Connection
MasteringKVM01
System
MasteringKVM02
System
MasteringKVM03
System
MasteringKVM04
System
MasteringKVM04-clone
System
MasteringKVM05
System

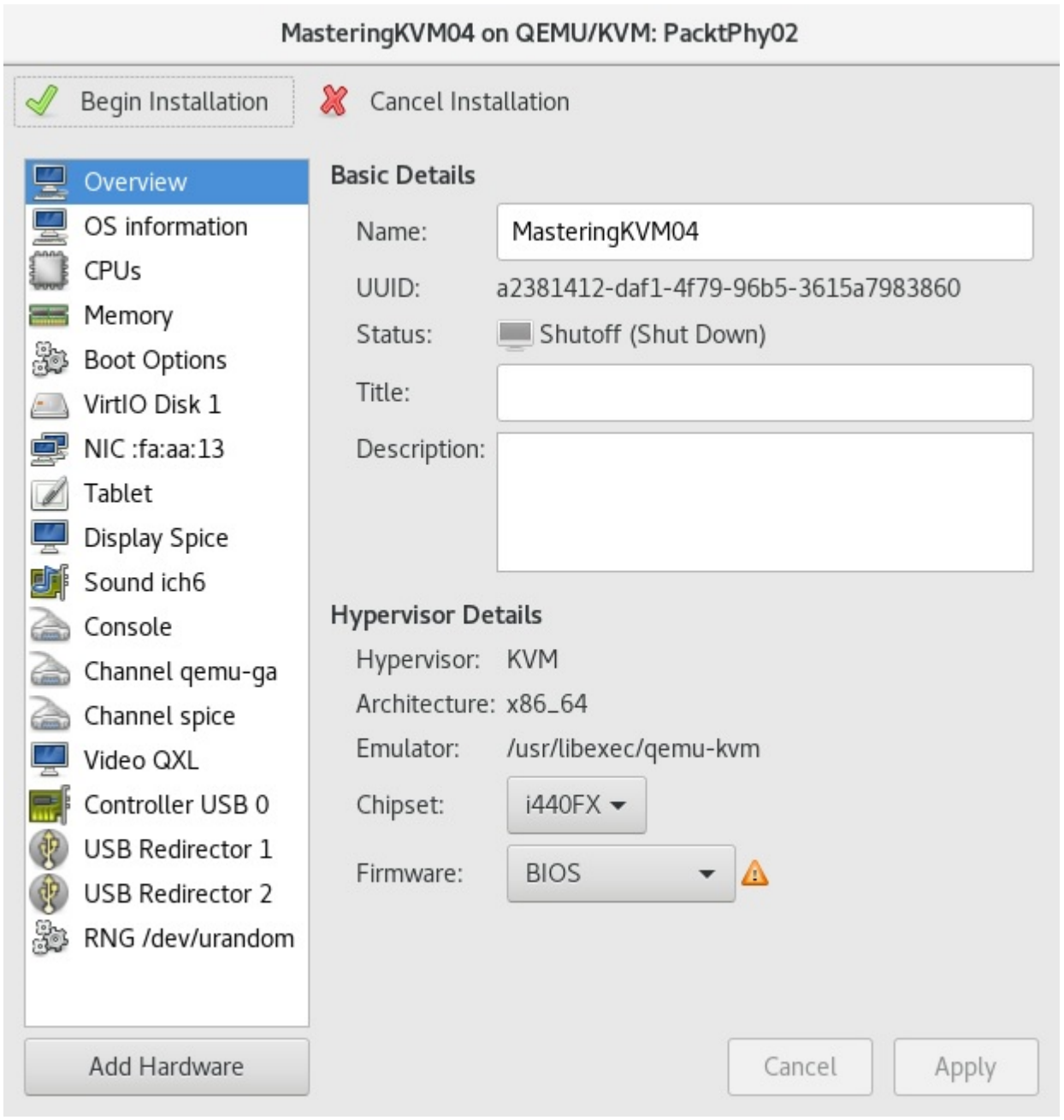

Create New Virtual Machine
Name
MasteringKVM07
Installation Type
Local Install Media
Installation Source
/iso/CentOS-8-x86_64-1905-dvd1.iso
Operating System
CentOS 8
Storage
Create New Volume
Size
10
287
10
GiB
Memory
1
11
2
GiB
Immediately Start VM
Cancel
Create

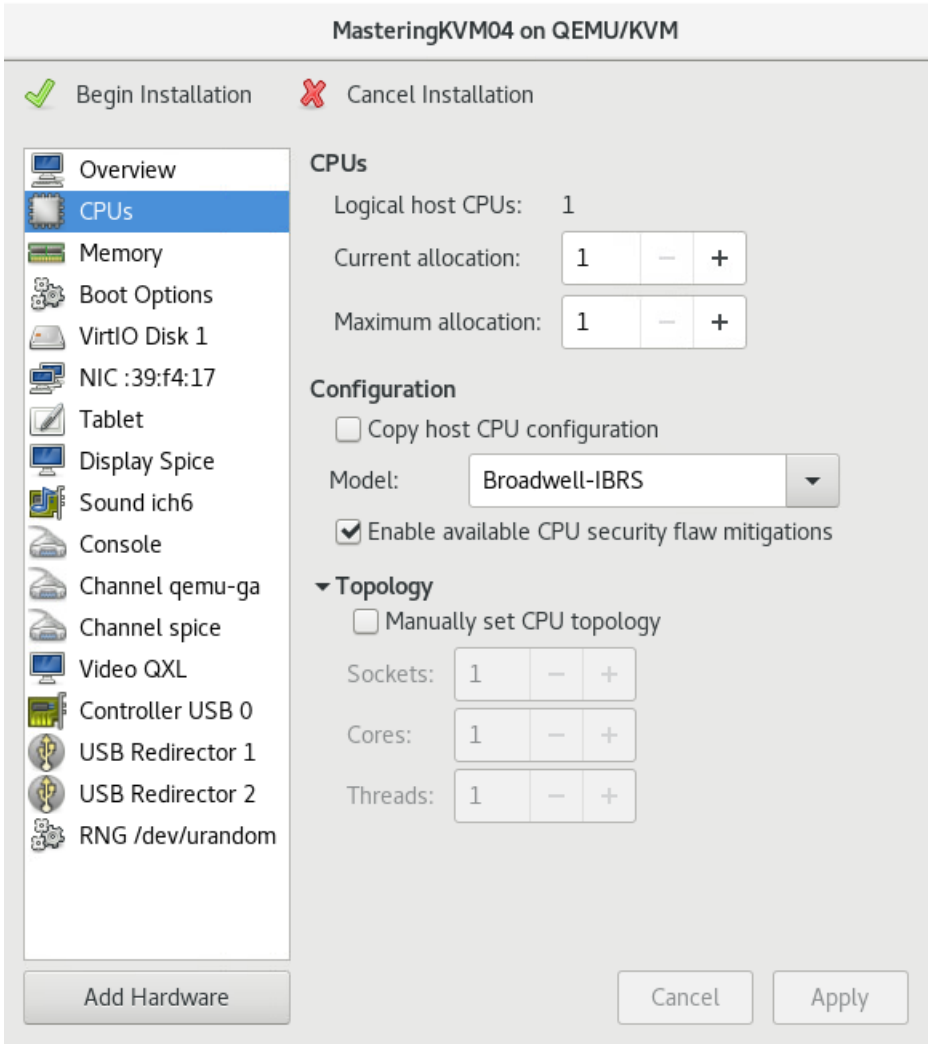

New Virtual Machine
General
System
Initial Run
Console
Host
High Availability
Resource Allocation
Boot Options
Random Generator
Custom Properties
Icon
Foreman/Satellite
Affinity Labels
Cluster
Datacenter
Data Center: Primar
Template
Blank | (0)
Operating System
Linux
Instance Type
Small
Optimized for
Server
Name
Description
Comment
VM ID
Stateless
Start in Pause Mode
Delete Protection
Instance Images
Attach
Create
Instantiate VM network interfaces by picking a vNIC profile.
nic1
Please select an item...
Hide Advanced Options
OK
Cancel

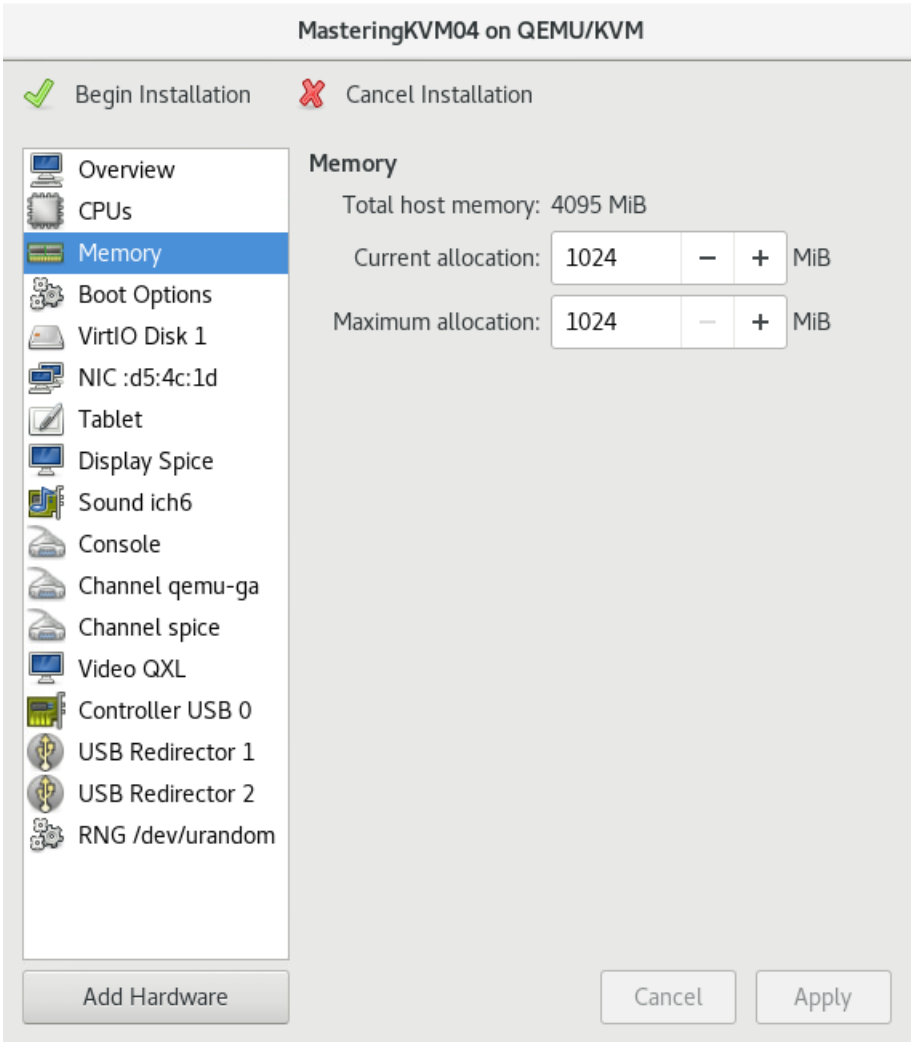

New Virtual Machine
General
System
Initial Run
Console
Host
High Availability
Resource Allocation
Boot Options
Random Generator
Custom Properties
Icon
Foreman/Satellite
Affinity Labels
Cluster
Datacenter
Data Center: Primar
Template
Blank | (0)
Operating System
Linux
Instance Type
Small
Optimized for
Server
Memory Size
2048 MB
Maximum memory
8192 MB
Physical Memory Guaranteed
2048 MB
Total Virtual CPUs
1
Advanced Parameters
General
Hardware Clock Time Offset
default: (GMT+00:00) GMT Standard Time
Provide custom serial number policy
Hide Advanced Options
OK
Cancel

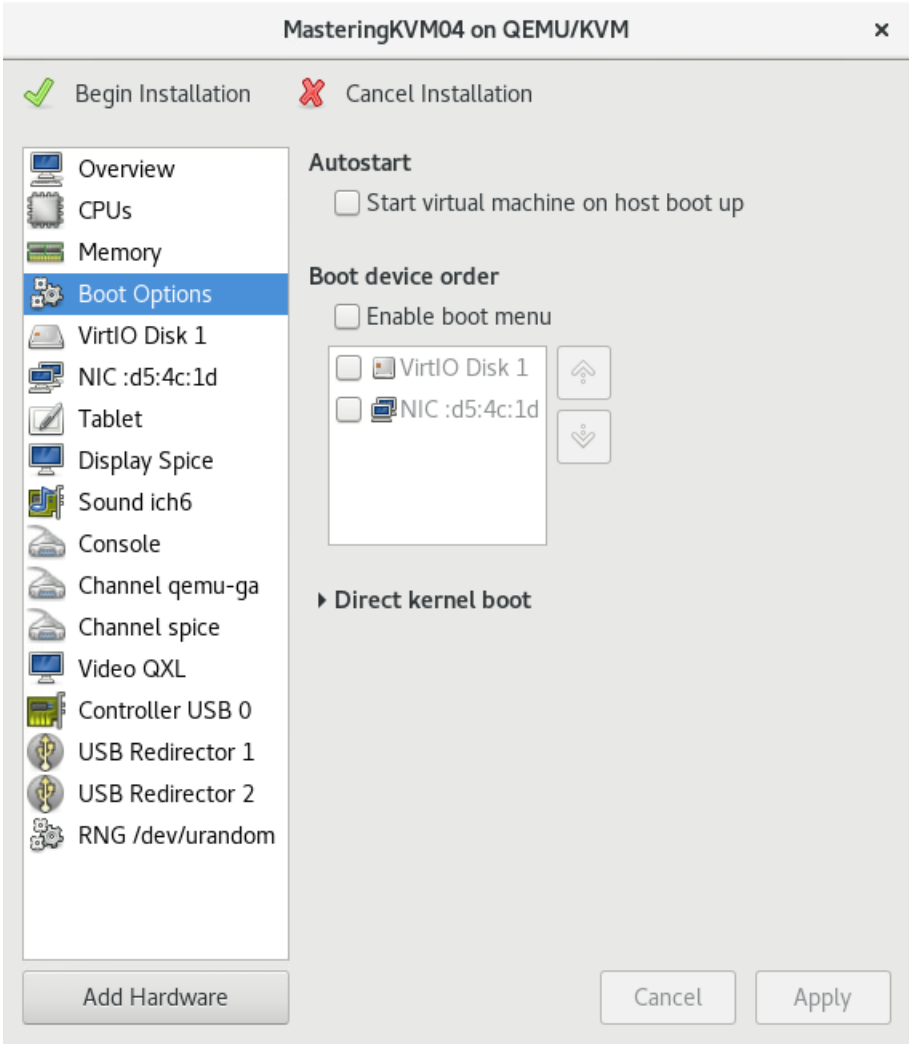

New Virtual Machine
General
System
Initial Run
Console
Host
High Availability
Resource Allocation
Boot Options
Random Generator
Custom Properties
Icon
Foreman/Satellite
Affinity Labels
Cluster
Datacenter
Data Center: Primar
Template
Blank | (0)
Operating System
Linux
Instance Type
Custom
Optimized for
Server
Boot Sequence:
First Device
Hard Disk
Second Device
[None]
Attach CD
CentOS-7-x86_64-NetInstall-1908.iso
Enable menu to select boot device
Linux Boot Options:
kernel path
initrd path
kernel parameters
Hide Advanced Options
OK
Cancel

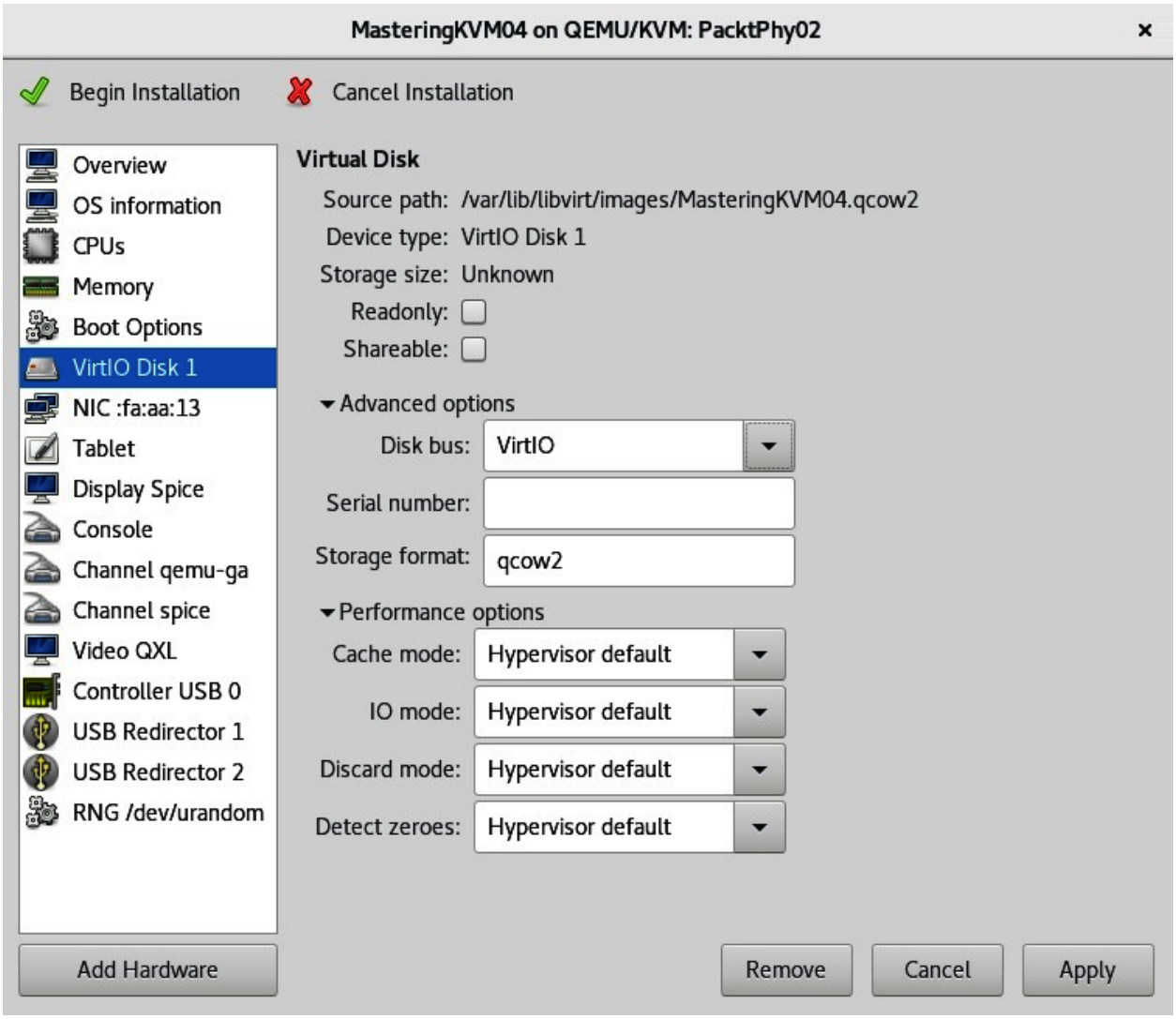

New Virtual Machine
General
System
Initial Run
Console
Host
High Availability
Resource Allocation
Boot Options
Random Generator
Custom Properties
Icon
Foreman/Satellite
Affinity Labels
Cluster
MyCluster
Data Center: Primary
Template
Blank | (0)
Operating System
Linux
Instance Type
Custom
Optimized for
Server
Name
MasteringKVM07
Description
oVirt KVM machine
Comment
VM ID
Stateless
Start in Pause Mode
Delete Protection
Instance Images
Attach
Create
Instantiate VM network interfaces by picking a vNIC profile.
nic1
Please select an item...
Hide Advanced Options
OK
Cancel

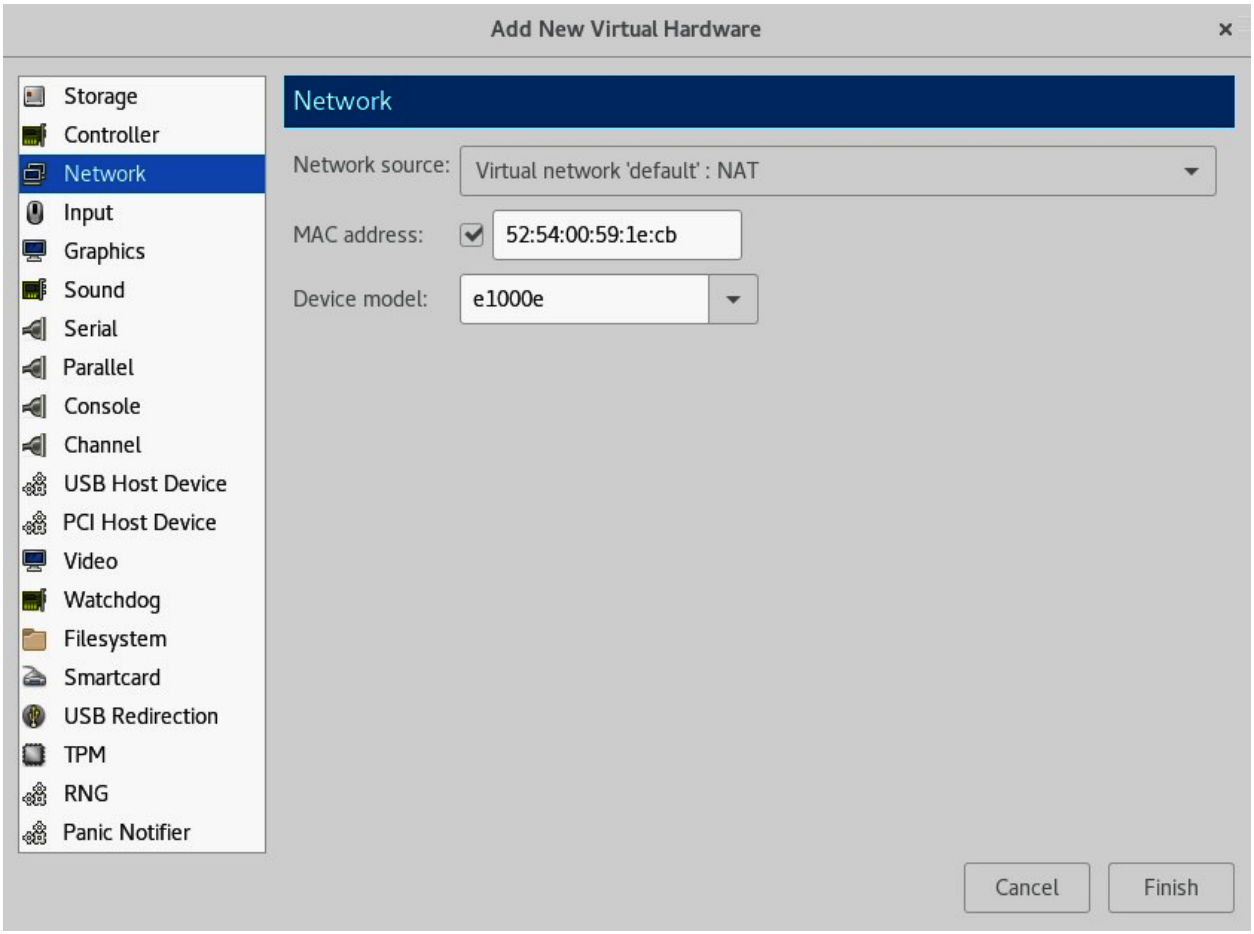

MasteringKVM04 on QEMU/KVM: PacktPhy02
Begin Installation
Cancel Installation
Overview
OS information
CPUs
Memory
Boot Options
VirtIO Disk 1
NIC :fa:aa:13
Tablet
Display Spice
Sound ich6
Console
Channel qemu-ga
Channel spice
Video QXL
Controller USB 0
USB Redirector 1
USB Redirector 2
RNG /dev/urandom
Basic Details
Name: MasteringKVM04
UUID: a2381412-daf1-4f79-96b5-3615a7983860
Status: Shutoff (Shut Down)
Title:
Description:
Hypervisor Details
Hypervisor: KVM
Architecture: x86_64
Emulator: /usr/libexec/qemu-kvm
Chipset: i440FX
Firmware: BIOS
Add Hardware
Cancel
Apply

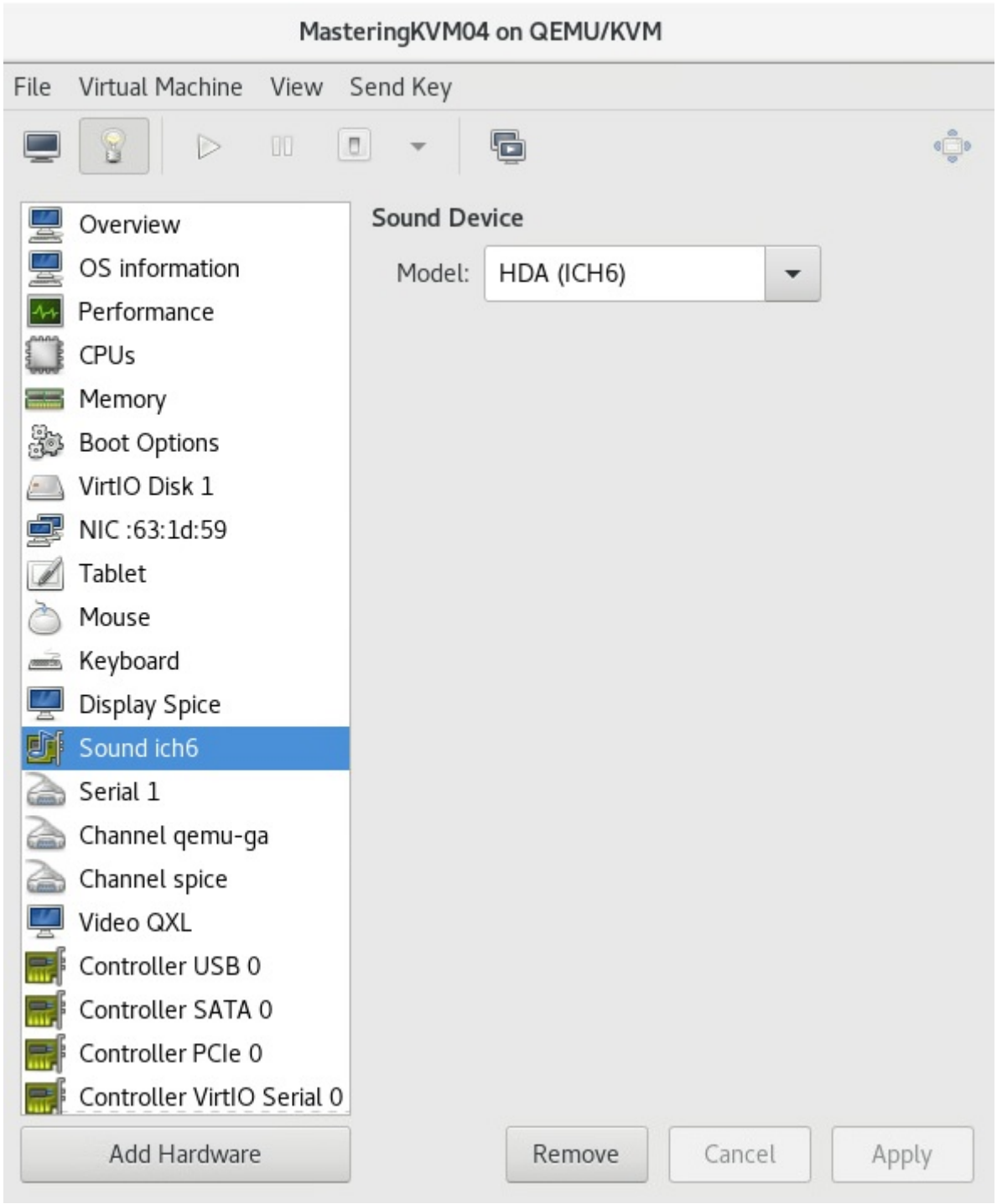

MasteringKVM04 on QEMU/KVM
Begin Installation
Cancel Installation
Overview
CPUs
Memory
Boot Options
VirtIO Disk 1
NIC :39:f4:17
Tablet
Display Spice
Sound ich6
Console
Channel qemu-ga
Channel spice
Video QXL
Controller USB 0
USB Redirector 1
USB Redirector 2
RNG /dev/urandom
Add Hardware
CPUs
Logical host CPUs: 1
Current allocation: 1
Maximum allocation: 1
Configuration
Copy host CPU configuration
Model: Broadwell-IBRS
Enable available CPU security flaw mitigations
Topology
Manually set CPU topology
Sockets: 1
Cores: 1
Threads: 1
Cancel
Apply

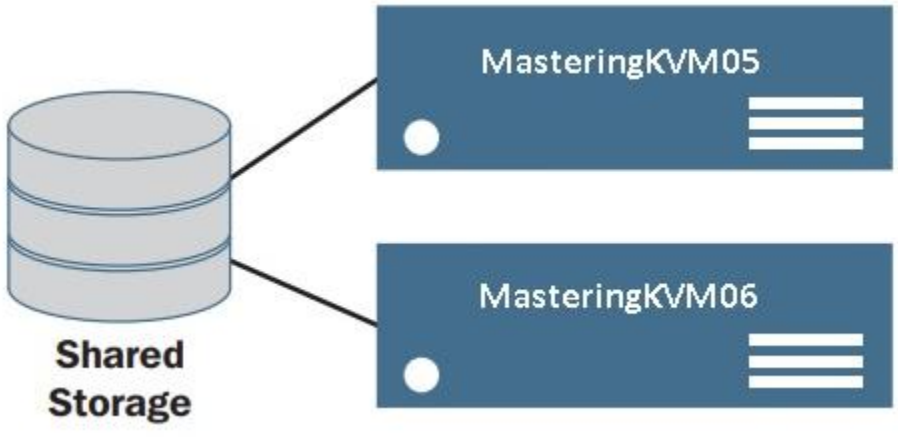

MasteringKVM04 on QEMU/KVM
Begin Installation
Cancel Installation
Overview
CPUs
Memory
Boot Options
VirtIO Disk 1
NIC :d5:4c:1d
Tablet
Display Spice
Sound ich6
Console
Channel qemu-ga
Channel spice
Video QXL
Controller USB 0
USB Redirector 1
USB Redirector 2
RNG /dev/urandom
Memory
Total host memory: 4095 MiB
Current allocation: 1024 MiB
Maximum allocation: 1024 MiB
Add Hardware
Cancel
Apply


MasteringKVM04 on QEMU/KVM
Begin Installation
Cancel Installation
Overview
CPUs
Memory
Boot Options
VirtIO Disk 1
NIC :d5:4c:1d
Tablet
Display Spice
Sound ich6
Console
Channel qemu-ga
Channel spice
Video QXL
Controller USB 0
USB Redirector 1
USB Redirector 2
RNG /dev/urandom
Add Hardware
Autostart
Start virtual machine on host boot up
Boot device order
Enable boot menu
VirtIO Disk 1
NIC :d5:4c:1d
Direct kernel boot
Cancel
Apply

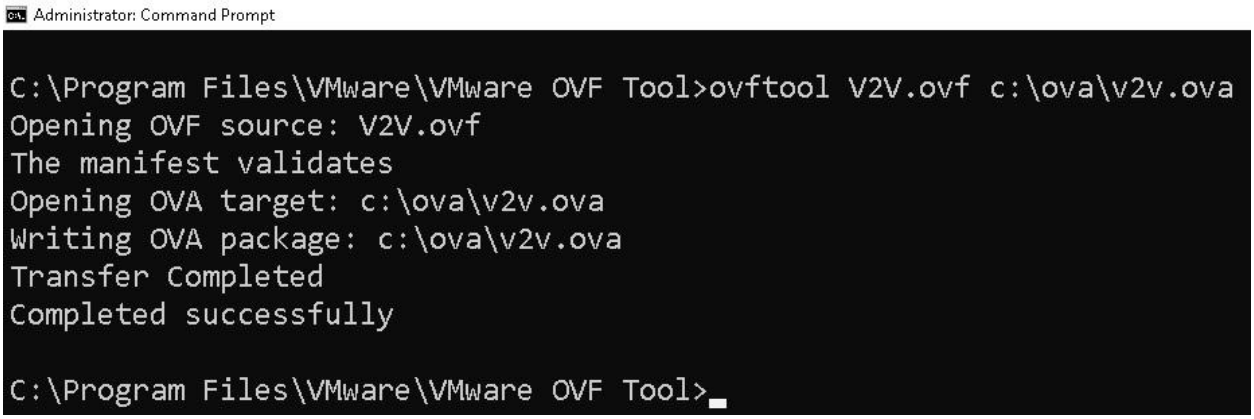

MasteringKVM04 on QEMU/KVM: PacktPhy02
Begin Installation
Cancel Installation
Overview
OS information
CPUs
Memory
Boot Options
VirtIO Disk 1
NIC :fa:aa:13
Tablet
Display Spice
Console
Channel qemu-ga
Channel spice
Video QXL
Controller USB 0
USB Redirector 1
USB Redirector 2
RNG /dev/urandom
Virtual Disk
Source path: /var/lib/libvirt/images/MasteringKVM04.qcow2
Device type: VirtIO Disk 1
Storage size: Unknown
Readonly:
Shareable:
Advanced options
Disk bus: VirtIO
Serial number:
Storage format: qcow2
Performance options
Cache mode: Hypervisor default
IO mode: Hypervisor default
Discard mode: Hypervisor default
Detect zeroes: Hypervisor default
Add Hardware
Remove
Cancel
Apply

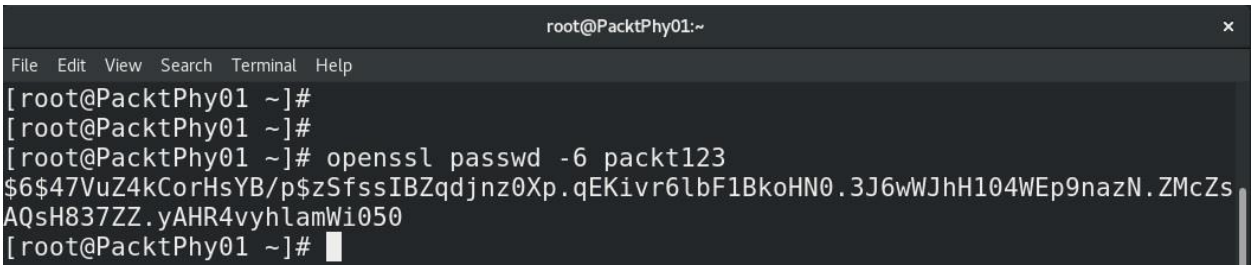

Add New Virtual Hardware
Storage
Controller
Network
Input
Graphics
Sound
Serial
Parallel
Console
Channel
USB Host Device
PCI Host Device
Video
Watchdog
Filesystem
Smartcard
USB Redirection
TPM
RNG
Panic Notifier
Network
Network source:
Virtual network 'default' : NAT
MAC address:
52:54:00:59:1e:cb
Device model:
e1000e
Cancel
Finish


MasteringKVM04 on QEMU/KVM
File
Virtual Machine
View
Send Key
Overview
OS information
Performance
CPUs
Memory
Boot Options
VirtIO Disk 1
NIC :63:1d:59
Tablet
Mouse
Keyboard
Display Spice
Sound ich6
Serial 1
Channel qemu-ga
Channel spice
Video QXL
Controller USB 0
Controller SATA 0
Controller PCIe 0
Controller VirtIO Serial 0
Sound Device
Model:
HDA (ICH6)
Add Hardware
Remove
Cancel
Apply


MasteringKVM05
MasteringKVM06
Shared
Storage

Chapter 8: Creating and Modifying VM Disks, Templates, and Snapshots





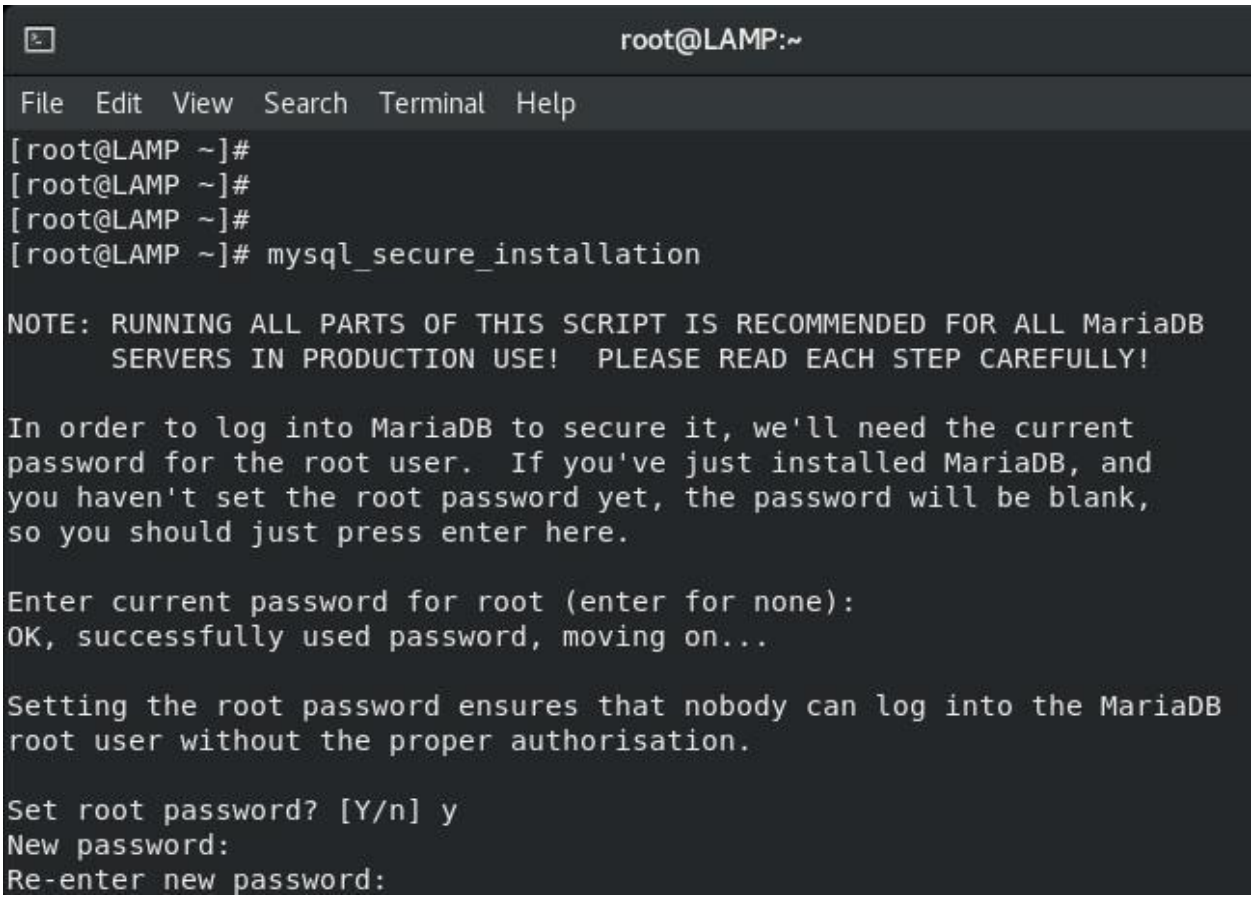
```
root@PacktPhy01:~
[root@PacktPhy01 test]# export LIBGUESTFS_BACKEND=direct
[root@PacktPhy01 test]# guestfish --rw -a P2Vtest.qcow2

Welcome to guestfish, the guest filesystem shell for
editing virtual machine filesystems and disk images.

Type: 'help' for help on commands
      'man' to read the manual
      'quit' to quit the shell

><fs> run
><fs> list-filesystems
/dev/sda1: xfs
/dev/centos/root: xfs
/dev/centos/swap: swap
><fs> mount /dev/centos/root /
><fs> vi /etc/shadow
><fs> exit

[root@PacktPhy01 test]#
```

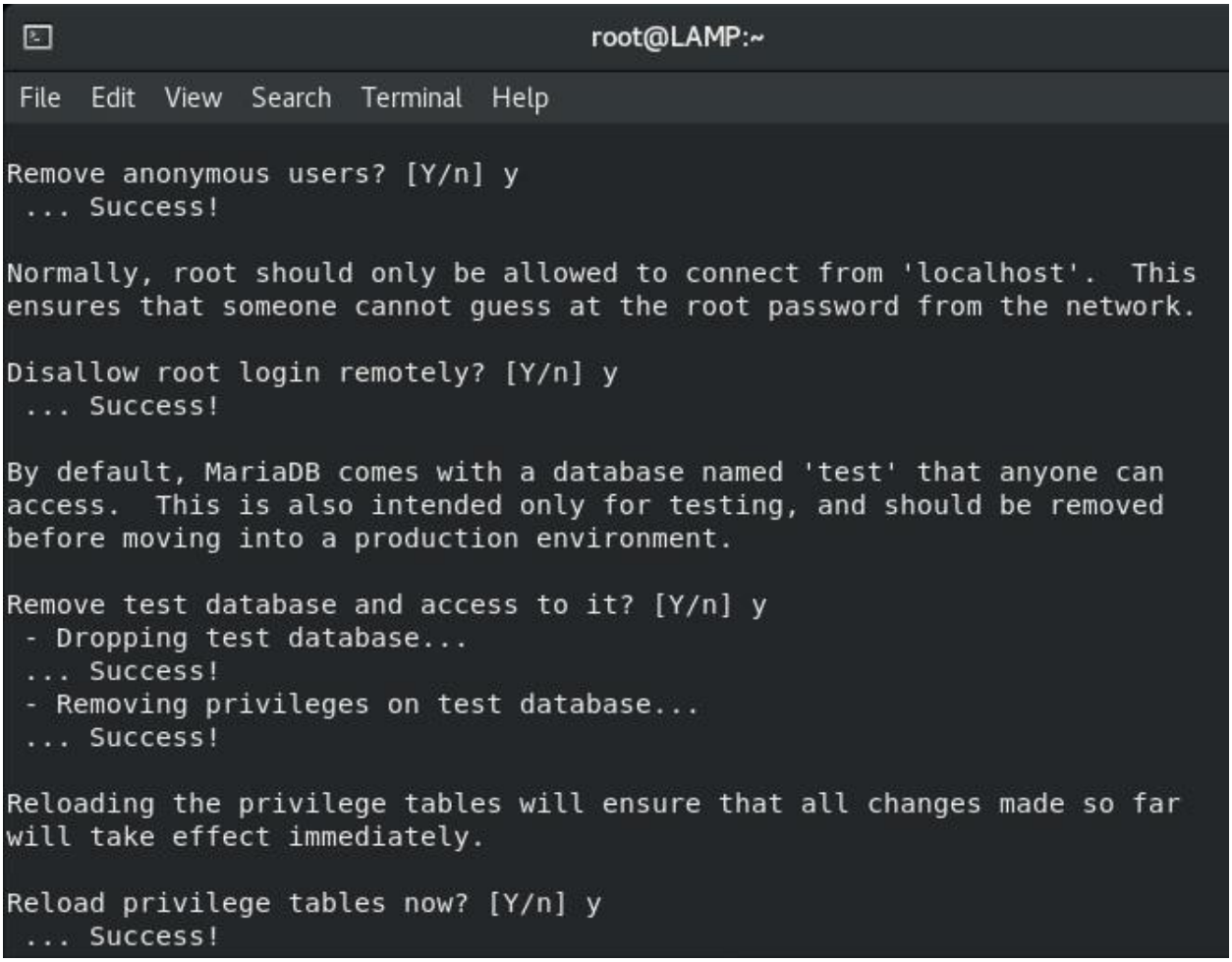
```
root@PacktPhy01:~/test
File  Edit  View  Search  Terminal  Help
[root@PacktPhy01 test]# virt-customize -a /root/test/P2Vtest.qcow2 --run-command
 'rm /etc/ssh/ssh_host_*'
[   0.0] Examining the guest ...
[   6.4] Setting a random seed
[   6.5] Running: rm /etc/ssh/ssh_host_*
[   6.6] Finishing off
[root@PacktPhy01 test]#
```

```
root@PacktPhy01:/etc
File  Edit  View  Search  Terminal  Help
[root@PacktPhy01 test]# guestfish -a P2Vtest.qcow2 -i ln-sf /dev/null /etc/syste
md/system/cloud-init.service
```

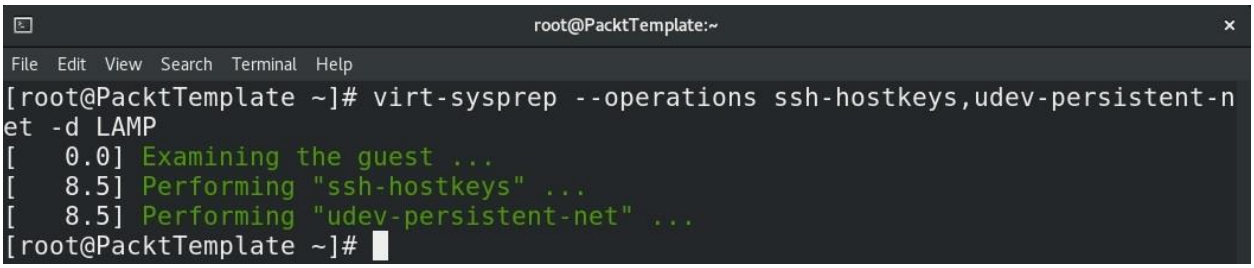
```
root@PacktPhy01:/etc
File  Edit  View  Search  Terminal  Help
[root@PacktPhy01 etc]# virt-copy-in -a /root/test/P2Vtest.qcow2 resolv.conf /etc
[root@PacktPhy01 etc]#
```

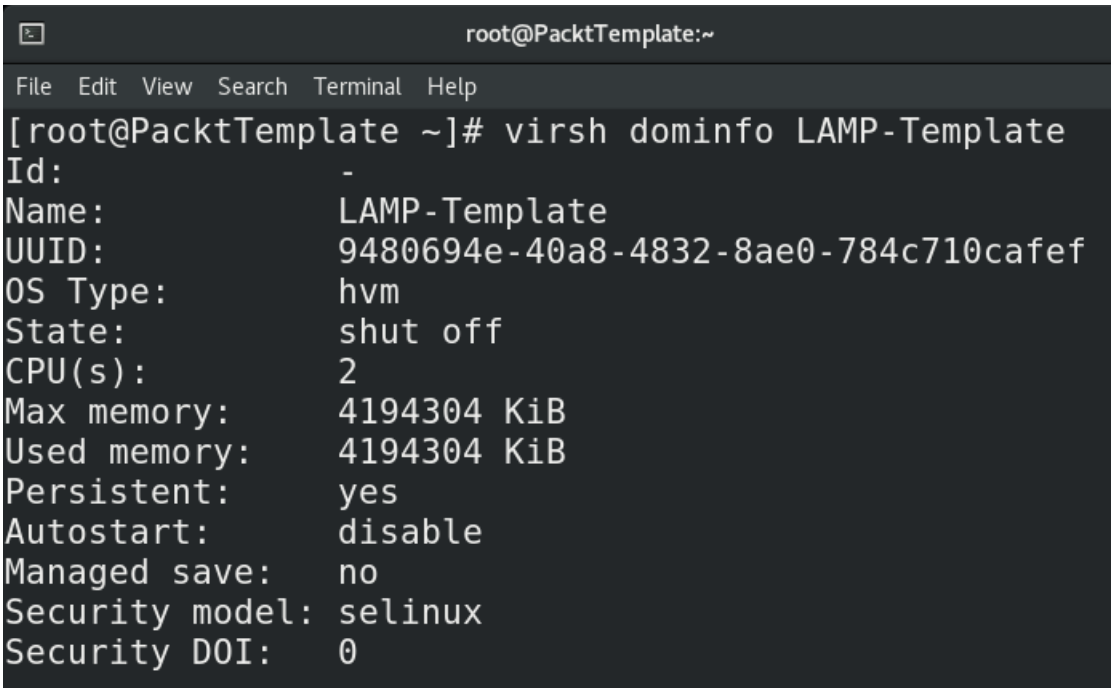

Step 5
Configure webserver
Configure webserver
Configure webserver
Configure webserver
Step 4
Install webserver Packages
Install webserver Packages
Install webserver Packages
Install webserver Packages
Step 3
Configure software repository
Configure software repository
Configure software repository
Configure software repository
Step 2
Install Operating system
Install Operating system
Install Operating system
Install Operating system
Step 1
Create VM1
Create Vm2
Create Vm3
Create Vm4
Step 5
Configure webserver
Step 4
Install webserver Packages
Step 3
Configure software repository
Step 2
Install Operating system
Step 1
Create VM
Create a Template
Deploy VM1 with webserver ready
Deploy VM2 with webserver ready
Deploy VM3 with webserver ready
Deploy VM4 with webserver ready

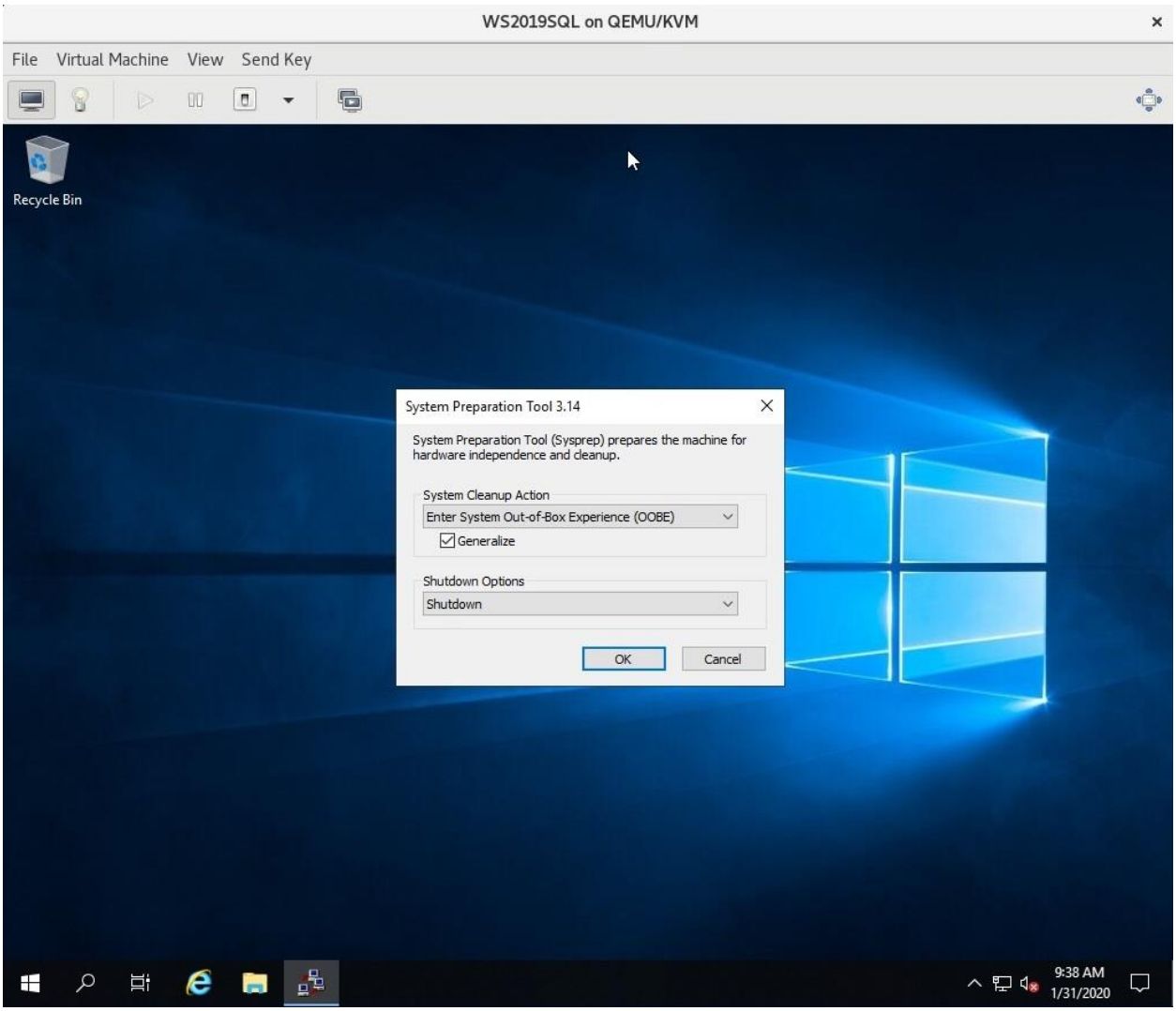

root@LAMP:~
File Edit View Search Terminal Help
[root@LAMP ~]#
[root@LAMP ~]#
[root@LAMP ~]#
[root@LAMP ~]# mysql_secure_installation
NOTE: RUNNING ALL PARTS OF THIS SCRIPT IS RECOMMENDED FOR ALL MariaDB
SERVERS IN PRODUCTION USE! PLEASE READ EACH STEP CAREFULLY!
In order to log into MariaDB to secure it, we'll need the current
password for the root user. If you've just installed MariaDB, and
you haven't set the root password yet, the password will be blank,
so you should just press enter here.
Enter current password for root (enter for none):
OK, successfully used password, moving on...
Setting the root password ensures that nobody can log into the MariaDB
root user without the proper authorisation.
Set root password? [Y/n] y
New password:
Re-enter new password:

