OpenStack

From NorNet Wiki

Installation Guide: https://docs.openstack.org/ocata/install-guide-ubuntu/index.html

Contents

Custom Repositories

```
sudo apt-add-repository -s -y ppa:dreibh/ppa
sudo add-apt-repository -s -y cloud-archive:pike
sudo apt-get update
sudo apt-get install melodic-management melodic-server
```

Server Configurations

- Controller: 10.1.1.79 (nisse.simula.nornet)
- Compute Node 1: 10.1.1.78 (troll.simula.nornet)
- Compute Node 2: 10.1.1.77 (huldra.simula.nornet)

/etc/hosts must contain the corresponding names!

Controller

/etc/hosts on nisse.simula.nornet

```
127.0.0.1       localhost
10.1.1.79       nisse.simula.nornet nisse
...
```

- eth0: NorNet, 10.1.1.79
- eth1: UNINETT

/etc/sysctl.conf on nisse.simula.nornet

```
...
# ====== MELODIC/NorNet Core ======
net.ipv6.conf.all.autoconf=0
net.ipv6.conf.default.autoconf=0
net.ipv6.conf.eth0.autoconf=0
```

```
net.ipv6.conf.eth1.autoconf=0
# ====== MELODIC/NorNet Core ======
```

/etc/hosts on troll.simula.nornet

```
127.0.0.1       localhost
10.1.1.78       troll.simula.nornet troll
...
```

- eth0: NorNet, 10.1.1.78
- eth1: UNINETT
- eth2: NorNet (no address configured -> for bridging VMs)

/etc/sysctl.conf on troll.simula.nornet

```
...
# ====== MELODIC/NorNet Core ======
net.ipv6.conf.all.autoconf=0
net.ipv6.conf.default.autoconf=0
net.ipv6.conf.eth0.autoconf=0
net.ipv6.conf.eth1.autoconf=0
net.ipv6.conf.eth2.autoconf=0
# ====== MELODIC/NorNet Core ======
```

These settings are important, since unexpected IPv6 addresses will cause Neutron configuration of a new instance to fail!

/etc/hosts on huldra.simula.nornet

```
127.0.0.1       localhost
10.1.1.77       huldra.simula.nornet huldra
...
```

- eth0: NorNet, 10.1.1.77
- eth1: UNINETT
- eth2: NorNet (no address configured -> for bridging VMs)

/etc/sysctl.conf on huldra.simula.nornet

```
...
# ====== MELODIC/NorNet Core ======
net.ipv6.conf.all.autoconf=0
net.ipv6.conf.default.autoconf=0
net.ipv6.conf.eth0.autoconf=0
net.ipv6.conf.eth1.autoconf=0
net.ipv6.conf.eth2.autoconf=0
# ====== MELODIC/NorNet Core ======
```

These settings are important, since unexpected IPv6 addresses will cause Neutron configuration of a new instance to fail!

Controller Basics

sudo apt install melodic-controller

MariaDB Database

Details: [1] (https://docs.openstack.org/ocata/install-guide-ubuntu/environment-sql-database.html)

/etc/mysql/mariadb.conf.d/99-openstack.cnf

Create /etc/mysql/mariadb.conf.d/99-openstack.cnf:

```
[mysqld]
bind-address = 10.1.1.79
default-storage-engine = innodb
innodb_file_per_table = on
max_connections = 4096
collation-server = utf8_general_ci
character-set-server = utf8
```

Restart MariaDB

```
sudo service mysql restart
```

Security configuration

```
sudo mysql_secure_installation
```

Settings:

- Generate and set MariaDB root password, referred as <MariaDB-Root-Password>.
- Remove anonymous users
- Disallow root login from remote
- Remove test database

RabbitMQ Message Queue

Details: [2] (https://docs.openstack.org/ocata/install-guide-ubuntu/environment-messaging.html)

Create RabbitMQ user "openstack" and set password, referred as <RabbitMQ-openstack-Password>.

```
sudo rabbitmqctl add_user openstack <RabbitMQ-openstack-Password>
sudo rabbitmqctl set_permissions openstack ".*" ".*" ".*"
```

Memcached Memory Cache Daemon

Details: [3] (https://docs.openstack.org/ocata/install-guide-ubuntu/environment-memcached.html)

/etc/memcached.conf

Modify /etc/memcached.conf:

```
...
# Specify which IP address to listen on. The default is to listen on all IP addresses
# This parameter is one of the only security measures that memcached has, so make sure
# it's listening on a firewalled interface.
-l 10.1.1.79
...
```

Restart Memcached

```
sudo service memcached restart
```

Identity Service (Keystone)

Details: [4] (https://docs.openstack.org/ocata/install-guide-ubuntu/keystone.html)

Keystone Database

Generate MariaDB Keystone Password, referred as <MariaDB-Keystone-Password>.

```
sudo mysql
```

In MariaDB shell:

```
CREATE DATABASE keystone;
GRANT ALL PRIVILEGES ON keystone.* TO 'keystone'@'localhost' IDENTIFIED BY '<MariaDB-Keystone-Password>
GRANT ALL PRIVILEGES ON keystone.* TO 'keystone'@'%' IDENTIFIED BY '<MariaDB-Keystone-Password>';
FLUSH PRIVILEGES;
```

Identity Service

Keystone

Details: [5] (https://docs.openstack.org/ocata/install-guide-ubuntu/keystone-install.html)

/etc/keystone/keystone.conf

Modify /etc/keystone/keystone.conf (set database access):

```
[database]
...
connection = mysql+pymysql://keystone:<MariaDB-Keystone-Password>@nisse.simula.nornet/keystone
...
```

Modify /etc/keystone/keystone.conf (set token provider):

```
[token]
...
provider = fernet
...
```

Populate the Identity service database

```
sudo su -s /bin/sh -c "keystone-manage db_sync" keystone
```

Check error log (leave it running in another shell):

```
sudo tail -f /var/log/keystone/keystone-manage.log
```

