Test Environment Example

Here is an example test environment for a working OpenStack-Ansible (OSA) deployment with a small number of servers.

This example environment has the following characteristics:

- One infrastructure node for the **control plane** host (32 vCPU, 128 GB RAM, 2 TB RAID1 HDD)
- One compute node (32 vCPU, 128 GB RAM, 2 TB RAID1 HDD)
- One Storage node (2 vCPU, 64 GB RAM, 2 TB RAID1 HDD).
- Dual Port Network Interface Card (NIC) for each host
- Internet access via the router address `192.168.10.1` on the Management Network

The following figure depicts this test environment and its components.

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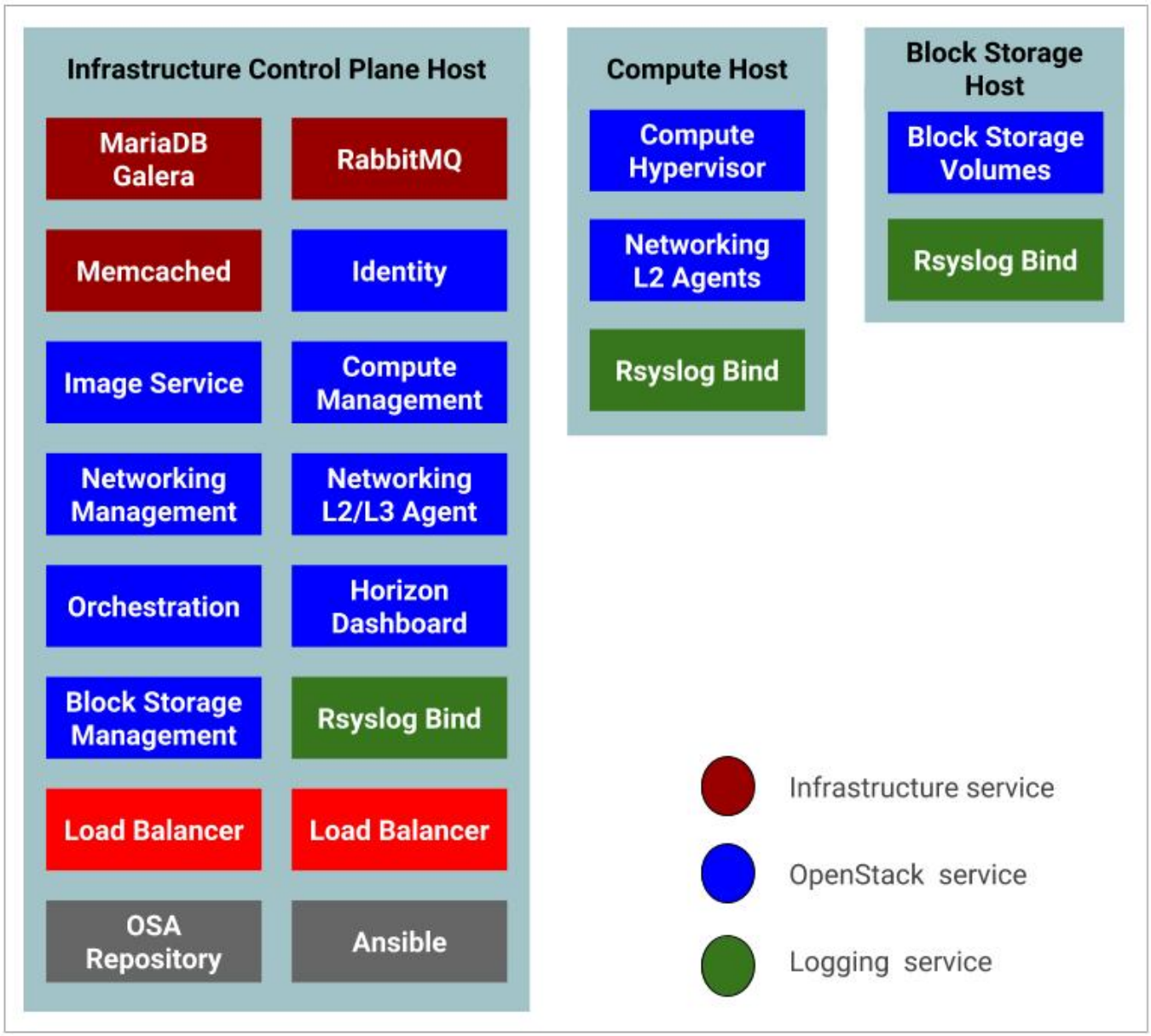