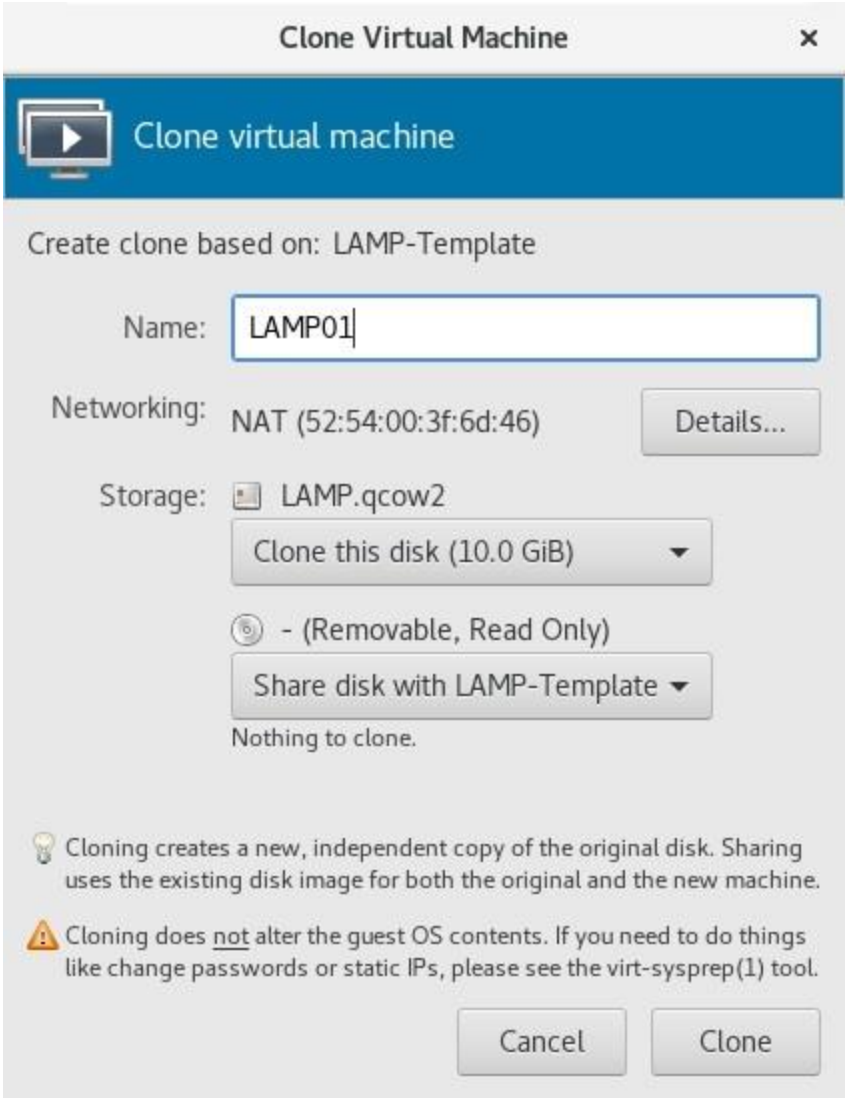

root@LAMP:~
File Edit View Search Terminal Help
Remove anonymous users? [Y/n] y
... Success!
Normally, root should only be allowed to connect from 'localhost'. This ensures that someone cannot guess at the root password from the network.
Disallow root login remotely? [Y/n] y
... Success!
By default, MariaDB comes with a database named 'test' that anyone can access. This is also intended only for testing, and should be removed before moving into a production environment.
Remove test database and access to it? [Y/n] y
- Dropping test database...
... Success!
- Removing privileges on test database...
... Success!
Reloading the privilege tables will ensure that all changes made so far will take effect immediately.
Reload privilege tables now? [Y/n] y
... Success!


root@PacktTemplate:~
File Edit View Search Terminal Help
[root@PacktTemplate ~]# virt-sysprep -d LAMP
[0.0] Examining the guest ...
[8.3] Performing "abrt-data" ...
[8.3] Performing "backup-files" ...
[8.9] Performing "bash-history" ...
[8.9] Performing "blkid-tab" ...
[8.9] Performing "crash-data" ...
[8.9] Performing "cron-spool" ...
[9.0] Performing "dhcp-client-state" ...
[9.0] Performing "dhcp-server-state" ...
[9.0] Performing "dovecot-data" ...
[9.0] Performing "logfiles" ...
[9.0] Performing "machine-id" ...
[9.0] Performing "mail-spool" ...
[9.0] Performing "net-hostname" ...
[9.1] Performing "net-hwaddr" ...
[9.1] Performing "pacct-log" ...
[9.1] Performing "package-manager-cache" ...
[9.1] Performing "pam-data" ...
[9.2] Performing "passwd-backups" ...
[9.2] Performing "puppet-data-log" ...
[9.2] Performing "rh-subscription-manager" ...
[9.2] Performing "rhn-systemid" ...
[9.2] Performing "rpm-db" ...
[9.2] Performing "samba-db-log" ...
[9.3] Performing "script" ...
[9.3] Performing "smolt-uuid" ...
[9.3] Performing "ssh-hostkeys" ...
[9.3] Performing "ssh-userdir" ...
[9.3] Performing "sssd-db-log" ...
[9.3] Performing "tmp-files" ...
[9.3] Performing "udev-persistent-net" ...
[9.3] Performing "utmp" ...
[9.3] Performing "yum-uuid" ...
[9.4] Performing "customize" ...
[9.4] Setting a random seed
[9.4] Setting the machine ID in /etc/machine-id
[9.4] Performing "lvm-uuids" ...
[root@PacktTemplate ~]#


root@PacktTemplate:~
File Edit View Search Terminal Help
[root@PacktTemplate ~]# virt-sysprep --operations ssh-hostkeys,udev-persistent-net -d LAMP
[0.0] Examining the guest ...
[8.5] Performing "ssh-hostkeys" ...
[8.5] Performing "udev-persistent-net" ...
[root@PacktTemplate ~]#


root@PacktTemplate:~
File Edit View Search Terminal Help
[root@PacktTemplate ~]# virsh dominfo LAMP-Template
Id: -
Name: LAMP-Template
UUID: 9480694e-40a8-4832-8ae0-784c710cafef
OS Type: hvm
State: shut off
CPU(s): 2
Max memory: 4194304 KiB
Used memory: 4194304 KiB
Persistent: yes
Autostart: disable
Managed save: no
Security model: selinux
Security DOI: 0


WS2019SQL on QEMU/KVM
File
Virtual Machine
View
Send Key
Recycle Bin
System Preparation Tool 3.14
System Preparation Tool (Sysprep) prepares the machine for hardware independence and cleanup.
System Cleanup Action
Enter System Out-of-Box Experience (OOBE)
Generalize
Shutdown Options
Shutdown
OK
Cancel
9:38 AM
1/31/2020

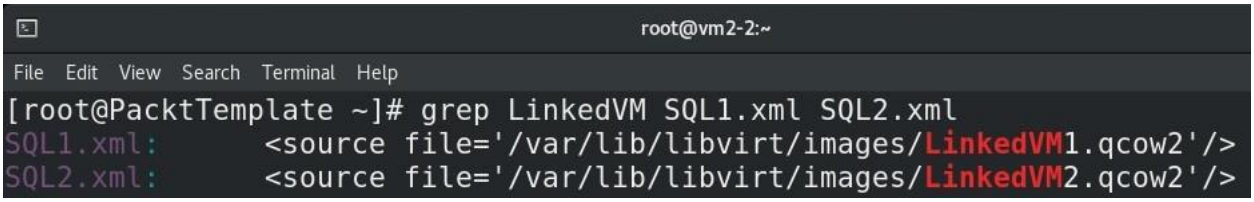


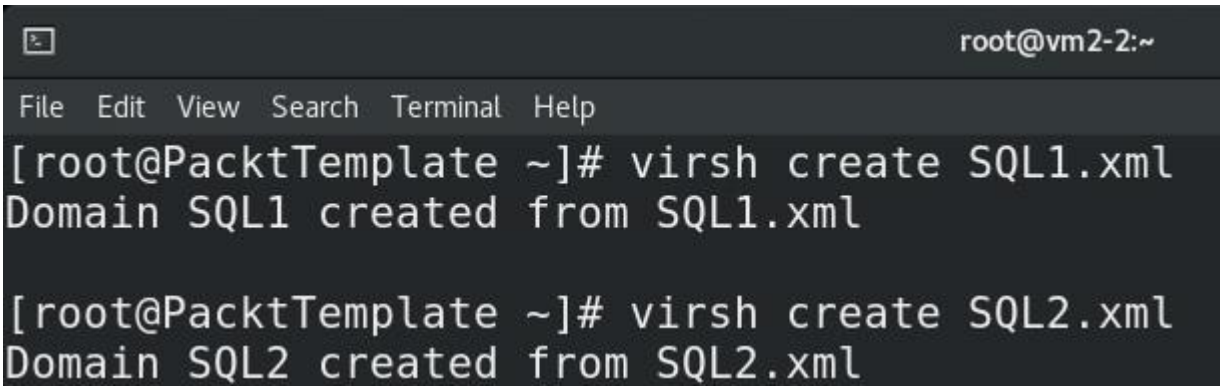

```
root@vm2-2:~
File  Edit  View  Search  Terminal  Help
[root@PacktTemplate ~]# cd
[root@PacktTemplate ~]# virsh list --all
 Id    Name                           State
----------------------------------------------------
 3     WS2019SQL                      running
 -     LAMP-Template                  shut off
 -     LAMP01                         shut off

[root@PacktTemplate ~]#
```

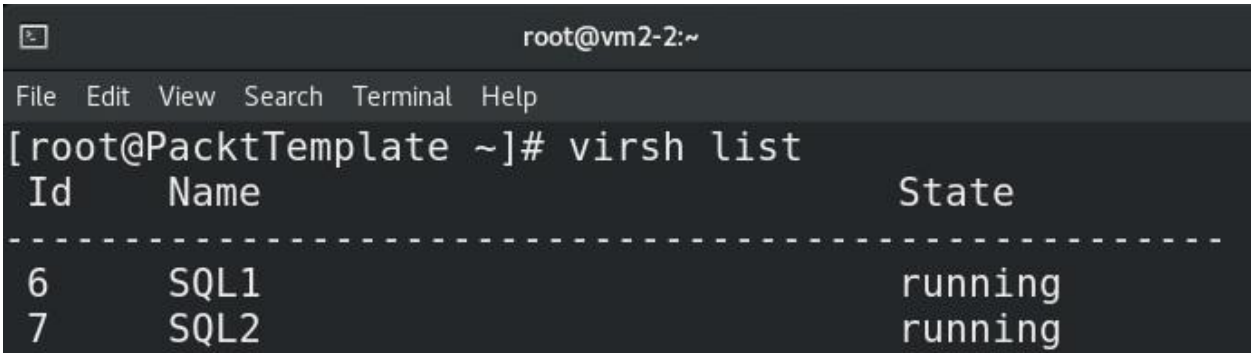
```
root@vm2-2:~
File  Edit  View  Search  Terminal  Help
[root@PacktTemplate ~]# qemu-img create -b /var/lib/libvirt/images/WS2019SQL.qco
w2 -f qcow2 /var/lib/libvirt/images/LinkedVM1.qcow2
Formatting '/var/lib/libvirt/images/LinkedVM1.qcow2', fmt=qcow2 size=53687091200
 backing_file=/var/lib/libvirt/images/WS2019SQL.qcow2 cluster_size=65536 lazy_re
fcounts=off refcount_bits=16
[root@PacktTemplate ~]# qemu-img create -b /var/lib/libvirt/images/WS2019SQL.qco
w2 -f qcow2 /var/lib/libvirt/images/LinkedVM2.qcow2
Formatting '/var/lib/libvirt/images/LinkedVM2.qcow2', fmt=qcow2 size=53687091200
 backing_file=/var/lib/libvirt/images/WS2019SQL.qcow2 cluster_size=65536 lazy_re
fcounts=off refcount_bits=16
[root@PacktTemplate ~]# qemu-img info /var/lib/libvirt/images/LinkedVM1.qcow2
image: /var/lib/libvirt/images/LinkedVM1.qcow2
file format: qcow2
virtual size: 50G (53687091200 bytes)
disk size: 196K
cluster_size: 65536
backing file: /var/lib/libvirt/images/WS2019SQL.qcow2
Format specific information:
    compat: 1.1
    lazy refcounts: false
    refcount bits: 16
    corrupt: false
```

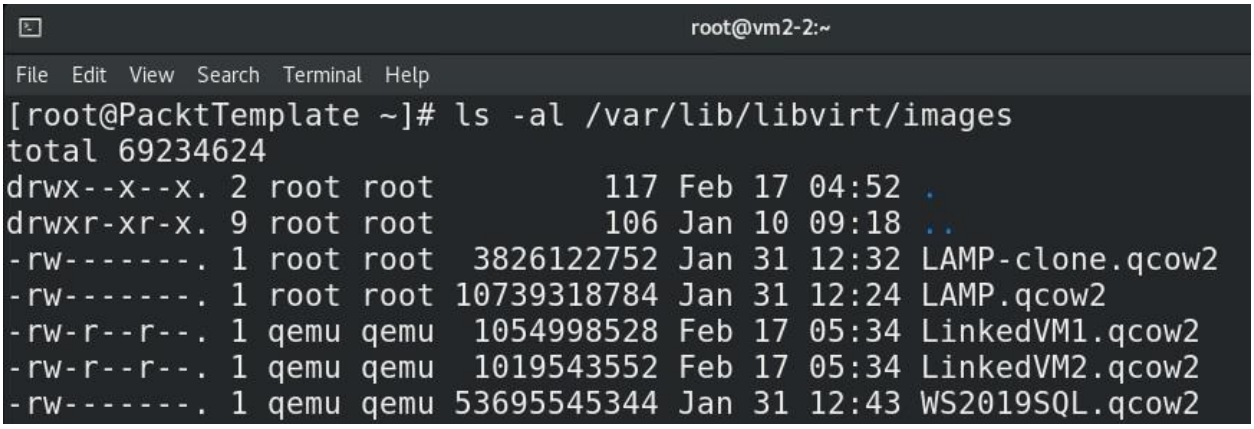
```
root@vm2-2:~
File  Edit  View  Search  Terminal  Help
[root@PacktTemplate ~]# uuidgen -r
948666b3-8b89-4f15-9e0b-e4592270b283
[root@PacktTemplate ~]# uuidgen -r
60292b3f-53fc-43f3-8802-f02971a46d7c
```

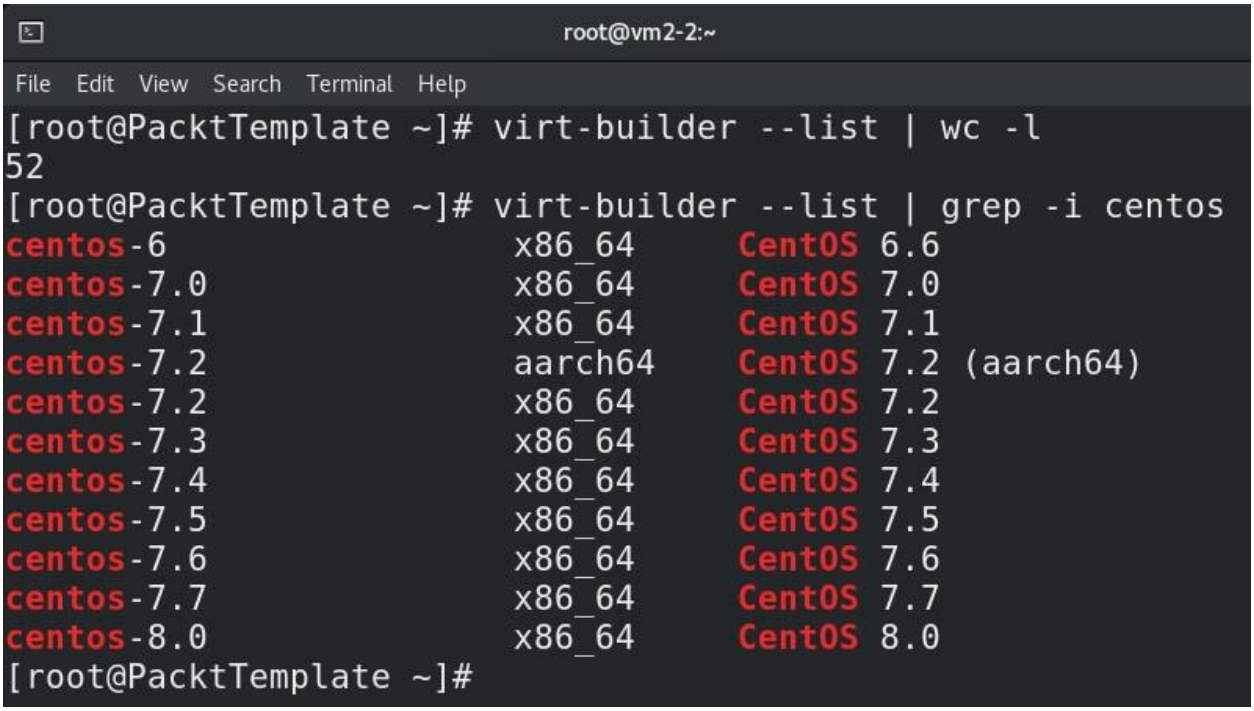
```
root@vm2-2:~
File  Edit  View  Search  Terminal  Help
[root@PacktTemplate ~]# head -n3 SQL1.xml SQL2.xml
==> SQL1.xml <==
<domain type='kvm'>
  <name>SQL1</name>
  <uuid>948666b3-8b89-4f15-9e0b-e4592270b283</uuid>

==> SQL2.xml <==
<domain type='kvm'>
  <name>SQL2</name>
  <uuid>60292b3f-53fc-43f3-8802-f02971a46d7c</uuid>
```

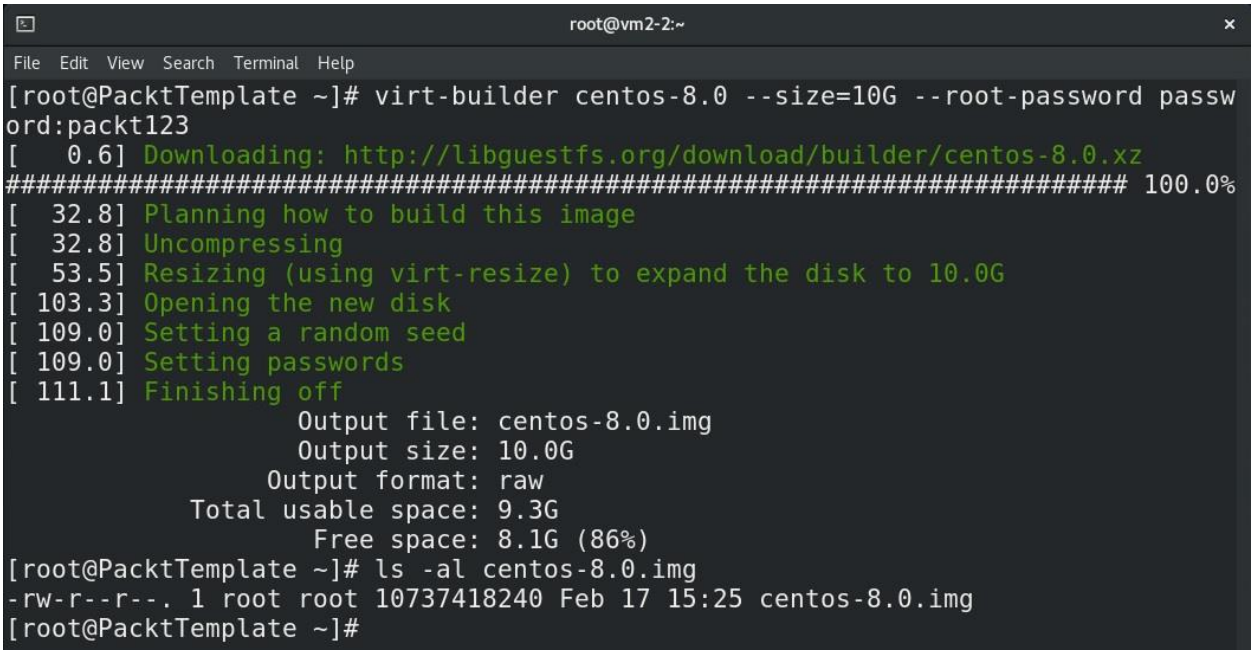

root@vm2-2:~
File Edit View Search Terminal Help
[root@PacktTemplate ~]# grep LinkedVM SQL1.xml SQL2.xml
SQL1.xml: <source file='/var/lib/libvirt/images/LinkedVM1.qcow2'/>
SQL2.xml: <source file='/var/lib/libvirt/images/LinkedVM2.qcow2'/>

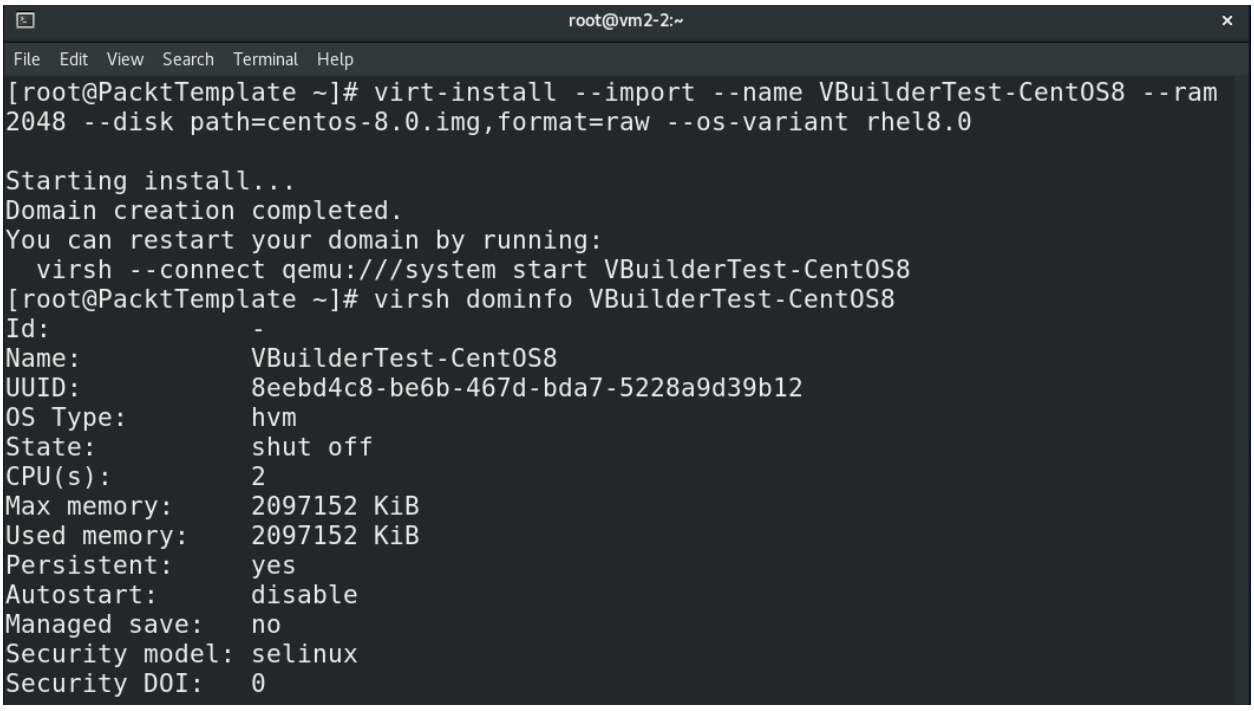

root@vm2-2:~
File Edit View Search Terminal Help
[root@PacktTemplate ~]# virsh create SQL1.xml
Domain SQL1 created from SQL1.xml
[root@PacktTemplate ~]# virsh create SQL2.xml
Domain SQL2 created from SQL2.xml

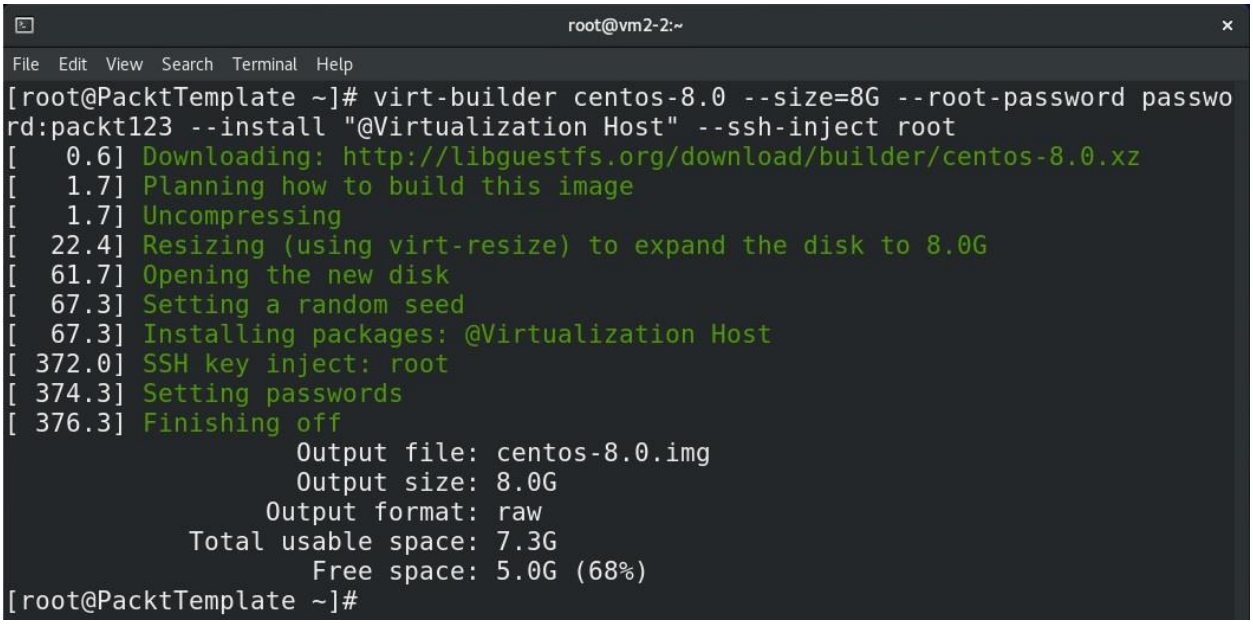

root@vm2-2:~
File Edit View Search Terminal Help
[root@PacktTemplate ~]# virsh list
Id Name State
6 SQL1 running
7 SQL2 running


root@vm2-2:~
File Edit View Search Terminal Help
[root@PacktTemplate ~]# ls -al /var/lib/libvirt/images
total 69234624
drwx--x--x. 2 root root 117 Feb 17 04:52 .
drwxr-xr-x. 9 root root 106 Jan 10 09:18 ..
-rw-------. 1 root root 3826122752 Jan 31 12:32 LAMP-clone.qcow2
-rw-------. 1 root root 10739318784 Jan 31 12:24 LAMP.qcow2
-rw-r--r--. 1 qemu qemu 1054998528 Feb 17 05:34 LinkedVM1.qcow2
-rw-r--r--. 1 qemu qemu 1019543552 Feb 17 05:34 LinkedVM2.qcow2
-rw-------. 1 qemu qemu 53695545344 Jan 31 12:43 WS2019SQL.qcow2

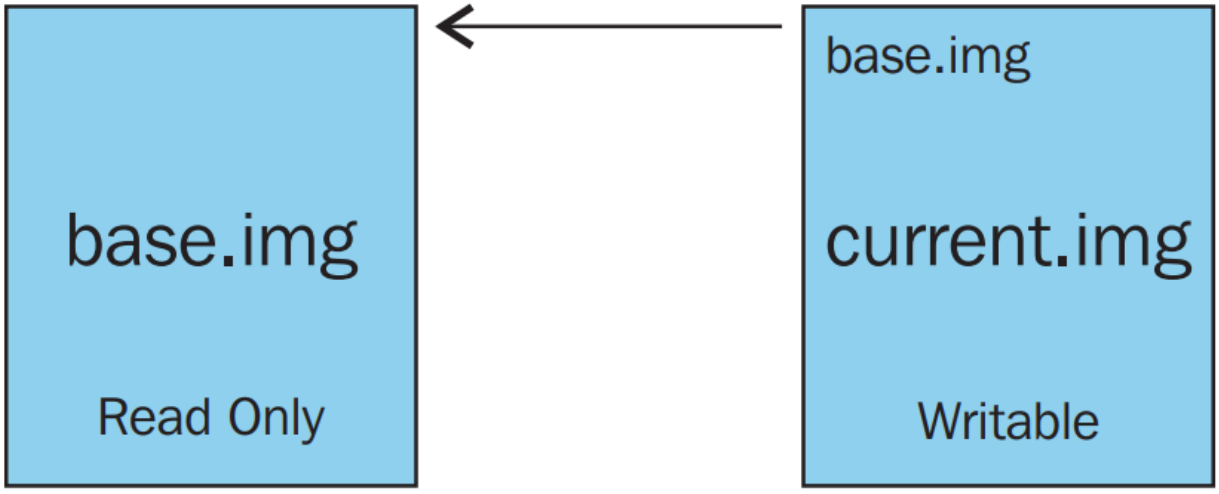

root@vm2-2:~
File Edit View Search Terminal Help
[root@PacktTemplate ~]# virt-builder --list | wc -l
52
[root@PacktTemplate ~]# virt-builder --list | grep -i centos
centos-6 x86_64 CentOS 6.6
centos-7.0 x86_64 CentOS 7.0
centos-7.1 x86_64 CentOS 7.1
centos-7.2 aarch64 CentOS 7.2 (aarch64)
centos-7.2 x86_64 CentOS 7.2
centos-7.3 x86_64 CentOS 7.3
centos-7.4 x86_64 CentOS 7.4
centos-7.5 x86_64 CentOS 7.5
centos-7.6 x86_64 CentOS 7.6
centos-7.7 x86_64 CentOS 7.7
centos-8.0 x86_64 CentOS 8.0
[root@PacktTemplate ~]#

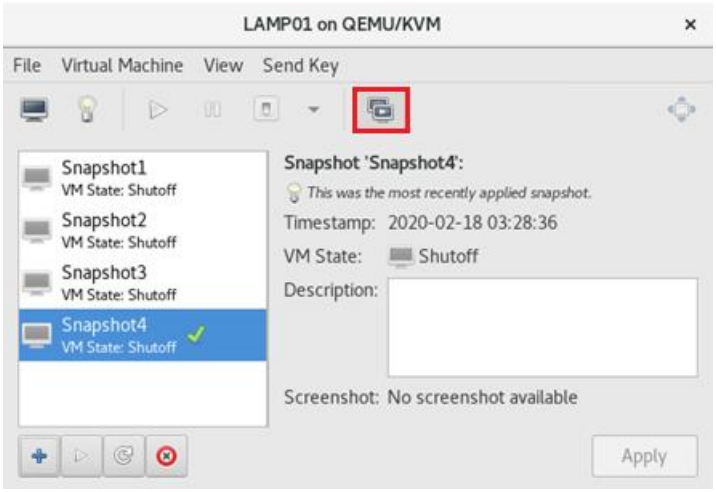

root@vm2-2:~
File Edit View Search Terminal Help
[root@PacktTemplate ~]# virt-builder centos-8.0 --size=10G --root-password passw
ord:packt123
[0.6] Downloading: http://libguestfs.org/download/builder/centos-8.0.xz
100.0%
[32.8] Planning how to build this image
[32.8] Uncompressing
[53.5] Resizing (using virt-resize) to expand the disk to 10.0G
[103.3] Opening the new disk
[109.0] Setting a random seed
[109.0] Setting passwords
[111.1] Finishing off
Output file: centos-8.0.img
Output size: 10.0G
Output format: raw
Total usable space: 9.3G
Free space: 8.1G (86%)
[root@PacktTemplate ~]# ls -al centos-8.0.img
-rw-r--r--. 1 root root 10737418240 Feb 17 15:25 centos-8.0.img
[root@PacktTemplate ~]#

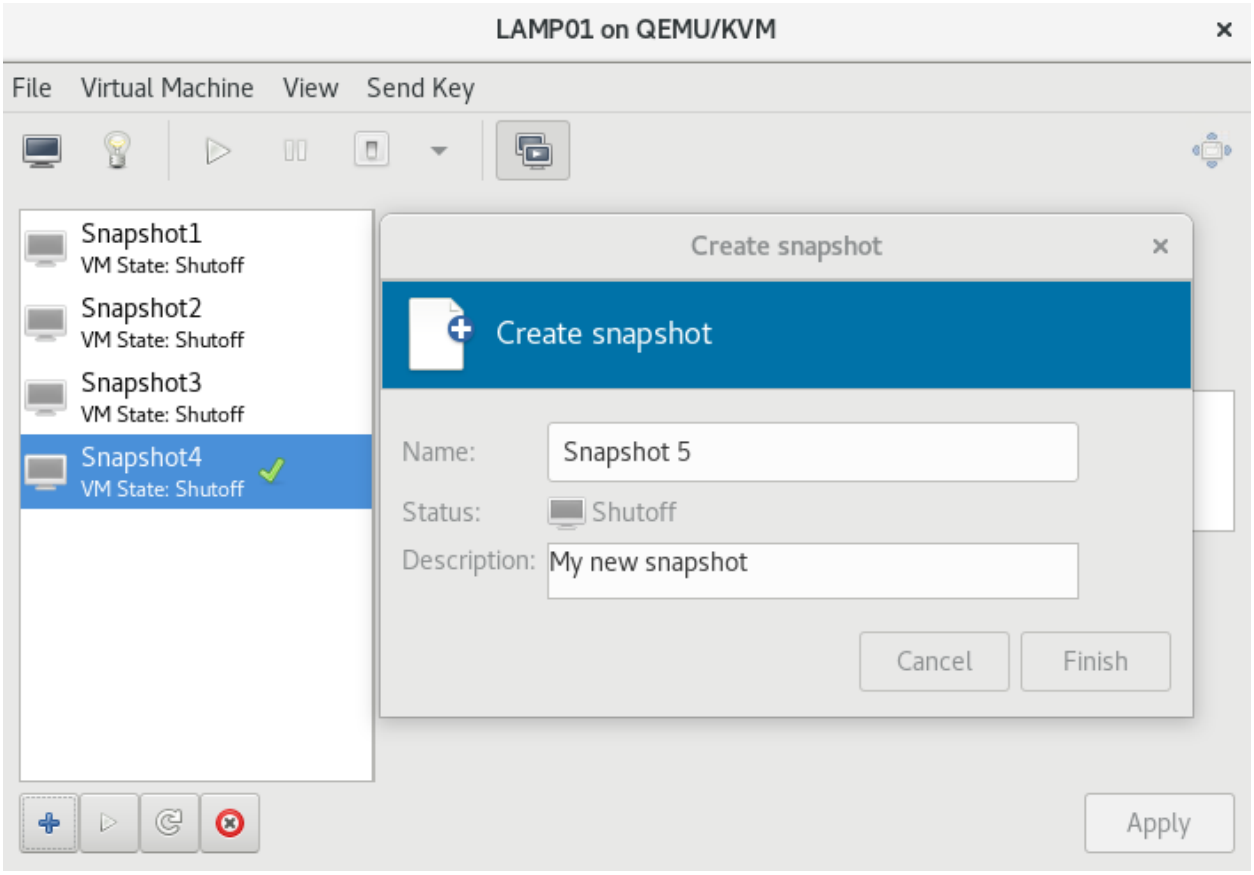

root@vm2-2:~
File Edit View Search Terminal Help
[root@PacktTemplate ~]# virt-install --import --name VBuilderTest-CentOS8 --ram
2048 --disk path=centos-8.0.img,format=raw --os-variant rhel8.0
Starting install...
Domain creation completed.
You can restart your domain by running:
virsh --connect qemu:///system start VBuilderTest-CentOS8
[root@PacktTemplate ~]# virsh dominfo VBuilderTest-CentOS8
Id: -
Name: VBuilderTest-CentOS8
UUID: 8eebd4c8-be6b-467d-bda7-5228a9d39b12
OS Type: hvm
State: shut off
CPU(s): 2
Max memory: 2097152 KiB
Used memory: 2097152 KiB
Persistent: yes
Autostart: disable
Managed save: no
Security model: selinux
Security DOI: 0

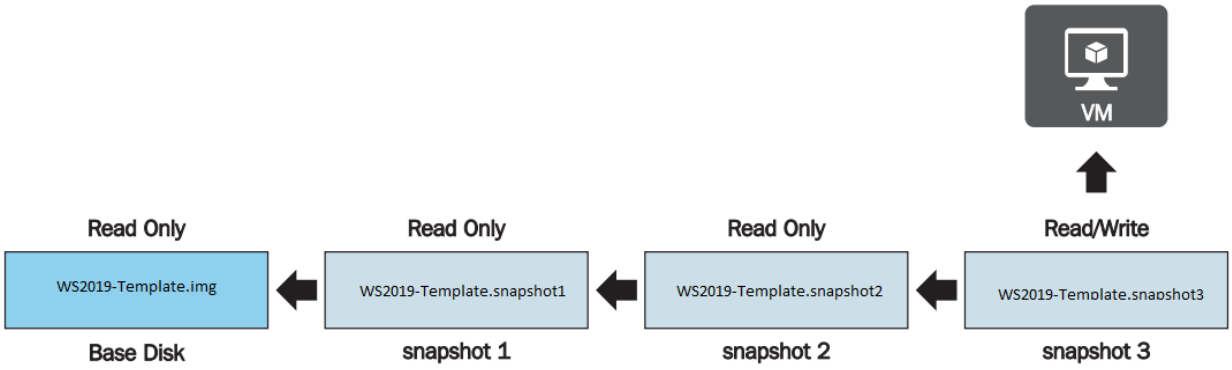

root@vm2-2:~
File Edit View Search Terminal Help
[root@PacktTemplate ~]# virt-builder centos-8.0 --size=8G --root-password passwo
rd:packt123 --install "@Virtualization Host" --ssh-inject root
[0.6] Downloading: http://libguestfs.org/download/builder/centos-8.0.xz
[1.7] Planning how to build this image
[1.7] Uncompressing
[22.4] Resizing (using virt-resize) to expand the disk to 8.0G
[61.7] Opening the new disk
[67.3] Setting a random seed
[67.3] Installing packages: @Virtualization Host
[372.0] SSH key inject: root
[374.3] Setting passwords
[376.3] Finishing off
Output file: centos-8.0.img
Output size: 8.0G
Output format: raw
Total usable space: 7.3G
Free space: 5.0G (68%)
[root@PacktTemplate ~]#

```
root@vm2-2:~/virt-builder
File  Edit  View  Search  Terminal  Help
Packt01                         x86_64     PacktCentOS8
opensuse-13.1                   x86_64     openSUSE 13.1
opensuse-13.2                   x86_64     openSUSE 13.2
opensuse-42.1                   x86_64     openSUSE Leap 42.1
opensuse-tumbleweed             x86_64     openSUSE Tumbleweed
centos-6                        x86_64     CentOS 6.6
centos-7.0                      x86_64     CentOS 7.0
centos-7.1                      x86_64     CentOS 7.1
centos-7.2                      aarch64    CentOS 7.2 (aarch64)
centos-7.2                      x86_64     CentOS 7.2
centos-7.3                      x86_64     CentOS 7.3
centos-7.4                      x86_64     CentOS 7.4
centos-7.5                      x86_64     CentOS 7.5
centos-7.6                      x86_64     CentOS 7.6
centos-7.7                      x86_64     CentOS 7.7
centos-8.0                      x86_64     CentOS 8.0
cirros-0.3.1                    x86_64     CirrOS 0.3.1
cirros-0.3.5                    x86_64     CirrOS 0.3.5
debian-10                       x86_64     Debian 10 (buster)
debian-6                        x86_64     Debian 6 (Squeeze)
debian-7                        sparc64    Debian 7 (Wheezy) (sparc64)
debian-7                        x86_64     Debian 7 (wheezy)
debian-8                        x86_64     Debian 8 (jessie)
--More--
```

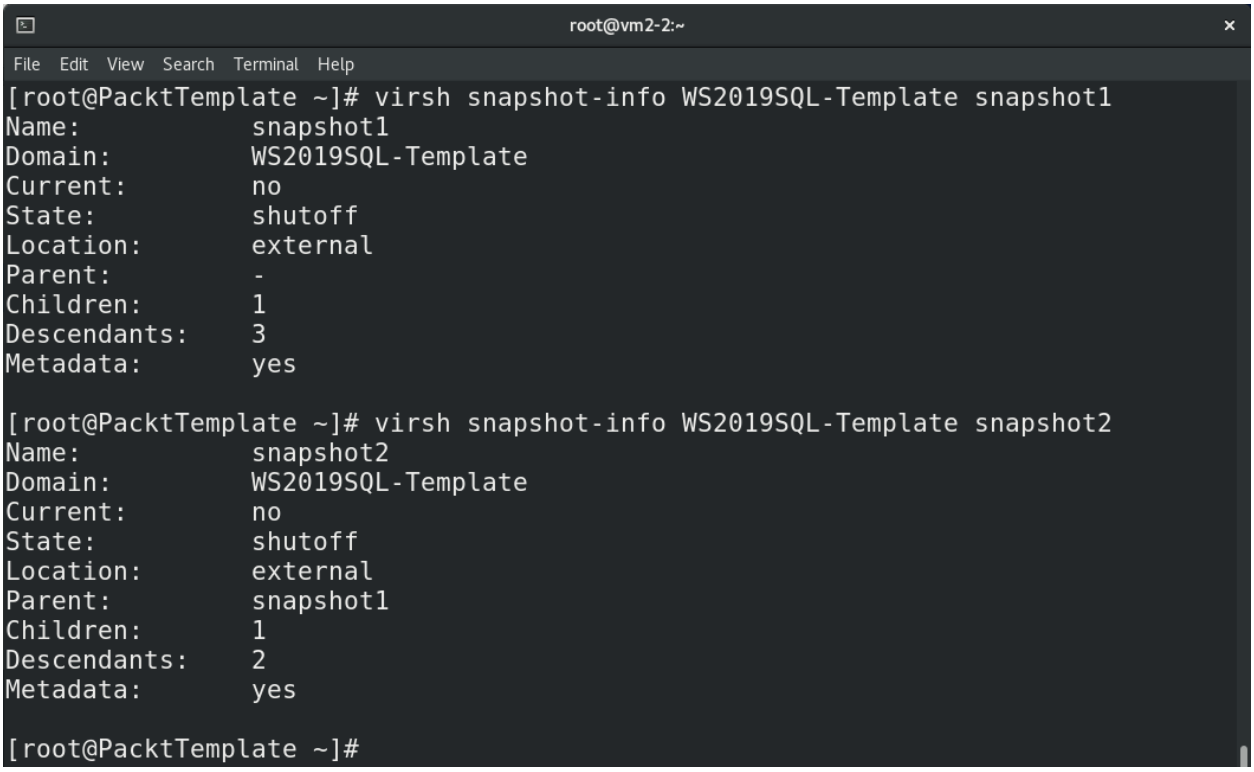



LAMP01 on QEMU/KVM
File
Virtual Machine
View
Send Key
Snapshot1
VM State: Shutoff
Snapshot2
VM State: Shutoff
Snapshot3
VM State: Shutoff
Snapshot4
VM State: Shutoff
Snapshot 'Snapshot4':
This was the most recently applied snapshot.
Timestamp: 2020-02-18 03:28:36
VM State: Shutoff
Description:
Screenshot: No screenshot available
Apply


LAMP01 on QEMU/KVM
File
Virtual Machine
View
Send Key
Snapshot1
VM State: Shutoff
Snapshot2
VM State: Shutoff
Snapshot3
VM State: Shutoff
Snapshot4
VM State: Shutoff
Create snapshot
Create snapshot
Name:
Snapshot 5
Status:
Shutoff
Description:
My new snapshot
Cancel
Finish
Apply




```
root@vm2-2:~
File  Edit  View  Search  Terminal  Help
[root@PacktTemplate ~]# virsh snapshot-info --domain LAMP01 --snapshotname Snaps
hot4
Name:           Snapshot4
Domain:         LAMP01
Current:        yes
State:          shutoff
Location:       internal
Parent:         Snapshot3
Children:       0
Descendants:    0
Metadata:       yes

[root@PacktTemplate ~]# virsh snapshot-info --domain LAMP01 --snapshotname Snaps
hot3
Name:           Snapshot3
Domain:         LAMP01
Current:        no
State:          shutoff
Location:       internal
Parent:         Snapshot2
Children:       1
Descendants:    1
Metadata:       yes

[root@PacktTemplate ~]#
```


root@vm2-2:~
File Edit View Search Terminal Help
[root@PacktTemplate ~]# virsh snapshot-info WS2019SQL-Template snapshot1
Name: snapshot1
Domain: WS2019SQL-Template
Current: no
State: shutoff
Location: external
Parent: -
Children: 1
Descendants: 3
Metadata: yes
[root@PacktTemplate ~]# virsh snapshot-info WS2019SQL-Template snapshot2
Name: snapshot2
Domain: WS2019SQL-Template
Current: no
State: shutoff
Location: external
Parent: snapshot1
Children: 1
Descendants: 2
Metadata: yes
[root@PacktTemplate ~]#

Chapter 9: Customizing a Virtual Machine with cloud-init

```
Cloud-init v. 19.4-33-gbb4131a2-0ubuntu1~18.04.1 running 'init-local' at Sat, 28 Mar 2020 14:51:09 +0
000. Up 16.31 seconds.
Cloud-init v. 19.4-33-gbb4131a2-0ubuntu1~18.04.1 running 'init' at Sat, 28 Mar 2020 15:34:11 +0000. U
p 2599.03 seconds.
ci-info: ++++++++++++++++++++++++++++++++++++++Net device info++++++++++++++++++++++++++++++++++++++
ci-info: +--------+------+-----------------------------+---------------+--------+-------------------+
ci-info: | Device |  Up  |           Address           |      Mask     | Scope  |     Hw-Address    |
ci-info: +--------+------+-----------------------------+---------------+--------+-------------------+
ci-info: |  eth0  | True |          10.0.2.8           | 255.255.255.0 | global | 00:0d:3a:b8:19:73 |
ci-info: |  eth0  | True | fe80::20d:3aff:feb8:1973/64 |       .       |  link  | 00:0d:3a:b8:19:73 |
ci-info: |   lo   | True |          127.0.0.1          |   255.0.0.0   |  host  |         .         |
ci-info: |   lo   | True |           ::1/128           |       .       |  host  |         .         |
ci-info: +--------+------+-----------------------------+---------------+--------+-------------------+
```