Initialize Fernet key repositories

```
sudo keystone-manage fernet_setup --keystone-user keystone --keystone-group keystone
sudo keystone-manage credential_setup --keystone-user keystone --keystone-group keystone
```

Bootstrap the Identity service

```
sudo keystone-manage bootstrap --bootstrap-password <Keystone-admin-Password> \
    --bootstrap-admin-url http://nisse.simula.nornet:35357/v3/ \
    --bootstrap-internal-url http://nisse.simula.nornet:5000/v3/ \
    --bootstrap-public-url http://nisse.simula.nornet:5000/v3/ \
    --bootstrap-region-id RegionOne
```

Apache

/etc/apache2/apache2.conf

Modify /etc/apache2/apache2.conf (set ServerName to "nisse"):

```
...
ServerName nisse.simula.nornet
...
```

Restart Apache and remove initial SQLite database

```
sudo service apache2 restart
sudo rm -f /var/lib/keystone/keystone.db
```

Admin User Environment

Configure environment of user "nornetpp"

Add to ~nornetpp/.bashrc:

```
# ====== MELODIC/NorNet Core ======
export OS_USERNAME="admin"
export OS_PASSWORD="<Keystone-admin-Password>"
export OS_PROJECT_NAME="admin"
export OS_USER_DOMAIN_NAME="Default"
export OS_PROJECT_DOMAIN_NAME="Default"
export OS_AUTH_URL="http://nisse.simula.nornet:35357/v3"
```

```
export OS_IDENTITY_API_VERSION=3
# ====== MELODIC/NorNet Core ======
```

As "nornetpp":

```
source ~/.bashrc
```

Projects, Users and Roles

Details: [6] (https://docs.openstack.org/ocata/install-guide-ubuntu/keystone-users.html)

Run as "nornetpp":

Project "Service":

```
openstack project create --domain default --description "Service Project" service
```

It will be used for services like Glance.

Project "NorNet Core":

```
openstack project create --domain default --description "NorNet Core Project" nnc
```

User for "NorNet Core" (with password referred as <Keystone-nnc-Password>):

```
openstack user create --domain default --password <Keystone-nnc-Password> nnc
```

```
openstack role create user
openstack role add --project nnc --user nnc user
```

Verify operation

Temporary disable authentication settings in environment variables:

```
unset OS_AUTH_URL OS_PASSWORD
```

Check to get authentication token as user "admin" (needs <Keystone-admin-Password>):

```
openstack --os-auth-url http://nisse.simula.nornet:35357/v3 \
 --os-project-domain-name default \
 --os-user-domain-name default \
 --os-project-name admin --os-username admin token issue
```

Check to get authentication token as user "nnc" (needs <Keystone-admin-Password>):

```
openstack --os-auth-url http://nisse.simula.nornet:5000/v3 \
 --os-project-domain-name default \
 --os-user-domain-name default \
 --os-project-name nnc --os-username nnc token issue
```

Image Service (Glance)

Details: [7] (https://docs.openstack.org/ocata/install-guide-ubuntu/common/get-started-image-service.html)

Glance Database

Generate MariaDB Glance Password, referred as <MariaDB-glance-Password>.

```
sudo mysql
```

In MariaDB shell:

```
CREATE DATABASE glance;
```

```
GRANT ALL PRIVILEGES ON glance.* TO 'glance'@'localhost' IDENTIFIED BY '<MariaDB-glance-Password>';
GRANT ALL PRIVILEGES ON glance.* TO 'glance'@'%' IDENTIFIED BY '<MariaDB-glance-Password>';
FLUSH PRIVILEGES;
```

Create Image service

Create user "glance" with "admin" role (with password referred as <Keystone-glance-Password>):

```
openstack user create --domain default --password <Keystone-glance-Password> glance
openstack role add --project service --user glance admin
```

Create Image service:

```
openstack service create --name glance --description "OpenStack Image" image
```

Create Image service API endpoints:

```
openstack endpoint create --region RegionOne image public http://nisse.simula.nornet:9292
openstack endpoint create --region RegionOne image internal http://nisse.simula.nornet:9292
openstack endpoint create --region RegionOne image admin http://nisse.simula.nornet:9292
```

Configure Glance

/etc/glance/glance-api.conf

Modify /etc/glance/glance-api.conf:

```
[database]
...
connection = mysql+pymysql://glance:<MariaDB-glance-Password>@nisse.simula.nornet/glance
...
```

```
[keystone_authtoken]
...
# ====== MELODIC/NorNet Core ======
auth_uri = http://nisse.simula.nornet:5000
auth_url = http://nisse.simula.nornet:35357
memcached_servers = nisse.simula.nornet:11211
auth_type = password
project_domain_name = default
user_domain_name = default
project_name = service
username = glance
password = <Keystone-glance-Password>
# ====== MELODIC/NorNet Core ======
```

```
[paste_deploy]
...
flavor = keystone
```

```
[glance_store]
...
# ====== MELODIC/NorNet Core ======
stores = file,http
default_store = file
filesystem_store_datadir = /var/lib/glance/images/
# ====== MELODIC/NorNet Core ======
```

/etc/glance/glance-registry.conf

Modify /etc/glance/glance-registry.conf:

```
[database]
```

```
...
connection = mysql+pymysql://glance:<MariaDB-glance-Password>@nisse.simula.nornet/glance
...
```

```
[keystone_authtoken]
...
# ====== MELODIC/NorNet Core ======
auth_uri = http://nisse.simula.nornet:5000
auth_url = http://nisse.simula.nornet:35357
memcached_servers = nisse.simula.nornet:11211
auth_type = password
project_domain_name = default
user_domain_name = default
project_name = service
username = glance
password = <Keystone-glance-Password>
# ====== MELODIC/NorNet Core ======
```

```
[paste_deploy]
...
flavor = keystone
```

Populate the Image service database

```
sudo su -s /bin/sh -c "glance-manage db_sync" glance
```

Restart the Image services

```
sudo service glance-registry restart
sudo service glance-api restart
```