Configuring the network

OpenStack-Ansible uses bridges to connect physical and logical network interfaces on the host to virtual network interfaces within containers. Target hosts need to be configured with the following network bridges:

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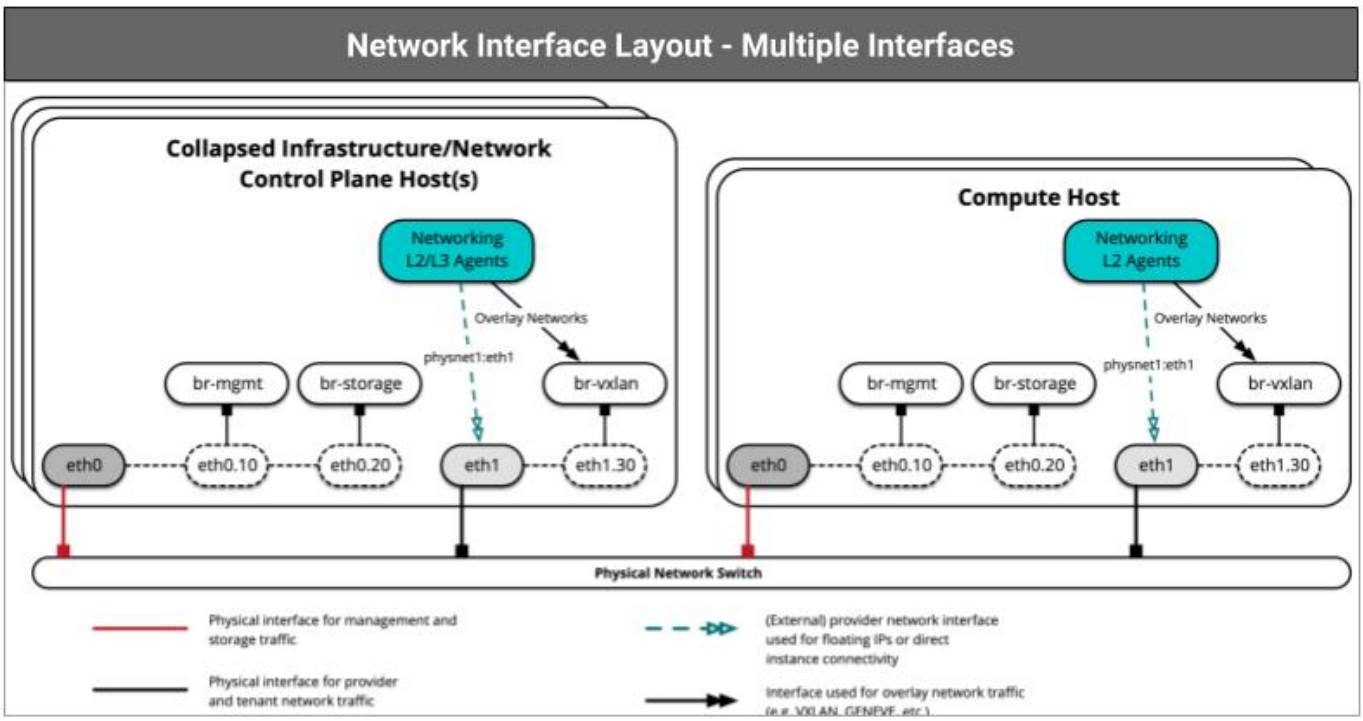
Bridge name	Best configured on	With a static IP*
br-mgmt	On every node	Always
br-storage	On every storage node	When component is deployed on metal
	On every compute node	Always
br-vxlan	On every network node	When component is deployed on metal
	On every compute node	Always
br-vlan	On every network node	Never
	On every compute node	Never

Network Architecture

In our test environment each has a dual port Ethernet card and we will configure our test environment network as a multiple interfaces as depicted by the diagram below.



Network CIDR/VLAN Assignments

The following CIDR and VLAN assignments are used for this environment.

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Network	CIDR	VLAN
Management Network	`172.29.236.0/22`	`10`
Tunnel (VXLAN) Network	`172.29.240.0/22`	`30`
Storage Network	`172.29.244.0/22`	`20`

IP Assignments

The following host name and IP address assignments are used for this environment.

Host name	Management IP	Tunnel (VxLAN) I/P	Storage IP
infra1	`172.29.236.11`	`172.29.240.11`	`172.29.244.11`
compute1	`172.29.236.12`	`172.29.240.12`	`172.29.244.12`
storage1	`172.29.236.13`	`-`	`172.29.244.13`

Configuring the Operating System

This section covers how to install and configure **Ubuntu 18.04 LTS server** in our OpenStack-Ansible host.