CentOS-7-x86_64-GenericCloud-1808.qcow2c	2018-09-06 09:18	399M
CentOS-7-x86_64-GenericCloud-1808.raw.tar.gz	2018-09-06 09:21	384M
CentOS-7-x86_64-GenericCloud-1809.qcow2	2018-10-05 17:09	873M
CentOS-7-x86_64-GenericCloud-1809.qcow2.xz	2018-10-05 17:09	252M
CentOS-7-x86_64-GenericCloud-1809.qcow2c	2018-10-05 17:09	383M
CentOS-7-x86_64-GenericCloud-1809.raw.tar.gz	2018-10-05 17:09	368M
CentOS-7-x86_64-GenericCloud-1811.qcow2	2018-12-03 16:21	895M
CentOS-7-x86_64-GenericCloud-1811.qcow2.xz	2018-12-03 16:21	261M
CentOS-7-x86_64-GenericCloud-1811.qcow2c	2018-12-03 16:22	396M
CentOS-7-x86_64-GenericCloud-1811.raw.tar.gz	2018-12-03 16:22	380M
CentOS-7-x86_64-GenericCloud-1901.qcow2	2019-01-28 21:40	895M
CentOS-7-x86_64-GenericCloud-1901.qcow2.xz	2019-01-28 21:40	259M
CentOS-7-x86_64-GenericCloud-1901.qcow2c	2019-01-28 21:40	395M
CentOS-7-x86_64-GenericCloud-1901.raw.tar.gz	2019-01-28 21:42	379M
CentOS-7-x86_64-GenericCloud-1905.qcow2	2019-06-04 09:28	898M
CentOS-7-x86_64-GenericCloud-1905.qcow2.xz	2019-06-04 09:28	262M
CentOS-7-x86_64-GenericCloud-1905.qcow2c	2019-06-04 09:29	397M
CentOS-7-x86_64-GenericCloud-1905.raw.tar.gz	2019-06-04 09:29	381M
CentOS-7-x86_64-GenericCloud-1907.qcow2	2019-08-08 13:30	899M
CentOS-7-x86_64-GenericCloud-1907.qcow2.xz	2019-08-08 13:30	263M
CentOS-7-x86_64-GenericCloud-1907.qcow2c	2019-08-08 13:30	398M
CentOS-7-x86_64-GenericCloud-1907.raw.tar.gz	2019-08-08 14:55	382M

```
[root@localhost testimages]# ls
bionic-server-cloudimg-amd64.img  CentOS-7-x86_64-GenericCloud-1809.qcow2
[root@localhost testimages]# qemu-img info CentOS-7-x86_64-GenericCloud-1809.qcow2
image: CentOS-7-x86_64-GenericCloud-1809.qcow2
file format: qcow2
virtual size: 8.0G (8589934592 bytes)
disk size: 679M
cluster_size: 65536
Format specific information:
    compat: 0.10
[root@localhost testimages]# qemu-i
qemu-img  qemu-io
[root@localhost testimages]# qemu-img info bionic-server-cloudimg-amd64.img
image: bionic-server-cloudimg-amd64.img
file format: qcow2
virtual size: 2.2G (2361393152 bytes)
disk size: 329M
cluster_size: 65536
Format specific information:
    compat: 0.10
[root@localhost testimages]#
```

```
[root@localhost testimages]# ls -al
total 1031984
drwxr-xr-x. 2 root root        93 Jan 12 16:06 .
dr-xr-x---. 6 root root       242 Jan 12 16:05 ..
-rw-r--r--. 1 root root 344981504 Jan  7 18:29 bionic-server-cloudimg-amd64.img
-rw-r--r--. 1 root root 711770112 Jan 12 01:27 CentOS-7-x86_64-GenericCloud-1809.qcow2
[root@localhost testimages]#
```

```
[root@localhost testimages]# qemu-img resize bionic-server-cloudimg-amd64.img 10G
Image resized.
[root@localhost testimages]# qemu-img resize CentOS-7-x86_64-GenericCloud-1809.qcow2 10G
Image resized.
[root@localhost testimages]# qemu-img info CentOS-7-x86_64-GenericCloud-1809.qcow2
image: CentOS-7-x86_64-GenericCloud-1809.qcow2
file format: qcow2
virtual size: 10G (10737418240 bytes)
disk size: 679M
cluster_size: 65536
Format specific information:
    compat: 0.10
[root@localhost testimages]# qemu-img info bionic-server-cloudimg-amd64.img
image: bionic-server-cloudimg-amd64.img
file format: qcow2
virtual size: 10G (10737418240 bytes)
disk size: 329M
cluster_size: 65536
Format specific information:
    compat: 0.10
[root@localhost testimages]#
```

```
[root@localhost testimages]# ls -al
total 1032052
drwxr-xr-x. 2 root root        93 Jan 12 16:06 .
dr-xr-x---. 6 root root       242 Jan 12 16:05 ..
-rw-r--r--. 1 root root 344982016 Jan 12 16:13 bionic-server-cloudimg-amd64.img
-rw-r--r--. 1 root root 914948608 Jan 12 16:13 CentOS-7-x86 64-GenericCloud-1809.qcow2
[root@localhost testimages]#
```

```
[root@localhost testimages]# mv * /var/lib/libvirt/images/
[root@localhost testimages]# cd /var/lib/libvirt/images/
[root@localhost images]# ls -alh
total 1008M
drwx--x--x.  2 root root   93 Jan 12 16:15 .
drwxr-xr-x. 10 root root  117 Jan 12 01:18 ..
-rw-r--r--.  1 root root 330M Jan 12 16:13 bionic-server-cloudimg-amd64.img
-rw-r--r--.  1 root root 873M Jan 12 16:13 CentOS-7-x86_64-GenericCloud-1809.qcow2
[root@localhost images]#
```

```
[root@localhost images]# qemu-img create -f qcow2 -o backing_file=/var/lib/libvi
rt/images/CentOS-7-x86_64-GenericCloud-1809.qcow2 deploy-1/centos1.qcow2
Formatting 'deploy-1/centos1.qcow2', fmt=qcow2 size=8589934592 backing_file='/va
r/lib/libvirt/images/CentOS-7-x86_64-GenericCloud-1809.qcow2' encryption=off clu
ster_size=65536 lazy_refcounts=off
[root@localhost images]# cd deploy-1/
[root@localhost deploy-1]# ls -alh
total 196K
drwxr-xr-x. 2 root root   27 Jun 21 20:48 .
drwx--x--x. 3 root root   69 Jun 21 20:47 ..
-rw-r--r--. 1 root root 193K Jun 21 20:48 centos1.qcow2
```

```
local-hostname: deploy-1

meta-data (END)
```

```
[root@localhost ~]# ssh-keygen
Generating public/private rsa key pair.
Enter file in which to save the key (/root/.ssh/id_rsa):
Enter passphrase (empty for no passphrase):
Enter same passphrase again:
Your identification has been saved in /root/.ssh/id_rsa.
Your public key has been saved in /root/.ssh/id_rsa.pub.
The key fingerprint is:
SHA256:iNGTi2P1qCnKhl9dVZy5hDhdukBbax81VZN2Soc3Etg root@localhost
The key's randomart image is:
+---[RSA 2048]----+
|        .o.+=+++=|
|     . oooo==Eo==|
|    . = o.=..oo+o|
|     = * + o...  |
|    = + S . .    |
|   . = .         |
|. . + .          |
|oo o             |
|oo.              |
+----[SHA256]-----+
[root@localhost ~]# ls -al .ssh
total 20
drwx------.  2 root root   80 Jun 22 16:52 .
dr-xr-x---. 20 root root 4096 Jun 21 20:41 ..
-rw-------.  1 root root 1374 Apr 17 01:22 authorized_keys
-rw-------.  1 root root 1679 Jun 22 16:52 id_rsa
-rw-r--r--.  1 root root  396 Jun 22 16:52 id_rsa.pub
-rw-r--r--.  1 root root  366 Apr 27 11:23 known_hosts
```

```
[root@localhost deploy-1]# genisoimage -output deploy-1-cidata.iso -volid cidata
 -joliet -rock user-data meta-data
I: -input-charset not specified, using utf-8 (detected in locale settings)
Total translation table size: 0
Total rockridge attributes bytes: 331
Total directory bytes: 0
Path table size(bytes): 10
Max brk space used 0
183 extents written (0 MB)
[root@localhost deploy-1]#
```

```
[root@localhost deploy-1]# ls -al
total 38908
drwxr-xr-x. 2 root root       88 Jan 12 17:42 .
drwx--x--x. 5 root root      141 Jan 12 21:36 ..
-rw-r--r--. 1 qemu qemu 39518208 Jan 12 23:37 centos1.qcow2
-rw-r--r--. 1 qemu qemu   374784 Jan 12 18:51 deploy-1-cidata.iso
-rw-r--r--. 1 root root       26 Jan 12 16:27 meta-data
-rw-r--r--. 1 root root      629 Jan 12 17:42 user-data
```

```
[root@localhost deploy-1]# virt-install --connect qemu:///system --virt-type kvm
 --name deploy-1 --ram 2048 --vcpus=1 --os-type linux --os-variant generic --dis
k path=/var/lib/libvirt/images/deploy-1/centos1.qcow2,format=qcow2 --disk /var/l
ib/libvirt/images/deploy-1/deploy-1-cidata.iso,device=cdrom --import --network n
etwork=default --noautoconsole

Starting install...
Domain creation completed.
[root@localhost deploy-1]# virsh domifaddr deploy-1
 Name       MAC address          Protocol     Address
-------------------------------------------------------------------------------
 vnet0      52:54:00:55:93:9e    ipv4         192.168.122.2/24

[root@localhost deploy-1]# ssh cloud@192.168.122.120
^C
[root@localhost deploy-1]# ssh cloud@192.168.122.2
The authenticity of host '192.168.122.2 (192.168.122.2)' can't be established.
ECDSA key fingerprint is SHA256:WRucACtXNTbAlvwfuynPEgqo6FjJoLas6bLKymPJrEQ.
ECDSA key fingerprint is MD5:44:b5:04:e8:87:ad:24:19:01:a3:e9:8d:a7:0e:42:34.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '192.168.122.2' (ECDSA) to the list of known hosts.
[cloud@deploy-1 ~]$
```

```
2020-01-12 19:32:56,966 - util.py[DEBUG]: Cloud-init v. 19.3-41-gc4735dd3-0ubuntu1~18.04.1 running 'init-local' at Sun, 12 Jan 2020 19:3
2:56 +0000. Up 12.65 seconds.
2020-01-12 19:32:56,966 - main.py[DEBUG]: No kernel command line url found.
2020-01-12 19:32:56,966 - main.py[DEBUG]: Closing stdin.
2020-01-12 19:32:56,969 - util.py[DEBUG]: Writing to /var/log/cloud-init.log - ab: [644] 0 bytes
2020-01-12 19:32:56,969 - util.py[DEBUG]: Changing the ownership of /var/log/cloud-init.log to 102:4
2020-01-12 19:32:56,969 - util.py[DEBUG]: Attempting to remove /var/lib/cloud/instance/boot-finished
2020-01-12 19:32:56,969 - util.py[DEBUG]: Attempting to remove /var/lib/cloud/data/no-net
2020-01-12 19:32:56,969 - handlers.py[DEBUG]: start: init-local/check-cache: attempting to read from cache [check]
2020-01-12 19:32:56,969 - util.py[DEBUG]: Reading from /var/lib/cloud/instance/obj.pkl (quiet=False)
2020-01-12 19:32:56,970 - stages.py[DEBUG]: no cache found
2020-01-12 19:32:56,970 - handlers.py[DEBUG]: finish: init-local/check-cache: SUCCESS: no cache found
2020-01-12 19:32:56,970 - util.py[DEBUG]: Attempting to remove /var/lib/cloud/instance
2020-01-12 19:32:56,976 - stages.py[DEBUG]: Using distro class <class 'cloudinit.distros.ubuntu.Distro'>
2020-01-12 19:32:56,977 - __init__.py[DEBUG]: Looking for data source in: ['NoCloud', 'None'], via packages ['', 'cloudinit.sources'] th
at matches dependencies ['FILESYSTEM']
2020-01-12 19:32:57,012 - __init__.py[DEBUG]: Searching for local data source in: ['DataSourceNoCloud']
2020-01-12 19:32:57,012 - handlers.py[DEBUG]: start: init-local/search-NoCloud: searching for local data from DataSourceNoCloud
2020-01-12 19:32:57,012 - __init__.py[DEBUG]: Seeing if we can get any data from <class 'cloudinit.sources.DataSourceNoCloud.DataSourceN
oCloud'>
2020-01-12 19:32:57,012 - __init__.py[DEBUG]: Update datasource metadata and network config due to events: New instance first boot
2020-01-12 19:32:57,012 - util.py[DEBUG]: Running command ['systemd-detect-virt', '--quiet', '--container'] with allowed return codes [0
] (shell=False, capture=True)
2020-01-12 19:32:57,016 - util.py[DEBUG]: Running command ['running-in-container'] with allowed return codes [0] (shell=False, capture=T
rue)
2020-01-12 19:32:57,017 - util.py[DEBUG]: Running command ['lxc-is-container'] with allowed return codes [0] (shell=False, capture=True)
2020-01-12 19:32:57,019 - util.py[DEBUG]: Reading from /proc/1/environ (quiet=False)
2020-01-12 19:32:57,019 - util.py[DEBUG]: Read 176 bytes from /proc/1/environ
2020-01-12 19:32:57,019 - util.py[DEBUG]: Reading from /proc/self/status (quiet=False)
2020-01-12 19:32:57,019 - util.py[DEBUG]: Read 1290 bytes from /proc/self/status
2020-01-12 19:32:57,019 - util.py[DEBUG]: querying dmi data /sys/class/dmi/id/product_serial
2020-01-12 19:32:57,019 - util.py[DEBUG]: Reading from /sys/class/dmi/id/product_serial (quiet=False)
2020-01-12 19:32:57,019 - util.py[DEBUG]: Read 1 bytes from /sys/class/dmi/id/product_serial
2020-01-12 19:32:57,019 - util.py[DEBUG]: dmi data /sys/class/dmi/id/product_serial returned
2020-01-12 19:32:57,019 - util.py[DEBUG]: Reading from /var/lib/cloud/seed/nocloud/user-data (quiet=False)
2020-01-12 19:32:57,019 - util.py[DEBUG]: Reading from /var/lib/cloud/seed/nocloud/meta-data (quiet=False)
2020-01-12 19:32:57,019 - util.py[DEBUG]: Reading from /var/lib/cloud/seed/nocloud/vendor-data (quiet=False)
2020-01-12 19:32:57,019 - util.py[DEBUG]: Reading from /var/lib/cloud/seed/nocloud/network-config (quiet=False)
2020-01-12 19:32:57,019 - util.py[DEBUG]: Reading from /var/lib/cloud/seed/nocloud-net/user-data (quiet=False)
2020-01-12 19:32:57,020 - util.py[DEBUG]: Reading from /var/lib/cloud/seed/nocloud-net/meta-data (quiet=False)
2020-01-12 19:32:57,020 - util.py[DEBUG]: Reading from /var/lib/cloud/seed/nocloud-net/vendor-data (quiet=False)
cloud-init.log
```

```
[root@localhost deploy-1]# cd ..
[root@localhost images]# mkdir deploy-2
[root@localhost images]# cd deploy-2
[root@localhost deploy-2]# cp ../deploy-1/user-data .
[root@localhost deploy-2]# cp ../deploy-1/meta-data .
[root@localhost deploy-2]# vi meta-data
[root@localhost deploy-2]# genisoimage -output deploy-2-cidata.iso -volid cidata -joliet -rock user-data meta-data
I: -input-charset not specified, using utf-8 (detected in locale settings)
Total translation table size: 0
Total rockridge attributes bytes: 331
Total directory bytes: 0
Path table size(bytes): 10
Max brk space used 0
183 extents written (0 MB)
```

```
[root@localhost deploy-2]# qemu-img create -f qcow2 -o backing_file=
/var/lib/libvirt/images/bionic-server-cloudimg-amd64.img bionic.qcow2
Formatting 'bionic.qcow2', fmt=qcow2 size=10737418240 backing file='
/var/lib/libvirt/images/bionic-server-cloudimg-amd64.img' encryption
=off cluster_size=65536 lazy_refcounts=off
[root@localhost deploy-2]# qemu-img resize bionic.qcow2 10G
Image resized.
```

```
[root@localhost deploy-2]# virt-install --connect qemu:///system --virt-type kvm --name de
ploy-2 --ram 2048 --vcpus 1 --os-type linux --os-variant generic --disk path=/var/lib/libv
irt/images/deploy-2/bionic.qcow2,format=qcow2 --disk path=/var/lib/libvirt/images/deploy-2
/deploy-2-cidata.iso,device=cdrom --import --network network=default --noautoconsole
Starting install...
Domain creation completed.
```

```
[root@localhost deploy-2]# virsh domifaddr deploy-1
 Name       MAC address          Protocol     Address
-------------------------------------------------------------------------------
 vnet0      52:54:00:55:93:9e    ipv4         192.168.122.2/24

[root@localhost deploy-2]# virsh domifaddr deploy-2
 Name       MAC address          Protocol     Address
-------------------------------------------------------------------------------
 vnet1      52:54:00:e9:6a:9f    ipv4         192.168.122.126/24
```

```
[root@localhost deploy-2]# ssh cloud@192.168.122.126
The authenticity of host '192.168.122.126 (192.168.122.126)' can't be established.
ECDSA key fingerprint is SHA256:4wD2aNIGUhKYIS8ByndSkH36hEe8xIhfb4Z/lLEyqTE.
ECDSA key fingerprint is MD5:a6:61:06:ac:f3:34:0d:0a:91:df:9c:8f:d7:54:d7:e3.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added '192.168.122.126' (ECDSA) to the list of known hosts.
Welcome to Ubuntu 18.04.3 LTS (GNU/Linux 4.15.0-74-generic x86_64)

 * Documentation:  https://help.ubuntu.com
 * Management:     https://landscape.canonical.com
 * Support:        https://ubuntu.com/advantage

  System information as of Sun Jan 12 19:33:37 UTC 2020

  System load:  0.68              Processes:           85
  Usage of /:   10.1% of 9.52GB   Users logged in:     0
  Memory usage: 5%                IP address for ens3: 192.168.122.126
  Swap usage:   0%

0 packages can be updated.
0 updates are security updates.



The programs included with the Ubuntu system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Ubuntu comes with ABSOLUTELY NO WARRANTY, to the extent permitted by
applicable law.

To run a command as administrator (user "root"), use "sudo <command>".
See "man sudo_root" for details.
```

```
2020-01-12 19:32:56,966 - util.py[DEBUG]: Cloud-init v. 19.3-41-gc4735dd3-0ubuntu1~18.04.1 running 'init-local' at Sun, 12 Jan 2
020 19:32:56 +0000. Up 12.65 seconds.
2020-01-12 19:32:56,966 - main.py[DEBUG]: No kernel command line url found.
2020-01-12 19:32:56,966 - main.py[DEBUG]: Closing stdin.
2020-01-12 19:32:56,969 - util.py[DEBUG]: Writing to /var/log/cloud-init.log - ab: [644] 0 bytes
2020-01-12 19:32:56,969 - util.py[DEBUG]: Changing the ownership of /var/log/cloud-init.log to 102:4
2020-01-12 19:32:56,969 - util.py[DEBUG]: Attempting to remove /var/lib/cloud/instance/boot-finished
2020-01-12 19:32:56,969 - util.py[DEBUG]: Attempting to remove /var/lib/cloud/data/no-net
2020-01-12 19:32:56,969 - handlers.py[DEBUG]: start: init-local/check-cache: attempting to read from cache [check]
2020-01-12 19:32:56,969 - util.py[DEBUG]: Reading from /var/lib/cloud/instance/obj.pkl (quiet=False)
2020-01-12 19:32:56,970 - stages.py[DEBUG]: no cache found
2020-01-12 19:32:56,970 - handlers.py[DEBUG]: finish: init-local/check-cache: SUCCESS: no cache found
2020-01-12 19:32:56,970 - util.py[DEBUG]: Attempting to remove /var/lib/cloud/instance
2020-01-12 19:32:56,976 - stages.py[DEBUG]: Using distro class <class 'cloudinit.distros.ubuntu.Distro'>
2020-01-12 19:32:56,977 - __init__.py[DEBUG]: Looking for data source in: ['NoCloud', 'None'], via packages ['', 'cloudinit.sour
ces'] that matches dependencies ['FILESYSTEM']
2020-01-12 19:32:57,012 - __init__.py[DEBUG]: Searching for local data source in: ['DataSourceNoCloud']
2020-01-12 19:32:57,012 - handlers.py[DEBUG]: start: init-local/search-NoCloud: searching for local data from DataSourceNoCloud
2020-01-12 19:32:57,012 - __init__.py[DEBUG]: Seeing if we can get any data from <class 'cloudinit.sources.DataSourceNoCloud.Dat
aSourceNoCloud'>
2020-01-12 19:32:57,012 - __init__.py[DEBUG]: Update datasource metadata and network config due to events: New instance first bo
ot
2020-01-12 19:32:57,012 - util.py[DEBUG]: Running command ['systemd-detect-virt', '--quiet', '--container'] with allowed return
codes [0] (shell=False, capture=True)
2020-01-12 19:32:57,016 - util.py[DEBUG]: Running command ['running-in-container'] with allowed return codes [0] (shell=False, c
apture=True)
2020-01-12 19:32:57,017 - util.py[DEBUG]: Running command ['lxc-is-container'] with allowed return codes [0] (shell=False, captu
re=True)
2020-01-12 19:32:57,019 - util.py[DEBUG]: Reading from /proc/1/environ (quiet=False)
2020-01-12 19:32:57,019 - util.py[DEBUG]: Read 176 bytes from /proc/1/environ
2020-01-12 19:32:57,019 - util.py[DEBUG]: Reading from /proc/self/status (quiet=False)
2020-01-12 19:32:57,019 - util.py[DEBUG]: Read 1290 bytes from /proc/self/status
2020-01-12 19:32:57,019 - util.py[DEBUG]: querying dmi data /sys/class/dmi/id/product_serial
2020-01-12 19:32:57,019 - util.py[DEBUG]: Reading from /sys/class/dmi/id/product_serial (quiet=False)
2020-01-12 19:32:57,019 - util.py[DEBUG]: Read 1 bytes from /sys/class/dmi/id/product_serial
2020-01-12 19:32:57,019 - util.py[DEBUG]: dmi data /sys/class/dmi/id/product_serial returned
2020-01-12 19:32:57,019 - util.py[DEBUG]: Reading from /var/lib/cloud/seed/nocloud/user-data (quiet=False)
2020-01-12 19:32:57,019 - util.py[DEBUG]: Reading from /var/lib/cloud/seed/nocloud/meta-data (quiet=False)
2020-01-12 19:32:57,019 - util.py[DEBUG]: Reading from /var/lib/cloud/seed/nocloud/vendor-data (quiet=False)
2020-01-12 19:32:57,019 - util.py[DEBUG]: Reading from /var/lib/cloud/seed/nocloud/network-config (quiet=False)
cloud-init.log
```

```
#cloud-config
users:
  - name: cloud
    ssh-authorized-keys:
      - ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAABAQCZh66Gf1lNuMeenGywifUSW1T16uKW0IXnucNwoIynhymSm1fkTCqyxLkImWbyd/tD
GitcSa7jWvkKvTLiPvxLP0CvcvGR4aiV/2TuxA1em3JweqpNppyuapH7u9q0SdxaG2gh3uViYl/+8uuzJLJJbxb/a8EK+szpdZq7bpLOvigOTgMa
tk5lxfKBLxwLpFq7JPfAv8DTMcdYqqqc5PhRnnKLakSUQ6OW0nv4fpa0MKuha1nrO72Zyur7FRf9XFvD+Uc7ABNpeyUTZVIj2dr5hjjFTPfZWUC9
ldomain
    sudo: ['ALL=(ALL) NOPASSWD:ALL']
    groups: sudo
    shell: /bin/bash

packages:
  - httpd

runcmd:
  - echo "AllowUsers cloud" >> /etc/ssh/sshd_config
  - restart ssh
```

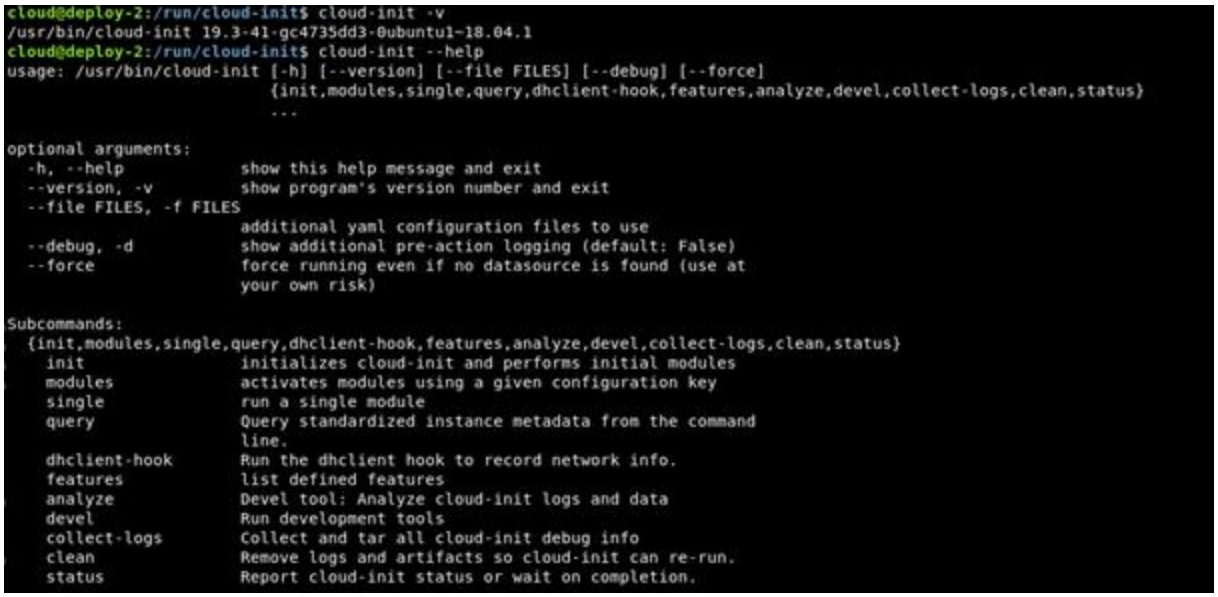
```
[root@localhost deploy-3]# qemu-img create -f qcow2 -o backing-file=/var/lib/libvirt/image
s/CentOS-7-x86 64-GenericCloud-1809.qcow2 centos2.qcow2
Formatting 'centos2.qcow2' fmt=qcow2 size=8589934592 backing_file='/var/lib/libvirt/images
/CentOS-7-x86_64-GenericCloud-1809.qcow2' encryption=off cluster_size=65535 lazy_refcounts
=off
[root@localhost ~]# qemu-img resize centos2.qcow2 10G
Image resized.
[root@localhost ~]# virt-install --connect qemu:///system --virt-type kvm --name deploy-3
--ram 2048 --vcpus=1 --os-type linux --os-variant generic --disk path=/var/lib/libvirt/ima
ges/deploy-3/centos2.qcow2,format=qcow2 --disk /var/lib/libvirt/images/deploy-3/deploy-3-c
idata.iso,device=cdrom --import --network network=default --noautoconsole

Starting install...
Domain creation completed.
```

```
● httpd.service - The Apache HTTP Server
   Loaded: loaded (/usr/lib/systemd/system/httpd.service; disabled; vendor preset: disabled)
   Active: inactive (dead)
     Docs: man:httpd(8)
           man:apachectl(8)
```

```
[root@deploy-1 cloud-init]# ls -al
total 4
drwxr-xr-x.  2 root root 140 Jan 12 16:43 .
drwxr-xr-x. 23 root root 740 Jan 12 16:43 ..
-rw-r--r--.  1 root root   0 Jan 12 16:43 enabled
-rw-r--r--.  1 root root   8 Jan 12 16:43 .instance-id
-rw-r--r--.  1 root root   0 Jan 12 16:43 network-config-ready
lrwxrwxrwx.  1 root root  36 Jan 12 16:43 result.json -> ../../var/lib/cloud/data/result.json
lrwxrwxrwx.  1 root root  36 Jan 12 16:43 status.json -> ../../var/lib/cloud/data/status.json
[root@deploy-1 cloud-init]#
```

```
[cloud@deploy-1 ~]$ cloud-init -v
cloud-init 0.7.9
[cloud@deploy-1 ~]$
```

```
cloud@deploy-2:~$ cloud-init -v
/usr/bin/cloud-init 19.3-41-gc4735dd3-0ubuntu1~18.04.1
cloud@deploy-2:~$
```



```
cloud@deploy-2:/run/cloud-init$ cloud-init -v
/usr/bin/cloud-init 19.3-41-gc4735dd3-0ubuntu1~18.04.1
cloud@deploy-2:/run/cloud-init$ cloud-init --help
usage: /usr/bin/cloud-init [-h] [--version] [--file FILES] [--debug] [--force]
                           {init,modules,single,query,dhclient-hook,features,analyze,devel,collect-logs,clean,status}
                           ...

optional arguments:
  -h, --help            show this help message and exit
  --version, -v         show program's version number and exit
  --file FILES, -f FILES
                        additional yaml configuration files to use
  --debug, -d           show additional pre-action logging (default: False)
  --force               force running even if no datasource is found (use at
                        your own risk)

Subcommands:
  {init,modules,single,query,dhclient-hook,features,analyze,devel,collect-logs,clean,status}
    init                initializes cloud-init and performs initial modules
    modules             activates modules using a given configuration key
    single              run a single module
    query               Query standardized instance metadata from the command
                        line.
    dhclient-hook       Run the dhclient hook to record network info.
    features            list defined features
    analyze             Devel tool: Analyze cloud-init logs and data
    devel               Run development tools
    collect-logs        Collect and tar all cloud-init debug info
    clean               Remove logs and artifacts so cloud-init can re-run.
    status              Report cloud-init status or wait on completion.
```

```
[cloud@deploy-1 ~]$ cloud-init -v
cloud-init 0.7.9
[cloud@deploy-1 ~]$ cloud-init --help
usage: cloud-init [-h] [--version] [--file FILES] [--debug] [--force]
                  {init,modules,query,single,dhclient-hook} ...

positional arguments:
  {init,modules,query,single,dhclient-hook}
    init                initializes cloud-init and performs initial modules
    modules             activates modules using a given configuration key
    query               query information stored in cloud-init
    single              run a single module
    dhclient-hook       run the dhclient hookto record network info

optional arguments:
  -h, --help            show this help message and exit
  --version, -v         show program's version number and exit
  --file FILES, -f FILES
                        additional yaml configuration files to use
  --debug, -d           show additional pre-action logging (default: False)
  --force               force running even if no datasource is found (use at
                        your own risk)
```

```
[cloud@deploy-3 ~]$ cloud-init -v
/usr/bin/cloud-init 18.5
[cloud@deploy-3 ~]$ cloud-init --help
usage: /usr/bin/cloud-init [-h] [--version] [--file FILES] [--debug] [--force]

                           {init,modules,single,query,dhclient-hook,features,analyze,devel,collect-logs,clean,status}
                           ...

optional arguments:
  -h, --help            show this help message and exit
  --version, -v         show program's version number and exit
  --file FILES, -f FILES
                        additional yaml configuration files to use
  --debug, -d           show additional pre-action logging (default: False)
  --force               force running even if no datasource is found (use at
                        your own risk)

Subcommands:
  {init,modules,single,query,dhclient-hook,features,analyze,devel,collect-logs,clean,status}
    init                initializes cloud-init and performs initial modules
    modules             activates modules using a given configuration key
    single              run a single module
    query               Query standardized instance metadata from the command
                        line.
    dhclient-hook       Run the dhclient hook to record network info.
    features            list defined features
    analyze             Devel tool: Analyze cloud-init logs and data
    devel               Run development tools
    collect-logs        Collect and tar all cloud-init debug info
    clean               Remove logs and artifacts so cloud-init can re-run.
    status              Report cloud-init status or wait on completion.
```

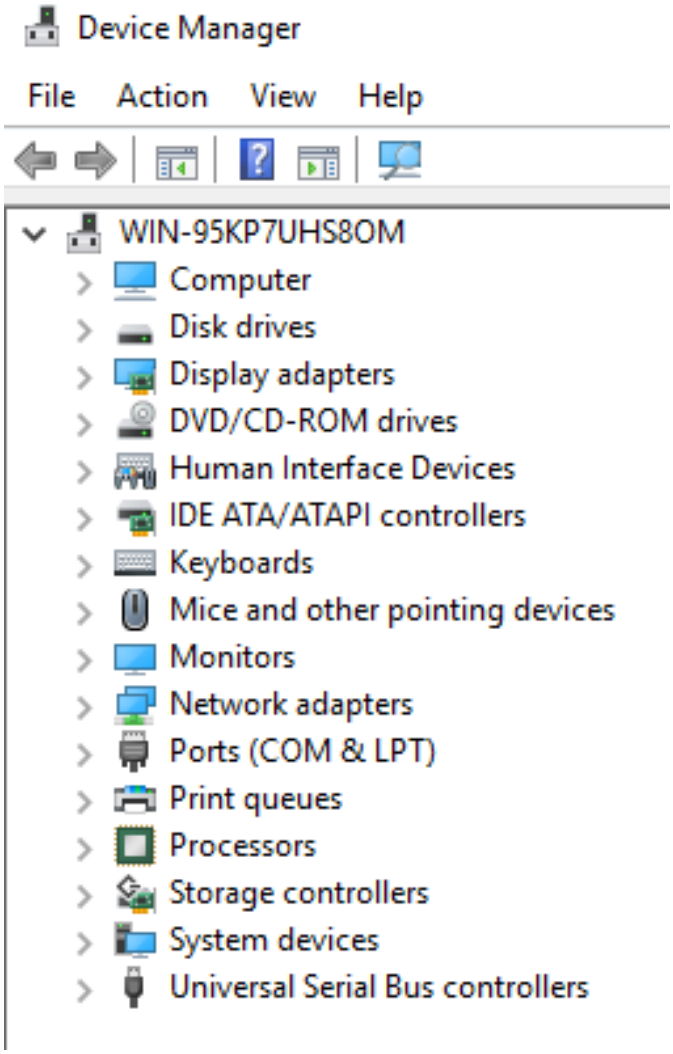
```
cloud@deploy-2:/run/cloud-init$ cloud-init analyze blame
-- Boot Record 01 --
     00.58700s (modules-config/config-grub-dpkg)
     00.46700s (init-network/config-growpart)
     00.37500s (init-network/config-resizefs)
     00.20000s (init-network/config-ssh)
     00.19400s (init-network/config-users-groups)
     00.16300s (init-local/search-NoCloud)
     00.08900s (modules-final/config-keys-to-console)
     00.08000s (modules-config/config-apt-configure)
     00.05500s (modules-final/config-ssh-authkey-fingerprints)
     00.01600s (init-network/check-cache)
     00.01500s (modules-final/config-scripts-user)
     00.00900s (modules-config/config-runcmd)
     00.00400s (modules-final/config-final-message)
     00.00400s (init-network/consume-user-data)
     00.00200s (modules-config/config-timezone)
     00.00100s (modules-final/config-snappy)
     00.00100s (modules-final/config-scripts-vendor)
     00.00100s (modules-final/config-salt-minion)
     00.00100s (modules-final/config-puppet)
     00.00100s (modules-final/config-phone-home)
     00.00100s (modules-final/config-package-update-upgrade-install)
     00.00100s (modules-final/config-lxd)
     00.00100s (modules-config/config-ubuntu-advantage)
     00.00100s (modules-config/config-snap_config)
     00.00100s (modules-config/config-snap)
     00.00100s (modules-config/config-set-passwords)
     00.00100s (modules-config/config-ntp)
     00.00100s (modules-config/config-locale)
     00.00100s (modules-config/config-byobu)
     00.00100s (modules-config/config-apt-pipelining)
     00.00100s (init-network/consume-vendor-data)
     00.00100s (init-network/config-write-files)
     00.00100s (init-network/config-update_hostname)
     00.00100s (init-network/config-seed_random)
     00.00100s (init-network/config-mounts)
     00.00100s (init-network/config-ca-certs)
```

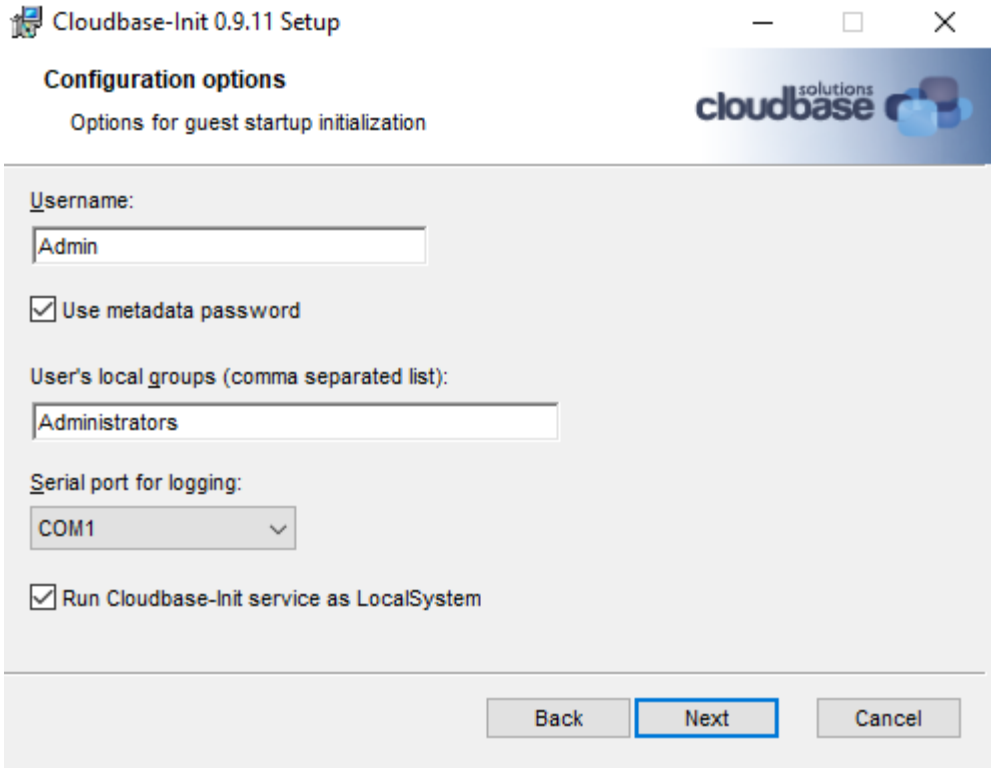
```
[cloud@deploy-3 ~]$ sudo cloud-init analyze blame
-- Boot Record 01 --
     34.06400s (modules-config/config-package-update-upgrade-install)
     00.33700s (init-network/config-growpart)
     00.16000s (modules-final/config-keys-to-console)
     00.13300s (init-network/config-users-groups)
     00.11500s (modules-config/config-set-passwords)
     00.11300s (init-local/search-NoCloud)
     00.10500s (init-network/config-set_hostname)
     00.05200s (init-network/check-cache)
     00.04500s (init-network/config-resizefs)
     00.03800s (modules-final/config-ssh-authkey-fingerprints)
     00.01900s (modules-config/config-mounts)
     00.01800s (modules-final/config-scripts-user)
     00.01400s (modules-final/config-power-state-change)
     00.01300s (init-network/consume-user-data)
     00.00600s (modules-config/config-salt-minion)
     00.00500s (init-network/config-update_hostname)
     00.00500s (init-network/config-ssh)
     00.00400s (modules-final/config-final-message)
     00.00400s (modules-config/config-locale)
     00.00300s (modules-config/config-timezone)
     00.00200s (modules-final/config-rightscale_userdata)
     00.00200s (modules-final/config-phone-home)
     00.00200s (modules-config/config-yum-add-repo)
     00.00200s (modules-config/config-runcmd)
     00.00200s (modules-config/config-rh_subscription)
     00.00200s (modules-config/config-puppet)
     00.00200s (modules-config/config-chef)
     00.00100s (modules-final/config-scripts-per-once)
     00.00100s (modules-final/config-scripts-per-instance)
     00.00100s (modules-config/config-mcollective)
     00.00100s (init-network/config-write-files)
     00.00100s (init-network/config-update_etc_hosts)
     00.00100s (init-network/config-rsyslog)
     00.00000s (modules-final/config-scripts-per-boot)
     00.00000s (modules-config/config-disable-ec2-metadata)
     00.00000s (init-network/consume-vendor-data)
     00.00000s (init-network/config-migrator)
     00.00000s (init-network/config-bootcmd)
     00.00000s (init-local/check-cache)
```

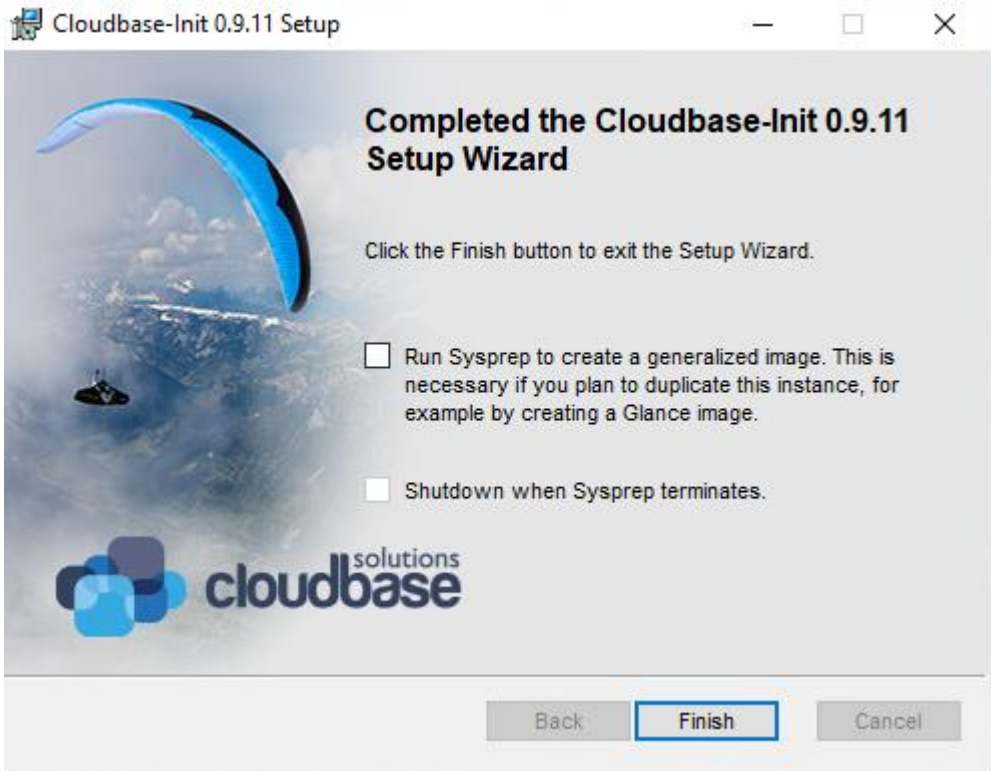
```
cloud@deploy-2:/run/cloud-init$ cloud-init analyze boot
-- Most Recent Boot Record --
    Kernel Started at: 2020-01-12 19:32:45.305890
    Kernel ended boot at: 2020-01-12 19:32:52.213325
    Kernel time to boot (seconds): 6.907434940338135
    Cloud-init activated by systemd at: 2020-01-12 19:32:56.283861
    Time between Kernel end boot and Cloud-init activation (seconds): 4.070536136627197
    Cloud-init start: 2020-01-12 19:32:56.966000
successful
```

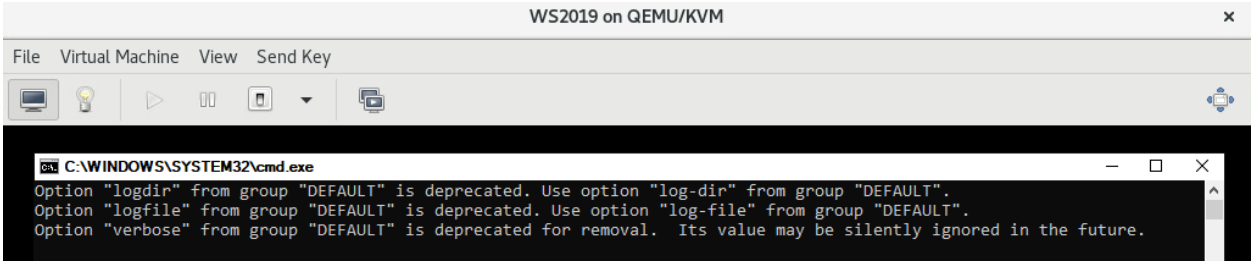
```
cloud@deploy-2:/var/log$ cloud-init query --all
{
 "_beta_keys": [
  "subplatform"
 ],
 "availability_zone": null,
 "base64_encoded_keys": [],
 "cloud_name": "unknown",
 "ds": {
  "_doc": "EXPERIMENTAL: The structure and format of content scoped under the 'ds' key may change in subsequent releases of clou
d-init.",
  "meta_data": {
   "dsmode": "net",
   "instance_id": "nocloud",
   "local_hostname": "deploy-2"
  }
 },
 "instance_id": "nocloud",
 "local_hostname": "deploy-2",
 "platform": "nocloud",
 "public_ssh_keys": [],
 "region": null,
 "sensitive_keys": [],
 "subplatform": "config-disk (/dev/sr0)",
 "userdata": "<redacted for non-root user> file:/var/lib/cloud/instance/user-data.txt",
 "v1": {
  "_beta_keys": [
   "subplatform"
  ],
  "availability_zone": null,
  "cloud_name": "unknown",
  "instance_id": "nocloud",
  "local_hostname": "deploy-2",
  "platform": "nocloud",
  "public_ssh_keys": [],
  "region": null,
  "subplatform": "config-disk (/dev/sr0)"
 },
 "vendordata": "<redacted for non-root user> file:/var/lib/cloud/instance/vendor-data.txt"
}
```

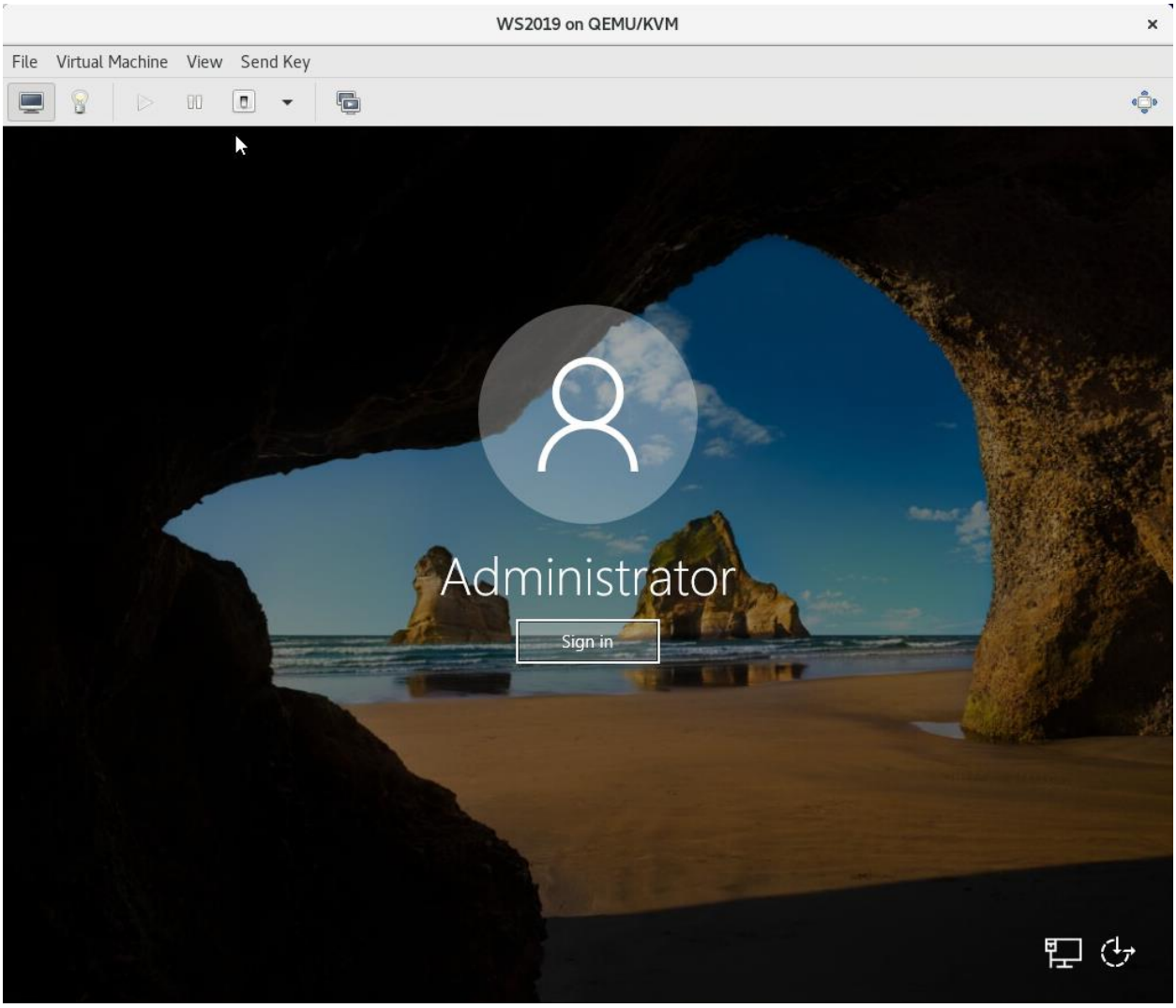
Chapter 10: Automated Windows Guest Deployment and Customization

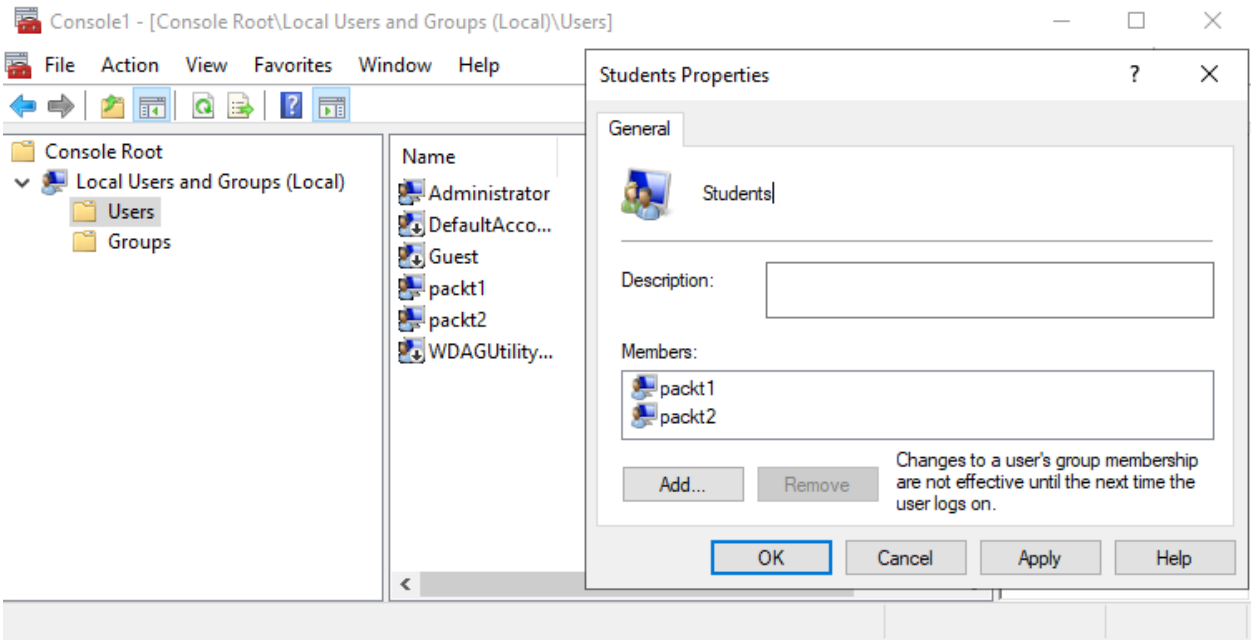


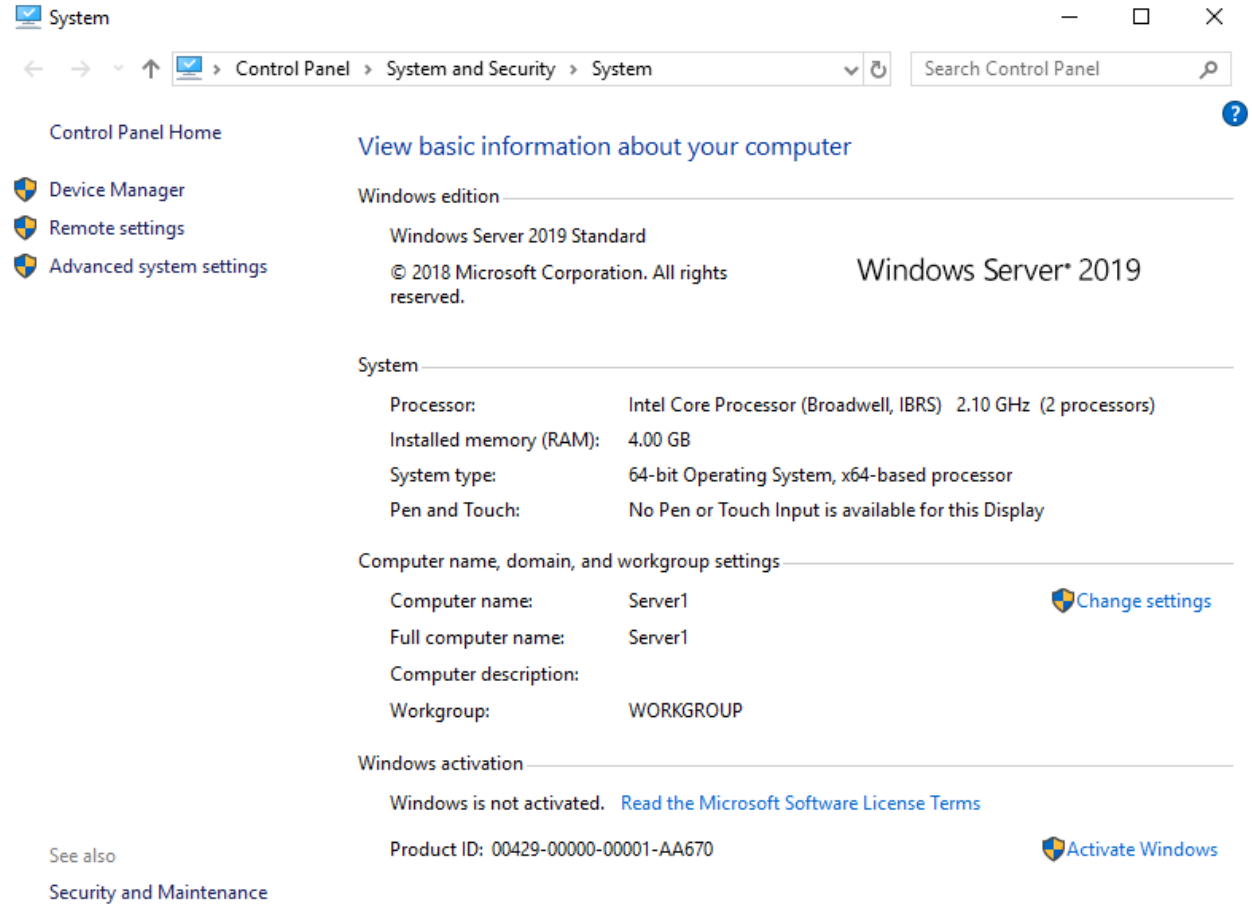

Cloudbase-Init 0.9.11 Setup
Configuration options
Options for guest startup initialization
cloudbase solutions
Username:
Admin
Use metadata password
User's local groups (comma separated list):
Administrators
Serial port for logging:
COM1
Run Cloudbase-Init service as LocalSystem
Back
Next
Cancel

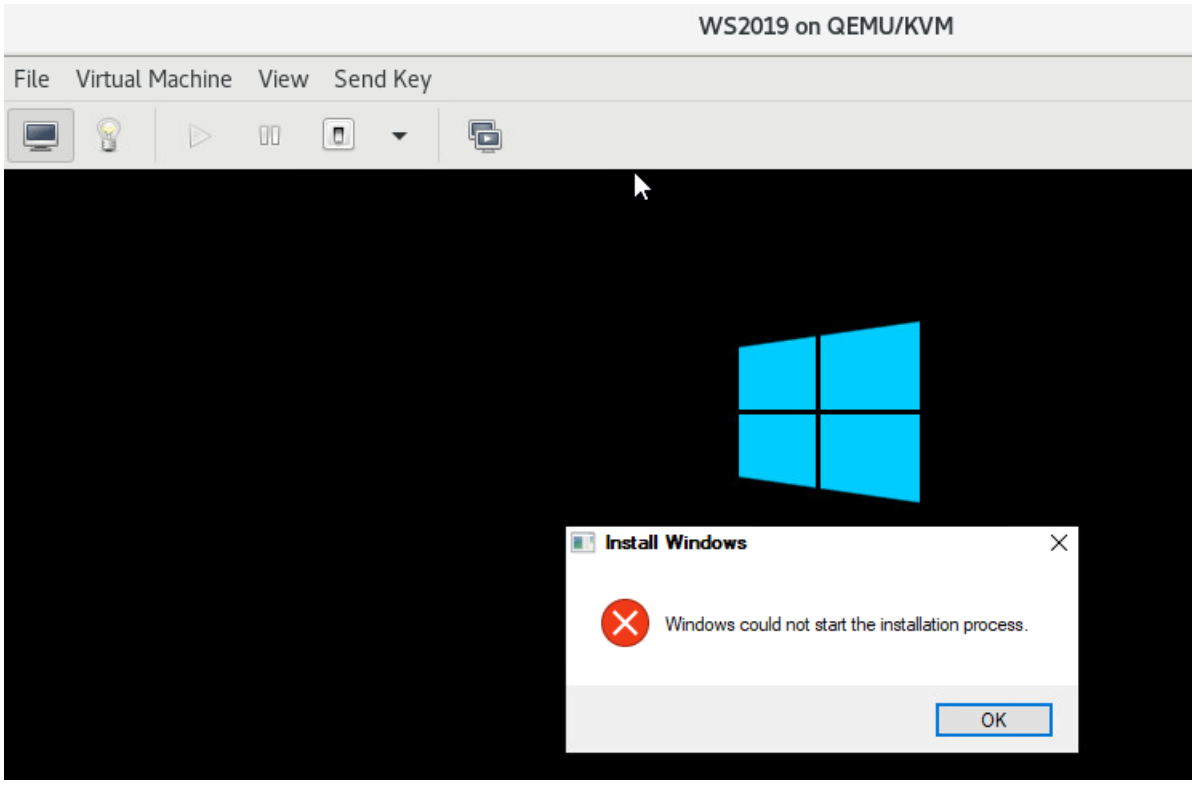

Cloudbase-Init 0.9.11 Setup
Completed the Cloudbase-Init 0.9.11 Setup Wizard
Click the Finish button to exit the Setup Wizard.
Run Sysprep to create a generalized image. This is necessary if you plan to duplicate this instance, for example by creating a Glance image.
Shutdown when Sysprep terminates.
cloudbase solutions
Back
Finish
Cancel


WS2019 on QEMU/KVM
File Virtual Machine View Send Key
C:\WINDOWS\SYSTEM32\cmd.exe
Option "logdir" from group "DEFAULT" is deprecated. Use option "log-dir" from group "DEFAULT".
Option "logfile" from group "DEFAULT" is deprecated. Use option "log-file" from group "DEFAULT".
Option "verbose" from group "DEFAULT" is deprecated for removal. Its value may be silently ignored in the future.