Verify operation

Cirros Image

```
wget -c http://download.cirros-cloud.net/0.3.5/cirros-0.3.5-x86_64-disk.img
openstack image create "Cirros-0.3.5-amd64" \
    --file cirros-0.3.5-x86_64-disk.img \
    --disk-format qcow2 --container-format bare \
    --public
openstack image set --property architecture=amd64 "Cirros-0.3.5-amd64"
openstack image list
# openstack image delete "Cirros-0.3.5-amd64"
```

Ubuntu Images

```
wget -c http://no.releases.ubuntu.com/16.04.3/ubuntu-16.04.3-server-amd64.iso
openstack image create "Install-Ubuntu-Server-16.04.3-amd64" \
    --file ubuntu-16.04.3-server-amd64.iso \
    --disk-format iso --container-format bare \
    --public
openstack image set --property architecture=amd64 "Ubuntu-Server-16.04.3-amd64"
openstack image list
# openstack image delete "Install-Ubuntu-Server-16.04.3-amd64"
```

```
wget -c http://no.releases.ubuntu.com/17.04/ubuntu-17.04-desktop-amd64.iso
openstack image create "Install-Ubuntu-Desktop-17.04-amd64" \
    --file ubuntu-17.04-desktop-amd64.iso \
    --disk-format iso --container-format bare \
    --public
openstack image set --property architecture=amd64 "Ubuntu-Desktop-17.04-amd64"
openstack image list
# openstack image delete "Install-Ubuntu-Desktop-17.04-amd64"
```

```
wget -c cdimage.ubuntu.com/kubuntu/releases/17.04/release/kubuntu-17.04-desktop-amd64.iso
openstack image create "Install-Kubuntu-Desktop-17.04-amd64" \
   --file kubuntu-17.04-desktop-amd64.iso \
   --disk-format iso --container-format bare \
   --public
openstack image set --property architecture=amd64 "Ubuntu-Desktop-17.04-amd64"
openstack image list
# openstack image delete "Install-Kubuntu-Desktop-17.04-amd64"
```

Compute Service (Nova)

Details: [8] (https://docs.openstack.org/ocata/install-guide-ubuntu/common/get-started-compute.html)

sudo apt install melodic-compute

Prepare Controller

Nova Database

Generate MariaDB Nova Password, referred as <MariaDB-nova-Password>.

```
sudo mysql
```

In MariaDB shell:

```
CREATE DATABASE nova_api;
CREATE DATABASE nova;
CREATE DATABASE nova_cell0;
GRANT ALL PRIVILEGES ON nova_api.* TO 'nova'@'localhost' IDENTIFIED BY '<MariaDB-nova-Password>';
GRANT ALL PRIVILEGES ON nova_api.* TO 'nova'@'%' IDENTIFIED BY '<MariaDB-nova-Password>';
GRANT ALL PRIVILEGES ON nova.* TO 'nova'@'localhost' IDENTIFIED BY '<MariaDB-nova-Password>';
GRANT ALL PRIVILEGES ON nova.* TO 'nova'@'%' IDENTIFIED BY '<MariaDB-nova-Password>';
GRANT ALL PRIVILEGES ON nova_cell0.* TO 'nova'@'localhost' IDENTIFIED BY '<MariaDB-nova-Password>';
GRANT ALL PRIVILEGES ON nova_cell0.* TO 'nova'@'%' IDENTIFIED BY '<MariaDB-nova-Password>';
FLUSH PRIVILEGES;
```

Create Compute service

Create user "nova" with "admin" role (with password referred as <Keystone-nova-Password>):

```
openstack user create --domain default --password <Keystone-nova-Password> nova
openstack role add --project service --user nova admin
```

Create Compute service:

```
openstack service create --name nova --description "OpenStack Compute" compute
```

Create Compute service API endpoints:

```
openstack endpoint create --region RegionOne compute public http://nisse.simula.nornet:8774/v2.1
openstack endpoint create --region RegionOne compute internal http://nisse.simula.nornet:8774/v2.1
openstack endpoint create --region RegionOne compute admin http://nisse.simula.nornet:8774/v2.1
```

Create user "placement" with "admin" role (with password referred as <Keystone-placement-Password>):

```
openstack user create --domain default --password <Keystone-placement-Password> placement
openstack role add --project service --user placement admin
```

Create Placement service:

```
openstack service create --name placement --description "Placement API" placement
```

Create Placement service API endpoints:

```
openstack endpoint create --region RegionOne placement public http://nisse.simula.nornet:8778
openstack endpoint create --region RegionOne placement internal http://nisse.simula.nornet:8778
openstack endpoint create --region RegionOne placement admin http://nisse.simula.nornet:8778
```

/etc/nova/nova.conf

Modify /etc/nova/nova.conf:

```
[api_database]
connection = mysql+pymysql://nova:<MariaDB-nova-Password>@nisse.simula.nornet/nova_api
...
```

```
[database]
connection = mysql+pymysql://nova:<MariaDB-nova-Password>@nisse.simula.nornet/nova
...
```

```
[DEFAULT]
...
transport_url = rabbit://openstack:<RabbitMQ-openstack-Password>@nisse.simula.nornet
...
my_ip = 10.1.1.79
...
use_neutron = True
...
firewall_driver = nova.virt.firewall.NoopFirewallDriver
...
```

```
[api]
...
auth_strategy = keystone
...
```

```
[keystone_authtoken]
...
# ====== MELODIC/NorNet Core ======
auth_uri = http://nisse.simula.nornet:5000
auth_url = http://nisse.simula.nornet:35357
memcached_servers = nisse.simula.nornet:11211
auth_type = password
project_domain_name = default
user_domain_name = default
project_name = service
username = nova
password = <Keystone-nova-Password>
# ====== MELODIC/NorNet Core ======
```

```
[vnc]
...
enabled = true
...
vncserver_listen = $my_ip
vncserver_proxyclient_address = $my_ip
```

```
[glance]
...
api_servers = http://nisse.simula.nornet:9292
...
```

```
[oslo_concurrency]
...
```

```
lock_path = /var/lib/nova/tmp
...
```

```
[placement]
...
# ====== MELODIC/NorNet Core ======
os_region_name = RegionOne
project_domain_name = Default
project_name = service
auth_type = password
user_domain_name = Default
auth_url = http://nisse.simula.nornet:35357/v3
username = placement
password = <Keystone-placement-Password>
# ====== MELODIC/NorNet Core ======
```

```
[scheduler]
...
discover_hosts_in_cells_interval = 300
...
```