Install the Operating System

If your have downloaded your Ubuntu server image download the installation ISO from alternate download section.

Alternative Ubuntu Server installer

Since we require advanced networking and storage features such as; LVM, RAID, multipath, vlans, bonds, or re-using existing partitions, you will want to continue to use the alternate installer.

Download the alternate installer

> **Note**
>
> We do not cover on how to install the Ubuntu server here. We assume that you already know howto do it.

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> **Important**
>
> We also recommend setting your locale to en_US.UTF-8. Other locales might work, but they are not tested or supported.

Configure Ubuntu

1. Update package source lists

```
sudo apt-get update
```

2. Upgrade the system packages and kernel:

```
sudo apt-get dist-upgrade
```

3. Reboot the host.

```
sudo systemctl reboot
```

4. Ensure that the kernel version is `3.13.0-34-generic` or later:

```
uname -r
```

5. Install additional software packages:

```
sudo apt-get install bridge-utils debootstrap ifenslave ifenslave-2.6 lsof lvm2
chrony openssh-server sudo tcpdump vlan python
```

6. Install the kernel extra package if you have one for your kernel version

```
sudo apt install linux-image-extra-$(uname -r)
```

7. Add the appropriate kernel modules to the `/etc/modules` file to enable VLAN and bond interfaces:

```
sudo echo 'bonding' >> /etc/modules && sudo  echo '8021q' >> /etc/modules
```

8. Configure Network Time Protocol (NTP) in `/etc/chrony/chrony.conf` to synchronize with a suitable time source and restart the service:

```
sudo systemctl enable chrony
sudo restart chrony
```

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9. Reboot the host to activate the changes and use the new kernel.

```
sudo systemctl reboot
```

Configure The Network Interfaces.

This section describes how to configure network interfaces of your host so that it can be used in OpenStack Ansible deployment.

Changing `netplan` to `ifupdown`

The classic `ifupdown` network configuration used in Debian/Ubuntu has been replaced by `netplan` on Ubuntu 18.04 server system.

You can view the current `netplan` configuration using the command below. You may have a different name for your `YML` as per your installation environment.

```
cat /etc/netplan/01-netcfg.yaml
```

You will get an output like below.

```
# This file describes the network interfaces available on your system
# For more information, see netplan(5).
network:
  version: 2
  renderer: networkd
  ethernets:
    enp0s3:
      dhcp4: yes
```

To re-enable `ifupdown` on this system, run:

```
sudo apt install ifupdown
```

Consistent Naming for Network Interfaces

New versions of Linux Kernel, including the one in our Ubuntu server name the network interfaces using a new convention based on the network interface type (PCI, PCIe, Onboard, Wireless, etc.,) and the relative position of the motherboard which we have slotted the specific card. For example, you may get interface names like `enp0s3, eno1, p2p1` etc. While this is an advantageous in many cases as it provides consist ant name of each interface during our OpenStack-Ansible deployment we are going to rename them back to our traditional naming convention `eth0, eth1` , and so on.

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To get back to `ethX` again will do the following configurations

```
sudo nano /etc/default/grub
```

Look for `GRUB_CMDLINE_LINUX` and add the following `net.ifnames=0 biosdevname=0` .

From:

```
GRUB_CMDLINE_LINUX=""
```

To:

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

Generate a new grub file using the following command.

```
sudo grub-mkconfig -o /boot/grub/grub.cfg
```

Now reboot your systems

```
sudo systemctl reboot
```

Now check your interface name:

```
ip link show
```

You should get an output like below:

```
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN mode DEFAULT
group default qlen 1000
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP mode
DEFAULT group default qlen 1000
    link/ether 08:00:27:cb:31:f1 brd ff:ff:ff:ff:ff:ff
3: eth1: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc fq_codel state UP mode
DEFAULT group default qlen 1000
    link/ether 08:00:27:b4:05:38 brd ff:ff:ff:ff:ff:ff
```

Infra1 Host Networking

According to above network architecture and design you can configure the network interfaces of infra1 host as below.

```
sudo nano /etc/network/interfaces
```