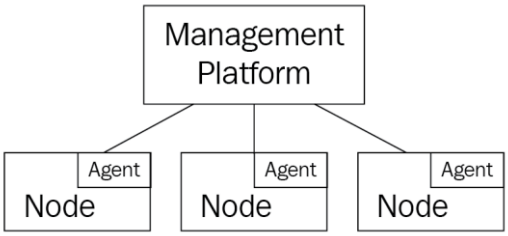

WS2019 on QEMU/KVM
File Virtual Machine View Send Key
Administrator
Sign in

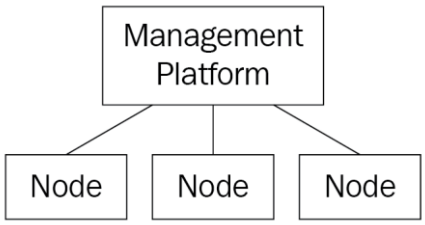

Console1 - [Console Root\Local Users and Groups (Local)\Users]
File Action View Favorites Window Help
Console Root
Local Users and Groups (Local)
Users
Groups
Name
Administrator
DefaultAcco...
Guest
packt1
packt2
WDAGUtility...
Students Properties
General
Students
Description:
Members:
packt1
packt2
Add...
Remove
Changes to a user's group membership are not effective until the next time the user logs on.
OK
Cancel
Apply
Help

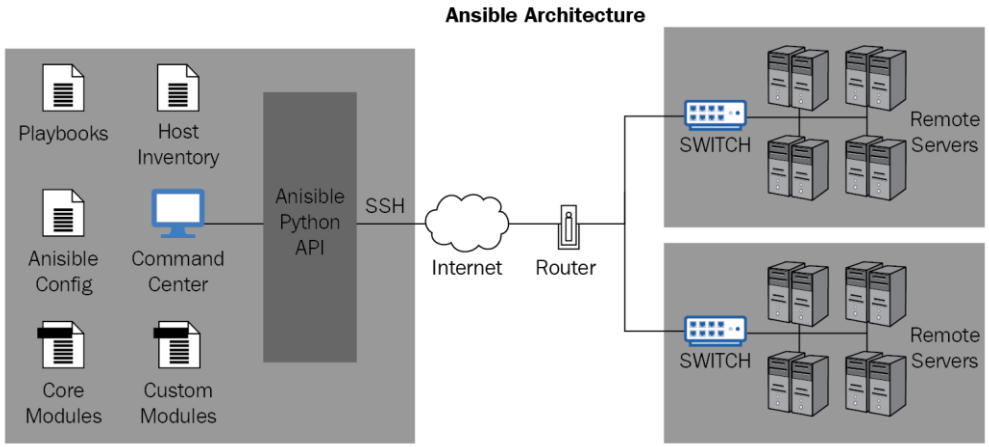

System
Control Panel › System and Security › System
Search Control Panel
Control Panel Home
Device Manager
Remote settings
Advanced system settings
View basic information about your computer
Windows edition
Windows Server 2019 Standard
© 2018 Microsoft Corporation. All rights reserved.
Windows Server 2019
System
Processor: Intel Core Processor (Broadwell, IBRS) 2.10 GHz (2 processors)
Installed memory (RAM): 4.00 GB
System type: 64-bit Operating System, x64-based processor
Pen and Touch: No Pen or Touch Input is available for this Display
Computer name, domain, and workgroup settings
Computer name: Server1
Change settings
Full computer name: Server1
Computer description:
Workgroup: WORKGROUP
Windows activation
Windows is not activated. Read the Microsoft Software License Terms
Product ID: 00429-00000-00001-AA670
Activate Windows
See also
Security and Maintenance

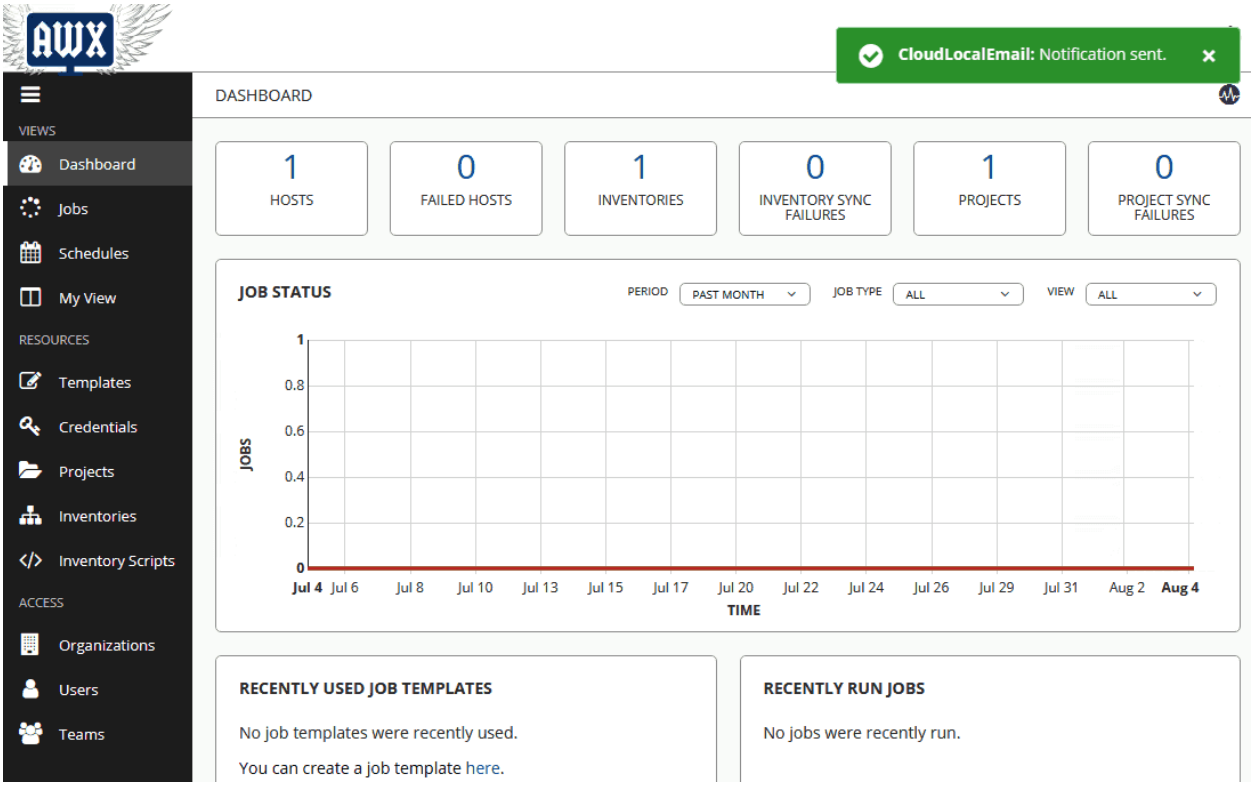

WS2019 on QEMU/KVM
File
Virtual Machine
View
Send Key
Install Windows
Windows could not start the installation process.
OK

Chapter 11: Ansible and Scripting for Orchestration and Automation










```
[root@awxdemo ~]# git clone -b 13.0.0 https://github.com/ansible/awx.git
Cloning into 'awx'...
remote: Enumerating objects: 1, done.
remote: Counting objects: 100% (1/1), done.
remote: Total 246524 (delta 0), reused 0 (delta 0), pack-reused 246523
Receiving objects: 100% (246524/246524), 228.71 MiB | 4.23 MiB/s, done.
Resolving deltas: 100% (190421/190421), done.
Note: checking out '69589821ce2fd49c8db8b60bf34ff6b4b0df683a'.

You are in 'detached HEAD' state. You can look around, make experimental
changes and commit them, and you can discard any commits you make in this
state without impacting any branches by performing another checkout.

If you want to create a new branch to retain commits you create, you may
do so (now or later) by using -b with the checkout command again. Example:

  git checkout -b <new-branch-name>

[root@awxdemo ~]#
```

```
[root@awxdemo ~]# dnf config-manager --add-repo=https://download.docker.com/linu
x/centos/docker-ce.repo
Adding repo from: https://download.docker.com/linux/centos/docker-ce.repo
```

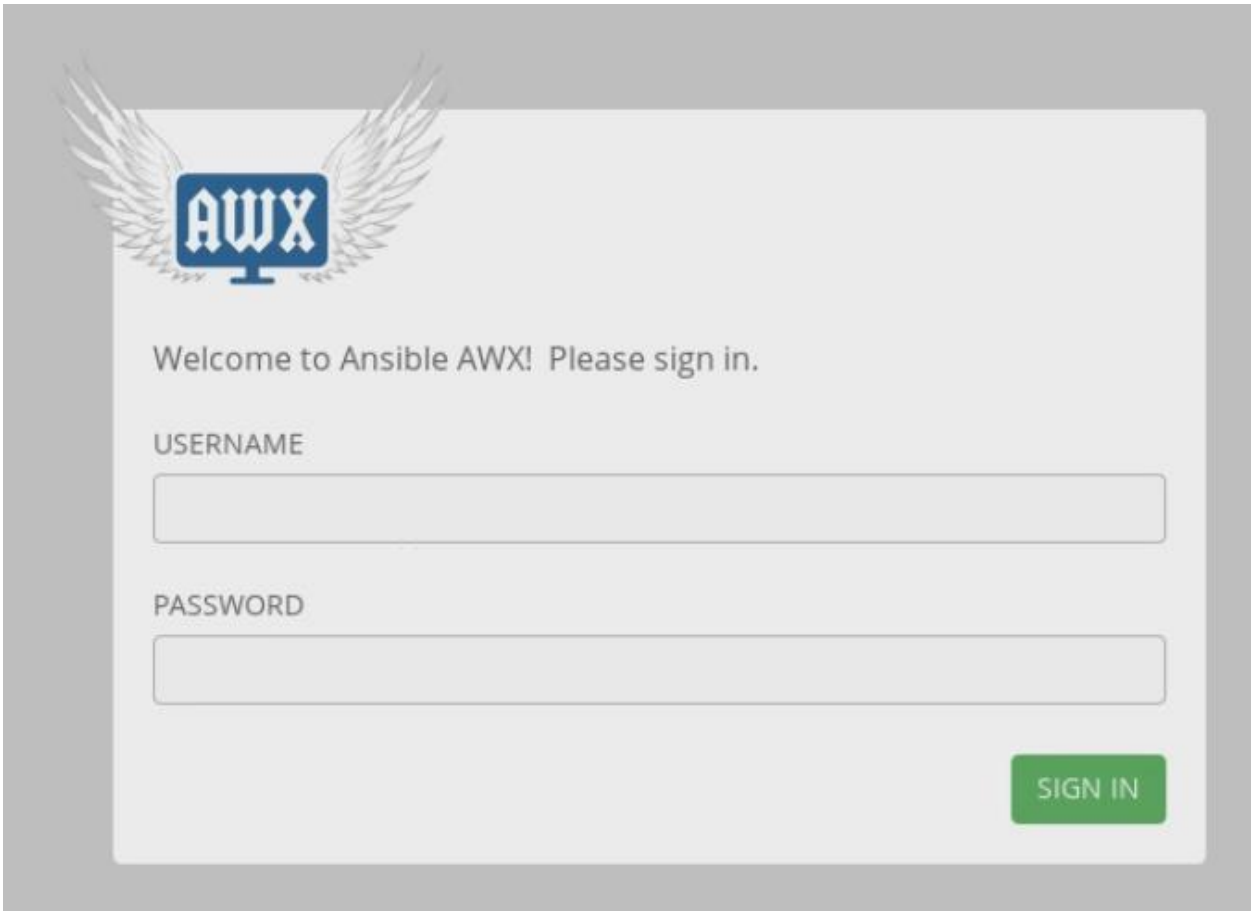
```
Installed:
  containerd.io-1.2.0-3.el7.x86_64          docker-ce-3:18.09.1-3.el7.x86_64
  docker-ce-cli-1:19.03.12-3.el7.x86_64     libcgroup-0.41-19.el8.x86_64

Skipped:
  docker-ce-3:19.03.12-3.el7.x86_64

Complete!
[root@awxdemo ~]# systemctl start docker
[root@awxdemo ~]# systemctl enable docker
Created symlink /etc/systemd/system/multi-user.target.wants/docker.service → /us
r/lib/systemd/system/docker.service.
[root@awxdemo ~]# docker --version
Docker version 19.03.12, build 48a66213fe
```

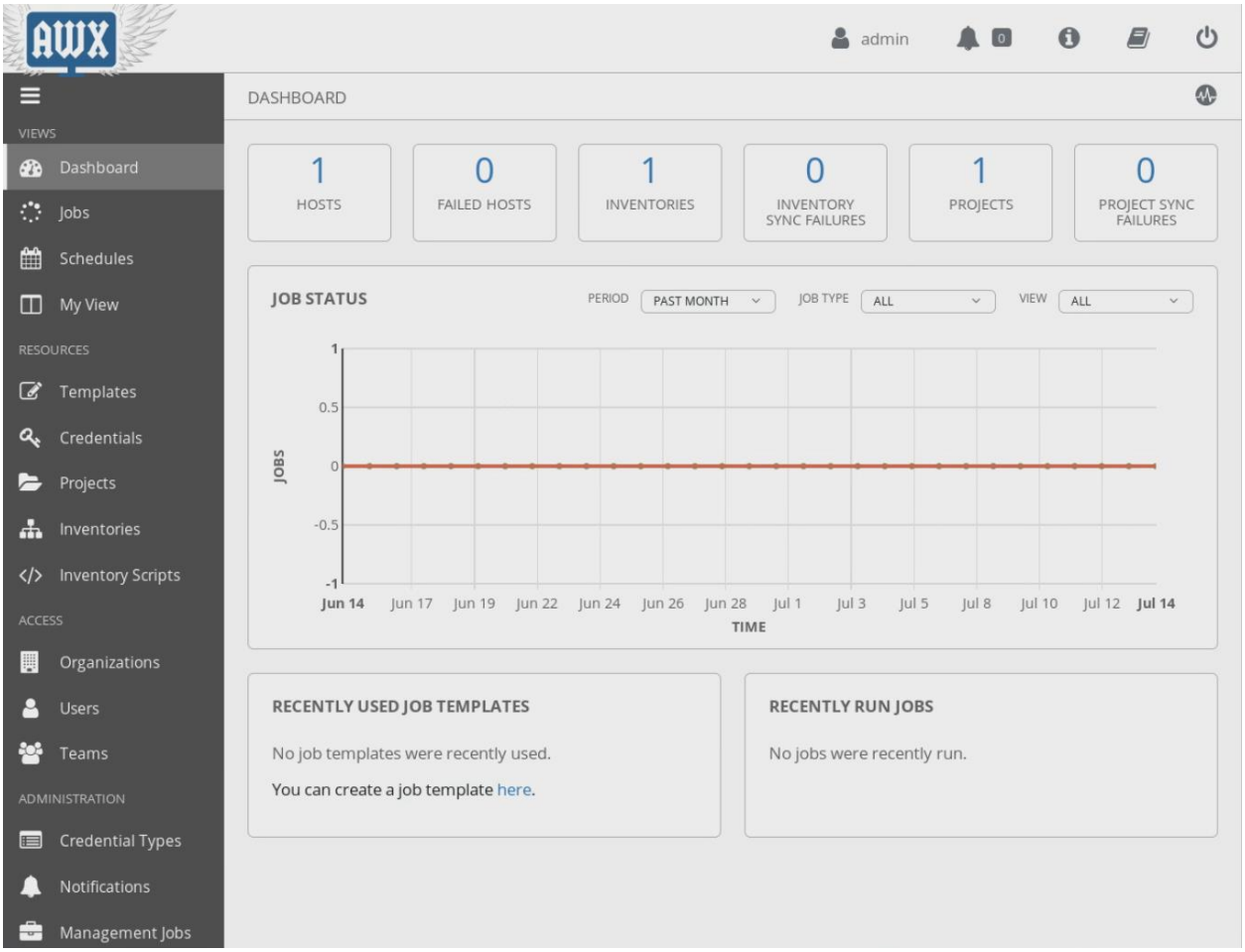
```
[root@awxdemo ~]# dnf install python
Last metadata expiration check: 0:14:53 ago on Wed 15 Jul 2020 05:07:09 PM EDT.
No match for argument: python
There are following alternatives for "python": python2, python36, python38
Error: Unable to find a match: python
[root@awxdemo ~]# dnf install python38
```

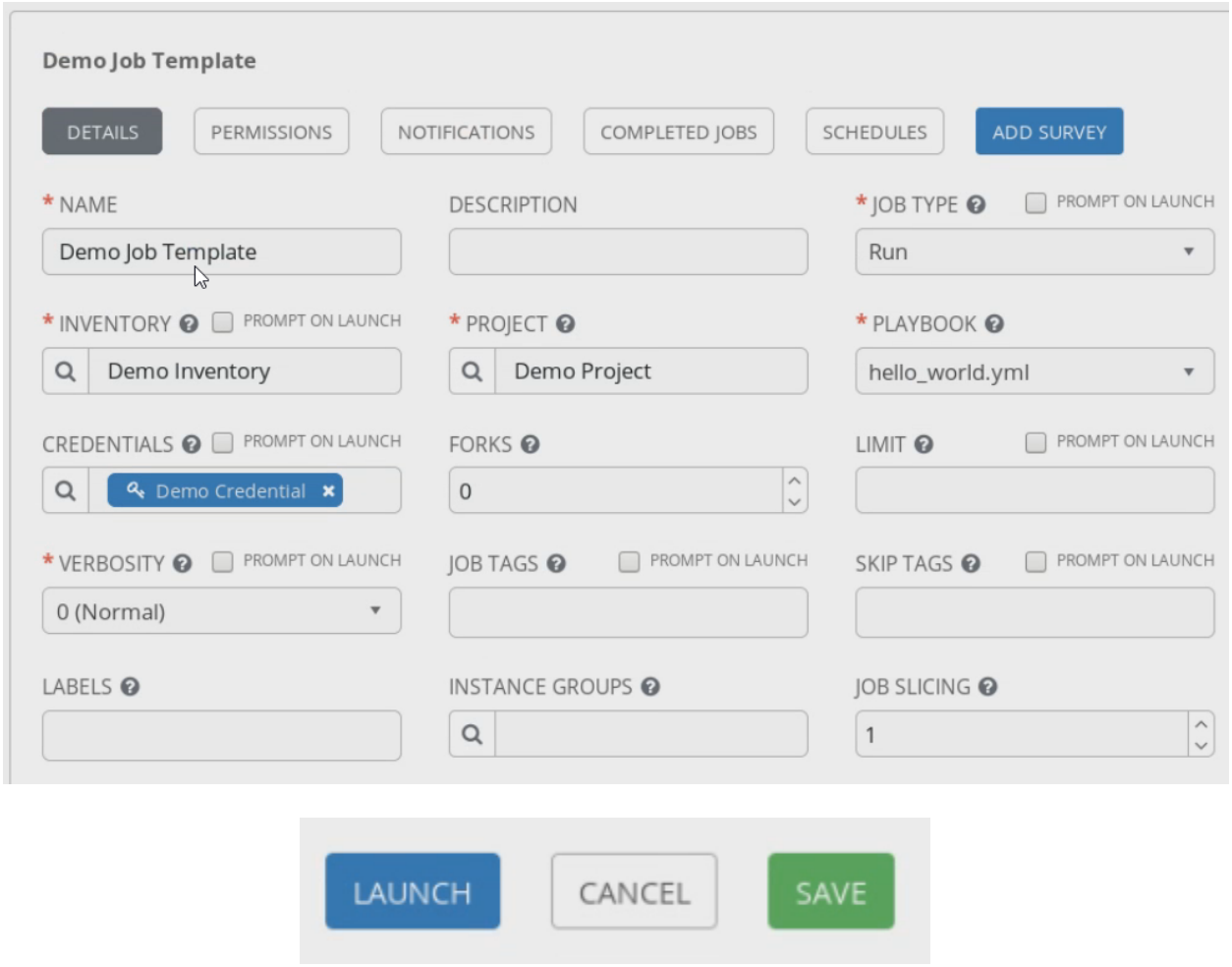
```
[root@awxdemo ~]# dnf install make
Last metadata expiration check: 0:17:07 ago on Wed 15 Jul 2020 05:07:09 PM EDT.
Dependencies resolved.
================================================================================
 Package       Architecture    Version                   Repository       Size
================================================================================
Installing:
 make          x86_64          1:4.2.1-10.el8            BaseOS          498 k

Transaction Summary
================================================================================
Install  1 Package
```

```
[root@awxdemo installer]# docker ps
CONTAINER ID        IMAGE                COMMAND                  CREATED
      STATUS              PORTS                NAMES
ba1dabec8a2a        ansible/awx:13.0.0   "tini -- /usr/bin/la…"   4 minutes ago
      Up 4 minutes        8052/tcp             awx_task
a5ba16f3529f        ansible/awx:13.0.0   "tini -- /bin/sh -c …"   4 minutes ago
      Up 4 minutes        0.0.0.0:80->8052/tcp   awx_web
8d5ae3c600f8        redis                "docker-entrypoint.s…"   4 minutes ago
      Up 4 minutes        6379/tcp             awx_redis
09ed8671d88a        postgres:10          "docker-entrypoint.s…"   4 minutes ago
      Up 4 minutes        5432/tcp             awx_postgres
```

```
[root@awxdemo installer]# docker logs -f awx_task
Using /etc/ansible/ansible.cfg as config file
127.0.0.1 | SUCCESS => {
    "ansible_facts": {
        "discovered_interpreter_python": "/usr/libexec/platform-python"
    },
    "changed": false,
    "elapsed": 0,
    "match_groupdict": {},
    "match_groups": [],
    "path": null,
    "port": 5432,
    "search_regex": null,
    "state": "started"
}
Using /etc/ansible/ansible.cfg as config file
127.0.0.1 | SUCCESS => {
    "ansible_facts": {
        "discovered_interpreter_python": "/usr/libexec/platform-python"
    },
```


AWX
Welcome to Ansible AWX! Please sign in.
USERNAME
PASSWORD
SIGN IN

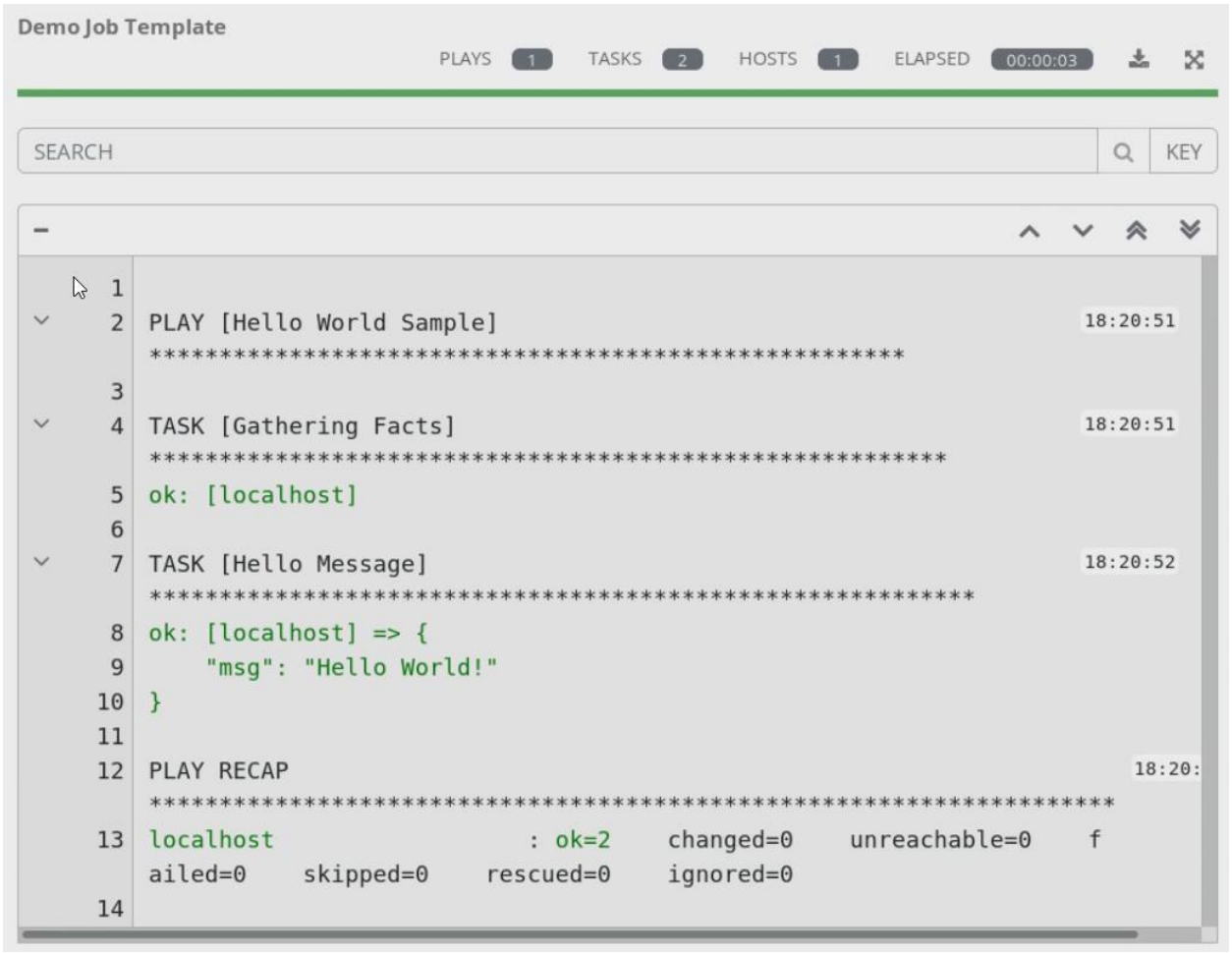

AWX
admin
0
DASHBOARD
VIEWS
Dashboard
Jobs
Schedules
My View
RESOURCES
Templates
Credentials
Projects
Inventories
Inventory Scripts
ACCESS
Organizations
Users
Teams
ADMINISTRATION
Credential Types
Notifications
Management Jobs
1
HOSTS
0
FAILED HOSTS
1
INVENTORIES
0
INVENTORY SYNC FAILURES
1
PROJECTS
0
PROJECT SYNC FAILURES
JOB STATUS
PERIOD
PAST MONTH
JOB TYPE
ALL
VIEW
ALL
1
0.5
0
-0.5
-1
JOBS
Jun 14
Jun 17
Jun 19
Jun 22
Jun 24
Jun 26
Jun 28
Jul 1
Jul 3
Jul 5
Jul 8
Jul 10
Jul 12
Jul 14
TIME
RECENTLY USED JOB TEMPLATES
No job templates were recently used.
You can create a job template here.
RECENTLY RUN JOBS
No jobs were recently run.


Demo Job Template
DETAILS
PERMISSIONS
NOTIFICATIONS
COMPLETED JOBS
SCHEDULES
ADD SURVEY
* NAME
Demo Job Template
DESCRIPTION
* JOB TYPE
PROMPT ON LAUNCH
Run
* INVENTORY
PROMPT ON LAUNCH
Demo Inventory
* PROJECT
Demo Project
* PLAYBOOK
hello_world.yml
CREDENTIALS
PROMPT ON LAUNCH
Demo Credential
FORKS
0
LIMIT
PROMPT ON LAUNCH
* VERBOSITY
PROMPT ON LAUNCH
0 (Normal)
JOB TAGS
PROMPT ON LAUNCH
SKIP TAGS
PROMPT ON LAUNCH
LABELS
INSTANCE GROUPS
JOB SLICING
1

LAUNCH
CANCEL
SAVE

DETAILS

STATUS	Successful
STARTED	7/15/2020 6:20:49 PM
FINISHED	7/15/2020 6:20:53 PM
JOB TEMPLATE	Demo Job Template
JOB TYPE	Run
LAUNCHED BY	admin
INVENTORY	Demo Inventory
PROJECT	Demo Project
REVISION	347e44f
PLAYBOOK	hello_world.yml
CREDENTIAL	Demo Credential
ENVIRONMENT	/var/lib/awx/venv/ansible
EXECUTION NODE	awx
INSTANCE GROUP	tower


Demo Job Template
PLAYS 1
TASKS 2
HOSTS 1
ELAPSED 00:00:03
SEARCH
KEY
1
2 PLAY [Hello World Sample] 18:20:51
****
3
4 TASK [Gathering Facts] 18:20:51
****
5 ok: [localhost]
6
7 TASK [Hello Message] 18:20:52
****
8 ok: [localhost] => {
9 "msg": "Hello World!"
10 }
11
12 PLAY RECAP 18:20:
****
13 localhost : ok=2 changed=0 unreachable=0 f
ailed=0 skipped=0 rescued=0 ignored=0
14

```
[root@vm0-101 ~]# ansible all -m ping
10.0.0.1 | SUCCESS => {
    "ansible_facts": {
        "discovered_interpreter_python": "/usr/bin/python"
    },
    "changed": false,
    "ping": "pong"
}
10.0.0.4 | SUCCESS => {
    "ansible_facts": {
        "discovered_interpreter_python": "/usr/bin/python"
    },
    "changed": false,
    "ping": "pong"
}
10.0.0.2 | SUCCESS => {
    "ansible_facts": {
        "discovered_interpreter_python": "/usr/bin/python"
    },
    "changed": false,
    "ping": "pong"
}
10.0.0.3 | SUCCESS => {
    "ansible_facts": {
        "discovered_interpreter_python": "/usr/bin/python"
    },
    "changed": false,
    "ping": "pong"
}
```

```
[root@vm0-101 ~]# ansible all -m shell -a "hostname"
10.0.0.3 | CHANGED | rc=0 >>
vm0-104.vua.cloud

10.0.0.1 | CHANGED | rc=0 >>
vm0-101.vua.cloud

10.0.0.4 | CHANGED | rc=0 >>
vm0-103.vua.cloud

10.0.0.2 | CHANGED | rc=0 >>
vm0-102.vua.cloud
```

```
[root@vm0-101 ~]# ansible all -m yum -a "name=lighttpd state=absent"
10.0.0.2 | SUCCESS => {
    "ansible_facts": {
        "discovered_interpreter_python": "/usr/bin/python"
    },
    "changed": false,
    "msg": "",
    "rc": 0,
    "results": [
        "lighttpd is not installed"
    ]
}
10.0.0.3 | SUCCESS => {
    "ansible_facts": {
        "discovered_interpreter_python": "/usr/bin/python"
    },
    "changed": false,
    "msg": "",
    "rc": 0,
    "results": [
        "lighttpd is not installed"
    ]
}
10.0.0.4 | SUCCESS => {
    "ansible_facts": {
        "discovered_interpreter_python": "/usr/bin/python"
    },
    "changed": false,
    "msg": "",
    "rc": 0,
    "results": [
        "lighttpd is not installed"
    ]
}
```

```
[root@vm0-101 ~]# ansible all -m yum -a "name=lighttpd state=present"
10.0.0.4 | CHANGED => {
    "ansible_facts": {
        "discovered_interpreter_python": "/usr/bin/python"
    },
    "changed": true,
    "changes": {
        "installed": [
            "lighttpd"
        ]
    },
    "msg": "",
    "rc": 0,
    "results": [
        "Loaded plugins: fastestmirror, langpacks\nLoading mirror speeds from cached hostfile\n * base: centos.lonyai
.com\n * epel: mirror.niif.hu\n * extras: centos.mirror.ba\n * updates: centos.lonyai.com\nResolving Dependencies\n--
> Running transaction check\n---> Package lighttpd.x86_64 0:1.4.54-1.el7 will be installed\n--> Processing Dependency
: libfam.so.0()(64bit) for package: lighttpd-1.4.54-1.el7.x86_64\n--> Running transaction check\n---> Package gamin.x
86_64 0:0.1.10-16.el7 will be installed\n--> Finished Dependency Resolution\n\nDependencies Resolved\n\n==========
================================================================\n Package            Arch             Version
            Repository     Size\n================================================================================\nIn
stalling:\n lighttpd         x86_64          1.4.54-1.el7             epel          438 k\nInstalling for dependenci
es:\n gamin              x86_64          0.1.10-16.el7            base          128 k\n\nTransaction Summary\n========
================================================================\nInstall  1 Package (+1 Dependent package)\n
\nTotal download size: 567 k\nInstalled size: 1.6 M\nDownloading packages:\n----------------------------------------
----------------------------------------\nTotal                                                    1.5 MB/s | 567 kB  00:00
    \nRunning transaction check\nRunning transaction test\nTransaction test succeeded\nRunning transaction\n  Install
ing : gamin-0.1.10-16.el7.x86_64                                          1/2 \n  Installing : lighttpd-1.4.54-1.el7.x86_64
                                2/2 \n  Verifying  : lighttpd-1.4.54-1.el7.x86_64                                1/2
 \n  Verifying  : gamin-0.1.10-16.el7.x86_64                                  2/2 \n\nInstalled:\n  lighttpd.x86_64
0:1.4.54-1.el7                                                \n\nDependency Installed:\n  gamin.x86_64 0:0.1.10-16.e
l7                                                \n\nComplete!\n"
    ]
}
```



```
[root@vm0-101 ~]# ansible all -m yum -a "name=lighttpd state=present"
10.0.0.3 | SUCCESS => {
    "ansible_facts": {
        "discovered_interpreter_python": "/usr/bin/python"
    },
    "changed": false,
    "msg": "",
    "rc": 0,
    "results": [
        "lighttpd-1.4.54-1.el7.x86_64 providing lighttpd is already installed"
    ]
}
10.0.0.2 | SUCCESS => {
    "ansible_facts": {
        "discovered_interpreter_python": "/usr/bin/python"
    },
    "changed": false,
    "msg": "",
    "rc": 0,
    "results": [
        "lighttpd-1.4.54-1.el7.x86_64 providing lighttpd is already installed"
    ]
}
10.0.0.1 | SUCCESS => {
    "ansible_facts": {
        "discovered_interpreter_python": "/usr/bin/python"
    },
    "changed": false,
    "msg": "",
    "rc": 0,
```

```
-
    - name: Install KVM
      hosts: all
      remote_user: root

      roles:
        - checkVirtualization
        - installKVM

---
- name: Check for CPU Virtualization
  shell: "lscpu | grep -i virtualization"
  register: result
  failed_when: "result.rc != 0"
```

```yaml
---
- name: Installing KVM Packages
  package:
    name: "{{ item }}"
    state: present
  with_items:
    - qemu-kvm
    - libvirt
    - libvirt-python
    - libguestfs-tools
    - virt-install

- name: Enable and Start libvirtd
  systemd:
    name: libvirtd
    state: started
    enabled: yes

- name: Verify KVM module is loaded
  shell: "lsmod | grep -i kvm"
  register: result
  failed_when: "result.rc != 0"
```

```
PLAY [Install KVM] *************************************************************************

TASK [Gathering Facts] *********************************************************************
ok: [10.0.0.3]
ok: [10.0.0.2]
ok: [10.0.0.4]
ok: [10.0.0.1]

TASK [checkVirtualization : Check for CPU Virtualization] **********************************
changed: [10.0.0.4]
changed: [10.0.0.2]
changed: [10.0.0.1]
changed: [10.0.0.3]

TASK [installKVM : Installing KVM Packages] ************************************************
ok: [10.0.0.2] => (item=qemu-kvm)
ok: [10.0.0.4] => (item=qemu-kvm)
ok: [10.0.0.3] => (item=qemu-kvm)
ok: [10.0.0.1] => (item=qemu-kvm)
changed: [10.0.0.1] => (item=libvirt)
changed: [10.0.0.2] => (item=libvirt)
changed: [10.0.0.4] => (item=libvirt)
changed: [10.0.0.3] => (item=libvirt)
changed: [10.0.0.1] => (item=libvirt-python)
changed: [10.0.0.4] => (item=libvirt-python)
changed: [10.0.0.3] => (item=libvirt-python)
changed: [10.0.0.2] => (item=libvirt-python)
changed: [10.0.0.2] => (item=libguestfs-tools)
changed: [10.0.0.4] => (item=libguestfs-tools)
changed: [10.0.0.1] => (item=libguestfs-tools)
changed: [10.0.0.3] => (item=libguestfs-tools)
changed: [10.0.0.2] => (item=virt-install)
changed: [10.0.0.3] => (item=virt-install)
changed: [10.0.0.4] => (item=virt-install)
changed: [10.0.0.1] => (item=virt-install)


TASK [installKVM : Enable and Start libvirtd] **********************************************
changed: [10.0.0.3]
changed: [10.0.0.4]
changed: [10.0.0.2]
changed: [10.0.0.1]

TASK [installKVM : Verify KVM module is loaded] ********************************************
changed: [10.0.0.1]
changed: [10.0.0.3]
changed: [10.0.0.4]
changed: [10.0.0.2]

PLAY RECAP *********************************************************************************
10.0.0.1                   : ok=5    changed=4    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0
10.0.0.2                   : ok=5    changed=4    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0
10.0.0.3                   : ok=5    changed=4    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0
10.0.0.4                   : ok=5    changed=4    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0
```

```
[root@vm0-101 ~]# ansible all -m shell -a "virsh list --all"
10.0.0.2 | CHANGED | rc=0 >>
 Id    Name                           State
----------------------------------------------------

10.0.0.1 | CHANGED | rc=0 >>
 Id    Name                           State
----------------------------------------------------

10.0.0.4 | CHANGED | rc=0 >>
 Id    Name                           State
----------------------------------------------------

10.0.0.3 | CHANGED | rc=0 >>
 Id    Name                           State
----------------------------------------------------
```

```
---
- name: download Centos core image
  hosts: all
  tasks:
   - name: download from official repository
     get_url:
        url: http://mirror.eu.oneandone.net/linux/distributions/centos/7.6.1810/isos/x86_64/CentOS-7-x86_64-Minimal-1810.iso
        dest: /var/lib/libvirt/boot/
```

```
[root@vm0-101 ~]# ansible all -m shell -a "ls -al /var/lib/libvirt/boot"
10.0.0.3 | CHANGED | rc=0 >>
total 940032
drwx--x--x.  2 root root        46 Sep  6 22:05 .
drwxr-xr-x. 10 root root       117 Sep  6 16:58 ..
-rw-r--r--.  1 root root 962592768 Sep  6 22:05 CentOS-7-x86_64-Minimal-1810.iso

10.0.0.2 | CHANGED | rc=0 >>
total 940032
drwx--x--x.  2 root root        46 Sep  6 22:06 .
drwxr-xr-x. 10 root root       117 Sep  6 16:58 ..
-rw-r--r--.  1 root root 962592768 Sep  6 22:06 CentOS-7-x86_64-Minimal-1810.iso

10.0.0.4 | CHANGED | rc=0 >>
total 940032
drwx--x--x.  2 root root        46 Sep  6 22:06 .
drwxr-xr-x. 10 root root       117 Sep  6 16:58 ..
-rw-r--r--.  1 root root 962592768 Sep  6 22:06 CentOS-7-x86_64-Minimal-1810.iso

10.0.0.1 | CHANGED | rc=0 >>
total 940032
drwx--x--x.  2 root root        46 Sep  6 22:06 .
drwxr-xr-x. 10 root root       117 Sep  6 16:58 ..
-rw-r--r--.  1 root root 962592768 Sep  6 22:06 CentOS-7-x86_64-Minimal-1810.iso
```

```
[root@vm0-101 virt-manager]# ansible all -m shell -a "virsh list"
10.0.0.3 | CHANGED | rc=0 >>
 Id    Name                           State
----------------------------------------------------
 2     COS7Core                       running

10.0.0.4 | CHANGED | rc=0 >>
 Id    Name                           State
----------------------------------------------------
 2     COS7Core                       running

10.0.0.1 | CHANGED | rc=0 >>
 Id    Name                           State
----------------------------------------------------
 4     COS7Core                       running

10.0.0.2 | CHANGED | rc=0 >>
 Id    Name                           State
----------------------------------------------------
 2     COS7Core                       running
```

```
#cloud-config
package_upgrade: true
users:
    - name: ansible
      groups: wheel
      lock_passwd: false
      passwd: F1AppspmE+Lz8lMLW2PK5ohcuogevH
      shell: /bin/bash
      sudo: ['ALL=(ALL) NOPASSWD:ALL']
      ssh-authorized-keys:
       - ssh-rsa AAAAB3NzaC1yc2EAAAADAQABAAABAQDf7E8+1x0AW3WxezOmx1tOrLx
```

```
[root@vm0-101 cloud1]# ls -alh /clouddeploy/
total 899M
drwxr-xr-x.  2 root root   71 Sep  9 18:32 .
dr-xr-xr-x. 18 root root  243 Sep  9 18:07 ..
-rw-r--r--.  1 root root 899M Aug  8 15:30 CentOS-7-x86_64-GenericCloud-1907.qcow2
-rw-r--r--.  1 root root 366K Sep  9 18:32 config.iso
```

```
---
  - name: download Centos core image
    hosts: cloudhosts
    tasks:
     - name: Copy to cloud instance
       copy:
          src: /clouddeploy/CentOS-7-x86_64-GenericCloud-1907.qcow2
          dest: /var/lib/libvirt/images/cloudsrv1/
          owner: qemu
          group: qemu
          mode: u=rw,g=rw,o=r

     - name: Copy cloud-init configuration
       copy:
          src: /clouddeploy/config.iso
          dest: /var/lib/libvirt/images/cloudsrv1/
          owner: qemu
          group: qemu
          mode: u=rw,g=rw,o=r

     - name: Create machine
       command: >
                virt-install --name=COS7Cloud --ram=1024 --vcpus=1 --os-type=linux --os-variant=rhel7
                --disk path=/var/lib/libvirt/images/cloudsrv1/CentOS-7-x86_64-GenericCloud-1907.qcow2,device=disk
                --disk /var/lib/libvirt/images/cloudsrv1/config.iso,device=cdrom --graphics none --import --noautoconsole

     - name: Start VM
       virt:
          name: COS7Cloud
          state: running


[root@vm0-101 ~]# ansible-playbook installvms.yaml

PLAY [download Centos core image] **********************************************************************************************************************

TASK [Gathering Facts] *********************************************************************************************************************************
ok: [10.0.0.4]
ok: [10.0.0.2]
ok: [10.0.0.3]

TASK [Copy to cloud instance] **************************************************************************************************************************
ok: [10.0.0.2]
ok: [10.0.0.4]
ok: [10.0.0.3]

TASK [Copy cloud-init configuration] *******************************************************************************************************************
changed: [10.0.0.3]
changed: [10.0.0.2]
changed: [10.0.0.4]

TASK [Create machine] **********************************************************************************************************************************
changed: [10.0.0.4]
changed: [10.0.0.3]
changed: [10.0.0.2]

TASK [Start VM] ****************************************************************************************************************************************
ok: [10.0.0.3]
ok: [10.0.0.4]
ok: [10.0.0.2]

PLAY RECAP *********************************************************************************************************************************************
10.0.0.2                   : ok=5    changed=2    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0
10.0.0.3                   : ok=5    changed=2    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0
10.0.0.4                   : ok=5    changed=2    unreachable=0    failed=0    skipped=0    rescued=0    ignored=0
```

```
[root@vm0-161 ~]# ansible cloudhosts -m shell -a "virsh list --all"
10.0.0.4 | CHANGED | rc=0 >>
 Id    Name                           State
----------------------------------------------------
 3     COS7Cloud                      running

10.0.0.3 | CHANGED | rc=0 >>
 Id    Name                           State
----------------------------------------------------
 3     COS7Cloud                      running

10.0.0.2 | CHANGED | rc=0 >>
 Id    Name                           State
----------------------------------------------------
 3     COS7Cloud                      running
```

```
[root@vm0-101 ~]# ansible cloudhosts -m shell -a "virsh net-dhcp-leases --network default"
10.0.0.2 | CHANGED | rc=0 >>
 Expiry Time          MAC address        Protocol  IP address                Hostname        Client ID or DUID
-------------------------------------------------------------------------------------------------------------------
 2019-09-09 19:33:19  52:54:00:9a:e0:20  ipv4      192.168.122.38/24         -               -

10.0.0.4 | CHANGED | rc=0 >>
 Expiry Time          MAC address        Protocol  IP address                Hostname        Client ID or DUID
-------------------------------------------------------------------------------------------------------------------
 2019-09-09 19:33:19  52:54:00:a4:b8:21  ipv4      192.168.122.119/24        -               -

10.0.0.3 | CHANGED | rc=0 >>
 Expiry Time          MAC address        Protocol  IP address                Hostname        Client ID or DUID
-------------------------------------------------------------------------------------------------------------------
 2019-09-09 19:33:19  52:54:00:31:fc:7c  ipv4      192.168.122.161/24        -               -
```

```
[root@vm0-101 ~]# ansible cloudhosts -m virt -a "command=info"
10.0.0.4 | SUCCESS => {
    "COS7Cloud": {
        "autostart": 0,
        "cpuTime": "35130000000",
        "maxMem": "1048576",
        "memory": "1048576",
        "nrVirtCpu": 1,
        "state": "running"
    },
    "ansible_facts": {
        "discovered_interpreter_python": "/usr/bin/python"
    },
    "changed": false
}
10.0.0.3 | SUCCESS => {
    "COS7Cloud": {
        "autostart": 0,
        "cpuTime": "34500000000",
        "maxMem": "1048576",
        "memory": "1048576",
        "nrVirtCpu": 1,
        "state": "running"
    },
    "ansible_facts": {
        "discovered_interpreter_python": "/usr/bin/python"
    },
    "changed": false
}
10.0.0.2 | SUCCESS => {
    "COS7Cloud": {
        "autostart": 0,
        "cpuTime": "34260000000",
        "maxMem": "1048576",
        "memory": "1048576",
        "nrVirtCpu": 1,
        "state": "running"
    },
    "ansible_facts": {
        "discovered_interpreter_python": "/usr/bin/python"
    },
    "changed": false
}
```

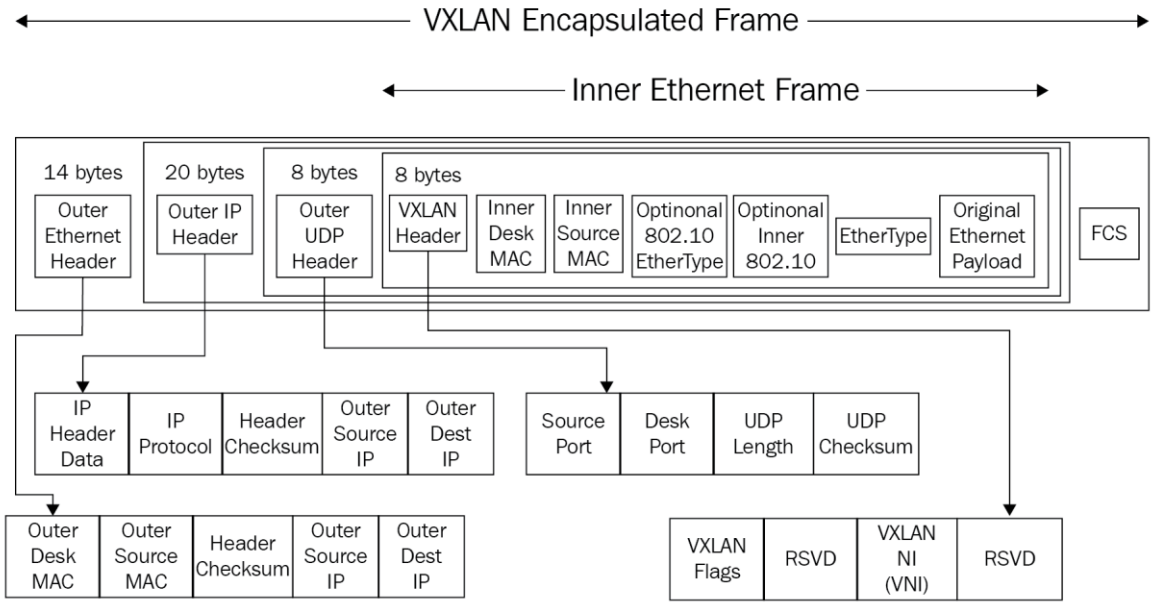
```yaml
---
- hosts: 127.0.0.1
  connection: local
  tasks:
    - name: install httpd
      package:
         name: "{{ item }}"
         state: present
      with_items:
           - httpd
           - php
           - mariadb-server
           - python2-PyMySQL

    - name: Copy php test file
      copy:
       src: index.php
       dest: /var/www/html

    - name: Start Apache
      systemd:
        name: httpd
        state: started
        enabled: yes

    - name: Start mariadb
      systemd:
        name: mariadb
        state: started
        enabled: yes

    - name: Create database
      mysql_db: name=ansible state=present login_user=root

    - name: Create user
      mysql_user: name=ansible password=ansible priv=*.*:ALL host=localhost state=present login_user=root
```