Populate the nova-api database

```
sudo su -s /bin/sh -c "nova-manage api_db sync" nova
```

Register the cell0 and cell1 databases

```
sudo su -s /bin/sh -c "nova-manage cell_v2 map_cell0" nova
sudo su -s /bin/sh -c "nova-manage cell_v2 create_cell --name=cell1 --verbose" nova 109e1d4b-536a-40d0-
```

Populate the nova database

```
sudo su -s /bin/sh -c "nova-manage db sync" nova
```

Verify cell0 and cell1 database registrations

```
sudo nova-manage cell_v2 list_cells
```

Restart services

```
sudo service nova-api restart
sudo service nova-consoleauth restart
sudo service nova-scheduler restart
sudo service nova-conductor restart
sudo service nova-novncproxy restart
```

Prepare Compute Node

Details: [9] (https://docs.openstack.org/ocata/install-guide-ubuntu/nova-compute-install.html)

Modify /etc/nova/nova.conf:

```
[DEFAULT]
...
transport_url = rabbit://openstack:<RabbitMQ-openstack-Password>@nisse.simula.nornet
...
my_ip = <IPv4-Address-of-Node>
...
use_neutron = True
...
firewall_driver = nova.virt.firewall.NoopFirewallDriver
...
```

```
[api]
...
auth_strategy = keystone
...
```

```
[keystone_authtoken]
...
# ====== MELODIC/NorNet Core ======
auth_uri = http://nisse.simula.nornet:5000
auth_url = http://nisse.simula.nornet:35357
memcached_servers = nisse.simula.nornet:11211
auth_type = password
project_domain_name = default
user_domain_name = default
project_name = service
username = nova
password = <Keystone-nova-Password>
# ====== MELODIC/NorNet Core ======
```

```
[vnc]
...
enabled = true
...
vncserver_listen = 0.0.0.0
vncserver_proxyclient_address = $my_ip
novncproxy_base_url = http://nisse.simula.nornet:6080/vnc_auto.html
```

```
[glance]
...
api_servers = http://nisse.simula.nornet:9292
...
```

```
[oslo_concurrency]
...
lock_path = /var/lib/nova/tmp
...
```

```
[placement]
...
# ====== MELODIC/NorNet Core ======
os_region_name = RegionOne
project_domain_name = Default
project_name = service
auth_type = password
user_domain_name = Default
auth_url = http://nisse.simula.nornet:35357/v3
username = placement
password = <Keystone-placement-Password>
# ====== MELODIC/NorNet Core ======
```

Restart service (logfile is /var/log/nova/nova-compute.log):

```
sudo service nova-compute restart
```

Add the new Compute Node (run **on the Controller**!):

```
sudo su -s /bin/sh -c "nova-manage cell_v2 discover_hosts --verbose" nova
openstack hypervisor list
```

discover_hosts_in_cells_interval=300 **on the Controller** applies automatic discovery of new compute nodes. "nova-manage cell_v2 discover_hosts" runs the discovery manually.

Verify operation

Details: [10] (https://docs.openstack.org/ocata/install-guide-ubuntu/nova-verify.html)

Run **on the Controller**:

```
openstack compute service list
```

This output should indicate three service components enabled on the controller node and one service component enabled on each compute node.

```
openstack catalog list
```

```
openstack image list
```

```
sudo nova-status upgrade check
```

Networking Service (Neutron)

Details: [11] (https://docs.openstack.org/ocata/install-guide-ubuntu/neutron-controller-install.html)

Neutron Database

Generate MariaDB Neutron Password, referred as <MariaDB-neutron-Password>.

```
sudo mysql
```

In MariaDB shell:

```
CREATE DATABASE neutron;
GRANT ALL PRIVILEGES ON neutron.* TO 'neutron'@'localhost' IDENTIFIED BY 'NEUTRON_DBPASS';
GRANT ALL PRIVILEGES ON neutron.* TO 'neutron'@'%' IDENTIFIED BY 'NEUTRON_DBPASS';
FLUSH PRIVILEGES;
```

Create Networking service

Create user "neutron" with "admin" role (with password referred as <Keystone-neutron-Password>):

```
openstack user create --domain default --password <Keystone-neutron-Password> neutron
openstack role add --project service --user neutron admin
```

Create Networking service:

```
openstack service create --name neutron --description "OpenStack Networking" network
```

Create Networking service API endpoints:

```
openstack endpoint create --region RegionOne network public http://nisse.simula.nornet:9696
openstack endpoint create --region RegionOne network internal http://nisse.simula.nornet:9696
openstack endpoint create --region RegionOne network admin http://nisse.simula.nornet:9696
```

Configure Neutron

Details: [12] (https://docs.openstack.org/ocata/install-guide-ubuntu/neutron-controller-install-option2.html)

MELODIC/NorNet is using "Networking Option 2: Self-service networks"

Controller

/etc/neutron/neutron.conf

Modify /etc/neutron/neutron.conf:

```
[database]
```

```
...
connection = mysql+pymysql://neutron:<MariaDB-neutron-Password>@nisse.simula.nornet/neutron
...
```

```
[DEFAULT]
...
transport_url = rabbit://openstack:<RabbitMQ-openstack-Password>@nisse.simula.nornet
...
```

```
[DEFAULT]
...
core_plugin = ml2
...
service_plugins = router
...
allow_overlapping_ips = true
...
notify_nova_on_port_status_changes = true
notify_nova_on_port_data_changes = true
...
```

```
[api]
...
auth_strategy = keystone
...
```

```
[keystone_authtoken]
...
# ====== MELODIC/NorNet Core ======
auth_uri = http://nisse.simula.nornet:5000
auth_url = http://nisse.simula.nornet:35357
memcached_servers = nisse.simula.nornet:11211
auth_type = password
project_domain_name = default
user_domain_name = default
project_name = service
username = neutron
password = <Keystone-neutron-Password>
# ====== MELODIC/NorNet Core ======
```

```
[nova]
...
# ====== MELODIC/NorNet Core ======
auth_url = http://nisse.simula.nornet:35357
auth_type = password
project_domain_name = default
user_domain_name = default
region_name = RegionOne
project_name = service
username = nova
password = <Keystone-nova-Password>
# ====== MELODIC/NorNet Core ======
```