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Add the the following configurations.

```
# Physical interfaces
auto eth0
iface eth0 inet manual

auto eth1
iface eth1 inet manual

# Container/Host management VLAN interface
auto eth0.10
iface eth0.10 inet manual
    vlan-raw-device eth0

# OpenStack Networking VXLAN (tunnel/overlay) VLAN interface
auto eth1.30
iface eth1.30 inet manual
    vlan-raw-device eth1

# Storage network VLAN interface (optional)
auto eth0.20
iface eth0.20 inet manual
    vlan-raw-device eth0

# Container/Host management bridge
auto br-mgmt
iface br-mgmt inet static
    bridge_stp off
    bridge_waitport 0
    bridge_fd 0
    bridge_ports eth0.10
    address 172.29.236.11
    netmask 255.255.252.0
    gateway 172.29.236.1
    dns-nameservers 8.8.8.8 8.8.4.4

# Bind the Internal LB VIP as we run haproxy without keepalived
auto br-mgmt:0
iface br-mgmt:0 inet static
    address 172.29.236.10
    netmask 255.255.252.0

# Bind the External LB VIP as we run haproxy without keepalived
auto eth1:0
iface eth1:0 inet static
    address 192.168.10.10
    netmask 255.255.255.0

# External Network access for Floating IP
auto eth1
face eth1 inet static
   address 192.168.10.11
   netmask 255.255.255.0
```

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```
   gateway 192.168.10.1
   dns-nameservers 8.8.8.8 8.8.4.4

# OpenStack Networking VXLAN (tunnel/overlay) bridge
#
# The COMPUTE, NETWORK and INFRA nodes must have an IP address
# on this bridge.
#
auto br-vxlan
iface br-vxlan inet static
    bridge_stp off
    bridge_waitport 0
    bridge_fd 0
    bridge_ports eth1.30
    address 172.29.240.11
    netmask 255.255.252.0

# OpenStack Networking VLAN bridge
auto br-vlan
iface br-vlan inet manual
    bridge_stp off
    bridge_waitport 0
    bridge_fd 0
    bridge_ports eth1

# Storage bridge (optional)
#
# Only the COMPUTE and STORAGE nodes must have an IP address
# on this bridge. When used by infrastructure nodes, the
# IP addresses are assigned to containers which use this
# bridge.Deploying and customizing OpenStack Mitaka with openstack-ansible
#
# Storage bridge
auto br-storage
iface br-storage inet static
    bridge_stp off
    bridge_waitport 0
    bridge_fd 0
    bridge_ports eth0.20
    address 172.29.244.11
    netmask 255.255.252.0
```

Reboot the system

```
sudo systemctl reboot
```

Compute1 Host Networking

According to above network architecture and design you can configure the network interfaces of Compute1 host as below.

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```
sudo nano /etc/network/interfaces
```

Add the the following configurations.

```
# Physical interfaces
auto eth0
iface eth0 inet manual

auto eth1
iface eth1 inet manual

# Container/Host management VLAN interface
auto eth0.10
iface eth0.10 inet manual
    vlan-raw-device eth0

# OpenStack Networking VXLAN (tunnel/overlay) VLAN interface
auto eth1.30
iface eth1.30 inet manual
    vlan-raw-device eth1

# Storage network VLAN interface (optional)
auto eth0.20
iface eth0.20 inet manual
    vlan-raw-device eth0

# Container/Host management bridge
auto br-mgmt
iface br-mgmt inet static
    bridge_stp off
    bridge_waitport 0
    bridge_fd 0
    bridge_ports eth0.10
    address 172.29.236.12
    netmask 255.255.252.0
    gateway 172.29.236.1
    dns-nameservers 8.8.8.8 8.8.4.4

# External Network access for Floating IP
auto eth1
face eth1 inet static
   address 192.168.10.12
   netmask 255.255.255.0
   gateway 192.168.10.1
   dns-nameservers 8.8.8.8 8.8.4.4

# OpenStack Networking VXLAN (tunnel/overlay) bridge
#
# The COMPUTE, NETWORK and INFRA nodes must have an IP address
# on this bridge.
#
auto br-vxlan
```

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```
iface br-vxlan inet static
    bridge_stp off
    bridge_waitport 0
    bridge_fd 0
    bridge_ports eth1.30
    address 172.29.240.12
    netmask 255.255.252.0

# OpenStack Networking VLAN bridge
auto br-vlan
iface br-vlan inet manual
    bridge_stp off
    bridge_waitport 0
    bridge_fd 0
    bridge_ports eth1

# For tenant vlan support, create a veth pair to be used when the neutron
# agent is not containerized on the compute hosts. 'eth12' is the value used on
# the host_bind_override parameter of the br-vlan network section of the
# openstack_user_config example file. The veth peer name must match the value
# specified on the host_bind_override parameter.
#
# When the neutron agent is containerized it will use the container_interface
# value of the br-vlan network, which is also the same 'eth12' value.
#
# Create veth pair, do not abort if already exists
#    pre-up ip link add br-vlan-veth type veth peer name eth12 || true
# Set both ends UP
#    pre-up ip link set br-vlan-veth up
#    pre-up ip link set eth12 up
# Delete veth pair on DOWN
#    post-down ip link del br-vlan-veth || true
#    bridge_ports eth0 br-vlan-veth