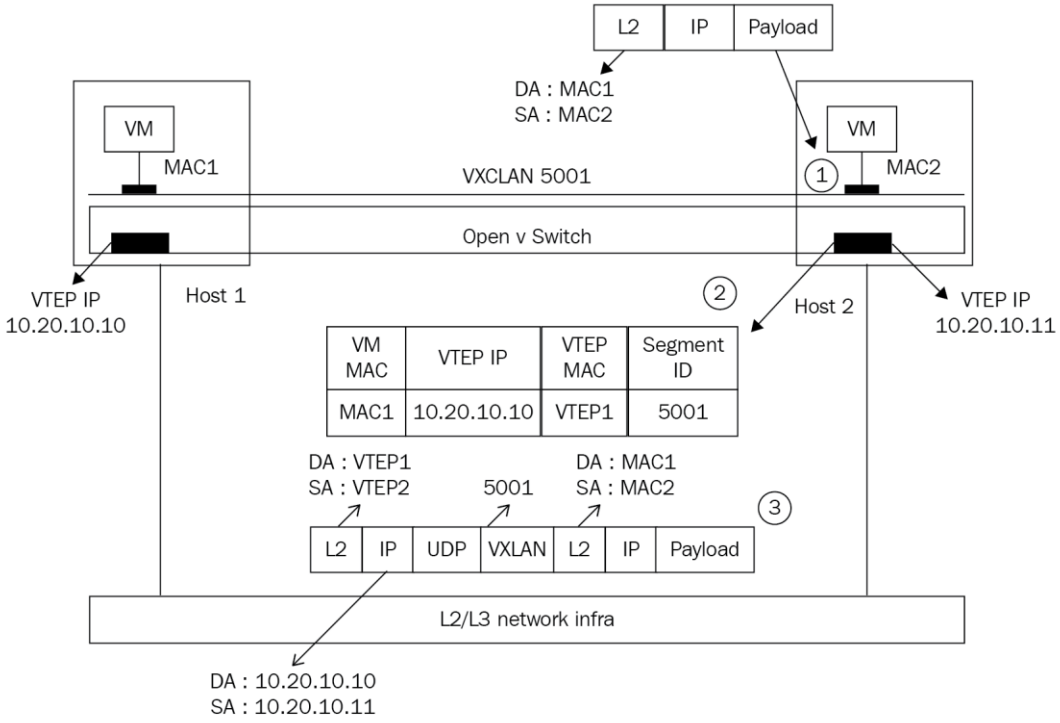
```php
<?php
phpinfo();
```

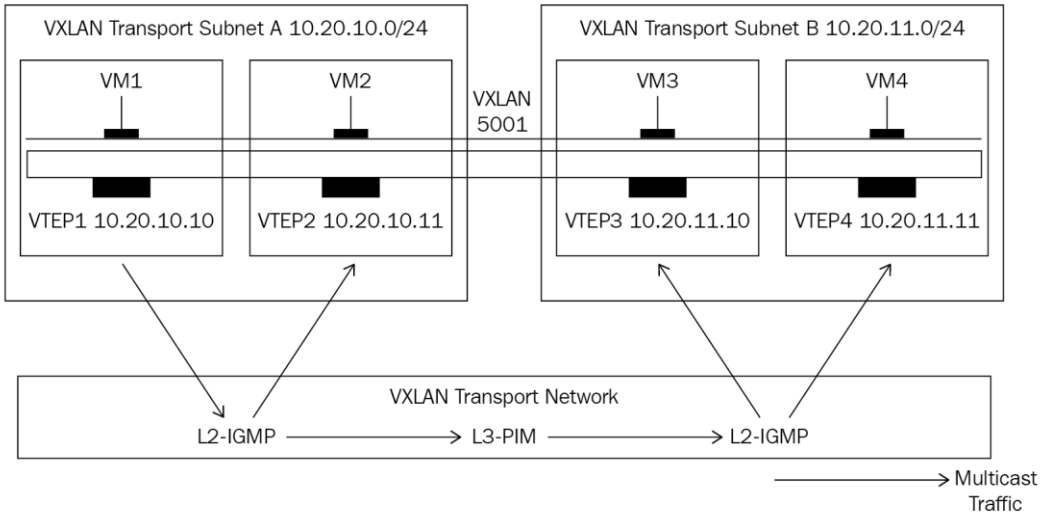
PHP Version 5.4.16

System	Linux vm0-101.vua.cloud 3.10.0-957.5.1.el7.x86_64 #1 SMP Fri Feb 1 14:54:57 UTC 2019 x86_64
Build Date	Oct 30 2018 19:31:42
Server API	Apache 2.0 Handler
Virtual Directory Support	disabled
Configuration File (php.ini) Path	/etc
Loaded Configuration File	/etc/php.ini
Scan this dir for additional .ini files	/etc/php.d
Additional .ini files parsed	/etc/php.d/curl.ini, /etc/php.d/fileinfo.ini, /etc/php.d/json.ini, /etc/php.d/phar.ini, /etc/php.d/zip.ini
PHP API	20100412
PHP Extension	20100525
Zend Extension	220100525
Zend Extension Build	API220100525,NTS
PHP Extension Build	API20100525,NTS
Debug Build	no
Thread Safety	disabled
Zend Signal Handling	disabled
Zend Memory Manager	enabled
Zend Multibyte Support	disabled
IPv6 Support	enabled
DTrace Support	disabled
Registered PHP Streams	https, ftps, compress.zlib, compress.bzip2, php, file, glob, data, http, ftp, phar, zip
Registered Stream Socket Transports	tcp, udp, unix, udg, ssl, sslv3, tls
Registered Stream Filters	zlib.*, bzip2.*, convert.iconv.*, string.rot13, string.toupper, string.tolower, string.strip_tags, convert.*, consumed, dechunk

Chapter 12: Scaling Out KVM with OpenStack

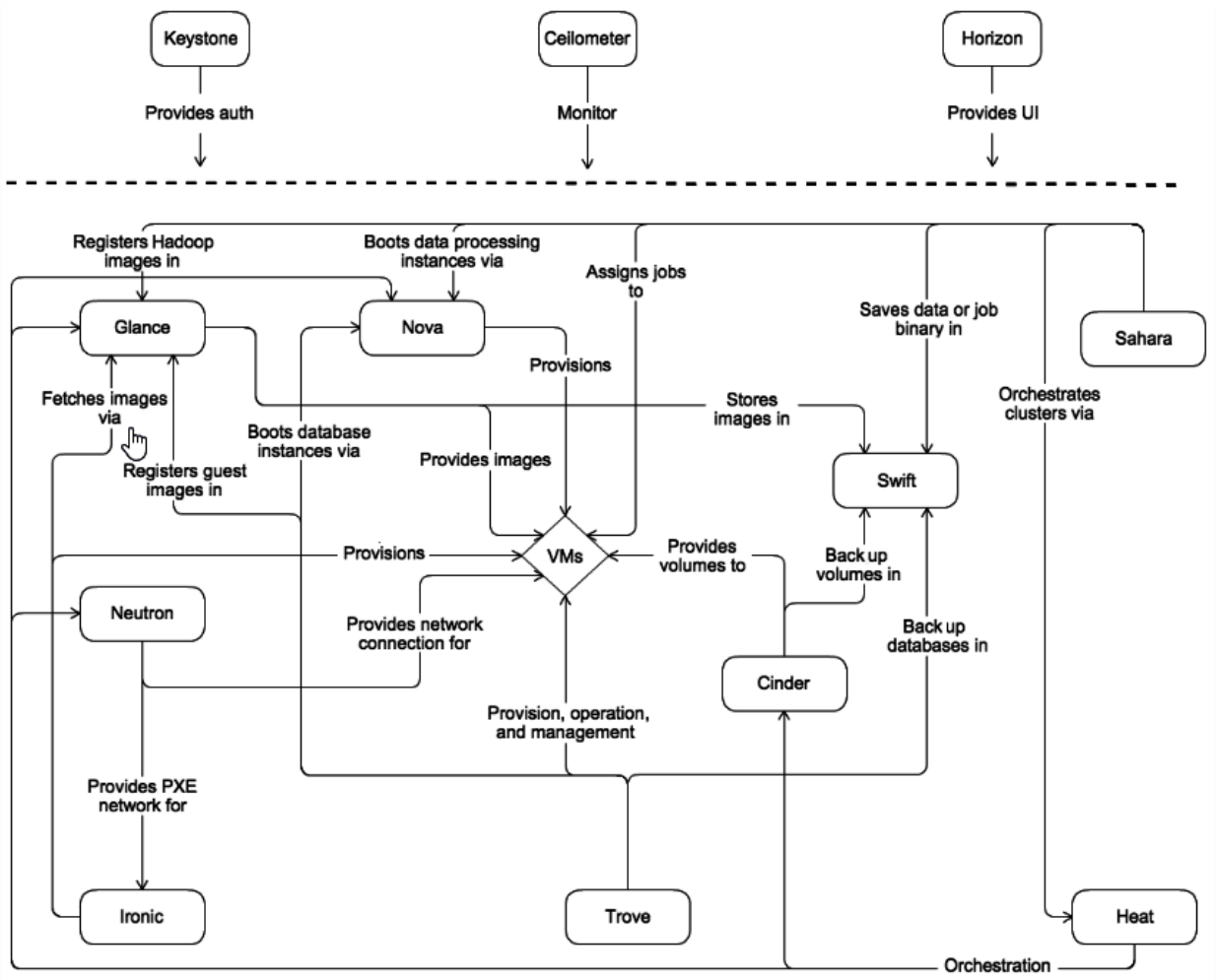


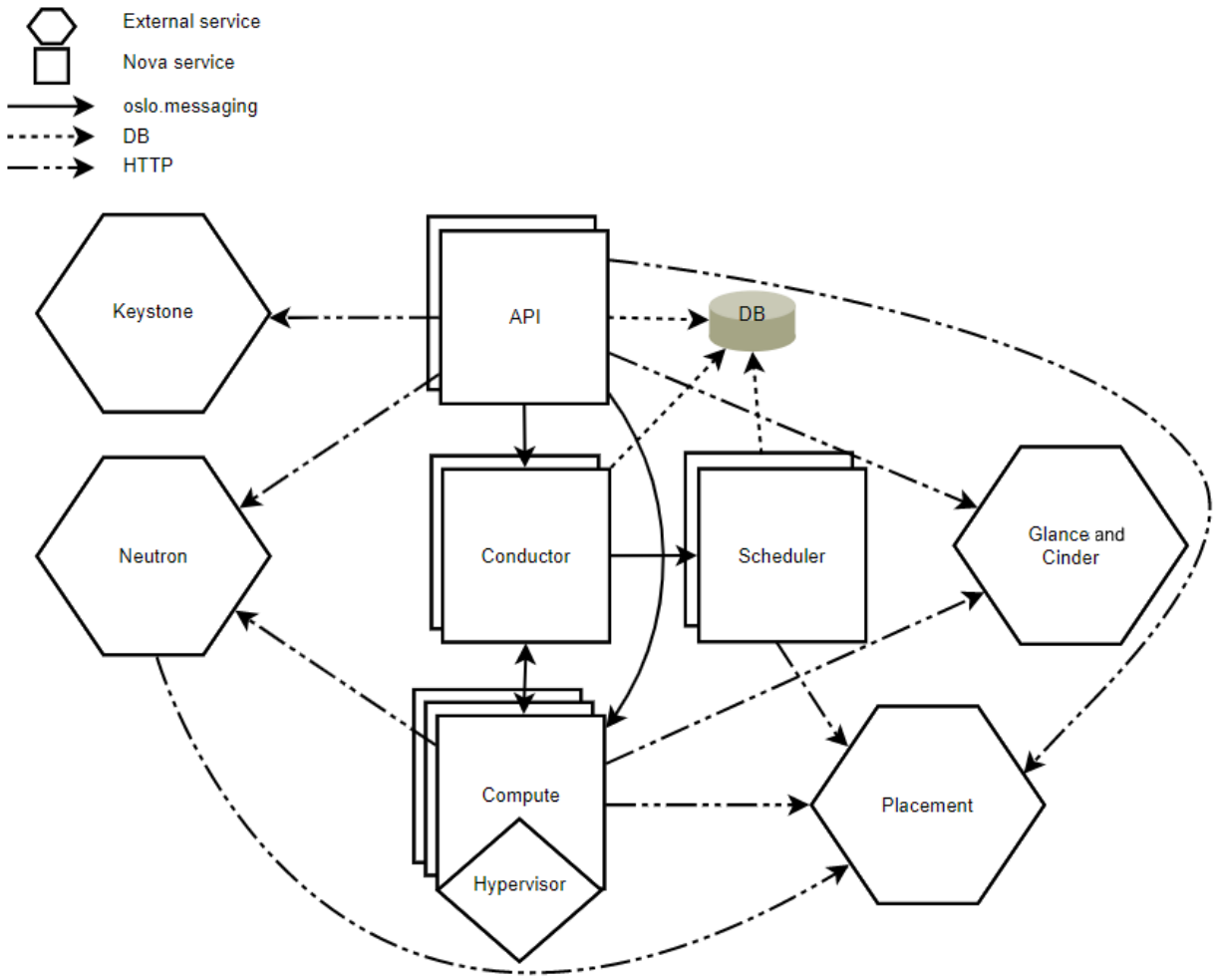


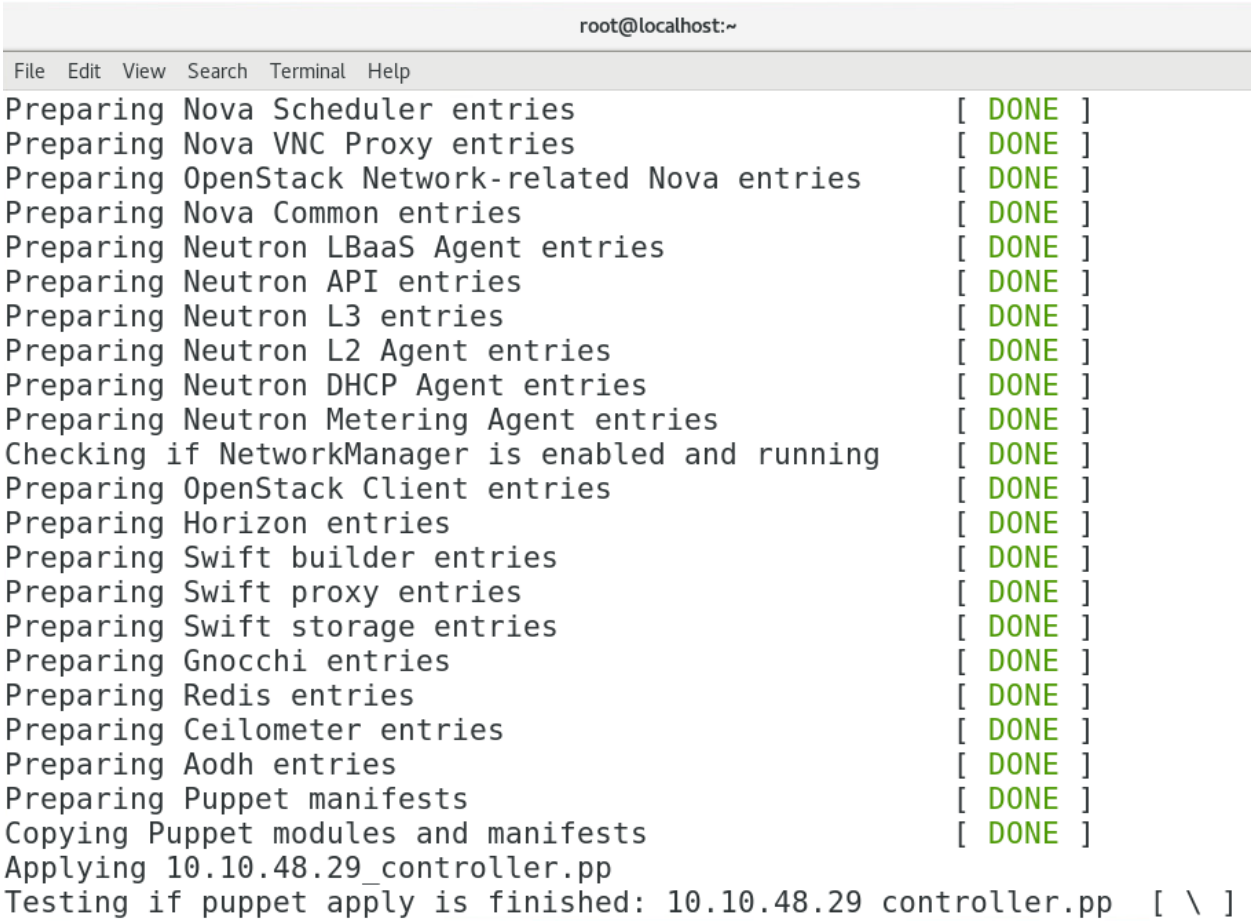


GENEVE Header

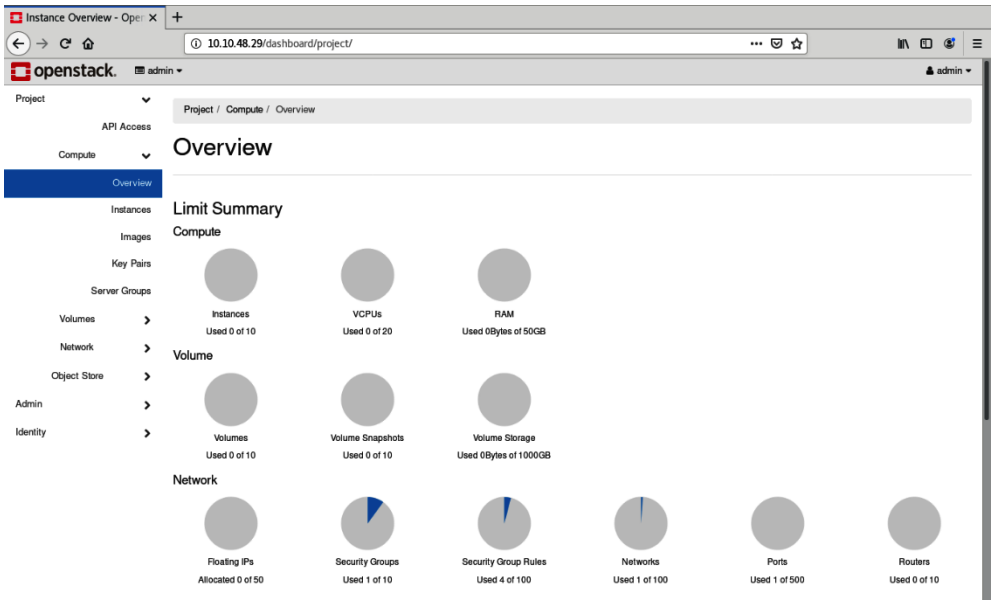
V	Option Length	O	C	Reserved	Protocol Type
VNI					Reserved
Variable Length Options					


Keystone
Ceilometer
Horizon
Provides auth
Monitor
Provides UI
Registers Hadoop images in
Boots data processing instances via
Assigns jobs to
Saves data or job binary in
Sahara
Glance
Nova
Provisions
Fetches images via
Stores images in
Orchestrates clusters via
Boots database instances via
Provides images
Registers guest images in
Swift
Provisions
VMs
Provides volumes to
Back up volumes in
Neutron
Provides network connection for
Back up databases in
Cinder
Provision, operation, and management
Provides PXE network for
Ironic
Trove
Heat
Orchestration


External service
Nova service
oslo.messaging
DB
HTTP
Keystone
API
DB
Neutron
Conductor
Scheduler
Glance and Cinder
Compute
Hypervisor
Placement


root@localhost:~
File Edit View Search Terminal Help
Preparing Nova Scheduler entries [DONE]
Preparing Nova VNC Proxy entries [DONE]
Preparing OpenStack Network-related Nova entries [DONE]
Preparing Nova Common entries [DONE]
Preparing Neutron LBaaS Agent entries [DONE]
Preparing Neutron API entries [DONE]
Preparing Neutron L3 entries [DONE]
Preparing Neutron L2 Agent entries [DONE]
Preparing Neutron DHCP Agent entries [DONE]
Preparing Neutron Metering Agent entries [DONE]
Checking if NetworkManager is enabled and running [DONE]
Preparing OpenStack Client entries [DONE]
Preparing Horizon entries [DONE]
Preparing Swift builder entries [DONE]
Preparing Swift proxy entries [DONE]
Preparing Swift storage entries [DONE]
Preparing Gnocchi entries [DONE]
Preparing Redis entries [DONE]
Preparing Ceilometer entries [DONE]
Preparing Aodh entries [DONE]
Preparing Puppet manifests [DONE]
Copying Puppet modules and manifests [DONE]
Applying 10.10.48.29_controller.pp
Testing if puppet apply is finished: 10.10.48.29 controller.pp [\ ]

```
root@localhost:~
File  Edit  View  Search  Terminal  Help
Finalizing                                           [ DONE ]

 **** Installation completed successfully ******

Additional information:
 * Parameter CONFIG_NEUTRON_L2_AGENT: You have choosen OVN neutron backend. Note
 that this backend does not support LBaaS, VPNaaS or FWaaS services. Geneve will
 be used as encapsulation method for tenant networks
 * A new answerfile was created in: /root/packstack-answers-20200204-114317.txt
 * Time synchronization installation was skipped. Please note that unsynchronize
d time on server instances might be problem for some OpenStack components.
 * Warning: NetworkManager is active on 10.10.48.29. OpenStack networking curren
tly does not work on systems that have the Network Manager service enabled.
 * File /root/keystonerc_admin has been created on OpenStack client host 10.10.4
8.29. To use the command line tools you need to source the file.
 * To access the OpenStack Dashboard browse to http://10.10.48.29/dashboard .
Please, find your login credentials stored in the keystonerc_admin in your home
directory.
 * Because of the kernel update the host 10.10.48.29 requires reboot.
 * The installation log file is available at: /var/tmp/packstack/20200204-114317
-3t0fVF/openstack-setup.log
 * The generated manifests are available at: /var/tmp/packstack/20200204-114317-
3t0fVF/manifests
[root@packstack ~]#
```



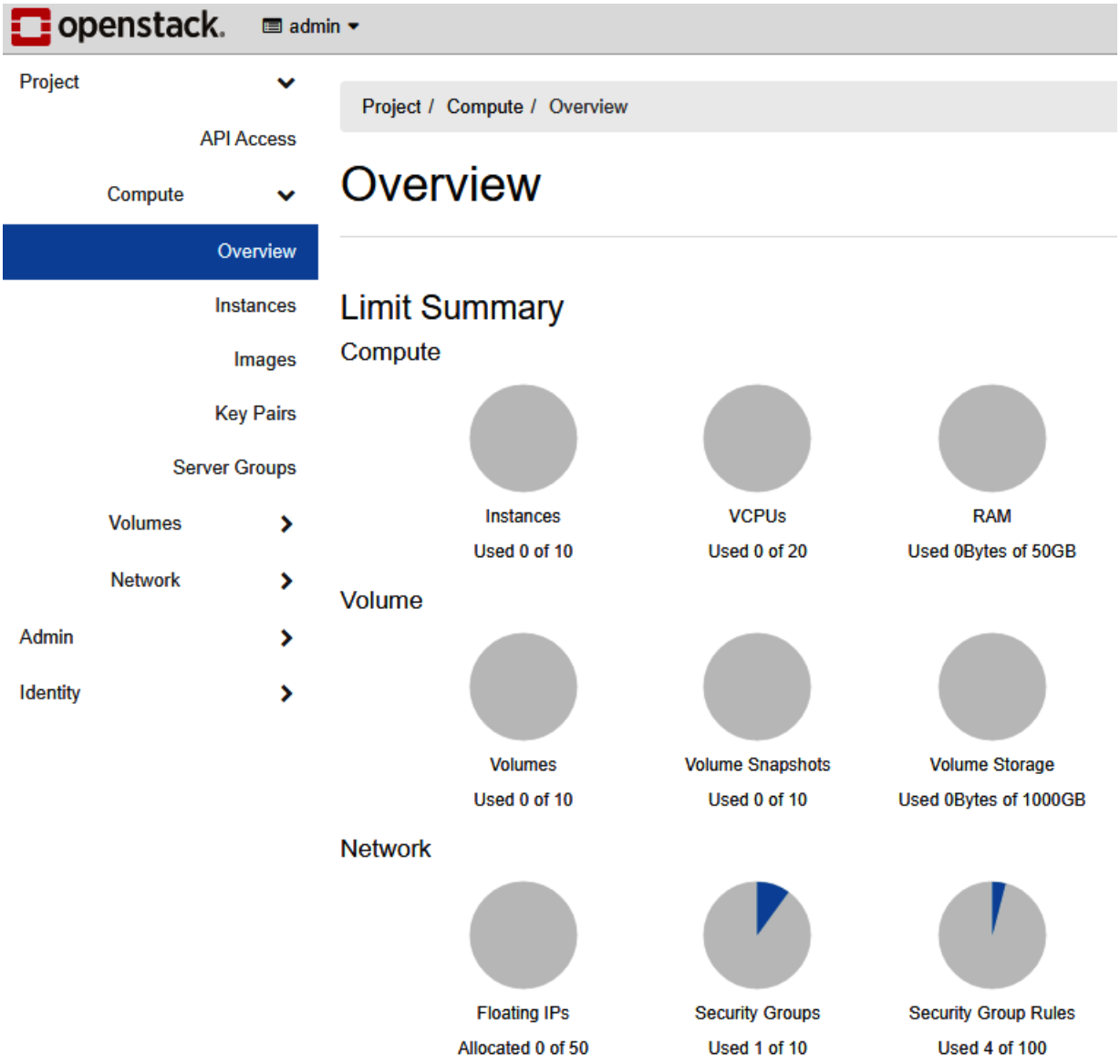
```
stack@openstack:~$ sudo apt install git
Reading package lists... Done
Building dependency tree
Reading state information... Done
The following additional packages will be installed:
  git-man libasn1-8-heimdal libcurl3-gnutls liberror-perl libgdbm-compat4 libgssapi3-heimdal
  libhcrypto4-heimdal libheimbase1-heimdal libheimntlm0-heimdal libhx509-5-heimdal
  libkrb5-26-heimdal libldap-2.4-2 libldap-common libnghttp2-14 libperl5.26 libroken18-heimdal
  librtmp1 libsasl2-2 libsasl2-modules libsasl2-modules-db libwind0-heimdal patch perl
  perl-modules-5.26
Suggested packages:
  git-daemon-run | git-daemon-sysvinit git-doc git-el git-email git-gui gitk gitweb git-cvs
  git-mediawiki git-svn libsasl2-modules-gssapi-mit | libsasl2-modules-gssapi-heimdal
  libsasl2-modules-ldap libsasl2-modules-otp libsasl2-modules-sql diffutils-doc perl-doc
  libterm-readline-gnu-perl | libterm-readline-perl-perl make
The following NEW packages will be installed:
  git git-man libasn1-8-heimdal libcurl3-gnutls liberror-perl libgdbm-compat4 libgssapi3-heimdal
  libhcrypto4-heimdal libheimbase1-heimdal libheimntlm0-heimdal libhx509-5-heimdal
  libkrb5-26-heimdal libldap-2.4-2 libldap-common libnghttp2-14 libperl5.26 libroken18-heimdal
  librtmp1 libsasl2-2 libsasl2-modules libsasl2-modules-db libwind0-heimdal patch perl
  perl-modules-5.26
0 upgraded, 25 newly installed, 0 to remove and 0 not upgraded.
Need to get 12.8 MB of archives.
After this operation, 80.6 MB of additional disk space will be used.
Do you want to continue? [Y/n] y
```

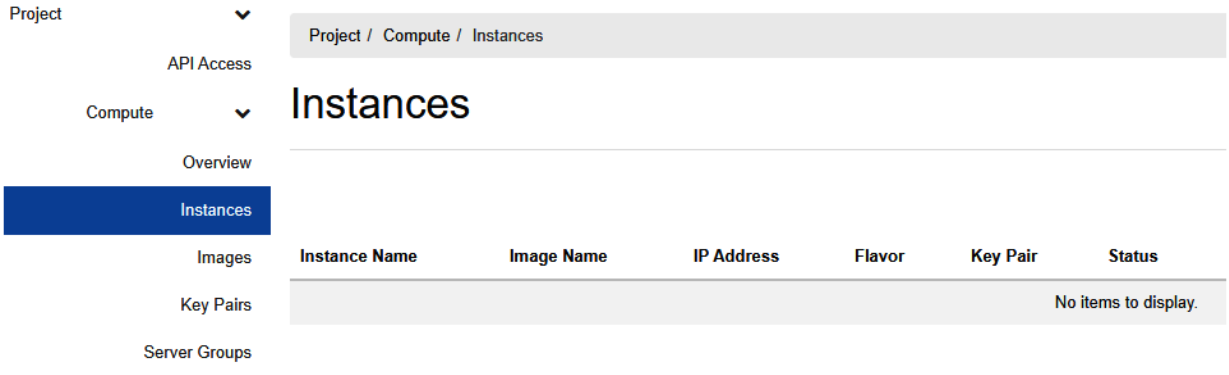
```
stack@openstack:~$ git clone https://opendev.org/openstack/devstack
Cloning into 'devstack'...
remote: Enumerating objects: 44764, done.
remote: Counting objects: 100% (44764/44764), done.
remote: Compressing objects: 100% (20257/20257), done.
remote: Total 44764 (delta 31643), reused 36536 (delta 23819)
Receiving objects: 100% (44764/44764), 9.10 MiB | 900.00 KiB/s, done.
Resolving deltas: 100% (31643/31643), done.
stack@openstack:~$ cd devstack/
stack@openstack:~/devstack$ _
```

```
# Sample ``local.conf`` for user-configurable variables in ``stack.sh``

# NOTE: Copy this file to the root DevStack directory for it to work properly.

# ``local.conf`` is a user-maintained settings file that is sourced from ``stackrc``.
# This gives it the ability to override any variables set in ``stackrc``.
# Also, most of the settings in ``stack.sh`` are written to only be set if no
# value has already been set; this lets ``local.conf`` effectively override the
# default values.

# This is a collection of some of the settings we have found to be useful
# in our DevStack development environments. Additional settings are described
# in https://docs.openstack.org/devstack/latest/configuration.html#local-conf
# These should be considered as samples and are unsupported DevStack code.

# The ``localrc`` section replaces the old ``localrc`` configuration file.
# Note that if ``localrc`` is present it will be used in favor of this section.
[[local|localrc]]

# Minimal Contents
# ----------------

# While ``stack.sh`` is happy to run without ``localrc``, devlife is better when
# there are a few minimal variables set:

# If the ``*_PASSWORD`` variables are not set here you will be prompted to enter
# values for them by ``stack.sh``and they will be added to ``local.conf``.
ADMIN_PASSWORD=nomoresecret
DATABASE_PASSWORD=stackdb
RABBIT_PASSWORD=stackqueue
SERVICE_PASSWORD=$ADMIN_PASSWORD

# ``HOST_IP`` and ``HOST_IPV6`` should be set manually for best results if
# the NIC configuration of the host is unusual, i.e. ``eth1`` has the default
# route but ``eth0`` is the public interface.  They are auto-detected in
# ``stack.sh`` but often is indeterminate on later runs due to the IP moving
:
```

```
[[local|localrc]]
FLOATING_RANGE=192.168.61.222/24
FIXED_RANGE=10.11.10.0/24
ADMIN_PASSWORD=secretpass
DATABASE_PASSWORD=dbpass
RABBIT_PASSWORD=rabbitpass
SERVICE_PASSWORD=$ADMIN_PASSWORD

LOGFILE=$DEST/logs/stack.sh.log

LOGDAYS=2

SWIFT_REPLICAS=1

SWIFT_DATA_DIR=$DEST/data
~
```

```
This is your host IP address: 192.168.61.129
This is your host IPv6 address: ::1
Horizon is now available at http://192.168.61.129/dashboard
Keystone is serving at http://192.168.61.129/identity/
The default users are: admin and demo
The password: secretpass

WARNING:
Using lib/neutron-legacy is deprecated, and it will be removed in the future


Services are running under systemd unit files.
For more information see:
https://docs.openstack.org/devstack/latest/systemd.html

DevStack Version: ussuri
Change: 455be66098353b08dabf38ec7256998de89ac755 Merge "Remove conflicting packages in Ubuntu" 2020-
01-30 00:01:06 +0000
OS Version: Ubuntu 18.04 bionic

stack@openstack:~/devstack$ _
```


openstack.
admin
Project
API Access
Compute
Overview
Instances
Images
Key Pairs
Server Groups
Volumes
Network
Admin
Identity
Project / Compute / Overview
Overview
Limit Summary
Compute
Instances
Used 0 of 10
VCPUs
Used 0 of 20
RAM
Used 0Bytes of 50GB
Volume
Volumes
Used 0 of 10
Volume Snapshots
Used 0 of 10
Volume Storage
Used 0Bytes of 1000GB
Network
Floating IPs
Allocated 0 of 50
Security Groups
Used 1 of 10
Security Group Rules
Used 4 of 100


Project
API Access
Compute
Overview
Instances
Images
Key Pairs
Server Groups
Project / Compute / Instances
Instances
Instance Name
Image Name
IP Address
Flavor
Key Pair
Status
No items to display.

Launch Instance

Details
Source
Flavor *
Networks *
Network Ports
Security Groups
Key Pair
Configuration
Server Groups
Scheduler Hints
Metadata

Please provide the initial hostname for the instance, the availability zone where it will be deployed, and the instance count. Increase the Count to create multiple instances with the same settings.

Instance Name *

OS demo 1

Description

OpenStack demo test1

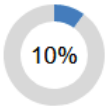
Availability Zone

nova

Count *

1

Total Instances
(10 Max)



0 Current Usage
1 Added
9 Remaining

Cancel | Back | Next | Launch Instance

Launch Instance

Details
Source
Flavor *
Networks *
Network Ports
Security Groups
Key Pair
Configuration
Server Groups
Scheduler Hints
Metadata

Instance source is the template used to create an instance. You can use an image, a snapshot of an instance (image snapshot), a volume or a volume snapshot (if enabled). You can also choose to use persistent storage by creating a new volume.

Select Boot Source

Image

Create New Volume

Yes | No

Volume Size (GB) *

1

Delete Volume on Instance Delete

Yes | No

Allocated

Name	Updated	Size	Type	Visibility
cirros-0.4.0-x86_64-disk	1/30/20 2:19 PM	12.13 MB	qcow2	Public

Available 0

Select one

Click here for filters or full text search.

Name	Updated	Size	Type	Visibility
No available items				

Cancel | Back | Next | Launch Instance

Launch Instance

- Details
- Source
- Flavor *
- Networks *
- Network Ports
- Security Groups
- Key Pair
- Configuration
- Server Groups
- Scheduler Hints
- Metadata

Flavors manage the sizing for the compute, memory and storage capacity of the instance.

Allocated

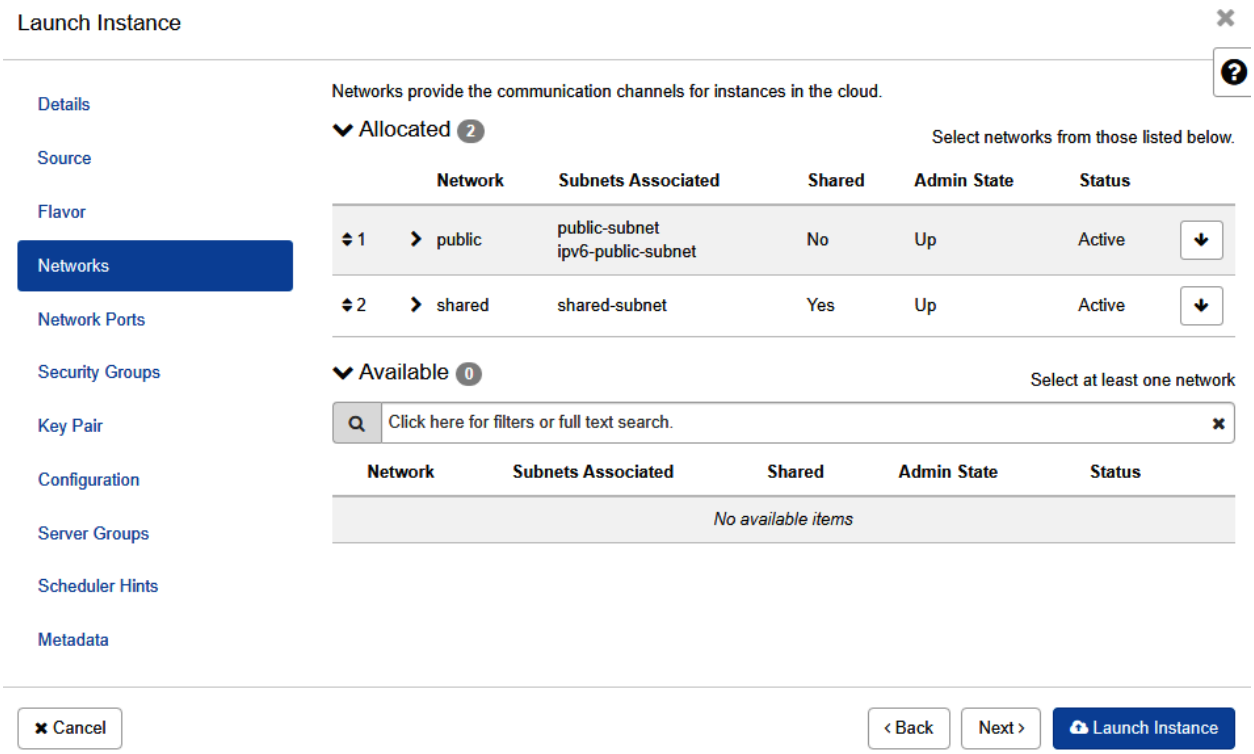
Name	VCPUS	RAM	Total Disk	Root Disk	Ephemeral Disk	Public
Select an item from Available items below						

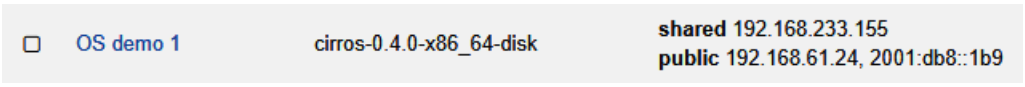
Available 12

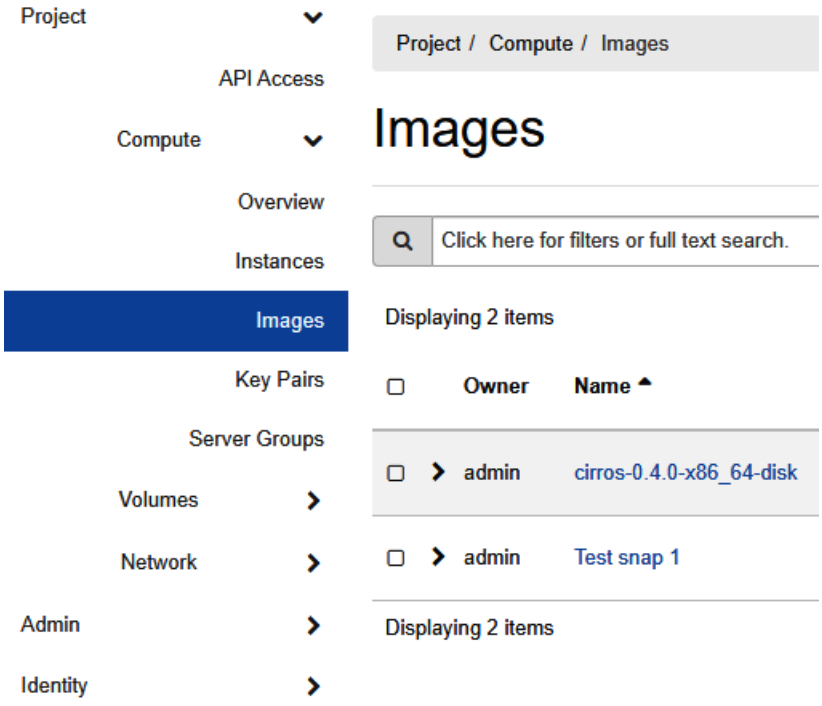
Select one

Click here for filters or full text search.

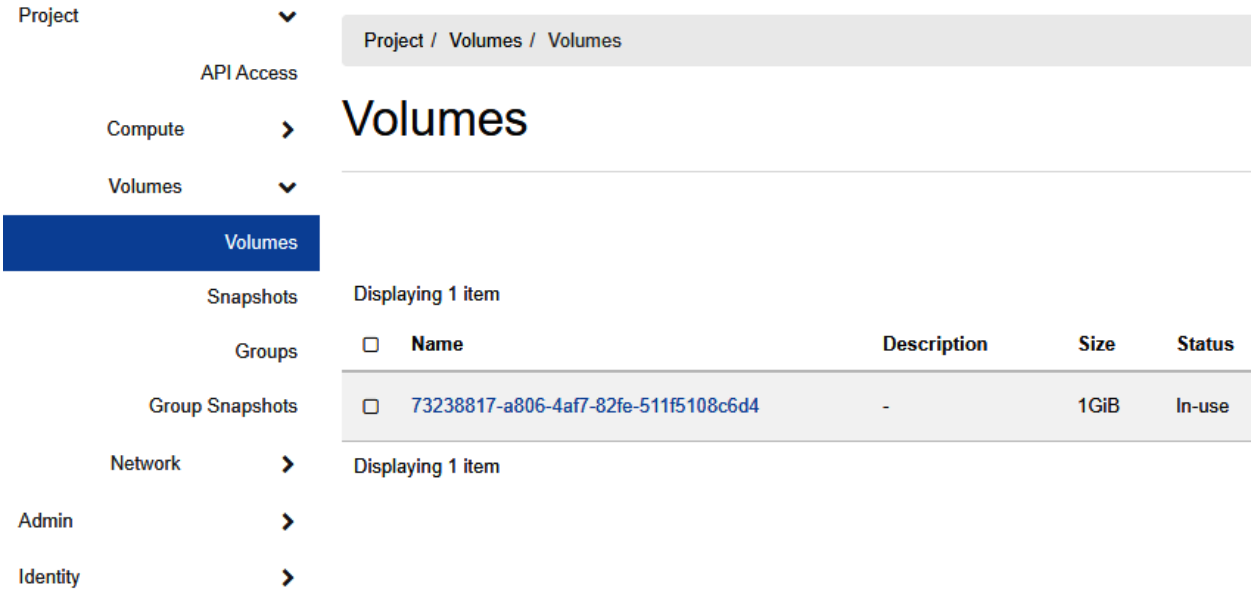
Name	VCPUS	RAM	Total Disk	Root Disk	Ephemeral Disk	Public	
m1.nano	1	64 MB	1 GB	1 GB	0 GB	Yes	
m1.micro	1	128 MB	1 GB	1 GB	0 GB	Yes	
cirros256	1	256 MB	1 GB	1 GB	0 GB	Yes	
m1.tiny	1	512 MB	1 GB	1 GB	0 GB	Yes	
ds512M	1	512 MB	5 GB	5 GB	0 GB	Yes	
ds1G	1	1 GB	10 GB	10 GB	0 GB	Yes	
m1.small	1	2 GB	20 GB	20 GB	0 GB	Yes	
ds2G	2	2 GB	10 GB	10 GB	0 GB	Yes	
m1.medium	2	4 GB	40 GB	40 GB	0 GB	Yes	
ds4G	4	4 GB	20 GB	20 GB	0 GB	Yes	
m1.large	4	8 GB	80 GB	80 GB	0 GB	Yes	
m1.xlarge	8	16 GB	160 GB	160 GB	0 GB	Yes	


Launch Instance
Details
Source
Flavor
Networks
Network Ports
Security Groups
Key Pair
Configuration
Server Groups
Scheduler Hints
Metadata
Networks provide the communication channels for instances in the cloud.
Allocated 2
Select networks from those listed below.
Network
Subnets Associated
Shared
Admin State
Status
1 public public-subnet ipv6-public-subnet No Up Active
2 shared shared-subnet Yes Up Active
Available 0
Select at least one network
Click here for filters or full text search.
Network
Subnets Associated
Shared
Admin State
Status
No available items
Cancel
Back
Next
Launch Instance


OS demo 1
cirros-0.4.0-x86_64-disk
shared 192.168.233.155
public 192.168.61.24, 2001:db8::1b9


Project
API Access
Compute
Overview
Instances
Images
Key Pairs
Server Groups
Volumes
Network
Admin
Identity
Project / Compute / Images
Images
Click here for filters or full text search.
Displaying 2 items
Owner
Name
admin
cirros-0.4.0-x86_64-disk
admin
Test snap 1
Displaying 2 items

☐	OS test 3	Test snap 1	**public** 192.168.61.221, 2001:db8::263 **shared** 192.168.233.191	cirros256
☐	OS demo 2	cirros-0.4.0-x86_64-disk	**shared** 192.168.233.121 **public** 192.168.61.98, 2001:db8::1b6	cirros256
☐	OS demo 1	cirros-0.4.0-x86_64-disk	**shared** 192.168.233.155 **public** 192.168.61.24, 2001:db8::1b9	cirros256

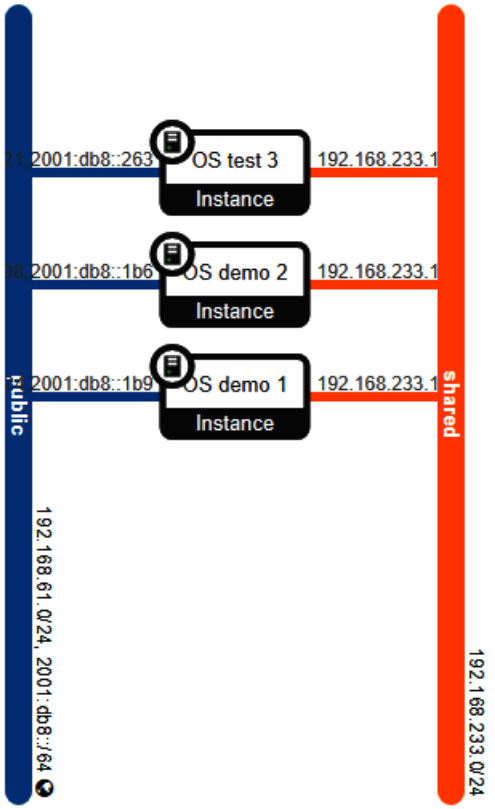

Project
API Access
Compute
Volumes
Volumes
Snapshots
Groups
Group Snapshots
Network
Admin
Identity
Project / Volumes / Volumes
Volumes
Displaying 1 item
Name
Description
Size
Status
73238817-a806-4af7-82fe-511f5108c6d4
-
1GiB
In-use
Displaying 1 item

Network Topology

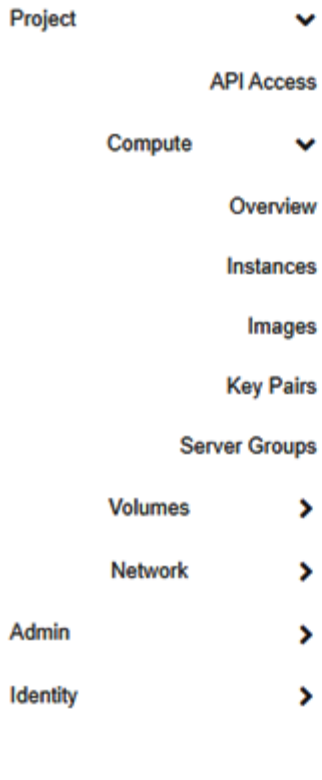
Project
API Access
Compute
Volumes
Network
Network Topology
Networks
Routers
Security Groups
Floating IPs
Admin
Identity

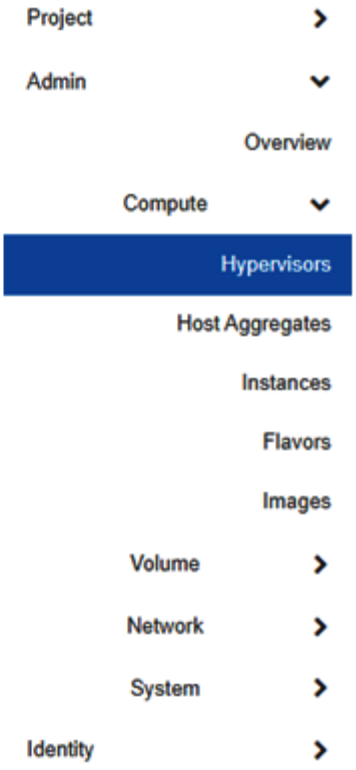
Topology | Graph

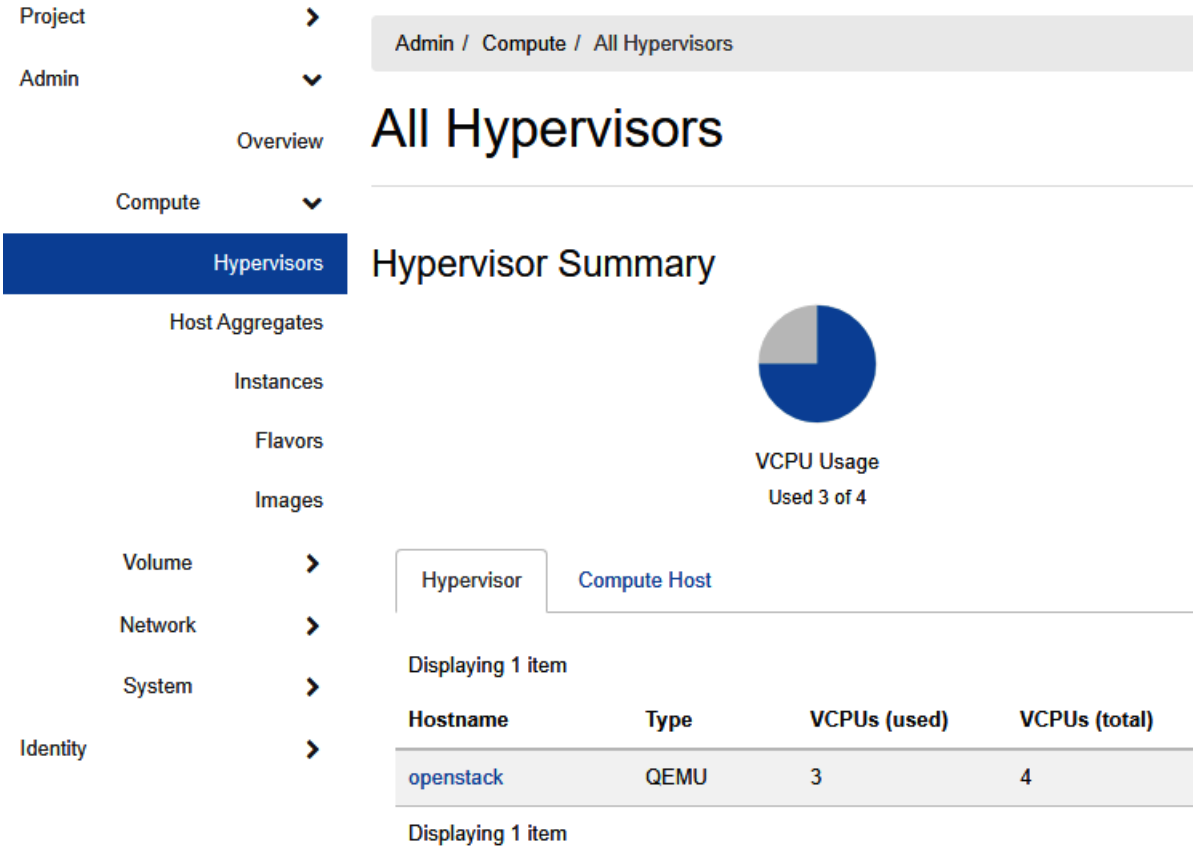
Small | Normal



Launch Instance | + Create Network | + Create Router


Project
API Access
Compute
Overview
Instances
Images
Key Pairs
Server Groups
Volumes
Network
Admin
Identity


Project
Admin
Overview
Compute
Hypervisors
Host Aggregates
Instances
Flavors
Images
Volume
Network
System
Identity


Project
Admin
Overview
Compute
Hypervisors
Host Aggregates
Instances
Flavors
Images
Volume
Network
System
Identity
Admin / Compute / All Hypervisors
All Hypervisors
Hypervisor Summary
VCPU Usage
Used 3 of 4
Hypervisor
Compute Host
Displaying 1 item
Hostname
Type
VCPUs (used)
VCPUs (total)
openstack
QEMU
3
4
Displaying 1 item

Create Flavor

Flavor Information * | Flavor Access

Name *

ID

auto

VCPUs *

RAM (MB) *

Root Disk (GB) *

Ephemeral Disk (GB)

0

Swap Disk (MB)

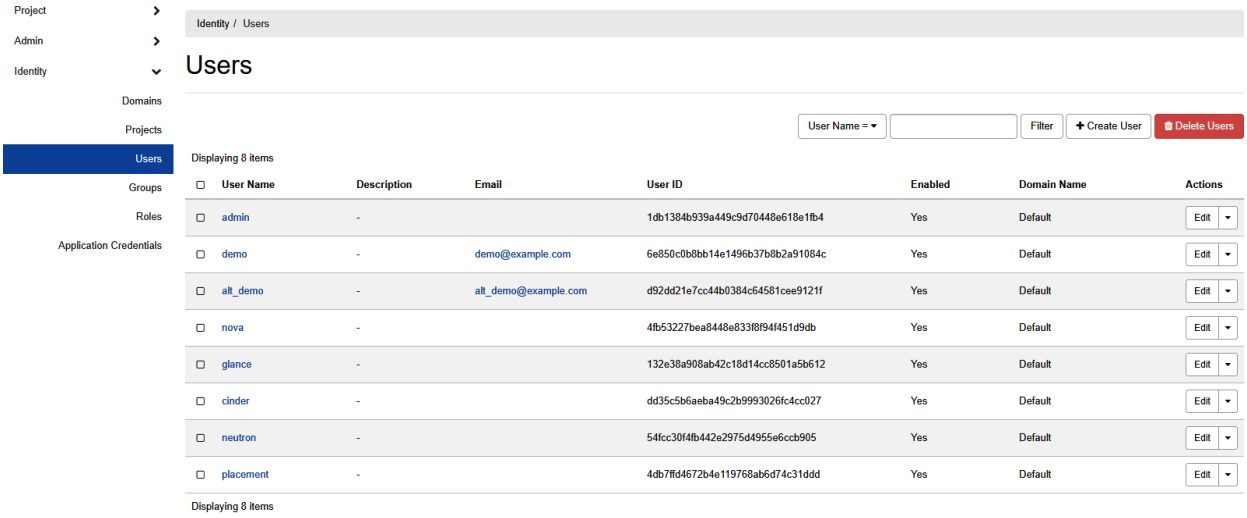
0

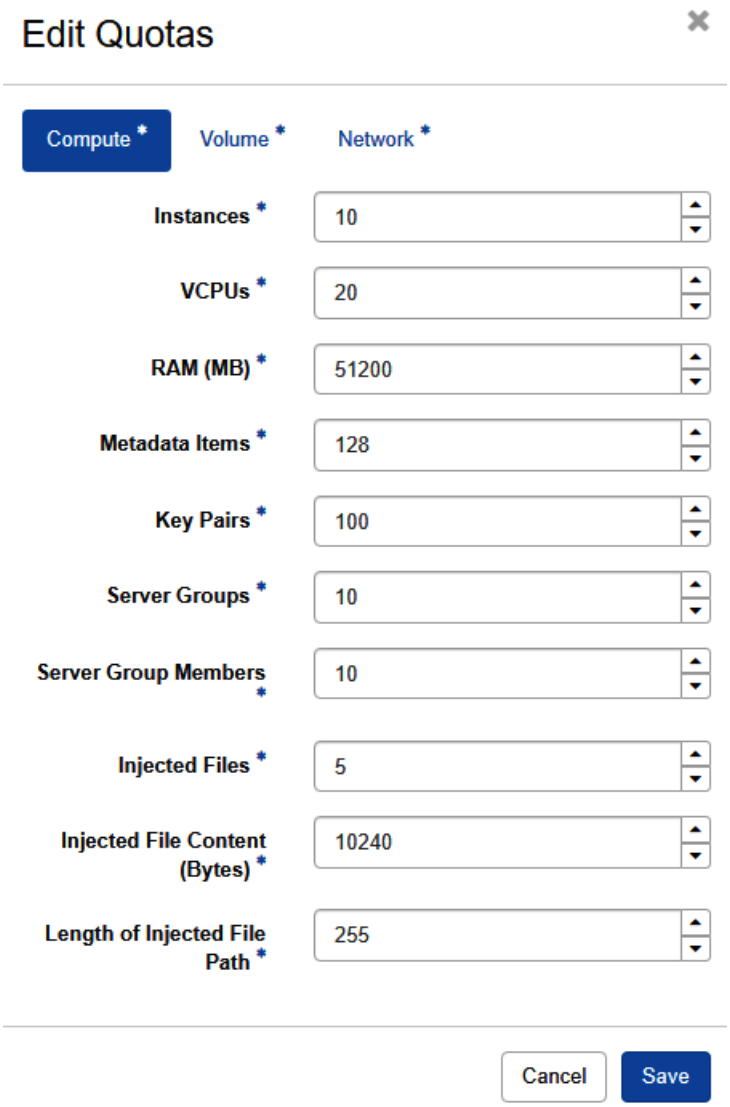
RX/TX Factor

1

Flavors define the sizes for RAM, disk, number of cores, and other resources and can be selected when users deploy instances.