/etc/neutron/plugins/ml2/ml2_conf.ini

Modify /etc/neutron/plugins/ml2/ml2_conf.ini:

```
[ml2]
type_drivers = flat,vlan,vxlan
tenant_network_types = vxlan
mechanism_drivers = linuxbridge,l2population
extension_drivers = port_security
...
```

```
[ml2_type_flat]
flat_networks = uninett-simula,nornet-simula
...
```

```
[ml2_type_vxlan]
vni_ranges = 1:1000
...
```

```
[securitygroup]
...
enable_ipset = true
...
```

/etc/neutron/plugins/ml2/linuxbridge_agent.ini

Modify /etc/neutron/plugins/ml2/linuxbridge_agent.ini:

```
[linux_bridge]
physical_interface_mappings = nornet-simula:eth2,uninett-simula:eth1
...
```

Note: eth2 is used here for NorNet, not eth0!

Assuming NorNet on eth0 and UNINETT on eth1.

```
[vxlan]
enable_vxlan = true
local_ip = 10.1.1.79
l2_population = true
```

```
[securitygroup]
firewall_driver = neutron.agent.linux.iptables_firewall.IptablesFirewallDriver
enable_security_group = true
enable_ipset = true
```

/etc/neutron/l3_agent.ini

Modify /etc/neutron/l3_agent.ini:

```
[DEFAULT]
...
interface_driver = linuxbridge
...
```

/etc/neutron/dhcp_agent.ini

Modify /etc/neutron/dhcp_agent.ini:

```
[DEFAULT]
...
interface_driver = linuxbridge
...
dhcp_driver = neutron.agent.linux.dhcp.Dnsmasq
enable_isolated_metadata = true
...
```

/etc/neutron/metadata_agent.ini

Modify /etc/neutron/metadata_agent.ini:

```
[DEFAULT]
...
```

```
nova_metadata_host = nisse.simula.nornet
metadata_proxy_shared_secret = <Neutron-Metadata-Secret>
```

```
<Neutron-Metadata-Secret> is a generated password.
```

/etc/nova/nova.conf

Modify /etc/nova/nova.conf:

```
[neutron]
...
# ====== MELODIC/NorNet Core ======
url = http://nisse.simula.nornet:9696
auth_url = http://nisse.simula.nornet:35357
auth_type = password
project_domain_name = default
user_domain_name = default
region_name = RegionOne
project_name = service
username = neutron
password = <Keystone-neutron-password>
service_metadata_proxy = true
metadata_proxy_shared_secret = <Neutron-Metadata-Secret>
# ====== MELODIC/NorNet Core ======
```

/etc/neutron/plugins/ml2/linuxbridge_agent.ini

Modify /etc/neutron/plugins/ml2/linuxbridge_agent.ini:

```
[linux_bridge]
physical_interface_mappings = nornet:eth0,uninett:eth1
...
```

```
Assuming NorNet on eth0 and UNINETT on eth1.
```

```
[vxlan]
enable_vxlan = true
local_ip = 10.1.1.78
l2_population = true
```

```
[securitygroup]
firewall_driver = neutron.agent.linux.iptables_firewall.IptablesFirewallDriver
enable_security_group = true
enable_ipset = true
```

Update services

```
sudo su -s /bin/sh -c "neutron-db-manage --config-file /etc/neutron/neutron.conf \
    --config-file /etc/neutron/plugins/ml2/ml2_conf.ini upgrade head" neutron
sudo service nova-api restart
sudo service neutron-server restart
sudo service neutron-linuxbridge-agent restart
sudo service neutron-dhcp-agent restart
sudo service neutron-metadata-agent restart
sudo service neutron-l3-agent restart
```

Compute Node

Details: [13] (https://docs.openstack.org/ocata/install-guide-ubuntu/neutron-compute-install.html)

/etc/neutron/neutron.conf

Modify /etc/neutron/neutron.conf:

```
[DEFAULT]
...
transport_url = rabbit://openstack:<RabbitMQ-openstack-Password>@nisse.simula.nornet
...
auth_strategy = keystone
...
```

```
[keystone_authtoken]
...
# ====== MELODIC/NorNet Core ======
auth_uri = http://nisse.simula.nornet:5000
auth_url = http://nisse.simula.nornet:35357
memcached_servers = nisse.simula.nornet:11211
auth_type = password
project_domain_name = default
user_domain_name = default
project_name = service
username = neutron
password = <Keystone-neutron-Password>
# ====== MELODIC/NorNet Core ======
```

Comment out "connection" option:

```
[database]
 # connection = sqlite:////var/lib/neutron/neutron.sqlite
```

/etc/nova/nova.conf

Modify /etc/nova/nova.conf:

```
[neutron]
...
# ====== MELODIC/NorNet Core ======
url = http://nisse.simula.nornet:9696
auth_url = http://nisse.simula.nornet:35357
auth_type = password
project_domain_name = default
user_domain_name = default
region_name = RegionOne
project_name = service
username = neutron
password = <Keystone-neutron-Password>
service_metadata_proxy = true
metadata_proxy_shared_secret = <Neutron-Metadata-Secret>
# ====== MELODIC/NorNet Core ======
```

/etc/neutron/plugins/ml2/linuxbridge_agent.ini

Modify /etc/neutron/plugins/ml2/linuxbridge_agent.ini:

```
[DEFAULT]
...
local_ip=10.1.1.78
```

Restart services

```
sudo service nova-compute restart
sudo service neutron-linuxbridge-agent restart
```

Verify operation

Details: [14] (https://docs.openstack.org/ocata/install-guide-ubuntu/neutron-verify.html) and [15] (https://docs.openstack.org/ocata/install-guide-ubuntu/neutron-verify-option2.html)

```
openstack extension list --network
```

This checks the successful launch of the neutron-server process.

```
openstack network agent list
```

This should show 4 agents on the controller, and one per compute node.