# Storage bridge (optional)
#
# Only the COMPUTE and STORAGE nodes must have an IP address
# on this bridge. When used by infrastructure nodes, the
# IP addresses are assigned to containers which use this
# bridge.Deploying and customizing OpenStack Mitaka with openstack-ansible
#
# Storage bridge
auto br-storage
iface br-storage inet static
    bridge_stp off
    bridge_waitport 0
    bridge_fd 0
    bridge_ports eth0.20
    address 172.29.244.12
    netmask 255.255.252.0
```

Reboot the system

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```
sudo systemctl reboot
```

Storage1 Host Networking

According to above network architecture and design you can configure the network interfaces of Host1 host as below.

```
sudo nano /etc/network/interfaces
```

Add the the following configurations.

```
# Physical interfaces
auto eth0
iface eth0 inet manual

auto eth1
iface eth1 inet manual

# Container/Host management VLAN interface
auto eth0.10
iface eth0.10 inet manual
    vlan-raw-device eth0

# OpenStack Networking VXLAN (tunnel/overlay) VLAN interface
auto eth1.30
iface eth1.30 inet manual
    vlan-raw-device eth1

# Storage network VLAN interface (optional)
auto eth0.20
iface eth0.20 inet manual
    vlan-raw-device eth0

# Container/Host management bridge
auto br-mgmt
iface br-mgmt inet static
    bridge_stp off
    bridge_waitport 0
    bridge_fd 0
    bridge_ports eth0.10
    address 172.29.236.13
    netmask 255.255.252.0
    gateway 172.29.236.1
    dns-nameservers 8.8.8.8 8.8.4.4

# Storage bridge
auto br-storage
iface br-storage inet static
    bridge_stp off
    bridge_waitport 0
```

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```
    bridge_fd 0
    bridge_ports eth0.20
    address 172.29.244.13
    netmask 255.255.252.0
```

Reboot the system

```
sudo systemctl reboot
```

Configure SSH keys

Ansible uses SSH to connect the deployment host and target hosts.

In this test environment we use `infra1` host as our `OpenStack-ansible` host we will create a `ssh` key pair as the root user and propagate the public key of the root user to `compute1` and `storage1` hosts.

1. 'Run the following command as `root` user in `infra1` host

```
sudo su -
ssh-keygen -t rsa
```

Press `Enter` key to create our keys without a passphrase

You will get an output like below.

```
OpenStack-Ansible automatically configures LVM on the nodes, and overrides any
existing LVM configuration. If you had a customized LVM configuration, edit the
generated configuration file as needed.


root@guru:~# ssh-keygen -t rsa
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:WpPMnxdgptMOBoV+qcSgO8qQDWZjtEtfmsB08A5Zr6s root@guru
The key's randomart image is:
+---[RSA 2048]----+
| ...   ..        |
| o+.o ..         |
|+ooo =.  .+      |
|.X+ ..++o* .     |
|=+=++. oS . .    |
|o.++. .+ * . .   |
|o. o  .   + .    |
```

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```
|...        .     |
| E               |
+----[SHA256]-----+
```

2. Copy the keys to compute1 and storage1 hosts.

```
ssh-copy-id root@compute1
ssh-copy-id root@Storage1
```

> **Note**
>
> We assume that you have configured your DNS or at least `/etc/hosts` file to resolve hostnames

3. Test it

```
ssh root@compute1
ssh root@Storage1Note

OpenStack-Ansible automatically configures LVM on the nodes, and overrides any
existing LVM configuration. If you had a customized LVM configuration, edit the
generated configuration file as needed.

Note

OpenStack-Ansible automatically configures LVM on the nodes, and overrides any
existing LVM configuration. If you had a customized LVM configuration, edit the
generated configuration file as needed.
```

If you can connect and get the shell without authenticating, it is working. SSH provides a shell without asking for a password.

> **Important**
>
> OpenStack-Ansible deployments require the presence of a `/root/.ssh/id_rsa.pub` file on the deployment host. The contents of this file is inserted into an `authorized_keys` file for the containers, which is a necessary step for the Ansible playbooks. You can override this behavior by setting the `lxc_container_ssh_key` variable to the public key for the container.

Configuring The storage

Logical Volume Manager (LVM) enables a single device to be split into multiple logical volumes that appear as a physical storage device to the operating system. The Block Storage (cinder) service, and LXC containers that optionally run the OpenStack infrastructure, can optionally use LVM for their data storage.

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