Cancel | Create Flavor


Project
Admin
Identity
Domains
Projects
Users
Groups
Roles
Application Credentials
Identity / Users
Users
User Name =
Filter
+ Create User
Delete Users
Displaying 8 items
User Name
Description
Email
User ID
Enabled
Domain Name
Actions
admin - 1db1384b939a449c9d70448e618e1fb4 Yes Default Edit
demo - demo@example.com 6e850c0b8bb14e1496b37b8b2a91084c Yes Default Edit
alt_demo - alt_demo@example.com d92dd21e7cc44b0384c64581cee9121f Yes Default Edit
nova - 4fb53227bea8448e833f8f94f451d9db Yes Default Edit
glance - 132e38a908ab42c18d14cc8501a5b612 Yes Default Edit
cinder - dd35c5b6aeba49c2b9993026fc4cc027 Yes Default Edit
neutron - 54fcc30f4fb442e2975d4955e6ccb905 Yes Default Edit
placement - 4db7ffd4672b4e119768ab6d74c31ddd Yes Default Edit
Displaying 8 items


Edit Quotas
Compute *
Volume *
Network *
Instances * 10
VCPUs * 20
RAM (MB) * 51200
Metadata Items * 128
Key Pairs * 100
Server Groups * 10
Server Group Members * 10
Injected Files * 5
Injected File Content (Bytes) * 10240
Length of Injected File Path * 255
Cancel
Save

Chapter 13: Scaling out KVM with AWS

Name	Code
US East (Ohio)	`us-east-2`
US East (N. Virginia)	`us-east-1`
US West (N. California)	`us-west-1`
US West (Oregon)	`us-west-2`
Asia Pacific (Hong Kong)	`ap-east-1`
Asia Pacific (Mumbai)	`ap-south-1`
Asia Pacific (Osaka-Local)	`ap-northeast-3`
Asia Pacific (Seoul)	`ap-northeast-2`
Asia Pacific (Singapore)	`ap-southeast-1`
Asia Pacific (Sydney)	`ap-southeast-2`
Asia Pacific (Tokyo)	`ap-northeast-1`
Canada (Central)	`ca-central-1`
Europe (Frankfurt)	`eu-central-1`
Europe (Ireland)	`eu-west-1`
Europe (London)	`eu-west-2`
Europe (Paris)	`eu-west-3`
Europe (Stockholm)	`eu-north-1`
Middle East (Bahrain)	`me-south-1`
South America (São Paulo)	`sa-east-1`

▼ All services

Compute
- EC2
- Lightsail
- Lambda
- Batch
- Elastic Beanstalk
- Serverless Application Repository
- AWS Outposts
- EC2 Image Builder

Containers
- Elastic Container Registry
- Elastic Container Service
- Elastic Kubernetes Service

Storage
- S3
- EFS
- FSx
- S3 Glacier
- Storage Gateway
- AWS Backup

Database
- RDS
- DynamoDB
- ElastiCache
- Neptune
- Amazon Redshift
- Amazon QLDB
- Amazon DocumentDB
- Amazon Keyspaces

Migration & Transfer
- AWS Migration Hub

Blockchain
- Amazon Managed Blockchain

Satellite
- Ground Station

Quantum Technologies
- Amazon Braket

Management & Governance
- AWS Organizations
- CloudWatch
- AWS Auto Scaling
- CloudFormation
- CloudTrail
- Config
- OpsWorks
- Service Catalog
- Systems Manager
- AWS AppConfig
- Trusted Advisor
- Control Tower
- AWS License Manager
- AWS Well-Architected Tool
- Personal Health Dashboard
- AWS Chatbot
- Launch Wizard
- AWS Compute Optimizer

Media Services
- Elastic Transcoder
- Kinesis Video Streams
- MediaConnect
- MediaConvert
- MediaLive

Security, Identity, & Compliance
- IAM
- Resource Access Manager
- Cognito
- Secrets Manager
- GuardDuty
- Inspector
- Amazon Macie
- AWS Single Sign-On
- Certificate Manager
- Key Management Service
- CloudHSM
- Directory Service
- WAF & Shield
- AWS Firewall Manager
- Artifact
- Security Hub
- Detective

AWS Cost Management
- AWS Cost Explorer
- AWS Budgets
- AWS Marketplace Subscriptions

Mobile
- AWS Amplify
- Mobile Hub
- AWS AppSync
- Device Farm

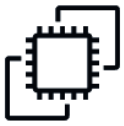
AR & VR
- Amazon Sumerian

Application Integration
- Step Functions

Build a solution

Get started with simple wizards and automated workflows.

Launch a virtual machine
With EC2
2-3 minutes



Build a web app
With Elastic Beanstalk
6 minutes

Build using virtual servers
With Lightsail
1-2 minutes

Register a domain
With Route 53
3 minutes

Connect an IoT device
With AWS IoT
5 minutes

Start migrating to AWS
With CloudEndure Migration
1-2 minutes

▶ See more

```
[cloud@workstation ~]$ virsh list
 Id    Name                           State
----------------------------------------------------

[cloud@workstation ~]$ sudo su
[sudo] password for cloud:
[root@workstation cloud]# virsh list
 Id    Name                           State
----------------------------------------------------
 1     deploy-1                       running
```

```
[root@workstation deploy-1]# ls
centos1.qcow2  deploy-1-cidata.iso  meta-data  user-data
[root@workstation deploy-1]# qemu-img convert centos1.qcow2 deploy1.raw
[root@workstation deploy-1]# ls
centos1.qcow2  deploy-1-cidata.iso  deploy1.raw  meta-data  user-data
[root@workstation deploy-1]#
```

```
[root@workstation deploy-1]# ls -al
total 941644
drwxr-xr-x. 2 root root        107 Apr 11 01:43 .
drwx--x--x. 6 root root        158 Jan 13 16:52 ..
-rw-r--r--. 1 root root   43188224 Apr 11 01:27 centos1.qcow2
-rw-r--r--. 1 qemu qemu     374784 Jan 12 18:51 deploy-1-cidata.iso
-rw-r--r--. 1 root root 8589934592 Apr 11 01:44 deploy1.raw
-rw-r--r--. 1 root root         26 Jan 12 16:27 meta-data
-rw-r--r--. 1 root root        629 Jan 12 17:42 user-data
[root@workstation deploy-1]#
```

```
[root@workstation ~]# curl "https://awscli.amazonaws.com/awscli-exe-linux-x86_64.zip" -o "awscliv2.zip"

unzip awscliv2.zip

sudo ./aws/in  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                    Dload  Upload   Total   Spent    Left  Speed
  0     0    0     0    0     0      0      0 --:--:-- --:--:-- --:--:--     0st100 31.1M  100 31.1M
[root@workstation ~]#
[root@workstation ~]# unzip awscliv2.zip
```

Welcome to Identity and Access Management

IAM users sign-in link:

https:// **.signin.aws.amazon.com/console** | Customize

IAM Resources

Users: 0 | Roles: 4

Groups: 0 | Identity Providers: 0

Customer Managed Policies: 0

Security Status

1 out of 5 complete.

- Delete your root access keys
- Activate MFA on your root account
- Create individual IAM users
- Use groups to assign permissions
- Apply an IAM password policy

Add user

1 2 3 4 5

Set user details

You can add multiple users at once with the same access type and permissions. Learn more

User name*

Add another user

Select AWS access type

Select how these users will access AWS. Access keys and autogenerated passwords are provided in the last step. Learn more

Access type* ☐ **Programmatic access**
Enables an **access key ID** and **secret access key** for the AWS API, CLI, SDK, and other development tools.

☐ **AWS Management Console access**
Enables a **password** that allows users to sign-in to the AWS Management Console.

Add user

1 2

Set user details

You can add multiple users at once with the same access type and permissions. Learn more

User name* Administrator

Add another user

Select AWS access type

Select how these users will access AWS. Access keys and autogenerated passwords are provided in the last step. Learn more

Access type* ☐ **Programmatic access**
Enables an **access key ID** and **secret access key** for the AWS API, CLI, SDK, development tools.

☑ **AWS Management Console access**
Enables a **password** that allows users to sign-in to the AWS Management Console.

Console password* ○ Autogenerated password
◉ Custom password

Pa$$w0rdPa$$w0rd

☑ Show password

Add user

1 2 3 4 5

Set permissions

Add user to group | Copy permissions from existing user | Attach existing policies directly

Add user to an existing group or create a new one. Using groups is a best-practice way to manage user's permissions by job functions. Learn more

Add user to group

Create group | Refresh

Search — Showing 1 result

Group	Attached policies

Create group

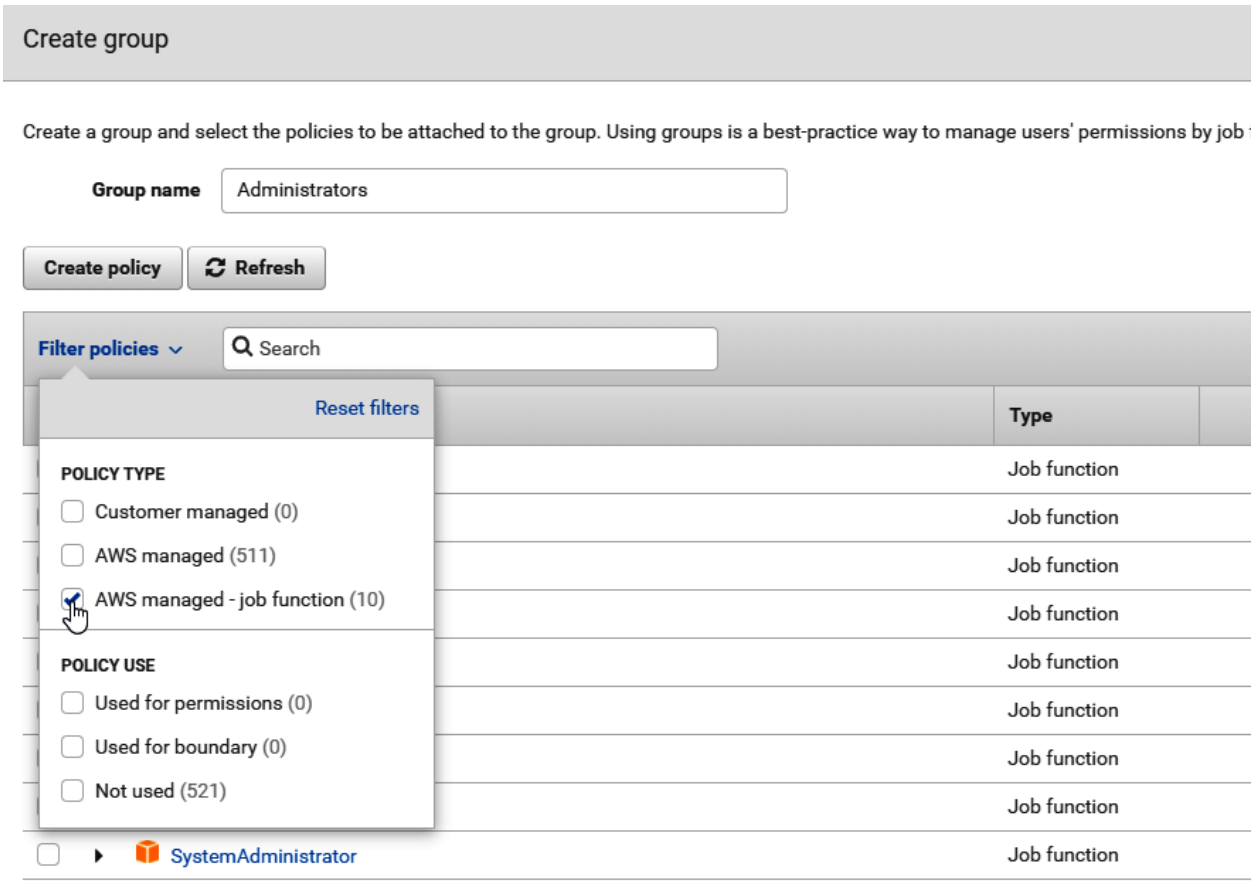
Create a group and select the policies to be attached to the group. Using groups is a best-practice way to manage users' permissions

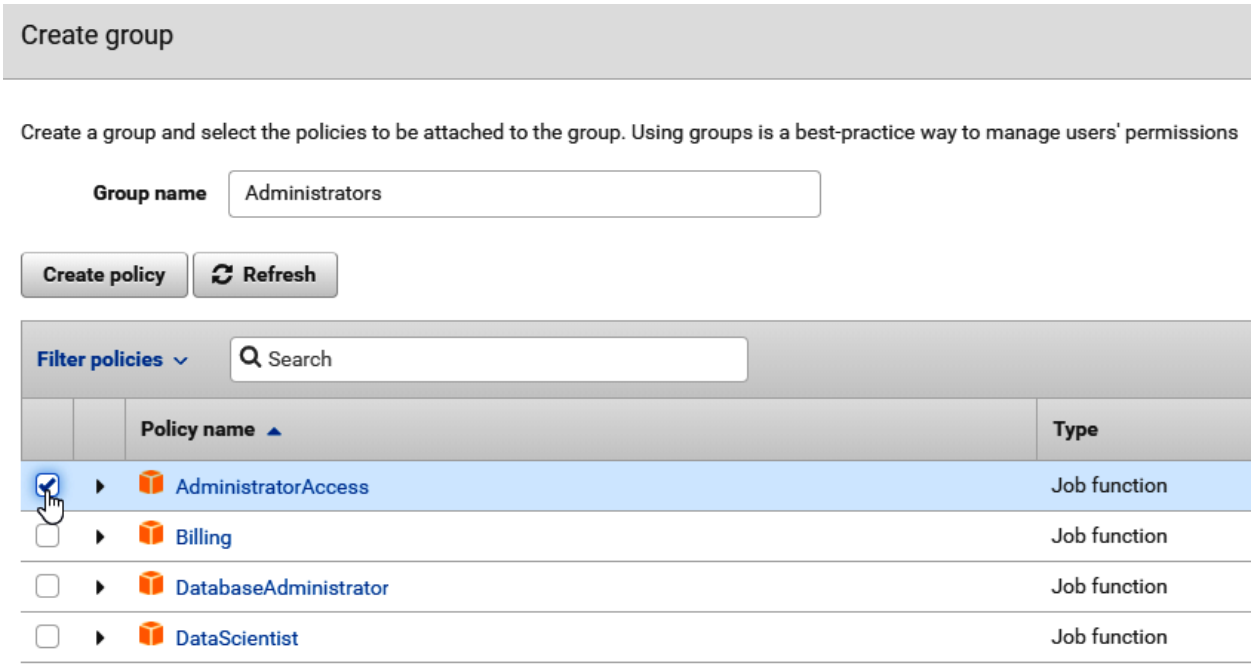
Group name Administrators

Create policy | Refresh

Filter policies | Search

Policy name	Type
AdministratorAccess	Job function
AlexaForBusinessDeviceSetup	AWS managed
AlexaForBusinessFullAccess	AWS managed
AlexaForBusinessGatewayExecution	AWS managed
AlexaForBusinessPolyDelegatedAccessPolicy	AWS managed


Create group
Create a group and select the policies to be attached to the group. Using groups is a best-practice way to manage users' permissions by job
Group name
Administrators
Create policy
Refresh
Filter policies
Search
Reset filters
POLICY TYPE
Customer managed (0)
AWS managed (511)
AWS managed - job function (10)
POLICY USE
Used for permissions (0)
Used for boundary (0)
Not used (521)
Type
Job function
SystemAdministrator


Create group
Create a group and select the policies to be attached to the group. Using groups is a best-practice way to manage users' permissions
Group name
Administrators
Create policy
Refresh
Filter policies
Search
Policy name
Type
AdministratorAccess
Billing
DatabaseAdministrator
DataScientist
Job function

Add user

1 2 3 4 5

Add tags (optional)

IAM tags are key-value pairs you can add to your user. Tags can include user information, such as an email address, or can be descriptive, such as a job title. You can use the tags to organize, track, or control access for this user. Learn more

Key	Value (optional)	Remove
Add new key		

You can add 50 more tags.

Add user

1 2 3 4 5

Review

Review your choices. After you create the user, you can view and download the autogenerated password and access key.

User details

User name	Administrator
AWS access type	AWS Management Console access - with a password
Console password type	Custom
Require password reset	Yes
Permissions boundary	Permissions boundary is not set

Permissions summary

The user shown above will be added to the following groups.

Type	Name
Group	Administrators
Managed policy	IAMUserChangePassword

Tags

No tags were added.

Add user

1 2 3 4 5

Success

You successfully created the users shown below. You can view and download user security credentials. You can also email users instructions for signing in to the AWS Management Console. This is the last time these credentials will be available to download. However, you can create new credentials at any time.

Users with AWS Management Console access can sign-in at: https://[redacted].signin.aws.amazon.com/console

Download .csv

User	Email login instructions
Administrator	Send email

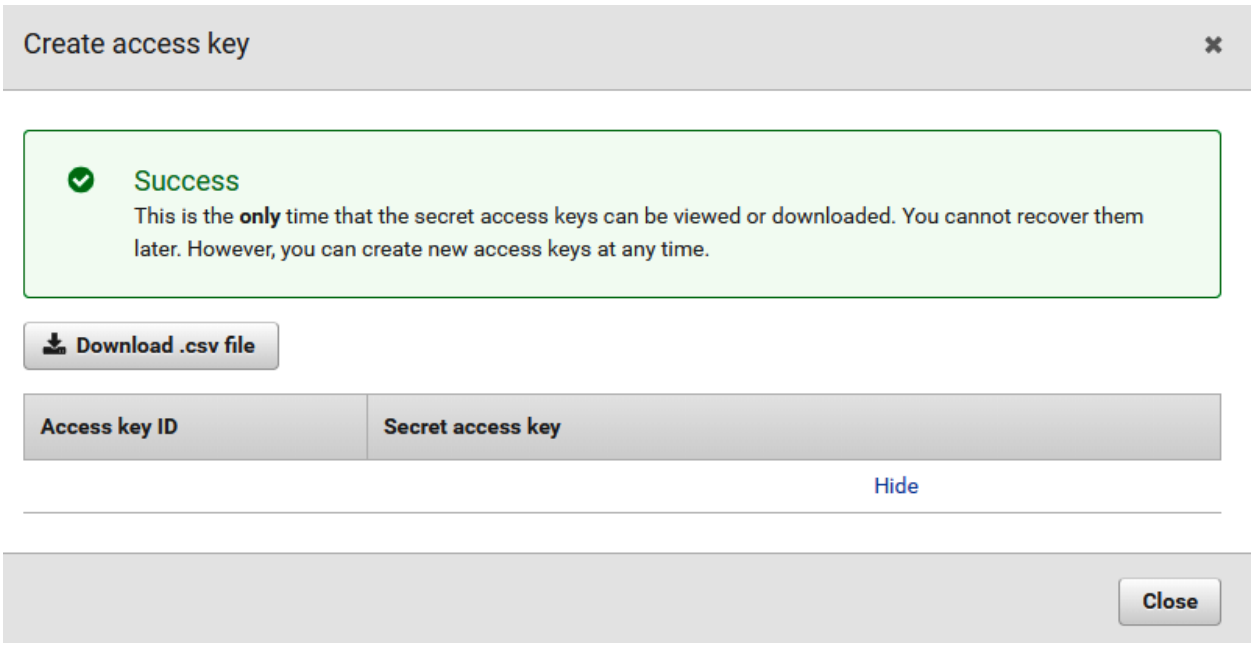
- Created user Administrator
- Attached policy IAMUserChangePassword to user Administrator
- Added user Administrator to group Administrators
- Created login profile for user Administrator

Access keys

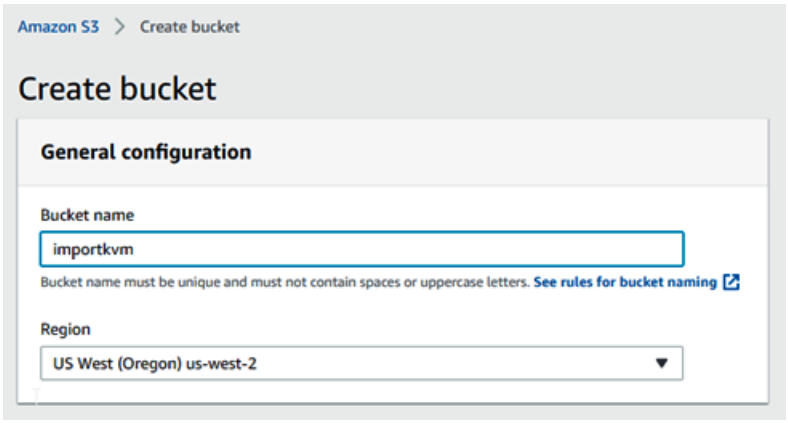
Use access keys to make secure REST or HTTP Query protocol requests to AWS service APIs.

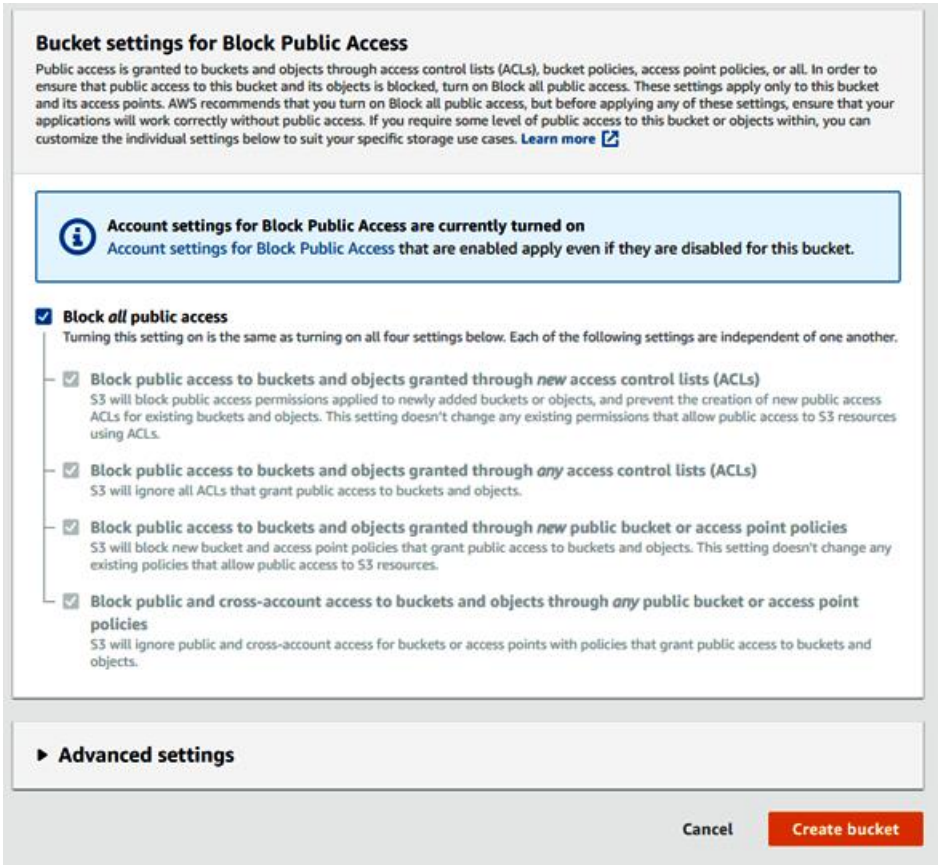
Create access key

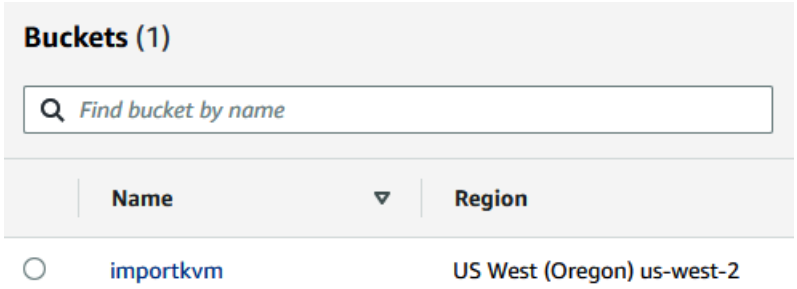
Access key ID	Created	Last used




```
 inflating: aws/dist/botocore/data/appconfig/2019-10-09/paginators-1.json
  creating: aws/dist/botocore/data/events/2015-10-07/
 inflating: aws/dist/botocore/data/events/2015-10-07/service-2.json
 inflating: aws/dist/botocore/data/events/2015-10-07/examples-1.json
 inflating: aws/dist/botocore/data/events/2015-10-07/paginators-1.json
  creating: aws/dist/botocore/data/comprehendmedical/2018-10-30/
 inflating: aws/dist/botocore/data/comprehendmedical/2018-10-30/service-2.json
 inflating: aws/dist/botocore/data/comprehendmedical/2018-10-30/paginators-1.json
root@workstation ~]#
root@workstation ~]# sudo ./aws/install
ou can now run: /usr/local/bin/aws --version
root@workstation ~]# aws
ash: aws: command not found...
root@workstation ~]# /usr/local/bin/aws --version
ws-cli/2.0.7 Python/3.7.3 Linux/3.10.0-1062.el7.x86_64 botocore/2.0.0dev11
root@workstation ~]#
root@workstation ~]#
root@workstation ~]#
root@workstation ~]# /usr/local/bin/aws configure
WS Access Key ID [None]:
WS Secret Access Key [Nor
efault region name [None]: us-west-2
efault output format [None]: table
root@workstation ~]#
```


Amazon S3 > Create bucket
Create bucket
General configuration
Bucket name
importkvm
Bucket name must be unique and must not contain spaces or uppercase letters. See rules for bucket naming
Region
US West (Oregon) us-west-2


Bucket settings for Block Public Access
Public access is granted to buckets and objects through access control lists (ACLs), bucket policies, access point policies, or all. In order to ensure that public access to this bucket and its objects is blocked, turn on Block all public access. These settings apply only to this bucket and its access points. AWS recommends that you turn on Block all public access, but before applying any of these settings, ensure that your applications will work correctly without public access. If you require some level of public access to this bucket or objects within, you can customize the individual settings below to suit your specific storage use cases. Learn more
Account settings for Block Public Access are currently turned on
Account settings for Block Public Access that are enabled apply even if they are disabled for this bucket.
Block all public access
Turning this setting on is the same as turning on all four settings below. Each of the following settings are independent of one another.
Block public access to buckets and objects granted through new access control lists (ACLs)
S3 will block public access permissions applied to newly added buckets or objects, and prevent the creation of new public access ACLs for existing buckets and objects. This setting doesn't change any existing permissions that allow public access to S3 resources using ACLs.
Block public access to buckets and objects granted through any access control lists (ACLs)
S3 will ignore all ACLs that grant public access to buckets and objects.
Block public access to buckets and objects granted through new public bucket or access point policies
S3 will block new bucket and access point policies that grant public access to buckets and objects. This setting doesn't change any existing policies that allow public access to S3 resources.
Block public and cross-account access to buckets and objects through any public bucket or access point policies
S3 will ignore public and cross-account access for buckets or access points with policies that grant public access to buckets and objects.
Advanced settings
Cancel
Create bucket


Buckets (1)
Find bucket by name
Name
Region
importkvm
US West (Oregon) us-west-2

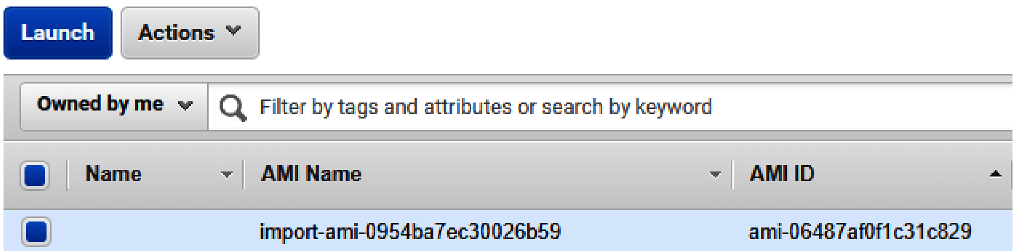
```
[root@workstation deploy-1]# /usr/local/bin/aws s3 cp deploy1.raw s3://importkvm
upload: ./deploy1.raw to s3://importkvm/deploy1.raw
[root@workstation deploy-1]#
```

```
[root@workstation deploy-1]# /usr/local/bin/aws s3 ls
2020-04-11 01:34:14 importkvm
[root@workstation deploy-1]# /usr/local/bin/aws s3 ls importkvm
2020-04-11 01:48:59 8589934592 deploy1.raw
[root@workstation deploy-1]#
```

```
---------------------------------------------------------------------------------------------------------------------------
|                                                    CreateRole                                                           |
+-------------------------------------------------------------------------------------------------------------------------+
||                                                     Role                                                              ||
|+-------------------------------------------+-----------------------------+-------+------------------------+-----------+|
||                    Arn                    |         CreateDate          | Path  |         RoleId         | RoleName  ||
|+-------------------------------------------+-----------------------------+-------+------------------------+-----------+|
||  arn:aws:iam::[redacted]:role/vmimport    |  2020-04-11T10:05:08+00:00  |  /    |  [redacted]            |  vmimport ||
|+-------------------------------------------+-----------------------------+-------+------------------------+-----------+|
|||                                          AssumeRolePolicyDocument                                                  |||
||+-------------------------------------------------+-----------------------------------------------------------------+||
|||  Version                                        |  2012-10-17                                                      |||
||+-------------------------------------------------+-----------------------------------------------------------------+||
||||                                                  Statement                                                      ||||
|||+------------------------------------------------------------------------+-------------------------------------+|||
||||                               Action                                   |               Effect                ||||
|||+------------------------------------------------------------------------+-------------------------------------+|||
||||  sts:AssumeRole                                                        |  Allow                              ||||
|||+------------------------------------------------------------------------+-------------------------------------+|||
|||||                                                Condition                                                  |||||
||||+-------------------------------------------------------------------------------------------------------------+||||
||||||                                            StringEquals                                                 ||||||
|||||+-------------------------------------------------------------------+-------------------------------------+|||||
||||||  sts:ExternalId                                                   |  vmimport                           ||||||
|||||+-------------------------------------------------------------------+-------------------------------------+|||||
|||||                                                Principal                                                  |||||
||||+------------------------------------+------------------------------------------------------------------------+||||
|||||  Service                           |  vmie.amazonaws.com                                                   |||||
||||+------------------------------------+------------------------------------------------------------------------+||||
```

```
[root@workstation deploy-1]# /usr/local/bin/aws ec2 import-image --description "Deploy 1" --disk-containers "file://deploy.json"
-----------------------------------------------------------------------------------------------------
|                                           ImportImage                                             |
+-------------+--------------------------------+-----------+---------+------------------------------+
| Description |          ImportTaskId          | Progress  | Status  |  StatusMessage               |
+-------------+--------------------------------+-----------+---------+------------------------------+
|  Deploy 1   |  import-ami-0954ba7ec30026b59  |  2        |  active |  pending                     |
+-------------+--------------------------------+-----------+---------+------------------------------+
||                                        SnapshotDetails                                          ||
|+-----------------------------------------------------+-------------------------------------------+|
||                    DiskImageSize                    |               Format                      ||
|+-----------------------------------------------------+-------------------------------------------+|
||  0.0                                                |  RAW                                      ||
|+-----------------------------------------------------+-------------------------------------------+|
|||                                       UserBucket                                              |||
||+----------------------------------------+----------------------------------------------------+||
|||               S3Bucket                 |                     S3Key                          |||
||+----------------------------------------+----------------------------------------------------+||
|||  importkvm                             |  deploy1.raw                                       |||
||+----------------------------------------+----------------------------------------------------+||
```

```
---------------------------------------------------------------------------------------------------------------------------------
|                                                   DescribeImportImageTasks                                                    |
+-------------------------------------------------------------------------------------------------------------------------------+
||                                                      ImportImageTasks                                                       ||
|+--------------+--------------+------------------------+-------------------------------+--------------+------------+------------+|
|| Architecture | Description  |        ImageId         |         ImportTaskId          | LicenseType  | Platform   |   Status   ||
|+--------------+--------------+------------------------+-------------------------------+--------------+------------+------------+|
||  x86_64      |  Deploy 1    |  ami-06487af0f1c31c829 |  import-ami-0954ba7ec30026b59 |  BYOL        |  Linux     |  completed ||
|+--------------+--------------+------------------------+-------------------------------+--------------+------------+------------+|
|||                                                      SnapshotDetails                                                      |||
||+----------------------+------------------+---------------------+------------+----------------------------------+-----------+||
|||      Description     |    DeviceName    |    DiskImageSize    |   Format   |            SnapshotId            |   Status  |||
||+----------------------+------------------+---------------------+------------+----------------------------------+-----------+||
|||  Test deployment     |  /dev/sda1       |  8589934592.0       |  RAW       |  snap-0e3cce75ff798ad46          |  completed|||
||+----------------------+------------------+---------------------+------------+----------------------------------+-----------+||
||||                                                        UserBucket                                                       ||||
|||+--------------------------------------------------------+----------------------------------------------------------------+|||
||||                        S3Bucket                        |                              S3Key                             ||||
|||+--------------------------------------------------------+----------------------------------------------------------------+|||
||||  importkvm                                             |  deploy1.raw                                                   ||||
|||+--------------------------------------------------------+----------------------------------------------------------------+|||
[root@workstation deploy-1]#
```



Step 2: Choose an Instance Type

Amazon EC2 provides a wide selection of instance types optimized to fit different use cases. Instances

Filter by: All instance types | Current generation | Show/Hide Columns

Currently selected: t2.micro (Variable ECUs, 1 vCPUs, 2.5 GHz, Intel Xeon Family, 1 GiB memory, EBS only)

	Family	Type
☐	General purpose	t2.nano
☑	General purpose	t2.micro Free tier eligible
☐	General purpose	t2.small
☐	General purpose	t2.medium
☐	General purpose	t2.large
☐	General purpose	t2.xlarge
☐	General purpose	t2.2xlarge
☐	General purpose	t3a.nano
☐	General purpose	t3a.micro

Select an existing key pair or create a new key pair

A key pair consists of a **public key** that AWS stores, and a **private key file** that you store. Together, they allow you to connect to your instance securely. For Windows AMIs, the private key file is required to obtain the password used to log into your instance. For Linux AMIs, the private key file allows you to securely SSH into your instance.

Note: The selected key pair will be added to the set of keys authorized for this instance. Learn more about removing existing key pairs from a public AMI.

Create a new key pair

Key pair name

deploy1key

Download Key Pair

You have to download the **private key file** (*.pem file) before you can continue. **Store it in a secure and accessible location.** You will not be able to download the file again after it's created.

Cancel | Launch Instances

Connect to your instance

Connection method

- (●) A standalone SSH client
- ( ) Session Manager
- ( ) EC2 Instance Connect (browser-based SSH connection)

To access your instance:

1. Open an SSH client. (find out how to connect using PuTTY)
2. Locate your private key file (deploy1key.pem). The wizard automatically detects the key you used to launch the instance.
3. Your key must not be publicly viewable for SSH to work. Use this command if needed:

```
chmod 400 deploy1key.pem
```

4. Connect to your instance using its Public DNS:

```
ec2-54-218-183-62.us-west-2.compute.amazonaws.com
```

Example:

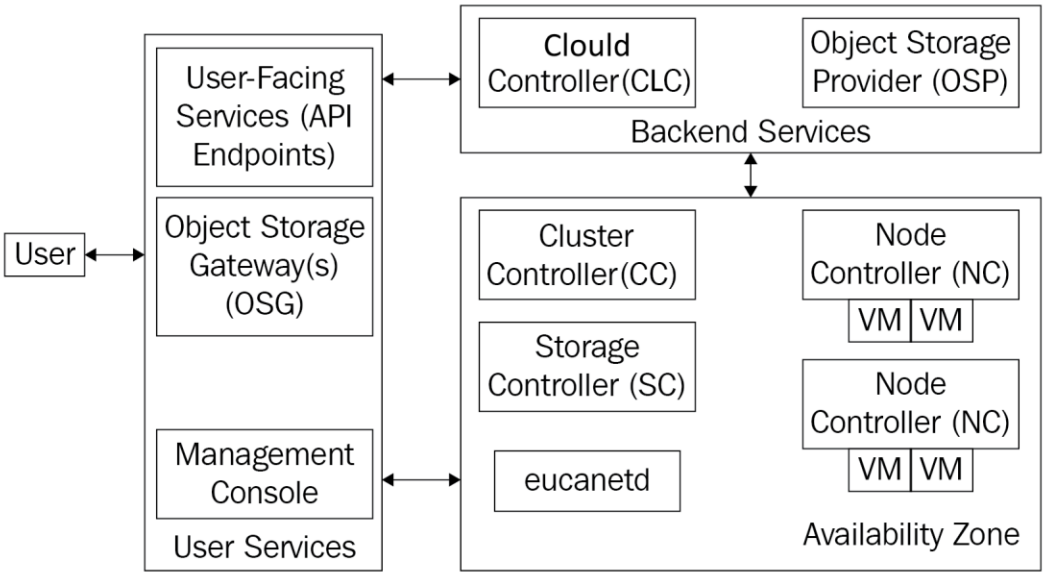
```
ssh -i "deploy1key.pem" root@ec2-54-218-183-62.us-west-2.compute.amazonaws.com
```

Please note that in most cases the username above will be correct, however please ensure that you read your AMI usage instructions to ensure that the AMI owner has not changed the default AMI username.

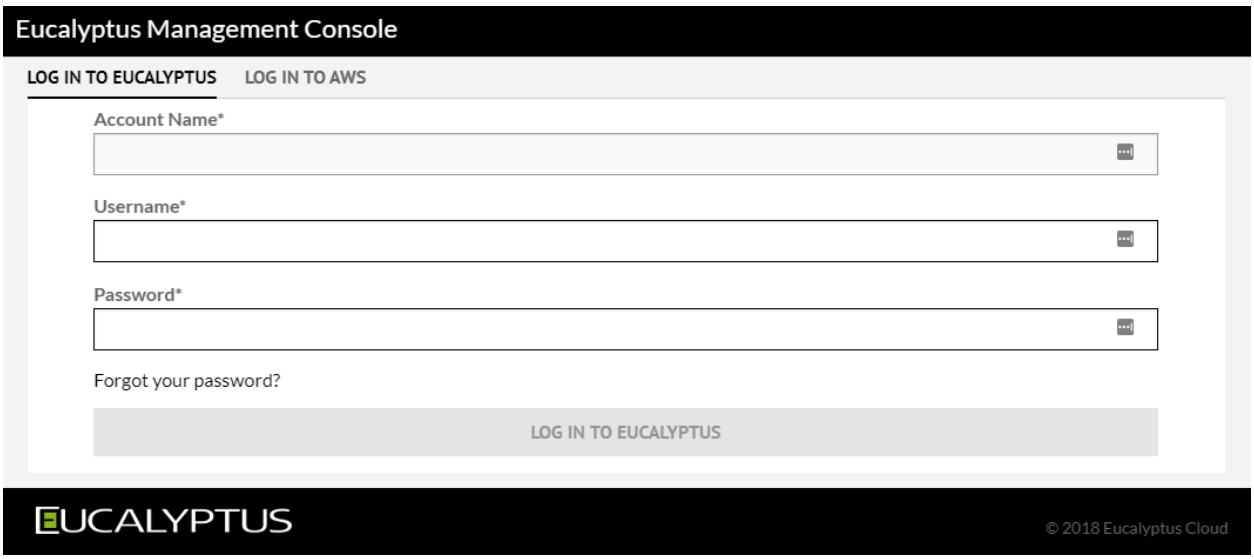
If you need any assistance connecting to your instance, please see our connection documentation.

Close

```
[root@workstation ~]# ssh -i deploy1key.pem centos@ec2-54-218-183-62.us-west-2.compute.amazonaws.com
The authenticity of host 'ec2-54-218-183-62.us-west-2.compute.amazonaws.com (54.218.183.62)' can't be established.
ECDSA key fingerprint is SHA256:WRucACtXNTbAlvwfuynPEgqo6FjJoLas6bLKymPJrEQ.
ECDSA key fingerprint is MD5:44:b5:04:e8:87:ad:24:19:01:a3:e9:8d:a7:0e:42:34.
Are you sure you want to continue connecting (yes/no)? yes
Warning: Permanently added 'ec2-54-218-183-62.us-west-2.compute.amazonaws.com,54.218.183.62' (ECDSA) to the list of known hosts.
Last login: Sat Apr 11 11:03:17 2020 from
[centos@ip-172-31-21-125 ~]$
```



```
[Yum Update] OK, running a full update of the OS. This could take a bit; please wait.

To see the update in progress, run the following command in another terminal:

  tail -f /var/log/euca-install-04.08.2020-18.06.50.log

[Yum Update] Package update in progress...

     ) )
    ( (
  ........
  |      |]
  \      /
   ------

[Yum Update] Full update of the OS completed.

Phase 0 (OS) completed successfully...getting a 2nd cup of tea and moving on to phase 1 (CLC).

     ) )
    ( (
  ........
  |      |]
  \      /
   ------

Phase 1 (CLC) completed successfully...getting a 3rd cup of tea and moving on to phase 2 (main cloud
 components).

     ) )
    ( (
  ........
  |      |]
  \      /
   ------
```



```
[root@euca tutorials]# ./master-tutorial.sh

*****

Welcome to the Getting Started Tutorial.  We will walk you through
some of the key concepts of managing your new Eucalyptus cloud.
It is strongly recommended for first-time users of Eucalyptus.

Would you like to walk through the Getting Started tutorial? [Y/n]
```

```
Remember: when using Eucalyptus, you must "log in".
When using euca2ools, the way to "log in" is to use
the euca2ools configuration credentials file located
under /root/.euca. By default, Faststart sets this
configuration file up for you. Once this has been
set up, with each euca2ools command, the
"--region" option must be used. For FastStart,
the region option will contain the value
"admin@192.168.5.48.nip.io".  For example:

euca-describe-availability-zones --region admin@192.168.5.48.nip.io

To learn more about using euca2ools configuration file, please refer to
the Euca2ools Guide section entitled "Working with Euca2ools Configuration Files":
  https://docs.eucalyptus.com/eucalyptus/4.4.2/index.html#shared/euca2ools_working_with_config_files.html

Hit Enter to continue.

The euca2ools command for listing images is euca-describe-images.
If you have ever worked with Amazon Web Services, you will
notice that the command, and the output from the command, is
nearly identical to the comparable AWS command; this is by design.
Press Enter to run euca-describe-images --region admin@192.168.5.48.nip.io now.

+ euca-describe-images --region admin@192.168.5.48.nip.io
IMAGE   emi-0142c1c3    default/default.img.manifest.xml        000028543277    available       public  x86_64  machine
vm

Now let's review some of the key output of that command:

  emi-0142c1c3 is the image ID, which is used
  to refer to the image by most other commands.

  default/default.img.manifest.xml is the image path.

  public is the permission for this image. Images that
  are accessible to all users of this cloud are marked public; images that can
  only be run by the owner of the image are marked private.

To learn more about the euca-describe-images command, check out the documentaion:
  http://docs.hpcloud.com/eucalyptus/4.2.0/#euca2ools-guide/euca-describe-images.html


Installing Images

Continue with Installing Images Tutorial? (Y/n)
```

INSTALL

Quickly install images for your Eucalyptus cloud by running:

```
python <(curl -Ls https://eucalyptus.cloud/images)
```

DOWNLOAD

Fetch and upload images to your Eucalyptus cloud(s):

CentOS and CentOS Atomic Host
From cloud.centos.org

Fedora CoreOS
From getfedora.org/en/coreos

Fedora
From alt.fedoraproject.org/cloud

Ubuntu
From cloud-images.ubuntu.com

by following the image guide, for installing an HVM image.

```
Complete!
Select an image Id from the following table:

ID    Format   Updates  Login    Description
1     qcow2    yes      ubuntu   Ubuntu 16.04/Xenial
2     qcow2    yes      ubuntu   Ubuntu 18.04/Bionic
3     qcow2    yes      ubuntu   Ubuntu 19.10/Eoan
4     raw      no       fedora   Fedora 31
5     vmdk     no       core     Fedora CoreOS Stable
6     raw      no       centos   CentOS 7
7     qcow2    no       centos   CentOS Atomic Host 7
8     qcow2    no       centos   CentOS 8
9     qcow2    yes      core     Flatcar Container Linux Stable

Enter the image ID you would like to install:
```

Eucalyptus Management Console admin@eucalyptus

Dashboard default

Running instances

LAUNCH INSTANCE

Stopped instances

Stacks

Create stack

Alarms in alarm state

0

Instances in scaling groups

Create scaling group

Elastic IPs

Allocate elastic IPs

Security groups

Create security group

Key pairs

Create key pair

Load balancers

Create load balancer

Service status

Compute	◌
Object Storage	✔
Auto Scaling	✔
Elastic Load Balancing	◌
CloudWatch	✔
CloudFormation	✔
Identity & Access Mgmt	✔

Volumes

Create volume

Snapshots

Create snapshot

Buckets (S3) **Accounts** **Users** **Groups**

/ Images

Images

MORE ACTIONS

Select facets for filter, or enter text to search

3 found

NAME (ID)	STATUS	EMI NAME ▲	DESCRIPTION	ROOT DEVICE	PLATFORM	ACTIONS
emi-0142c1c3	available	default		instance-store	unknown	•••
emi-44e3092d	available	Fedora31		instance-store	Fedora	•••
emi-e7d07d94	available	ubuntu-eoan		instance-store	Ubuntu	•••

/ Instances / Launch instance

Launch new instance

1 IMAGE 2 DETAILS 3 SECURITY 4 ADVANCED

Specify the number, name(s), size, availability zone, and tags.

Number of instances * 1

Name instance1

Instance type * m1.large: 2 CPUs, 512 memory (MB), 10 disk (GB,root device)

Availability zone default

TAGS

Add a tag:

name... value...

ADD TAG

USER DATA

- **Enter text**
- **Upload file**

* Required fields

NEXT Cancel

Summary

Image
ubuntu-eoan

Platform
Ubuntu

Root device
instance-store

Size
m1.large

Number
1

Zone
default

Name(s)

+ Help

/ Instances / Launch instance

Launch new instance

1 IMAGE 2 DETAILS 3 SECURITY 4 ADVANCED

Specify key pair and security group.

Key name * my-first-keypair

Or: Create key pair

Security group * default ×

Or: Create security group

✚ Rules for default

Specify an IAM role if you would like to give this instance special access privileges.

Role Select...