Block Storage Service (Cinder)

Details: [16] (https://docs.openstack.org/ocata/install-guide-ubuntu/cinder-controller-install.html)

Controller

Details: [17] (https://docs.openstack.org/ocata/install-guide-ubuntu/cinder-controller-install.html)

Cinder Database

Generate MariaDB Cinder Password, referred as <MariaDB-cinder-Password>.

```
sudo mysql
```

In MariaDB shell:

```
CREATE DATABASE cinder;
GRANT ALL PRIVILEGES ON cinder.* TO 'cinder'@'localhost' IDENTIFIED BY '<MariaDB-cinder-Password>';
GRANT ALL PRIVILEGES ON cinder.* TO 'cinder'@'%' IDENTIFIED BY '<MariaDB-cinder-Password>';
FLUSH PRIVILEGES;
```

Create Block Storage service

Create user "cinder" with "admin" role (with password referred as <Keystone-cinder-Password>):

```
openstack user create --domain default --password <Keystone-cinder-Password> cinder
openstack role add --project service --user cinder admin
```

Create Block Storage service:

```
openstack service create --name cinderv2 --description "OpenStack Block Storage" volumev2
openstack service create --name cinderv3 --description "OpenStack Block Storage" volumev3
```

Create Block Storage service API endpoints:

```
openstack endpoint create --region RegionOne volumev2 public http://nisse.simula.nornet:8776/v2/%\(proj
openstack endpoint create --region RegionOne volumev2 internal http://nisse.simula.nornet:8776/v2/%\(pr
openstack endpoint create --region RegionOne volumev2 admin http://nisse.simula.nornet:8776/v2/%\(proje
openstack endpoint create --region RegionOne volumev3 public http://nisse.simula.nornet:8776/v3/%\(proj
openstack endpoint create --region RegionOne volumev3 internal http://nisse.simula.nornet:8776/v3/%\(pr
openstack endpoint create --region RegionOne volumev3 admin http://nisse.simula.nornet:8776/v3/%\(proje
```

Configure Cinder

/etc/cinder/cinder.conf

Modify /etc/cinder/cinder.conf:

```
[DEFAULT]
...
transport_url = rabbit://openstack:<RabbitMQ-openstack-Password>@nisse.simula.nornet
...
auth_strategy = keystone
...
my_ip = 10.1.1.79
...
```

```
[database]
connection = mysql+pymysql://cinder:<MariaDB-cinder-Password>@nisse.simula.nornet/cinder
```

```
[keystone_authtoken]
# ====== MELODIC/NorNet Core ======
auth_uri = http://nisse.simula.nornet:5000
auth_url = http://nisse.simula.nornet:35357
memcached_servers = nisse.simula.nornet:11211
auth_type = password
project_domain_name = default
user_domain_name = default
project_name = service
username = cinder
password = <Keystone-cinder-Password>
# ====== MELODIC/NorNet Core ======
```

```
[oslo_concurrency]
lock_path = /var/lib/cinder/tmp
```

Populate the Block Storage service database:

```
sudo su -s /bin/sh -c "cinder-manage db sync" cinder
```

/etc/nova/nova.conf

Modify /etc/nova/nova.conf:

```
[cinder]
os_region_name = RegionOne
```

Fix necessary for "500 Internal Server Error"

Details: [18] (https://bugs.launchpad.net/cinder/+bug/1715024)

Change /etc/apache2/conf-available/cinder-wsgi.conf:

```
WSGIDaemonProcess cinder-wsgi processes=5 threads=1 user=cinder display-name=%{GROUP}
```

to:

```
WSGIDaemonProcess cinder-wsgi processes=5 threads=1 user=cinder group=cinder display-name=%{GROUP}
```

Restart the Block Storage service

```
sudo service nova-api restart
sudo service cinder-scheduler restart
sudo service apache2 restart
```

Storage Node

Details: [19] (https://docs.openstack.org/ocata/install-guide-ubuntu/cinder-storage-install.html)

Prepare LVM

WARNING: Double-check disk device name to avoid data loss!

Assuming /dev/sdb is exclusively allocated for LVM!

Create the LVM physical volume on /dev/sdb and LVM volume group "cinder-volumes":

```
sudo pvcreate -v /dev/sdb
sudo pvscan
vgcreate cinder-volumes /dev/sdb
```

Note: pvcreate only works on empty disks, i.e. without partition table. To clear "dd if=/dev/zero of=/dev/sdb bs=512 count=1".

Modify /etc/lvm/lvm.conf:

```
filter = [ "a/sdb/", "r/.*/"]
```

Accept only volumes on /dev/sdb, reject others. May be adapted as needed! See [20] (https://docs.openstack.org/ocata/install-guide-ubuntu /cinder-storage-install.html) .