* Required fields

LAUNCH INSTANCE Cancel

Or: Select advanced options

Summary

Image
ubuntu-eoan

Platform
Ubuntu

Root device
instance-store

Size
m1.large

Number
1

Zone
no preference

Name(s)

Network

Subnet

Key
my-first-keypair

Security group
default

✚ Help

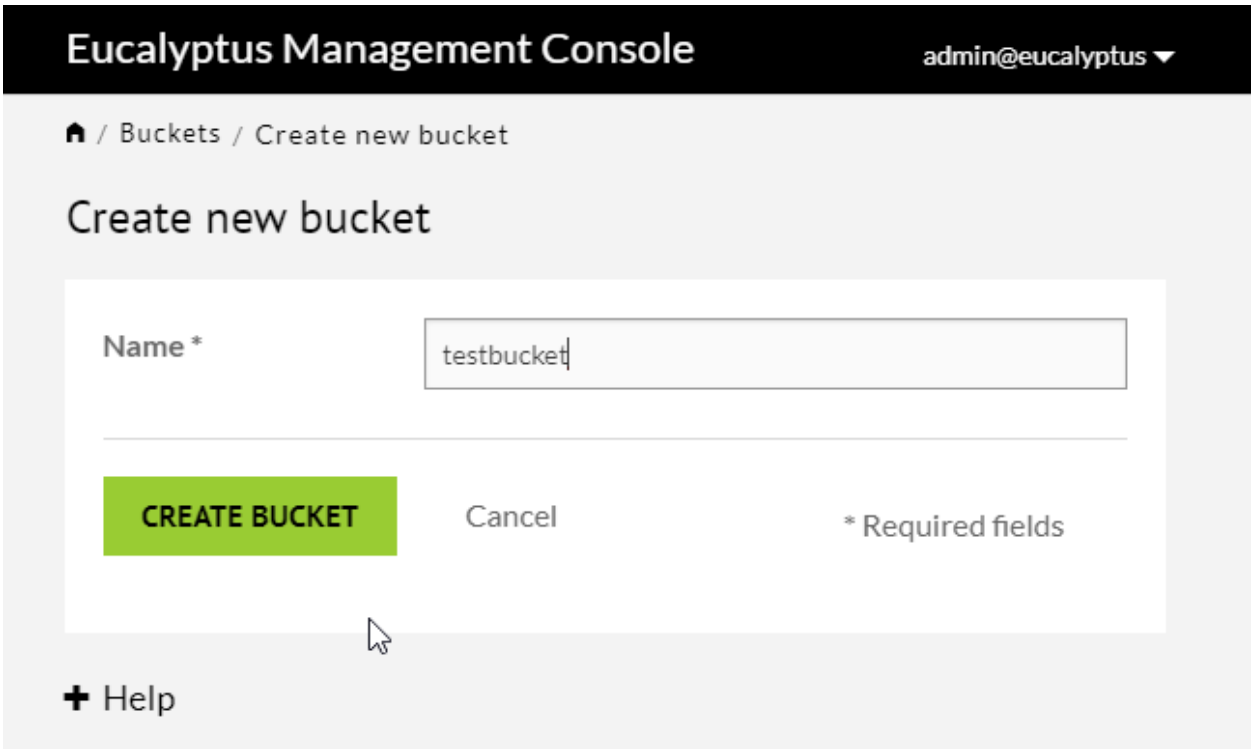
Instances

LAUNCH NEW INSTANCE MORE ACTIONS

Select facets for filter, or enter text to search

2 found

NAME (ID)	STATUS	ALARMS	IMAGE ID	ZONE	PUBLIC ADDR	KEY NAME	SECURITY GROUP	LAUNCH TIME ▼	ACTIONS
i-df8b314c	running		emi-e7d07d94	default	192.168.5.201	my-first-keypair	default	12:22:58 AM Apr 12 2020	•••
i-87699b4a	running		emi-44e3092d	default	192.168.5.202	my-first-keypair	default	10:43:41 AM Apr 10 2020	•••


Eucalyptus Management Console
admin@eucalyptus
/ Buckets / Create new bucket
Create new bucket
Name *
testbucket
CREATE BUCKET
Cancel
* Required fields
Help

Details for bucket: testbucket

BUCKET

ACTIONS

Name	testbucket
Owner	eucalyptus
Objects	0
Versioning	Disabled
Creation time	11:56:07 PM Apr 9 2020

SHARING

Bucket ACLs

☐ **Propagate grantee permissions to objects in this bucket**

eucalyptus: FULL_CONTROL ✖

Add another grantee :

Grantee * Select account or type to enter account ID

Permission Full Control

ADD GRANTEE

CORS Configuration

Using CORS (Cross-Origin Resource Sharing) you can selectively allow web applications running on other domains to access content in your bucket. Each CORS rule must contain the site of origins/domains and HTTP methods you want to allow for those origins. Optionally, you can also specify the headers users can set in requests or access in responses and the duration the preflight responses should be cached.

ADD CORS CONFIGURATION

SAVE CHANGES Cancel

✚ Help


Eucalyptus Management Console
LOG IN TO EUCALYPTUS
LOG IN TO AWS
Access key ID*
AAAAAAAAAAAAAAAA
Secret key*
LOG IN TO AWS
Need to access an IAM account?
Contact your cloud administrator
EUCALYPTUS
© 2018 Eucalyptus Cloud

Eucalyptus Management Console

US West (Oregon) ASIAYOUX...@AWS

Dashboard

All availability zones

Running instances

0

LAUNCH INSTANCE

Stopped instances

1

Stacks

0

Create stack

Alarms in alarm state

0

Instances in scaling groups

0

Create scaling group

Elastic IPs

0

Allocate elastic IPs

Security groups

2

Create security group

Key pairs

1

Create key pair

Load balancers

0

Create load balancer

Service status

Compute	✔
Object Storage	✔
Auto Scaling	✔
Elastic Load Balancing	✔
CloudWatch	✔
CloudFormation	✔

Volumes

1

Create volume

Snapshots

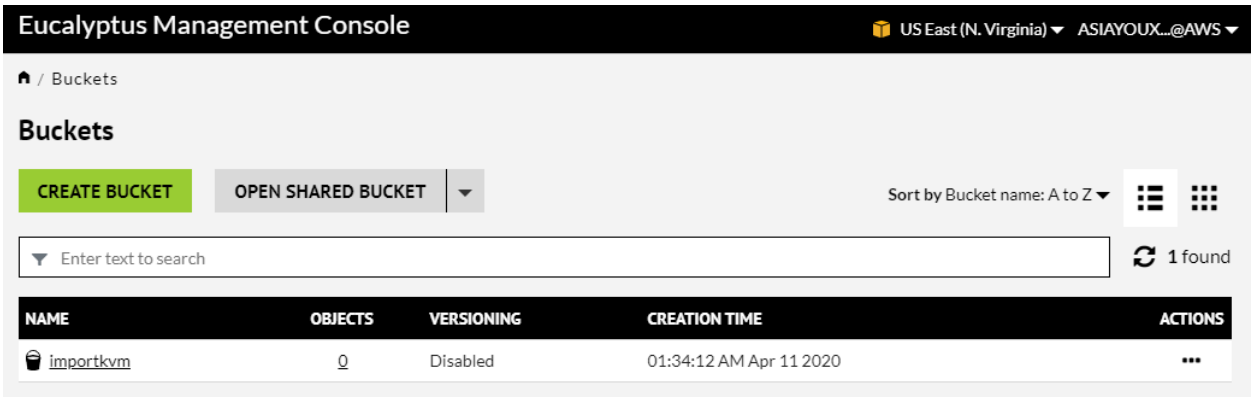
1

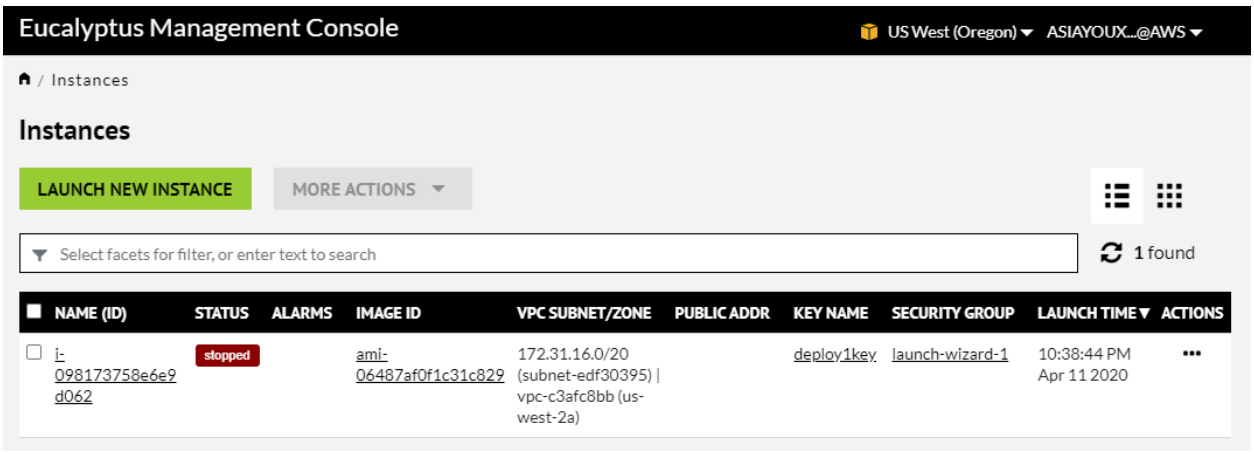
Create snapshot

Buckets (S3)

1

Create bucket

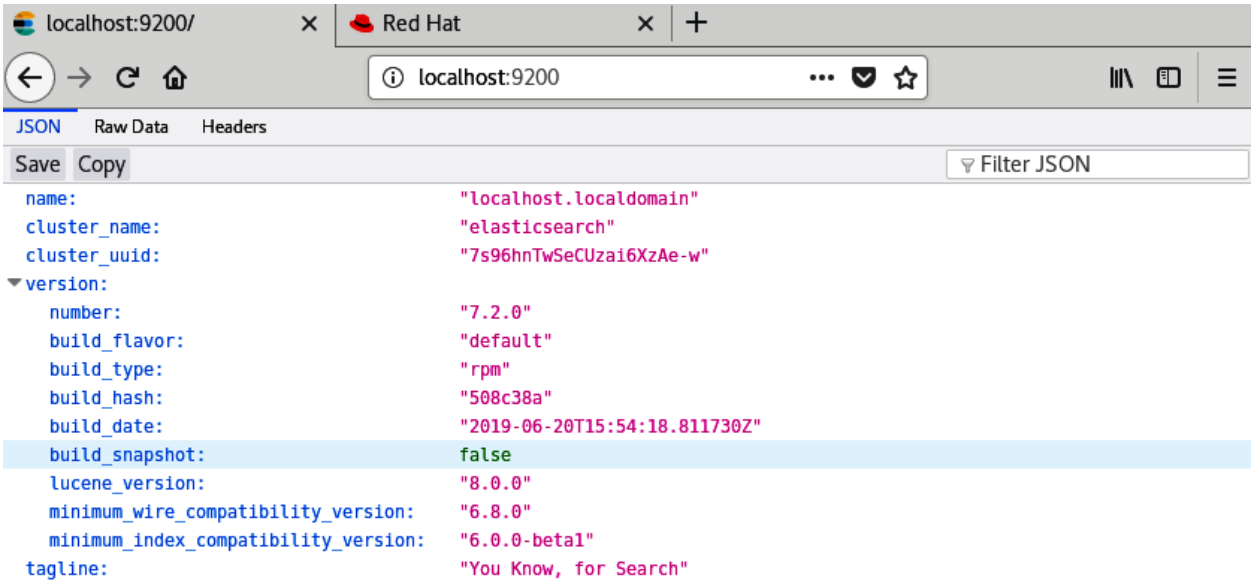

Eucalyptus Management Console
US East (N. Virginia)
ASIAYOUX...@AWS
/ Buckets
Buckets
CREATE BUCKET
OPEN SHARED BUCKET
Sort by Bucket name: A to Z
Enter text to search
1 found
NAME
OBJECTS
VERSIONING
CREATION TIME
ACTIONS
importkvm
0
Disabled
01:34:12 AM Apr 11 2020

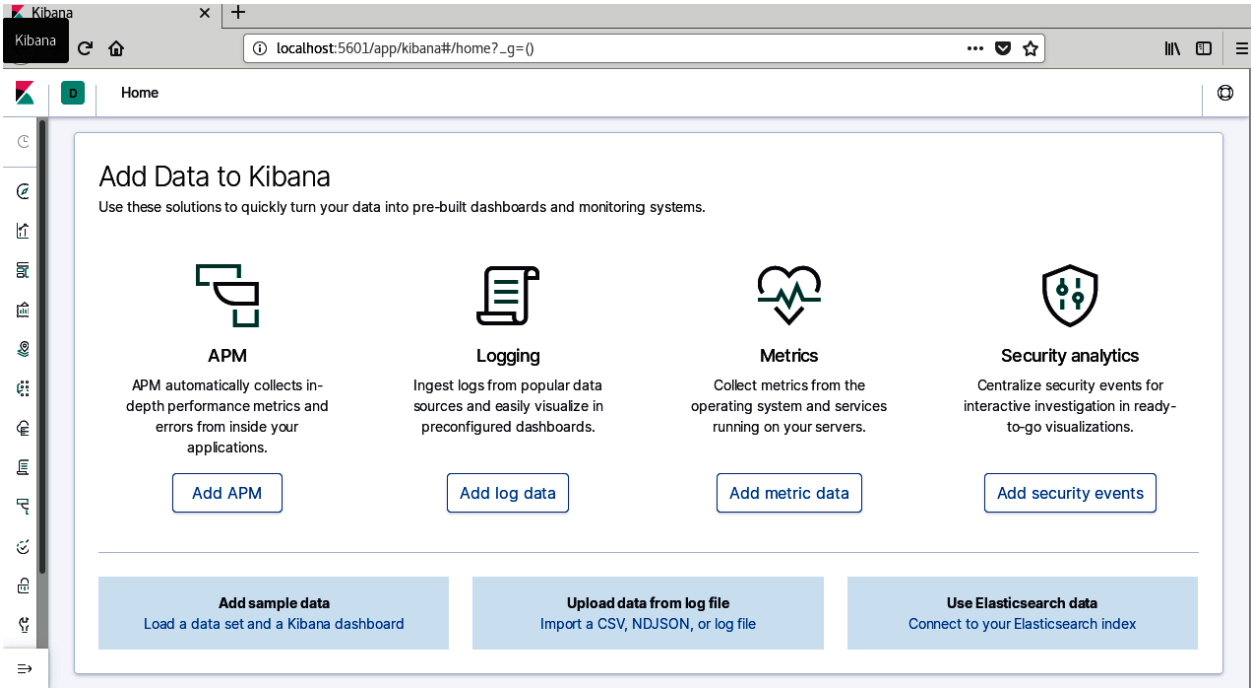

Eucalyptus Management Console
US West (Oregon)
ASIAYOUX...@AWS
/ Instances
Instances
LAUNCH NEW INSTANCE
MORE ACTIONS
Select facets for filter, or enter text to search
1 found
NAME (ID)
STATUS
ALARMS
IMAGE ID
VPC SUBNET/ZONE
PUBLIC ADDR
KEY NAME
SECURITY GROUP
LAUNCH TIME
ACTIONS
i-098173758e6e9d062
stopped
ami-06487af0f1c31c829
172.31.16.0/20 (subnet-edf30395) | vpc-c3afc8bb (us-west-2a)
deploy1key
launch-wizard-1
10:38:44 PM Apr 11 2020

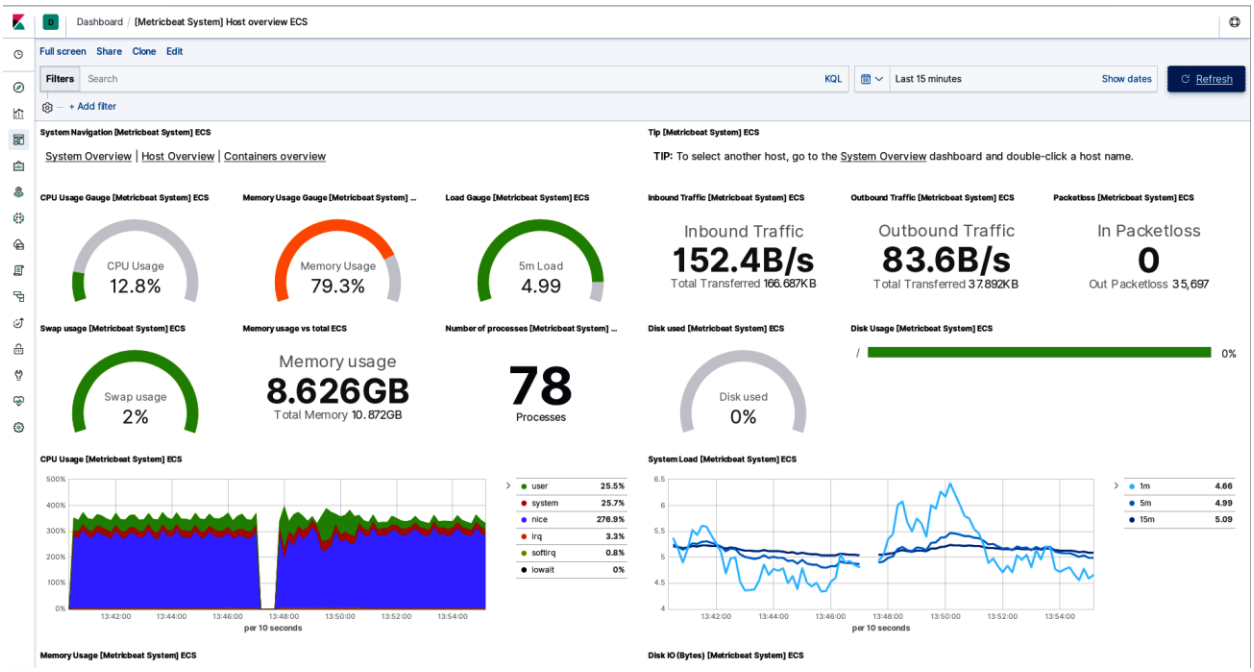
Chapter 14: Monitoring the KVM Virtualization Platform

```
[root@localhost yum.repos.d]# yum install java-11-openjdk-devel
Updating Subscription Management repositories.
Last metadata expiration check: 0:36:07 ago on Sat 27 Jul 2019 04:37:07 PM EDT.
Dependencies resolved.
================================================================================
 Package      Arch   Version             Repository                        Size
================================================================================
Installing:
 java-11-openjdk-devel
              x86_64 1:11.0.4.11-0.el8_0 rhel-8-for-x86_64-appstream-rpms 3.4 M
Installing dependencies:
 javapackages-filesystem
              noarch 5.3.0-1.module+el8+2447+6f56d9a6
                                         rhel-8-for-x86_64-appstream-rpms  30 k
 xorg-x11-fonts-Type1
              noarch 7.5-19.el8          rhel-8-for-x86_64-appstream-rpms 522 k
 copy-jdk-configs
              noarch 3.7-1.el8           rhel-8-for-x86_64-appstream-rpms  27 k
 ttmkfdir     x86_64 3.0.9-54.el8        rhel-8-for-x86_64-appstream-rpms  62 k
 java-11-openjdk-headless
              x86_64 1:11.0.4.11-0.el8_0 rhel-8-for-x86_64-appstream-rpms  39 M
 tzdata-java  noarch 2019b-1.el8         rhel-8-for-x86_64-appstream-rpms 189 k
 java-11-openjdk
              x86_64 1:11.0.4.11-0.el8_0 rhel-8-for-x86_64-appstream-rpms 227 k
 lksctp-tools x86_64 1.0.18-3.el8        rhel-8-for-x86_64-baseos-rpms    100 k
Enabling module streams:
 javapackages-runtime
                     201801

Transaction Summary
================================================================================
Install  9 Packages

Total download size: 44 M
Installed size: 180 M
Is this ok [y/N]: y
```

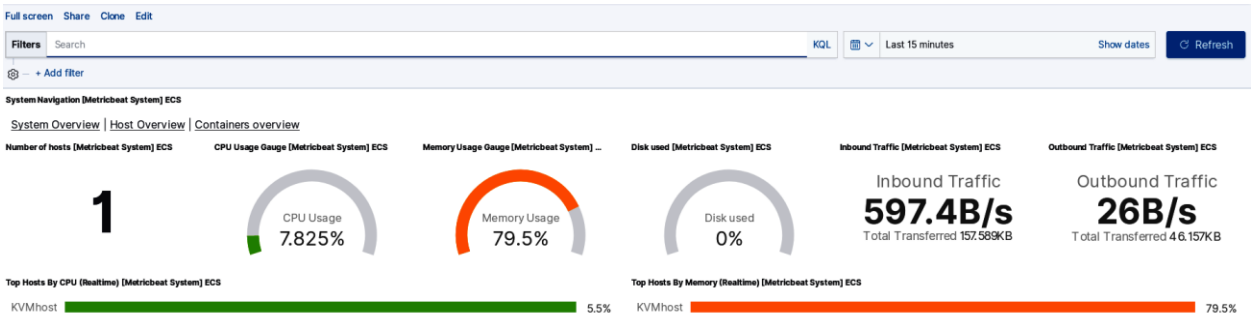
```
root@localhost yum.repos.d]# java -version
penjdk version "11.0.4" 2019-07-16 LTS
penJDK Runtime Environment 18.9 (build 11.0.4+11-LTS)
penJDK 64-Bit Server VM 18.9 (build 11.0.4+11-LTS, mixed mode, sharing)
root@localhost yum.repos.d]#
```


localhost:9200/
Red Hat
localhost:9200
JSON
Raw Data
Headers
Save
Copy
Filter JSON
name: "localhost.localdomain"
cluster_name: "elasticsearch"
cluster_uuid: "7s96hnTwSeCUzai6XzAe-w"
version:
number: "7.2.0"
build_flavor: "default"
build_type: "rpm"
build_hash: "508c38a"
build_date: "2019-06-20T15:54:18.811730Z"
build_snapshot: false
lucene_version: "8.0.0"
minimum_wire_compatibility_version: "6.8.0"
minimum_index_compatibility_version: "6.0.0-beta1"
tagline: "You Know, for Search"

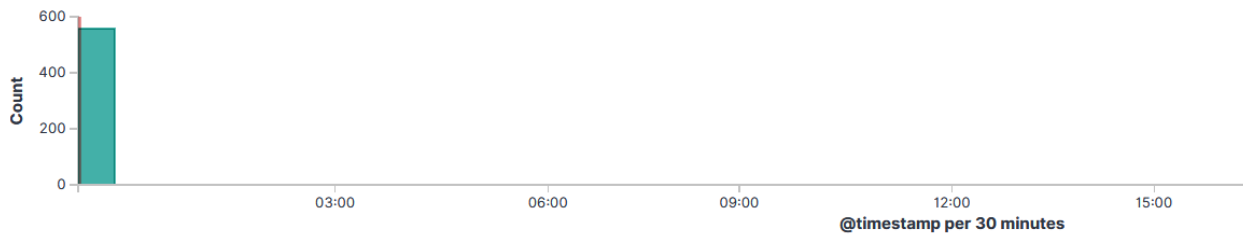

Kibana
localhost:5601/app/kibana#/home?_g=()
Home
Add Data to Kibana
Use these solutions to quickly turn your data into pre-built dashboards and monitoring systems.
APM
APM automatically collects in-depth performance metrics and errors from inside your applications.
Add APM
Logging
Ingest logs from popular data sources and easily visualize in preconfigured dashboards.
Add log data
Metrics
Collect metrics from the operating system and services running on your servers.
Add metric data
Security analytics
Centralize security events for interactive investigation in ready-to-go visualizations.
Add security events
Add sample data
Load a data set and a Kibana dashboard
Upload data from log file
Import a CSV, NDJSON, or log file
Use Elasticsearch data
Connect to your Elasticsearch index




```
#
 pipeline.id: main
#
# Set the number of workers that will, in parallel, execute the filters+outputs
# stage of the pipeline.
#
# This defaults to the number of the host's CPU cores.
#
 pipeline.workers: 2
#
# How many events to retrieve from inputs before sending to filters+workers
#
 pipeline.batch.size: 125
#
# How long to wait in milliseconds while polling for the next event
# before dispatching an undersized batch to filters+outputs
#
 pipeline.batch.delay: 50
#
# Force Logstash to exit during shutdown even if there are still inflight
# events in memory. By default, logstash will refuse to quit until all
# received events have been pushed to the outputs.
#
```


Full screen
Share
Clone
Edit
Filters
Search
KQL
Last 15 minutes
Show dates
Refresh
+ Add filter
System Navigation [Metricbeat System] ECS
System Overview | Host Overview | Containers overview
Number of hosts [Metricbeat System] ECS
1
CPU Usage Gauge [Metricbeat System] ECS
CPU Usage
7.825%
Memory Usage Gauge [Metricbeat System] ...
Memory Usage
79.5%
Disk used [Metricbeat System] ECS
Disk used
0%
Inbound Traffic [Metricbeat System] ECS
Inbound Traffic
597.4B/s
Total Transferred 157.589KB
Outbound Traffic [Metricbeat System] ECS
Outbound Traffic
26B/s
Total Transferred 46.157KB
Top Hosts By CPU (Realtime) [Metricbeat System] ECS
KVMhost
5.5%
Top Hosts By Memory (Realtime) [Metricbeat System] ECS
KVMhost
79.5%

Aug 7, 2019 @ 00:00:00.000 - Aug 7, 2019 @ 23:59:59.999 — Auto



Time	host.hostname
Aug 7, 2019 @ 00:01:01.352	rhelcoretest
Aug 7, 2019 @ 00:01:01.352	rhelcoretest
Aug 7, 2019 @ 00:01:01.352	rhelcoretest
Aug 7, 2019 @ 00:01:01.352	rhelcoretest
Aug 7, 2019 @ 00:01:01.352	rhelcoretest
Aug 7, 2019 @ 00:01:01.352	rhelcoretest
Aug 7, 2019 @ 00:01:01.352	rhelcoretest
Aug 7, 2019 @ 00:01:01.352	rhelcoretest
Aug 7, 2019 @ 00:01:01.352	rhelcoretest
Aug 7, 2019 @ 00:01:01.352	rhelcoretest
Aug 7, 2019 @ 00:01:01.352	rhelcoretest
Aug 7, 2019 @ 00:01:01.352	rhelcoretest
Aug 7, 2019 @ 00:01:01.345	rhelcoretest

Quick select

Last | 15 | minutes | Apply

Commonly used

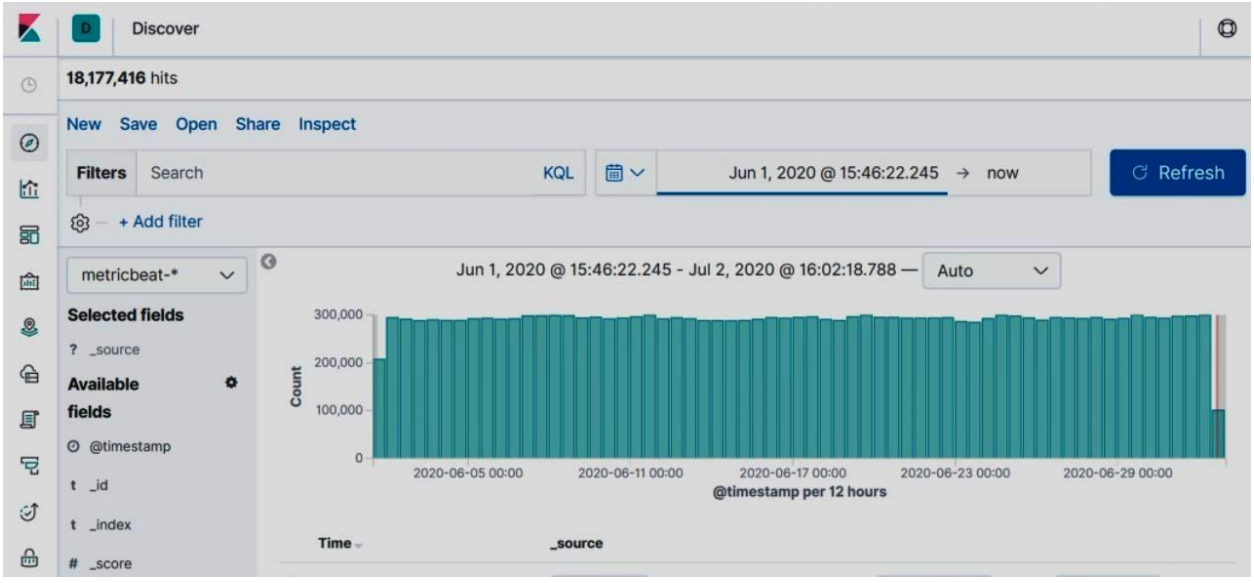
Today
This week
Last 15 minutes
Last 30 minutes
Last 1 hour
Last 24 hours
Last 7 days
Last 30 days
Last 90 days
Last 1 year

Recently used date ranges

Last 24 hours
Today
Aug 6, 2019 @ 03:47:17.882 to Aug 6, 2019 @ 22:37:06.182
Last 15 minutes
Last 1 hour

Refresh every

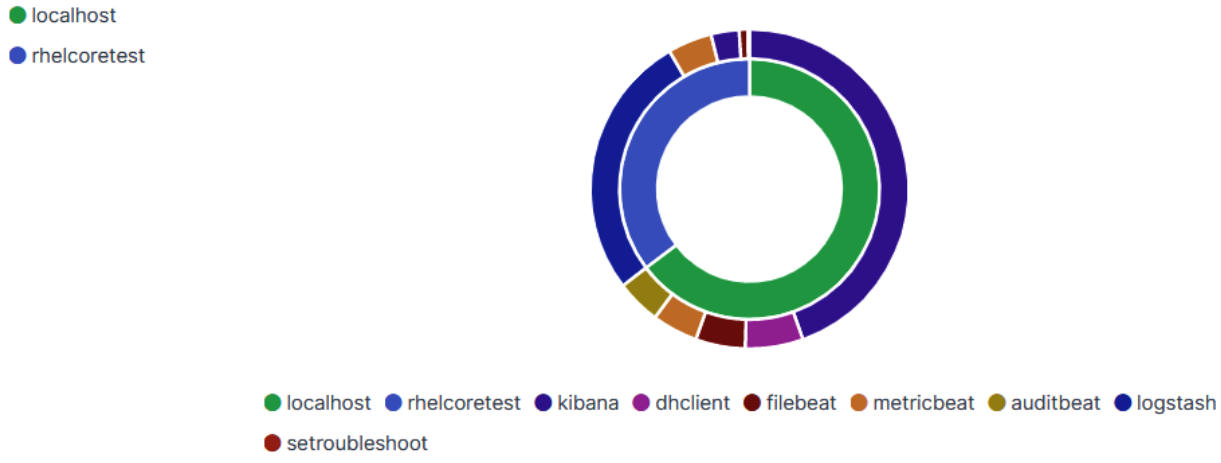
0 | seconds | Start



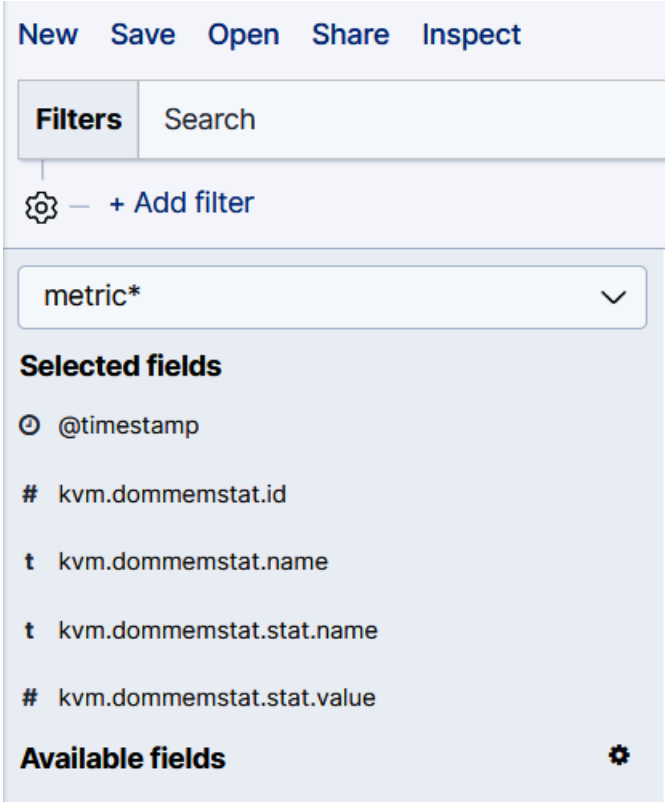
Syslog logs [Filebeat System] ECS

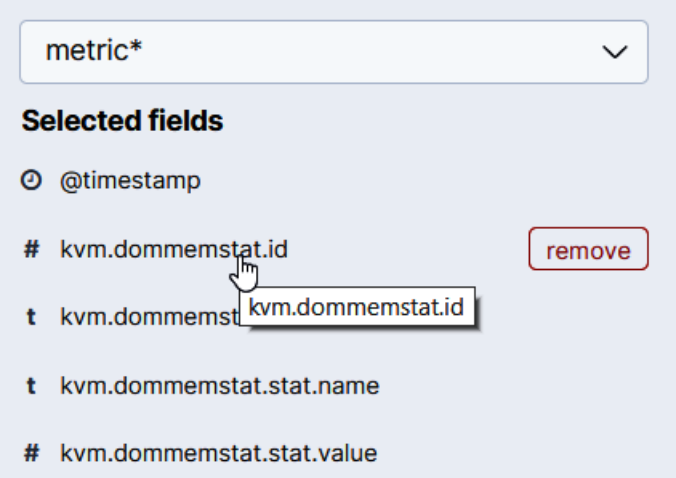
	Time	host.hostname	process.name
>	Aug 6, 2019 @ 20:35:01.000	localhost	kibana
>	Aug 6, 2019 @ 20:35:01.000	localhost	auditbeat
>	Aug 6, 2019 @ 20:35:01.000	rhelcoretest	logstash
>	Aug 6, 2019 @ 20:34:59.000	localhost	dbus-daemon
>	Aug 6, 2019 @ 20:34:59.000	localhost	systemd
>	Aug 6, 2019 @ 20:34:59.000	localhost	journal
>	Aug 6, 2019 @ 20:34:59.000	localhost	dbus-daemon

Syslog hostnames and processes [Filebeat System] ECS



```
virsh # dommemstat --domain cen
actual 1048576
swap_in 0
swap_out 0
major_fault 192
minor_fault 160373
unused 905060
available 1014904
usable 855520
last_update 1564957343
rss 580292

virsh #
```





Aug 8, 2019 @ 23:22:49.313	Aug 8, 2019 @ 23:22:49.313	2	cen	actualballoon		1,048,576
Aug 8, 2019 @ 23:22:49.313	Aug 8, 2019 @ 23:22:49.313	2	cen	swapin		0
Aug 8, 2019 @ 23:22:49.313	Aug 8, 2019 @ 23:22:49.313	2	cen	swapout		0
Aug 8, 2019 @ 23:22:49.313	Aug 8, 2019 @ 23:22:49.313	2	cen	majorfault		192
Aug 8, 2019 @ 23:22:49.313	Aug 8, 2019 @ 23:22:49.313	2	cen	minorfault		160,373
Aug 8, 2019 @ 23:22:49.313	Aug 8, 2019 @ 23:22:49.313	2	cen	unused		905,060
Aug 8, 2019 @ 23:22:49.313	Aug 8, 2019 @ 23:22:49.313	2	cen	available		1,014,904
Aug 8, 2019 @ 23:22:49.313	Aug 8, 2019 @ 23:22:49.313	2	cen	usable		855,520
Aug 8, 2019 @ 23:22:49.313	Aug 8, 2019 @ 23:22:49.313	2	cen	lastupdate		1,564,957,343
Aug 8, 2019 @ 23:22:49.313	Aug 8, 2019 @ 23:22:49.313	2	cen	rss		580,292

Visualizations

Create new visualization

Search...

Title	Type	Actions
Bytes Timeline [Filebeat NATS] ECS	Line	
Cache Hits, Misses [Metricbeat CoreDNS] ECS	Line	
ASA Events Over Time [Filebeat Cisco]	Vertical Bar	
ASA Firewall Blocked by Source [Filebeat Cisco]	Data Table	
ASA Flows by Network Bytes [Filebeat Cisco]	Vertical Bar	
ASA Top ACL by Blocked [Filebeat Cisco]	Data Table	
AWS Cloudwatch ECS CPU Available	TSVB	
AWS Cloudwatch ECS Memory Available	TSVB	
AWS Cloudwatch ELB Latency	TSVB	
AWS Cloudwatch ELB Request Count Top5	TSVB	

Rows per page: 10

1 2 3 4 5 ... 49

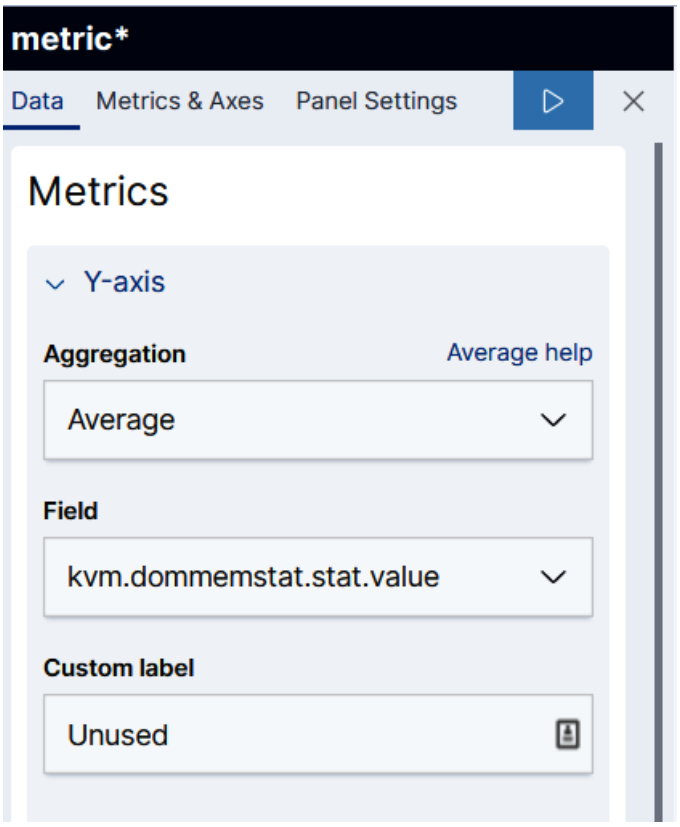
New Area / Choose a source

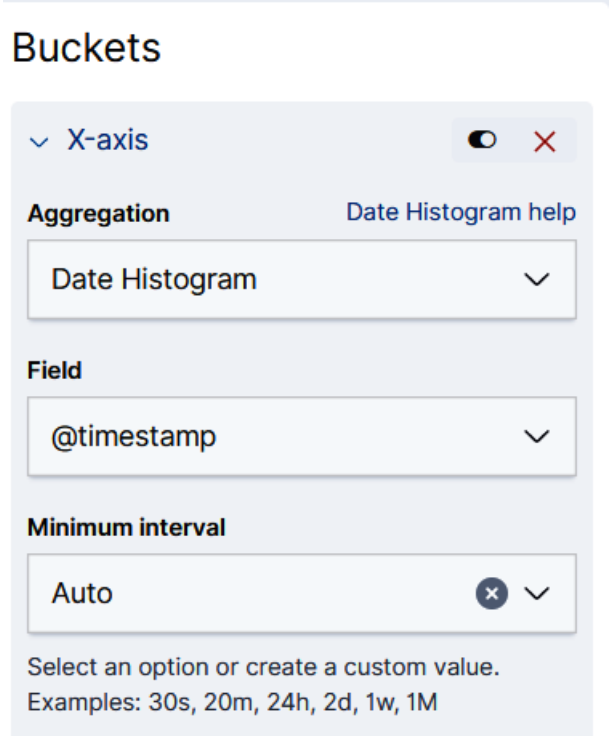
domm

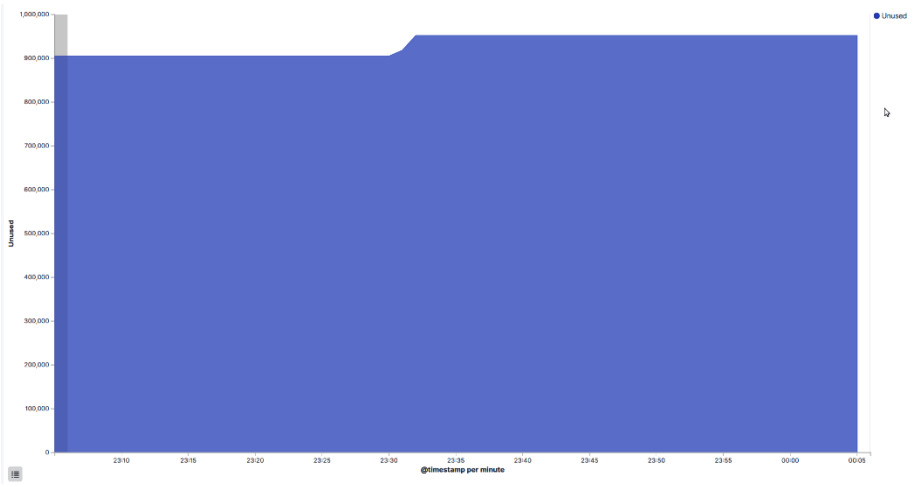
Sort

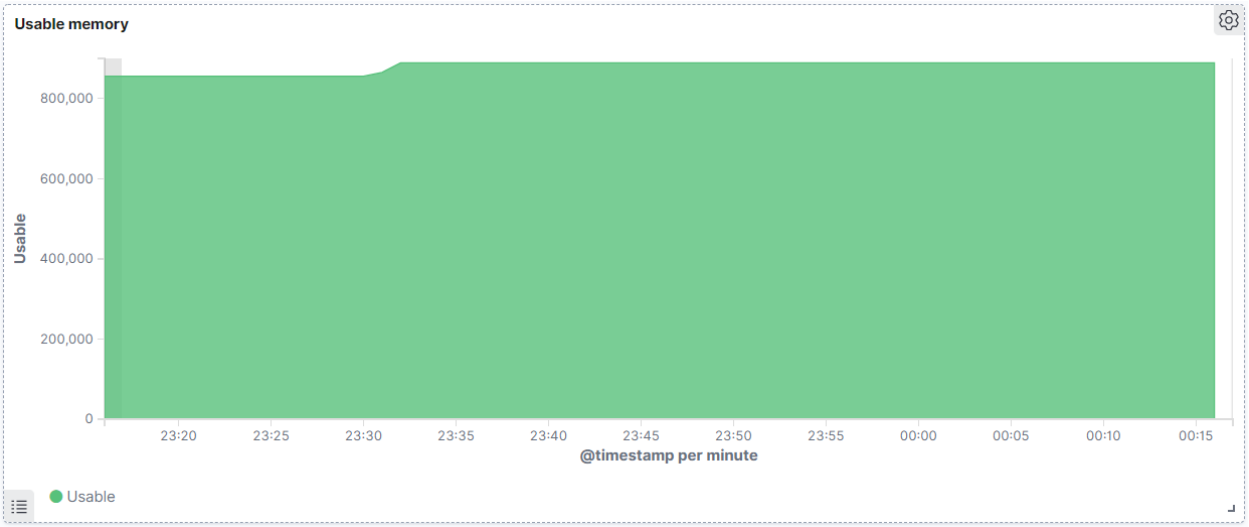
Types 2

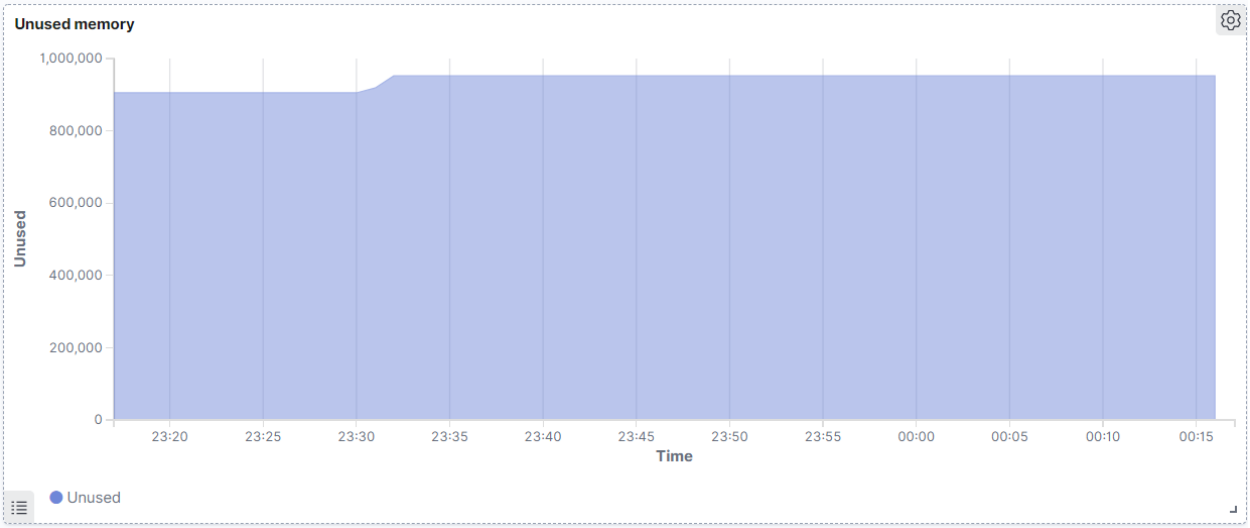
dommemstat

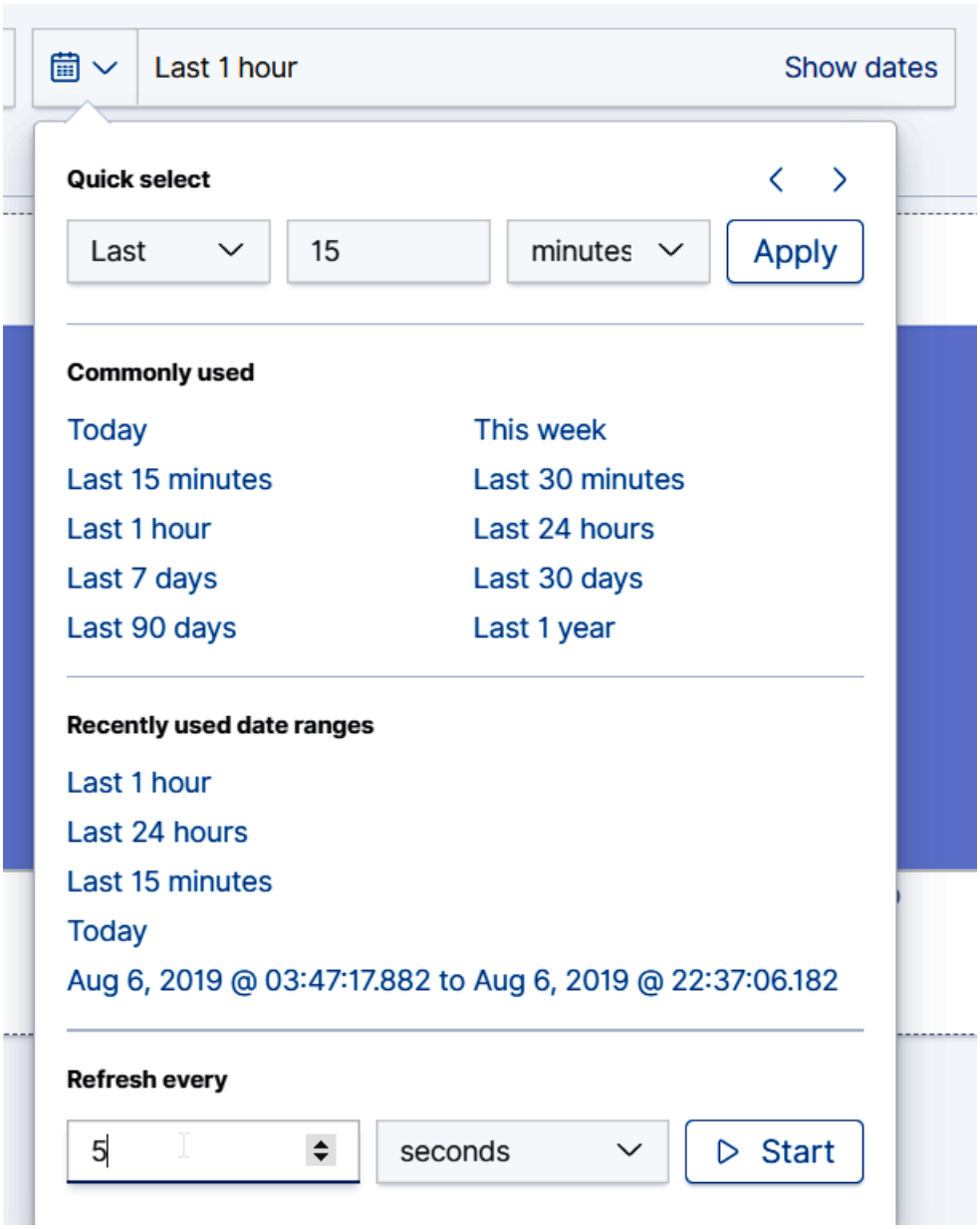

metric*
Data
Metrics & Axes
Panel Settings
Metrics
Y-axis
Aggregation
Average help
Average
Field
kvm.dommemstat.stat.value
Custom label
Unused


Buckets
X-axis
Aggregation
Date Histogram help
Date Histogram
Field
@timestamp
Minimum interval
Auto
Select an option or create a custom value.
Examples: 30s, 20m, 24h, 2d, 1w, 1M

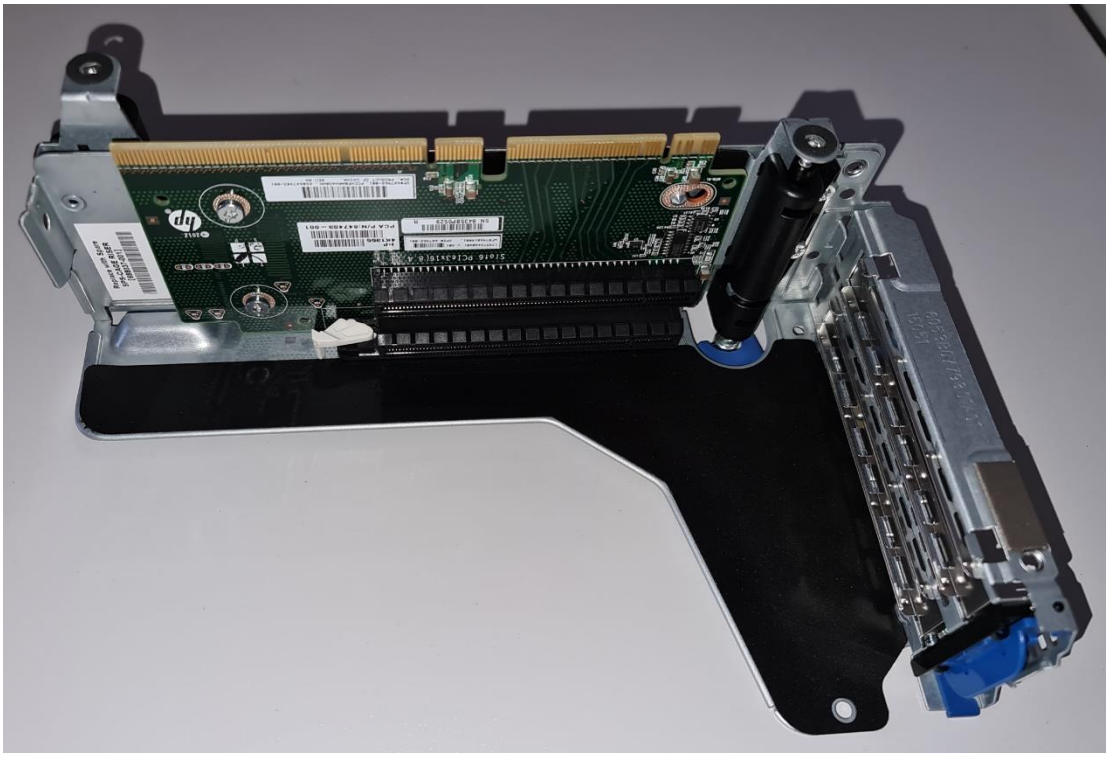

Unused
1,000,000
800,000
600,000
400,000
200,000
0
Unused
23:10
23:15
23:20
23:25
23:30
23:35
23:40
23:45
23:50
23:55
00:00
00:05
@timestamp per minute


Usable memory
800,000
600,000
400,000
200,000
0
Usable
23:20
23:25
23:30
23:35
23:40
23:45
23:50
23:55
00:00
00:05
00:10
00:15
@timestamp per minute
Usable


Unused memory
1,000,000
800,000
600,000
400,000
200,000
0
Unused
23:20
23:25
23:30
23:35
23:40
23:45
23:50
23:55
00:00
00:05
00:10
00:15
Time
Unused


Last 1 hour
Show dates
Quick select
Last
15
minutes
Apply
Commonly used
Today
This week
Last 15 minutes
Last 30 minutes
Last 1 hour
Last 24 hours
Last 7 days
Last 30 days
Last 90 days
Last 1 year
Recently used date ranges
Last 1 hour
Last 24 hours
Last 15 minutes
Today
Aug 6, 2019 @ 03:47:17.882 to Aug 6, 2019 @ 22:37:06.182
Refresh every
5
seconds
Start

Chapter 15: Performance Tuning and Optimization for KVM VMs



```
[root@packtphy02 ~]# virsh nodeinfo
CPU model:           x86_64
CPU(s):              10
CPU frequency:       2099 MHz
CPU socket(s):       1
Core(s) per socket:  10
Thread(s) per core:  1
NUMA cell(s):        1
Memory size:         4193784 KiB
```

```
root@packtphy02:~
File  Edit  View  Search  Terminal  Help
    <topology>
      <cells num='1'>
        <cell id='0'>
          <memory unit='KiB'>4193784</memory>
          <pages unit='KiB' size='4'>1048446</pages>
          <pages unit='KiB' size='2048'>0</pages>
          <pages unit='KiB' size='1048576'>0</pages>
          <distances>
            <sibling id='0' value='10'/>
          </distances>
          <cpus num='10'>
            <cpu id='0' socket_id='0' core_id='0' siblings='0'/>
            <cpu id='1' socket_id='0' core_id='1' siblings='1'/>
            <cpu id='2' socket_id='0' core_id='2' siblings='2'/>
            <cpu id='3' socket_id='0' core_id='3' siblings='3'/>
            <cpu id='4' socket_id='0' core_id='4' siblings='4'/>
            <cpu id='5' socket_id='0' core_id='5' siblings='5'/>
            <cpu id='6' socket_id='0' core_id='6' siblings='6'/>
            <cpu id='7' socket_id='0' core_id='7' siblings='7'/>
            <cpu id='8' socket_id='0' core_id='8' siblings='8'/>
            <cpu id='9' socket_id='0' core_id='9' siblings='9'/>
          </cpus>
        </cell>
      </cells>
    </topology>
```

```
[root@PacktPhy02 ~]# virsh vcpupin SQLForNuma
VCPU: CPU Affinity
----------------------------------
   0: 0-9
   1: 0-9
   2: 0-9
   3: 0-9

[root@PacktPhy02 ~]#
```

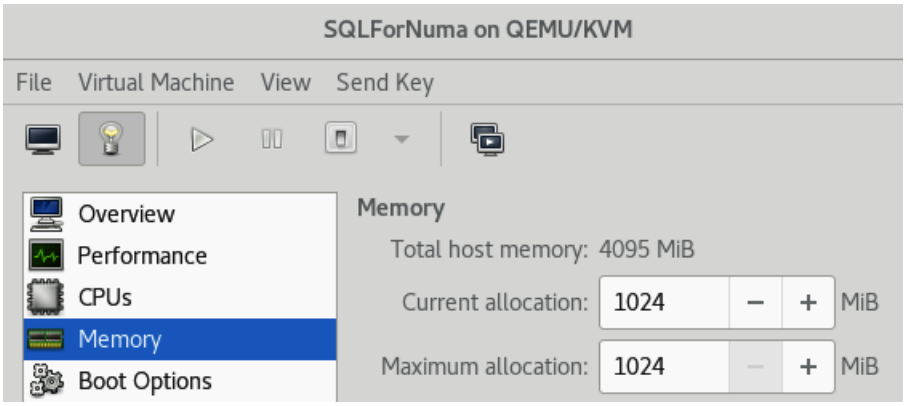
```
[root@PacktPhy02 ~]# virsh vcpupin SQLForNuma 0 0

[root@PacktPhy02 ~]# virsh vcpupin SQLForNuma 1 1

[root@PacktPhy02 ~]# virsh vcpupin SQLForNuma 2 2

[root@PacktPhy02 ~]# virsh vcpupin SQLForNuma 3 3

[root@PacktPhy02 ~]# virsh vcpupin SQLForNuma
VCPU: CPU Affinity
----------------------------------
   0: 0
   1: 1
   2: 2
   3: 3

[root@PacktPhy02 ~]#
```

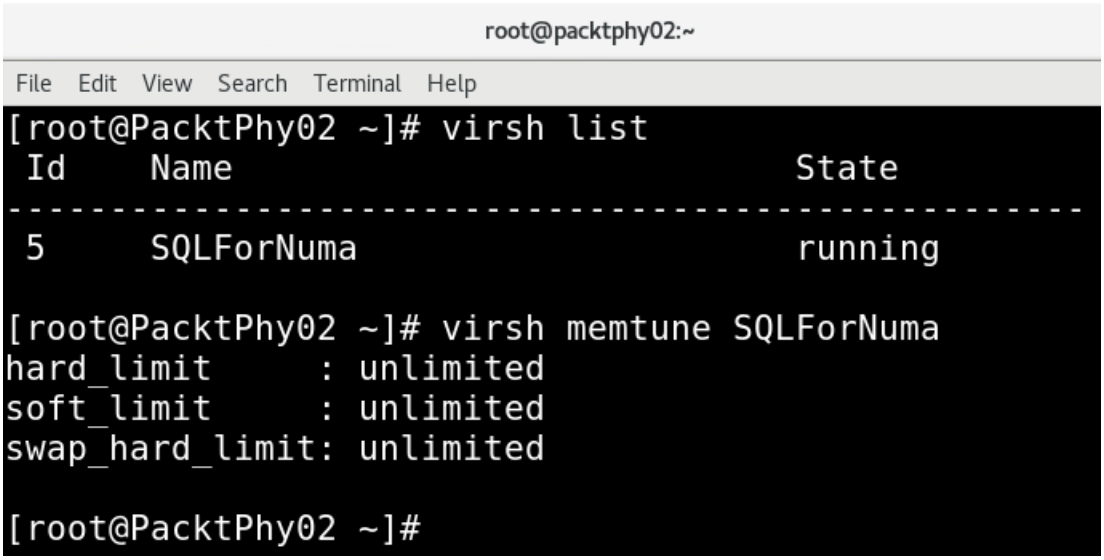
```
<vcpu placement='static'>4</vcpu>
<cputune>
  <vcpupin vcpu='0' cpuset='0'/>
  <vcpupin vcpu='1' cpuset='1'/>
  <vcpupin vcpu='2' cpuset='2'/>
  <vcpupin vcpu='3' cpuset='3'/>
</cputune>
```

root@packtphy02:~

File Edit View Search Terminal Help

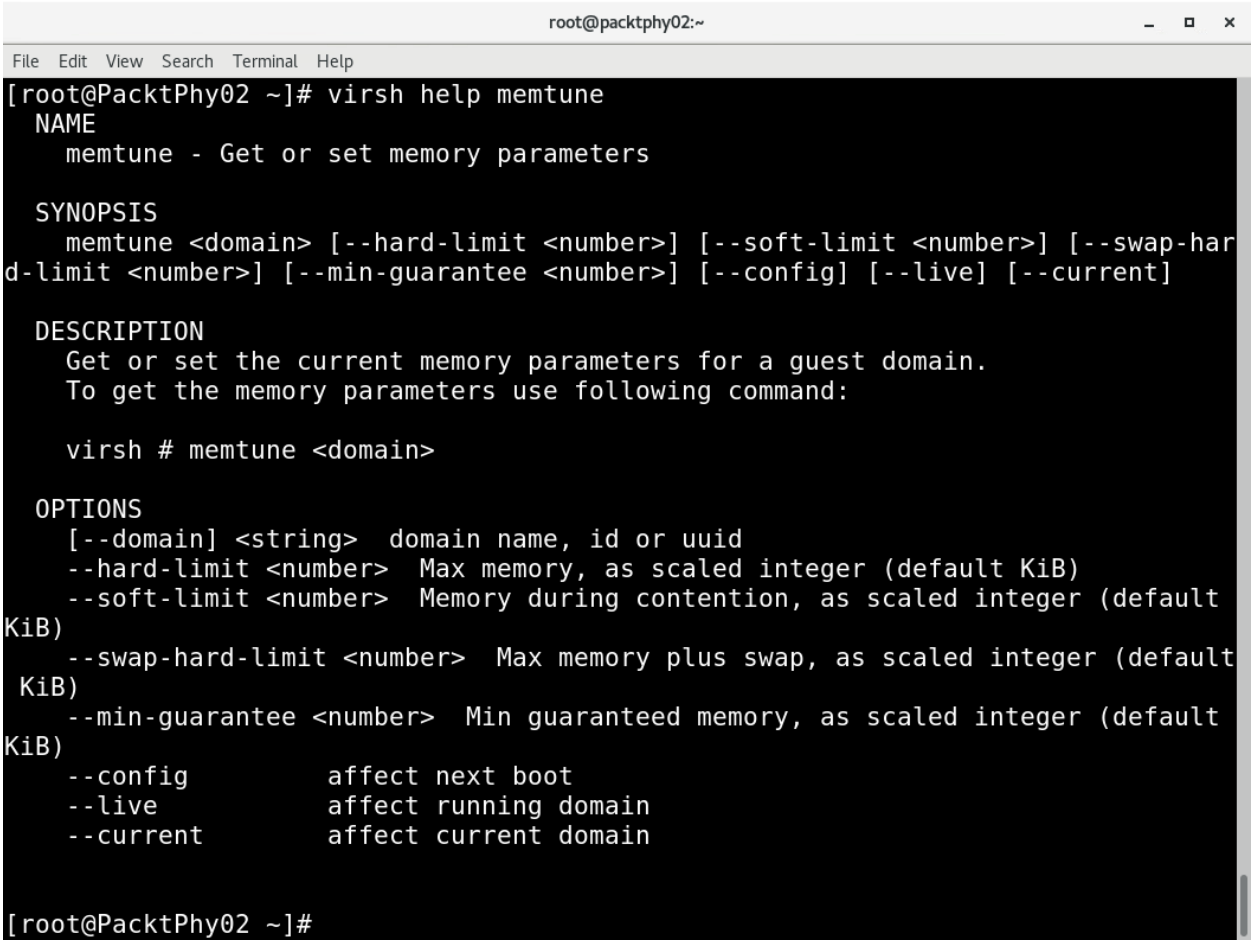
```
[root@PacktPhy02 ~]# virsh vcpuinfo SQLForNuma
VCPU:           0
CPU:            0
State:          running
CPU time:       2.8s
CPU Affinity:   y---------

VCPU:           1
CPU:            1
State:          running
CPU time:       0.0s
CPU Affinity:   -y--------

VCPU:           2
CPU:            2
State:          running
CPU time:       0.0s
CPU Affinity:   --y-------

VCPU:           3
CPU:            3
State:          running
CPU time:       0.0s
CPU Affinity:   ---y------

[root@PacktPhy02 ~]#
```




root@packtphy02:~
File Edit View Search Terminal Help
[root@PacktPhy02 ~]# virsh list
 Id   Name   State
----
 5   SQLForNuma   running

[root@PacktPhy02 ~]# virsh memtune SQLForNuma
hard_limit   : unlimited
soft_limit   : unlimited
swap_hard_limit: unlimited

[root@PacktPhy02 ~]#


root@packtphy02:~
File Edit View Search Terminal Help
[root@PacktPhy02 ~]# virsh help memtune
  NAME
    memtune - Get or set memory parameters

  SYNOPSIS
    memtune <domain> [--hard-limit <number>] [--soft-limit <number>] [--swap-har
d-limit <number>] [--min-guarantee <number>] [--config] [--live] [--current]

  DESCRIPTION
    Get or set the current memory parameters for a guest domain.
    To get the memory parameters use following command:

    virsh # memtune <domain>

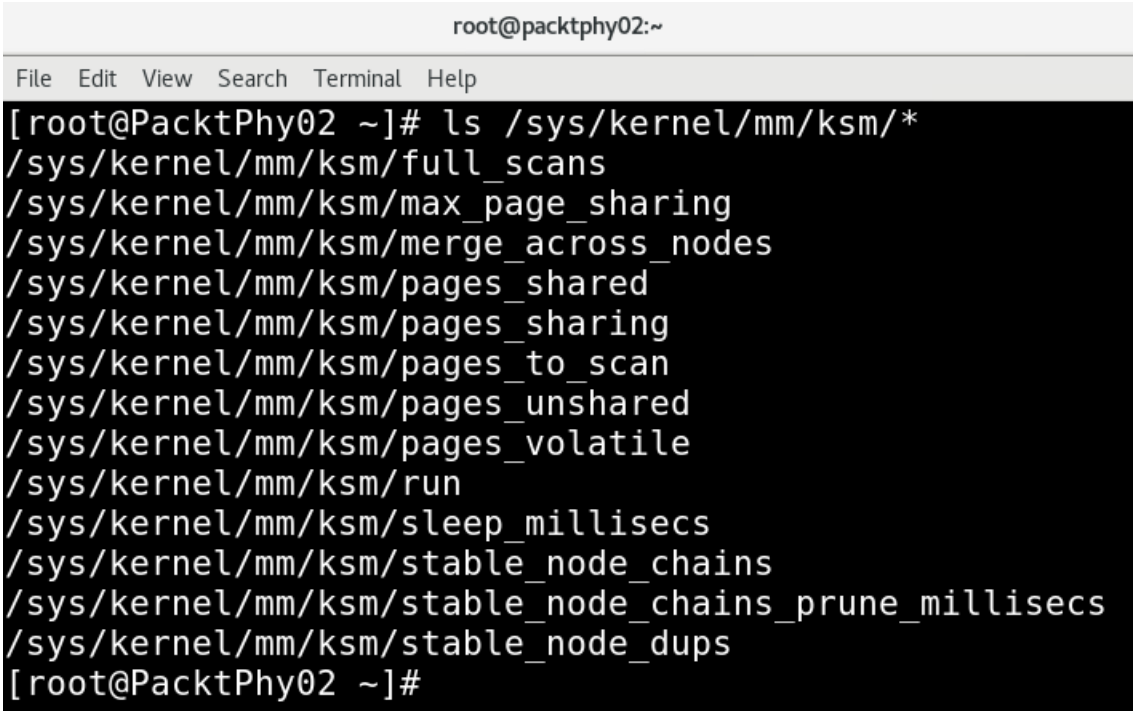
  OPTIONS
    [--domain] <string> domain name, id or uuid
    --hard-limit <number> Max memory, as scaled integer (default KiB)
    --soft-limit <number> Memory during contention, as scaled integer (default
KiB)
    --swap-hard-limit <number> Max memory plus swap, as scaled integer (default
 KiB)
    --min-guarantee <number> Min guaranteed memory, as scaled integer (default
KiB)
    --config   affect next boot
    --live   affect running domain
    --current   affect current domain

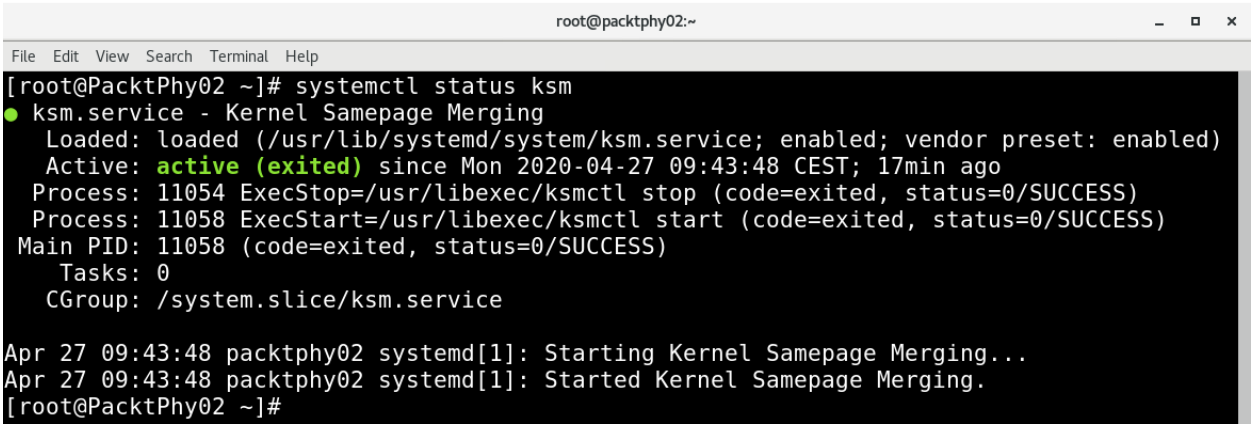
[root@PacktPhy02 ~]#

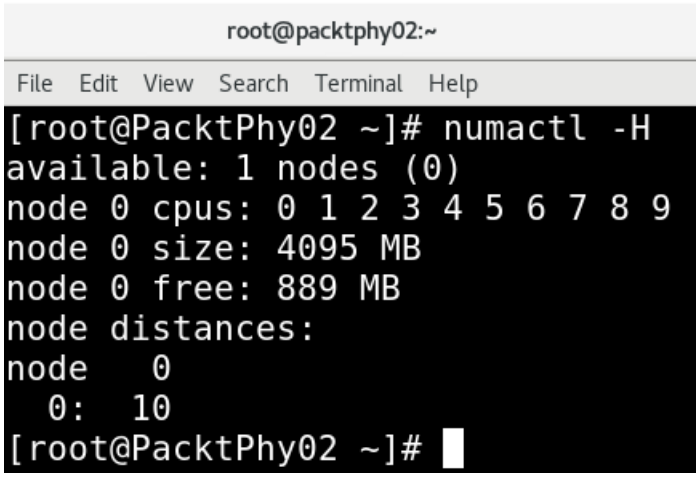
```
root@packtphy02:~
File  Edit  View  Search  Terminal  Help
[root@PacktPhy02 ~]# cat /proc/meminfo | grep -i huge
AnonHugePages:    401408 kB
HugePages_Total:       0
HugePages_Free:        0
HugePages_Rsvd:        0
HugePages_Surp:        0
Hugepagesize:       2048 kB
[root@PacktPhy02 ~]#
```

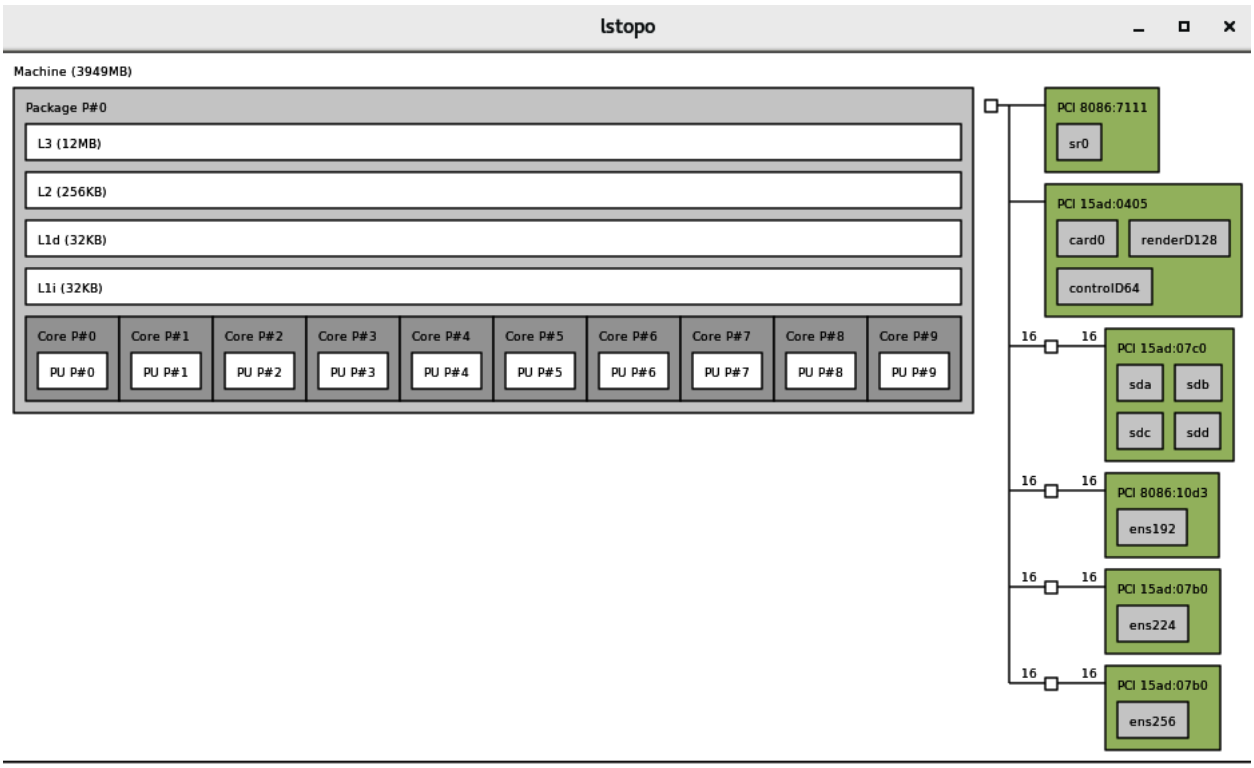
```
vm.hugepages_treat_as_movable = 0
vm.hugetlb_shm_group = 0
vm.nr_hugepages = 0
vm.nr_hugepages_mempolicy = 0
vm.nr_overcommit_hugepages = 0
```

```
root@packtphy02:~
File  Edit  View  Search  Terminal  Help
[root@PacktPhy02 ~]# cat /etc/redhat-release
CentOS Linux release 7.7.1908 (Core)
[root@PacktPhy02 ~]# uname -r
3.10.0-1062.18.1.el7.x86_64
[root@PacktPhy02 ~]# cat /boot/config-3.10.0-1062.18.1.el7.x86_64 | grep -i conf
ig_ksm
CONFIG_KSM=y
[root@PacktPhy02 ~]#
```


root@packtphy02:~
File Edit View Search Terminal Help
[root@PacktPhy02 ~]# ls /sys/kernel/mm/ksm/*
/sys/kernel/mm/ksm/full_scans
/sys/kernel/mm/ksm/max_page_sharing
/sys/kernel/mm/ksm/merge_across_nodes
/sys/kernel/mm/ksm/pages_shared
/sys/kernel/mm/ksm/pages_sharing
/sys/kernel/mm/ksm/pages_to_scan
/sys/kernel/mm/ksm/pages_unshared
/sys/kernel/mm/ksm/pages_volatile
/sys/kernel/mm/ksm/run
/sys/kernel/mm/ksm/sleep_millisecs
/sys/kernel/mm/ksm/stable_node_chains
/sys/kernel/mm/ksm/stable_node_chains_prune_millisecs
/sys/kernel/mm/ksm/stable_node_dups
[root@PacktPhy02 ~]#


root@packtphy02:~
File Edit View Search Terminal Help
[root@PacktPhy02 ~]# systemctl status ksm
● ksm.service - Kernel Samepage Merging
Loaded: loaded (/usr/lib/systemd/system/ksm.service; enabled; vendor preset: enabled)
Active: active (exited) since Mon 2020-04-27 09:43:48 CEST; 17min ago
Process: 11054 ExecStop=/usr/libexec/ksmctl stop (code=exited, status=0/SUCCESS)
Process: 11058 ExecStart=/usr/libexec/ksmctl start (code=exited, status=0/SUCCESS)
Main PID: 11058 (code=exited, status=0/SUCCESS)
Tasks: 0
CGroup: /system.slice/ksm.service
Apr 27 09:43:48 packtphy02 systemd[1]: Starting Kernel Samepage Merging...
Apr 27 09:43:48 packtphy02 systemd[1]: Started Kernel Samepage Merging.
[root@PacktPhy02 ~]#


root@packtphy02:~
File Edit View Search Terminal Help
[root@PacktPhy02 ~]# numactl -H
available: 1 nodes (0)
node 0 cpus: 0 1 2 3 4 5 6 7 8 9
node 0 size: 4095 MB
node 0 free: 889 MB
node distances:
node 0
0: 10
[root@PacktPhy02 ~]#



root@packtphy02:~

File Edit View Search Terminal Help

```
[root@PacktPhy02 ~]# virsh numatune --help
  NAME
    numatune - Get or set numa parameters

  SYNOPSIS
    numatune <domain> [--mode <string>] [--nodeset <string>] [--config] [--live] [--curre
nt]

  DESCRIPTION
    Get or set the current numa parameters for a guest domain.
    To get the numa parameters use following command:

    virsh # numatune <domain>

  OPTIONS
    [--domain] <string>  domain name, id or uuid
    --mode <string>  NUMA mode, one of strict, preferred and interleave
or a number from the virDomainNumatuneMemMode enum
    --nodeset <string>  NUMA node selections to set
    --config         affect next boot
    --live           affect running domain
    --current        affect current domain
```

```
[root@PacktPhy02 ~]# numactl --hardware
available: 1 nodes (0)
node 0 cpus: 0 1 2 3 4 5 6 7 8 9
node 0 size: 4095 MB
node 0 free: 2226 MB
node distances:
node   0
  0:  10
[root@PacktPhy02 ~]#
```

root@packtphy02:~

File Edit View Search Terminal Help

```
[root@PacktPhy02 ~]# ps auwx | grep numad
root     19826  0.0  0.0  19916   344 ?        Ssl  10:51   0:00 numad
root     20216  0.0  0.0 112712   964 pts/0    S+   10:51   0:00 grep --color=auto numad
[root@PacktPhy02 ~]#
```

root@packtphy02:~

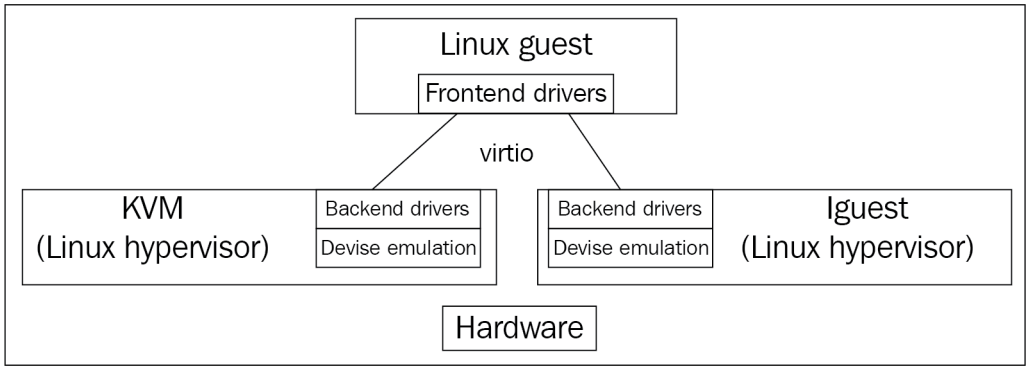
File Edit View Search Terminal Help

```
[root@PacktPhy02 ~]# virsh list
 Id    Name                           State
----------------------------------------------------
 5     SQLForNuma                     running

[root@PacktPhy02 ~]#
```

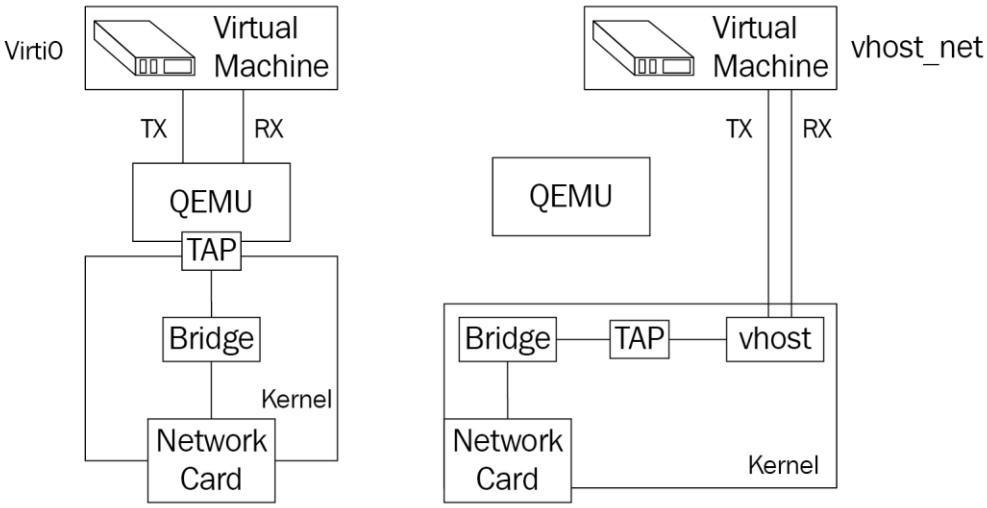
root@packtphy02:~

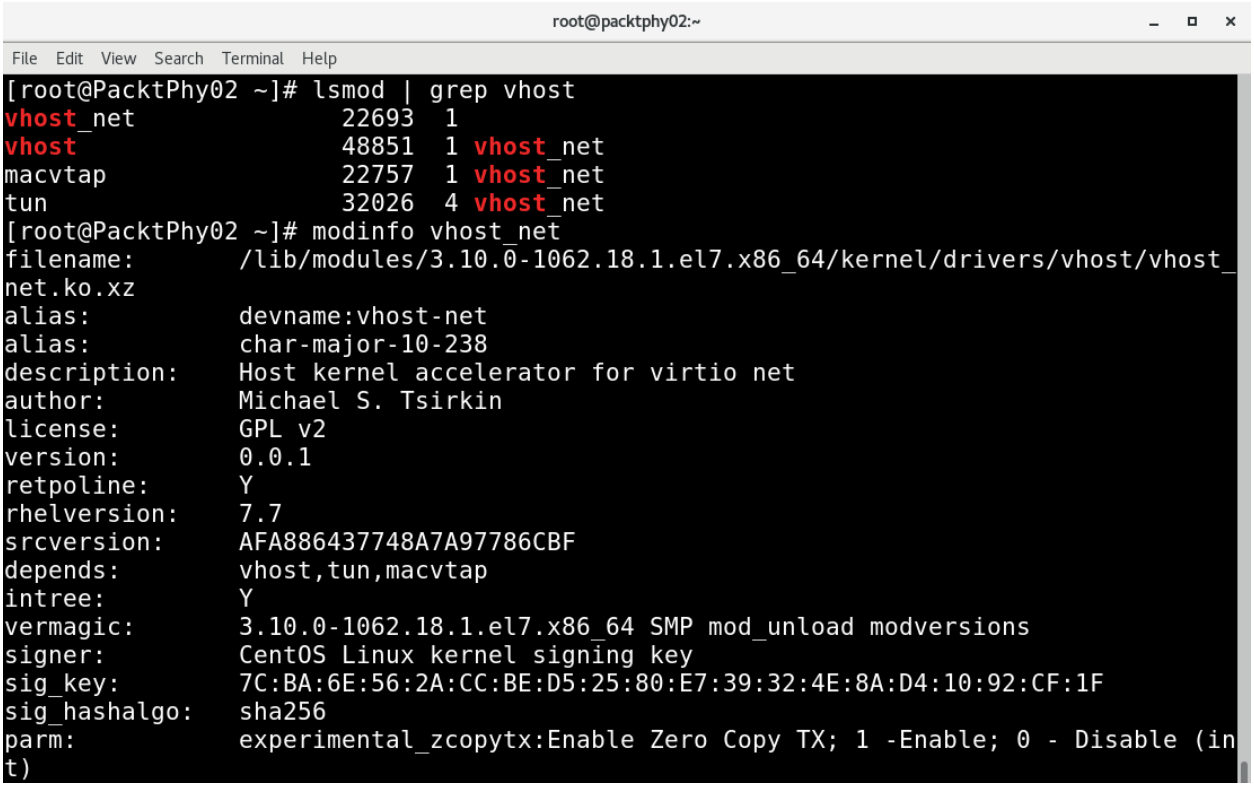
File Edit View Search Terminal Help

```
[root@PacktPhy02 ~]#
[root@PacktPhy02 ~]#
[root@PacktPhy02 ~]# numad -i 0
[root@PacktPhy02 ~]# numastat -c qemu-kvm

Per-node process memory usage (in MBs) for PID 32372 (qemu-kvm)
         Node 0 Total
         ------ -----
Huge          0     0
Heap         17    17
Stack         0     0
Private      30    30
-------  ------ -----
Total        47    47
[root@PacktPhy02 ~]#
```

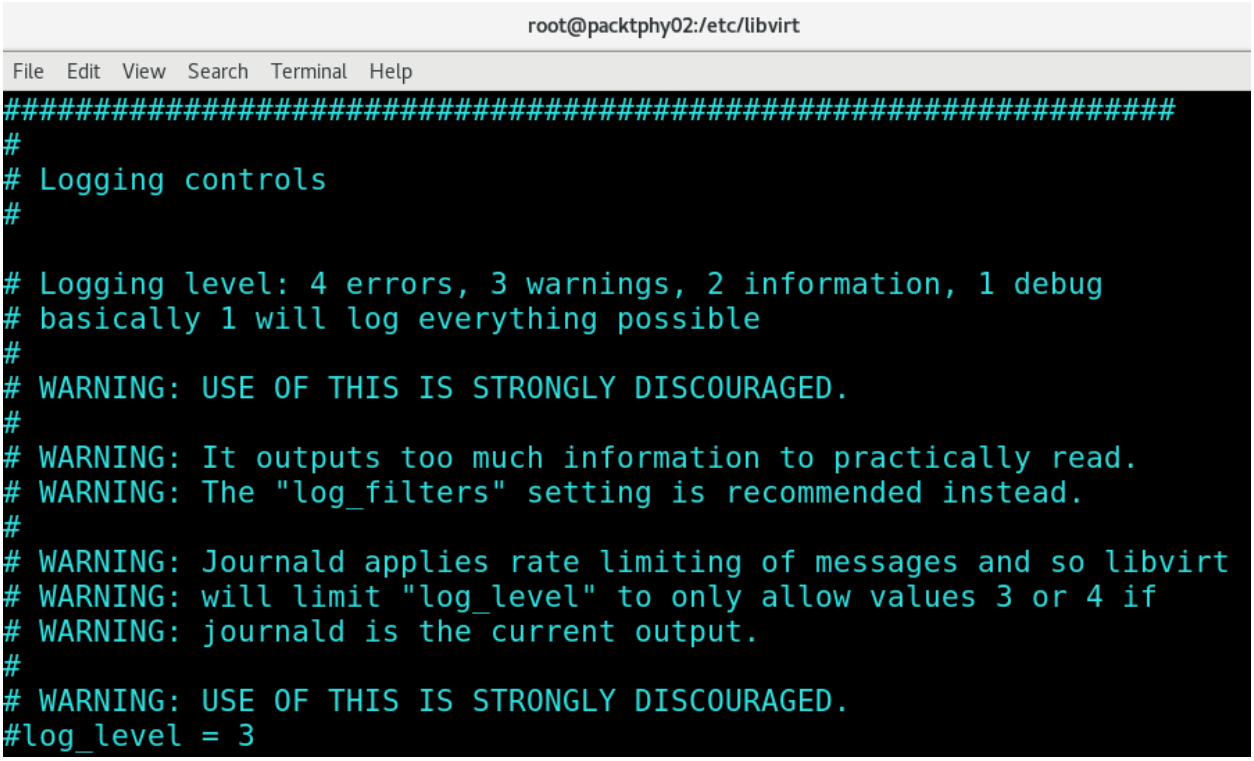


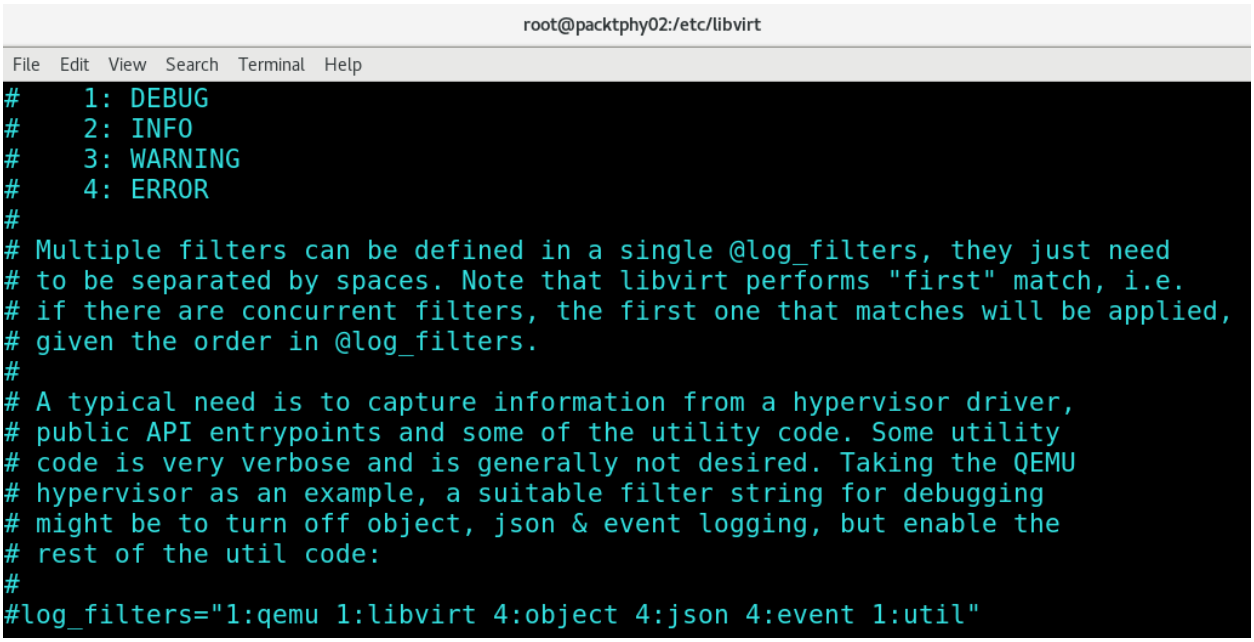

```
OPTIONS
  [--domain] <string>  domain name, id or uuid
  [--device] <string>  block device
  --total-bytes-sec <number>  total throughput limit, as scaled integer (default bytes)
  --read-bytes-sec <number>  read throughput limit, as scaled integer (default bytes)
  --write-bytes-sec <number>  write throughput limit, as scaled integer (default bytes)
  --total-iops-sec <number>  total I/O operations limit per second
  --read-iops-sec <number>  read I/O operations limit per second
  --write-iops-sec <number>  write I/O operations limit per second
  --total-bytes-sec-max <number>  total max, as scaled integer (default bytes)
  --read-bytes-sec-max <number>  read max, as scaled integer (default bytes)
  --write-bytes-sec-max <number>  write max, as scaled integer (default bytes)
  --total-iops-sec-max <number>  total I/O operations max
  --read-iops-sec-max <number>  read I/O operations max
  --write-iops-sec-max <number>  write I/O operations max
  --size-iops-sec <number>  I/O size in bytes
  --group-name <string>  group name to share I/O quota between multiple drives
  --total-bytes-sec-max-length <number>  duration in seconds to allow total max bytes
  --read-bytes-sec-max-length <number>  duration in seconds to allow read max bytes
  --write-bytes-sec-max-length <number>  duration in seconds to allow write max bytes
  --total-iops-sec-max-length <number>  duration in seconds to allow total I/O operations max
  --read-iops-sec-max-length <number>  duration in seconds to allow read I/O operations max
  --write-iops-sec-max-length <number>  duration in seconds to allow write I/O operations max
  --config         affect next boot
  --live           affect running domain
  --current        affect current domain
```

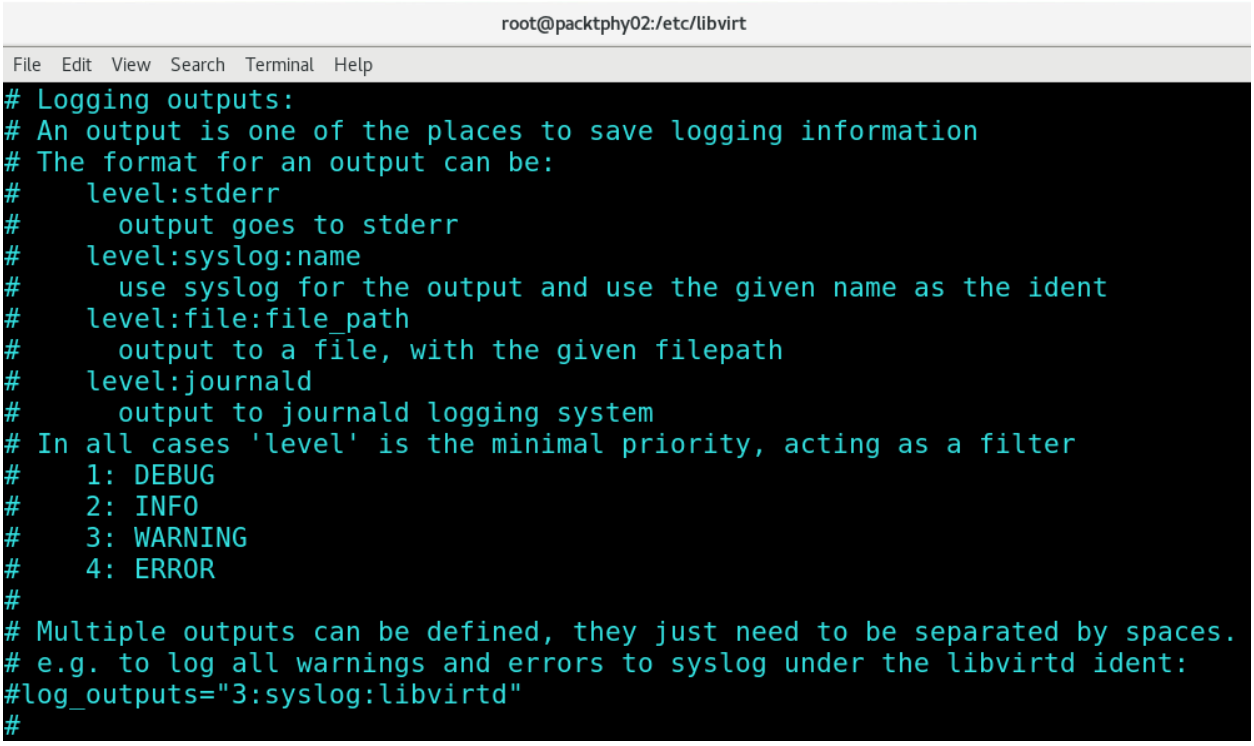


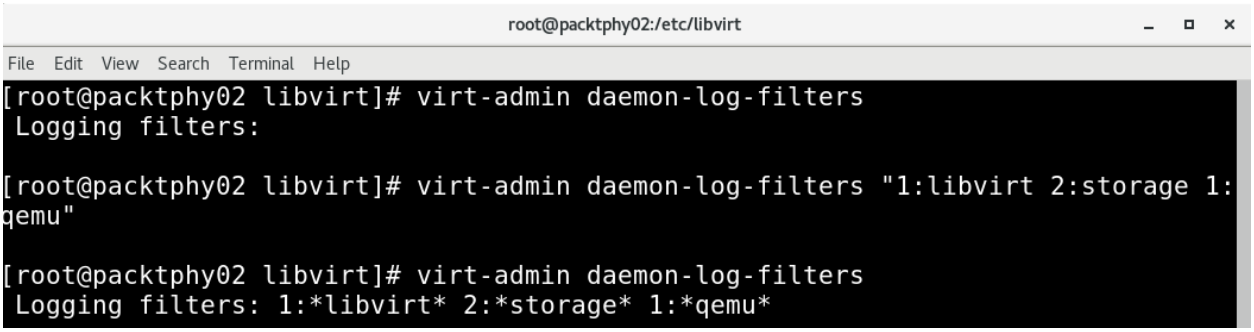

root@packtphy02:~
File Edit View Search Terminal Help
[root@PacktPhy02 ~]# lsmod | grep vhost
vhost_net   22693 1
vhost   48851 1 vhost_net
macvtap   22757 1 vhost_net
tun   32026 4 vhost_net
[root@PacktPhy02 ~]# modinfo vhost_net
filename: /lib/modules/3.10.0-1062.18.1.el7.x86_64/kernel/drivers/vhost/vhost_
net.ko.xz
alias: devname:vhost-net
alias: char-major-10-238
description: Host kernel accelerator for virtio net
author: Michael S. Tsirkin
license: GPL v2
version: 0.0.1
retpoline: Y
rhelversion: 7.7
srcversion: AFA886437748A7A97786CBF
depends: vhost,tun,macvtap
intree: Y
vermagic: 3.10.0-1062.18.1.el7.x86_64 SMP mod_unload modversions
signer: CentOS Linux kernel signing key
sig_key: 7C:BA:6E:56:2A:CC:BE:D5:25:80:E7:39:32:4E:8A:D4:10:92:CF:1F
sig_hashalgo: sha256
parm: experimental_zcopytx:Enable Zero Copy TX; 1 -Enable; 0 - Disable (in
t)

Chapter 16: Troubleshooting Guidelines for the KVM Platform






root@packtphy02:/etc/libvirt
File Edit View Search Terminal Help
Logging outputs:
An output is one of the places to save logging information
The format for an output can be:
level:stderr
output goes to stderr
level:syslog:name
use syslog for the output and use the given name as the ident
level:file:file_path
output to a file, with the given filepath
level:journald
output to journald logging system
In all cases 'level' is the minimal priority, acting as a filter
1: DEBUG
2: INFO
3: WARNING
4: ERROR
#
Multiple outputs can be defined, they just need to be separated by spaces.
e.g. to log all warnings and errors to syslog under the libvirtd ident:
#log_outputs="3:syslog:libvirtd"
#


root@packtphy02:/etc/libvirt
File Edit View Search Terminal Help
[root@packtphy02 libvirt]# virt-admin daemon-log-filters
 Logging filters:
[root@packtphy02 libvirt]# virt-admin daemon-log-filters "1:libvirt 2:storage 1:
qemu"
[root@packtphy02 libvirt]# virt-admin daemon-log-filters
 Logging filters: 1:*libvirt* 2:*storage* 1:*qemu*

```
    - execute the ruby block Upload cluster keys Chef Server
  * execute[Register User Facing 192.168.5.48] action run[2020-04-09T16:38:50-04:00] INFO: Processin
g execute[Register User Facing 192.168.5.48] action run (eucalyptus::register-components line 99)
[2020-04-09T16:38:50-04:00] INFO: Processing execute[Guard resource] action run (dynamically defined
)
[2020-04-09T16:38:56-04:00] INFO: execute[Register User Facing 192.168.5.48] ran successfully

    - execute eval `clcadmin-assume-system-credentials` &&  //usr/bin/euserv-register-service -t use
r-api -h 192.168.5.48 API_192.168.5.48
  * execute[Register Walrus] action run[2020-04-09T16:38:56-04:00] INFO: Processing execute[Register
 Walrus] action run (eucalyptus::register-components line 110)
[2020-04-09T16:38:56-04:00] INFO: Processing execute[Guard resource] action run (dynamically defined
)
[2020-04-09T16:38:58-04:00] INFO: execute[Register Walrus] ran successfully

    - execute eval `clcadmin-assume-system-credentials` &&  //usr/bin/euserv-register-service -t wal
rusbackend -h 192.168.5.48 walrus-0
Recipe: eucalyptus::walrus
  * yum_package[eucalyptus-walrus] action upgrade[2020-04-09T16:38:58-04:00] INFO: Processing yum_pa
ckage[eucalyptus-walrus] action upgrade (eucalyptus::walrus line 23)
[2020-04-09T16:39:04-04:00] INFO: yum_package[eucalyptus-walrus] installing eucalyptus-walrus-4.4.5-
0.34.as.el7 from eucalyptus repository
[2020-04-09T16:39:07-04:00] INFO: yum_package[eucalyptus-walrus] upgraded eucalyptus-walrus to 4.4.5
-0.34.as.el7

    - upgrade package eucalyptus-walrus from uninstalled to 4.4.5-0.34.as.el7
[2020-04-09T16:39:07-04:00] INFO: yum_package[eucalyptus-walrus] sending create action to template[e
ucalyptus.conf] (immediate)
Recipe: eucalyptus::storage-controller
  * template[eucalyptus.conf] action create[2020-04-09T16:39:07-04:00] INFO: Processing template[euc
alyptus.conf] action create (eucalyptus::storage-controller line 50)
[2020-04-09T16:39:07-04:00] INFO: template[eucalyptus.conf] backed up to /root/.chef/local-mode-cach
e/backup//etc/eucalyptus/eucalyptus.conf.chef-20200409163907.862503
[2020-04-09T16:39:07-04:00] INFO: template[eucalyptus.conf] updated file contents //etc/eucalyptus/e
ucalyptus.conf
```

```
[2020-04-09T16:34:24-04:00] INFO: Storing updated cookbooks/eucalyptus/faststart/tutorials/launch-in
stances.sh in the cache.
[2020-04-09T16:34:24-04:00] INFO: Storing updated cookbooks/eucalyptus/libraries/bind-addr.rb in the
 cache.
[2020-04-09T16:34:24-04:00] INFO: Storing updated cookbooks/eucalyptus/faststart/node-template.json
in the cache.
[2020-04-09T16:34:24-04:00] INFO: Storing updated cookbooks/eucalyptus/faststart/nuke.sh in the cach
e.
[2020-04-09T16:34:24-04:00] INFO: Storing updated cookbooks/eucalyptus/libraries/eucalyptus_helper.r
b in the cache.
[2020-04-09T16:34:24-04:00] INFO: Storing updated cookbooks/eucalyptus/libraries/enterprise.rb in th
e cache.
[2020-04-09T16:34:24-04:00] INFO: Storing updated cookbooks/eucalyptus/libraries/midonet.rb in the c
ache.
[2020-04-09T16:34:24-04:00] INFO: Storing updated cookbooks/eucalyptus/libraries/create_riakcs_user.
rb in the cache.
[2020-04-09T16:34:24-04:00] INFO: Storing updated cookbooks/eucalyptus/motherbrain.rb in the cache.
[2020-04-09T16:34:24-04:00] INFO: Storing updated cookbooks/eucalyptus/faststart/tutorials/install-i
mage.sh in the cache.
[2020-04-09T16:34:24-04:00] INFO: Storing updated cookbooks/eucalyptus/recipes/cloud-controller.rb i
n the cache.
[2020-04-09T16:34:24-04:00] INFO: Storing updated cookbooks/eucalyptus/libraries/ceph.rb in the cach
e.
[2020-04-09T16:34:24-04:00] INFO: Storing updated cookbooks/eucalyptus/recipes/cloud-service.rb in t
he cache.
[2020-04-09T16:34:24-04:00] INFO: Storing updated cookbooks/eucalyptus/faststart/install-nc.sh in th
e cache.
[2020-04-09T16:34:24-04:00] INFO: Storing updated cookbooks/eucalyptus/metadata.json in the cache.
[2020-04-09T16:34:24-04:00] INFO: Storing updated cookbooks/eucalyptus/faststart/cloud-in-a-box.sh i
n the cache.
[2020-04-09T16:34:24-04:00] INFO: Storing updated cookbooks/eucalyptus/recipes/create-first-resource
s.rb in the cache.
[2020-04-09T16:34:24-04:00] INFO: Storing updated cookbooks/eucalyptus/recipes/cluster-controller.rb
 in the cache.
[2020-04-09T16:34:24-04:00] INFO: Storing updated cookbooks/eucalyptus/recipes/eucanetd.rb in the ca
che.
:_
```

```
[Yum Update] OK, running a full update of the OS. This could take a bit; please wait.

To see the update in progress, run the following command in another terminal:

  tail -f /var/log/euca-install-04.08.2020-18.06.50.log

[Yum Update] Package update in progress...

     ) )
    ( (
  ........
  |      |]
  \      /
   ------

[Yum Update] Full update of the OS completed.

Phase 0 (OS) completed successfully...getting a 2nd cup of tea and moving on to phase 1 (CLC).

     ) )
    ( (
  ........
  |      |]
  \      /
   ------

Phase 1 (CLC) completed successfully...getting a 3rd cup of tea and moving on to phase 2 (main cloud
 components).

     ) )
    ( (
  ........
  |      |]
  \      /
   ------
```

Create policy | Policy actions

Filter policies | Search

Policy name	Type
AccessAnalyzerServiceRolePolicy	AWS managed
AdministratorAccess	Job function
AlexaForBusinessDeviceSetup	AWS managed
AlexaForBusinessFullAccess	AWS managed
AlexaForBusinessGatewayExecution	AWS managed
AlexaForBusinessNetworkProfileServicePolicy	AWS managed
AlexaForBusinessPolyDelegatedAccessPolicy	AWS managed
AlexaForBusinessReadOnlyAccess	AWS managed
AmazonAPIGatewayAdministrator	AWS managed
AmazonAPIGatewayInvokeFullAccess	AWS managed
AmazonAPIGatewayPushToCloudWatchLogs	AWS managed
AmazonAppStreamFullAccess	AWS managed
AmazonAppStreamReadOnlyAccess	AWS managed
AmazonAppStreamServiceAccess	AWS managed
AmazonAthenaFullAccess	AWS managed
AmazonAugmentedAIFullAccess	AWS managed
AmazonAugmentedAIHumanLoopFullAccess	AWS managed
AmazonAugmentedAIIntegratedAPIAccess	AWS managed
AmazonChimeFullAccess	AWS managed