Configure Cinder

/etc/cinder/cinder.conf

Modify /etc/cinder/cinder.conf:

```
[DEFAULT]
transport_url = rabbit://openstack:<RabbitMQ-openstack-Password>@nisse.simula.nornet
...
auth_strategy = keystone
...
my_ip = 10.1.1.78
...
enabled_backends = lvm
...
glance_api_servers = http://nisse.simula.nornet:9292
```

```
[database]
connection = mysql+pymysql://cinder:<MariaDB-cinder-Password>@nisse.simula.nornet/cinder
```

```
[keystone_authtoken]
# ====== MELODIC/NorNet Core ======
auth_uri = http://nisse.simula.nornet:5000
auth_url = http://nisse.simula.nornet:35357
memcached_servers = nisse.simula.nornet:11211
auth_type = password
project_domain_name = default
user_domain_name = default
project_name = service
username = cinder
password = <Keystone-cinder-Password>
# ====== MELODIC/NorNet Core ======
```

```
[oslo_concurrency]
lock_path = /var/lib/cinder/tmp
```

```
[lvm]
volume_driver = cinder.volume.drivers.lvm.LVMVolumeDriver
volume_group = cinder-volumes
iscsi_protocol = iscsi
iscsi_helper = tgtadm
```

Restart services

```
sudo service tgt restart
sudo service cinder-volume restart
```

Verify operation

```
openstack volume service list
```

Dashboard (Horizon)

Details: [21] (https://docs.openstack.org/ocata/install-guide-ubuntu/horizon-install.html)

/etc/openstack-dashboard/local_settings.py

Modify /etc/openstack-dashboard/local_settings.py:

```
...
SESSION_ENGINE = 'django.contrib.sessions.backends.cache'
CACHES = {
    'default': {
        'BACKEND':  'django.core.cache.backends.memcached.MemcachedCache',
        'LOCATION': 'nisse.simula.nornet:11211',
    }
}
...
OPENSTACK_HOST = "nisse.simula.nornet"
OPENSTACK_KEYSTONE_URL = "http://%s:5000/v3" % OPENSTACK_HOST
OPENSTACK_KEYSTONE_DEFAULT_ROLE = "user"
...
OPENSTACK_KEYSTONE_MULTIDOMAIN_SUPPORT = True
OPENSTACK_API_VERSIONS = {
  "identity": 3,
  "image": 2,
  "volume": 2,
}
...
ALLOWED_HOSTS = [ '*' ]
```

Adjust ALLOWED_HOSTS as necessary.

Verify operation

- URL: http://nisse.simula.nornet/horizon
- User: "admin" or "nnc".

TLS

```
sudo a2enmod headers ssl socache_shmcb
```

Configure /etc/apache2/sites-enabled/000-default.conf:

```
<VirtualHost *:80>
        ServerSignature off
        ServerName nisse.nntb.no
        Redirect permanent / https://nisse.nntb.no/
</VirtualHost>
```

```
<VirtualHost *:443>
        ServerSignature off
        ServerName nisse.nntb.no
        SSLEngine on
        SSLOptions +StrictRequire
        SSLProtocol +ALL -SSLv2 -SSLv3 -TLSv1 -TLSv1.1
        SSLHonorCipherOrder on
        # State of the art settings:
        SSLCipherSuite ECDHE-ECDSA-AES256-GCM-SHA384: \
            ECDHE-RSA-AES256-GCM-SHA384:ECDHE-ECDSA-AES256-SHA384: \
            ECDHE-RSA-AES256-SHA384:ECDHE-ECDSA-AES256-SHA: \
            ECDHE-RSA-AES256-SHA:AES256-SHA
        SSLCompression off
        # Add six earth month HSTS header for all users...
        Header add Strict-Transport-Security "max-age=15768000"
        # Further security headers (see https://securityheaders.io):
        Header always set X-Frame-Options "SAMEORIGIN"
        Header always set X-XSS-Protection "1; mode=block"
        Header always set X-Content-Type-Options "nosniff"
        Header always set Content-Security-Policy "default-src https:"
        Header always set Referrer-Policy "strict-origin"
        Header unset X-Powered-By
        # Let's Encrypt:
        SSLCertificateFile /etc/ssl/0001_chain+param.pem
        SSLCertificateKeyFile /etc/ssl/nisse.nntb.no.key
        DocumentRoot /var/www/html
```

```
        <Directory />
                SSLRequireSSL
                Options FollowSymLinks
                AllowOverride None
        </Directory>
</VirtualHost>
```

Get certificate signed!

Launch Instances

Details: [22] (https://docs.openstack.org/ocata/install-guide-ubuntu/launch-instance.html)

Preparations

Security settings

By default, allow SSH and Ping:

```
openstack security group rule create --proto icmp default
openstack security group rule create --proto tcp --dst-port 22 default
```

Create flavor

```
openstack flavor create --id 0    --vcpus 1 --ram   64                --disk 1 "Nano"
```

```
openstack flavor delete "Amiga 4500"
openstack flavor create --id 4500 --vcpus  1 --ram 1024               --disk 16 "Amiga 4500"
openstack flavor delete "Amiga 5000"
openstack flavor create --id 5000 --vcpus  1 --ram 1024  --swap  2048 --disk 16 "Amiga 5000"
openstack flavor delete "Amiga 6000"
openstack flavor create --id 6000 --vcpus  1 --ram 2048  --swap  2048 --disk 32 "Amiga 6000"
openstack flavor delete "Amiga 8000"
openstack flavor create --id 8000 --vcpus  4 --ram 4096  --swap  8192 --disk 64 "Amiga 8000"
openstack flavor delete "Amiga 9000"
openstack flavor create --id 9000 --vcpus 16 --ram 16384 --swap 16384 --disk 128 "Amiga 9000"
```

Create key pair

```
ssh-keygen -q -N ""
openstack keypair create --public-key ~/.ssh/id_rsa.pub mykey
openstack keypair list
```

Checks

```
openstack flavor list
openstack image list
openstack network list
openstack security group list
```

Create networks and subnets

NorNet

```
openstack network create --share --external \
```

??? --disable-port-security \

```
    --provider-physical-network  nornet-simula \
    --provider-network-type flat nornet-simula
```

Note: nornet-simula must be defined in /etc/neutron/plugins/ml2/ml2_conf.ini!

```
openstack subnet delete ipv4-nornet-uninett-simula
openstack subnet delete ipv4-nornet-kvantel-simula
openstack subnet delete ipv4-nornet-telenor-simula
openstack subnet delete ipv4-nornet-powertech-simula
openstack subnet delete ipv6-nornet-uninett-simula
openstack subnet delete ipv6-nornet-kvantel-simula
openstack subnet delete ipv6-nornet-telenor-simula
openstack subnet delete ipv6-nornet-powertech-simula
```

```
openstack subnet create ipv4-nornet-uninett-simula \
    --ip-version 4 --network nornet-simula \
    --description "NorNet IPv4 Uninett @ Simula Research Laboratory" \
    --dns-nameserver 10.1.1.1 --gateway 10.1.1.1 \
    --dhcp \
    --subnet-range 10.1.1.0/24
openstack subnet set ipv4-nornet-uninett-simula --no-allocation-pool
openstack subnet create ipv6-nornet-uninett-simula \
    --ip-version 6 --network nornet-simula \
    --description "NorNet IPv6 Uninett @ Simula Research Laboratory" \
    --dns-nameserver 2001:700:4100:101::1 --gateway 2001:700:4100:101::1 \
    --dhcp \
    --subnet-range 2001:700:4100:101::1/64
openstack subnet set ipv6-nornet-uninett-simula --no-allocation-pool
```

```
openstack subnet create ipv4-nornet-kvantel-simula \
    --ip-version 4 --network nornet-simula \
    --description "NorNet IPv4 Kvantel @ Simula Research Laboratory" \
    --no-dhcp \
    --dns-nameserver 10.2.1.1 --gateway 10.2.1.1 \
    --subnet-range 10.2.1.0/24
openstack subnet set ipv4-nornet-kvantel-simula --no-allocation-pool
openstack subnet create ipv6-nornet-kvantel-simula \
    --ip-version 6 --network nornet-simula \
    --description "NorNet IPv6 Kvantel @ Simula Research Laboratory" \
    --dhcp \
    --dns-nameserver 2001:700:4100:201::1 --gateway 2001:700:4100:201::1 \
    --subnet-range 2001:700:4100:201::1/64
openstack subnet set ipv6-nornet-kvantel-simula --no-allocation-pool
```

```
openstack subnet create ipv4-nornet-telenor-simula \
    --ip-version 4 --network nornet-simula \
    --description "NorNet IPv4 Telenor @ Simula Research Laboratory" \
    --no-dhcp \
    --dns-nameserver 10.4.1.1 --gateway 10.4.1.1 \
    --subnet-range 10.4.1.0/24
openstack subnet set ipv4-nornet-telenor-simula --no-allocation-pool
openstack subnet create --ip-version 6 --network nornet-simula \
    --description "NorNet IPv6 Telenor @ Simula Research Laboratory" \
    --dhcp \
    --dns-nameserver 2001:700:4100:401::1 --gateway 2001:700:4100:401::1 \
    --subnet-range 2001:700:4100:401::1/64 ipv6-nornet-telenor-simula
openstack subnet set ipv6-nornet-telenor-simula --no-allocation-pool
```

```
openstack subnet create ipv4-nornet-powertech-simula \
    --ip-version 4 --network nornet-simula \
    --description "NorNet IPv4 PowerTech @ Simula Research Laboratory" \
    --no-dhcp \
    --dns-nameserver 10.9.1.1 --gateway 10.9.1.1 \
    --subnet-range 10.9.1.0/24
openstack subnet set ipv4-nornet-powertech-simula --no-allocation-pool
openstack subnet create --ip-version 6 --network nornet-simula \
    --description "NorNet IPv6 PowerTech @ Simula Research Laboratory" \
    --dhcp \
    --dns-nameserver 2001:700:4100:901::1 --gateway 2001:700:4100:901::1 \
    --subnet-range 2001:700:4100:901::1/64 ipv6-nornet-powertech-simula
openstack subnet set ipv6-nornet-powertech-simula --no-allocation-pool
```

UNINETT

```
openstack network create --share --external \
    --provider-physical-network  uninett-simula \
    --provider-network-type flat uninett-simula
```

Note: uninett-simula must be defined in /etc/neutron/plugins/ml2/ml2_conf.ini!

Create instances

Cirros

```
openstack server delete vm-test1
openstack server create vm-test1 \
    --wait --flavor Nano --image "Cirros-0.3.5-amd64" \
    --nic net-id=ebd704de-d1c7-425e-9137-2f860642db04 --security-group default \
    --key-name mykey
openstack server list
openstack console url show vm-test1
```

Kubuntu 1

```
openstack port delete port-test2
openstack port create port-test2 \
    --network nornet-simula \
    --fixed-ip subnet=ipv4-nornet-uninett-simula,ip-address=10.1.1.246 \
    --fixed-ip subnet=ipv4-nornet-kvantel-simula,ip-address=10.2.1.246 \
    --fixed-ip subnet=ipv4-nornet-telenor-simula,ip-address=10.4.1.246 \
    --fixed-ip subnet=ipv4-nornet-powertech-simula,ip-address=10.9.1.246 \
    --fixed-ip subnet=ipv6-nornet-uninett-simula,ip-address=2001:700:4100:101::f6 \
    --fixed-ip subnet=ipv6-nornet-kvantel-simula,ip-address=2001:700:4100:201::f6 \
    --fixed-ip subnet=ipv6-nornet-telenor-simula,ip-address=2001:700:4100:401::f6 \
    --fixed-ip subnet=ipv6-nornet-powertech-simula,ip-address=2001:700:4100:901::f6 \
    --security-group default
openstack server delete vm-test2
openstack server create vm-test2 \
    --wait --flavor "Amiga 4500" \
    --image "Install-Kubuntu-Desktop-17.04-amd64" \
    --port port-test2 \
    --security-group default \
    --key-name mykey
openstack server list
openstack console url show vm-test2
```

Kubuntu 2

```
openstack port delete port-test3
openstack port create port-test3 \
    --network nornet-simula \
    --fixed-ip subnet=ipv4-nornet-uninett-simula,ip-address=10.1.1.245 \
    --fixed-ip subnet=ipv4-nornet-kvantel-simula,ip-address=10.2.1.245 \
    --fixed-ip subnet=ipv4-nornet-telenor-simula,ip-address=10.4.1.245 \
    --fixed-ip subnet=ipv4-nornet-powertech-simula,ip-address=10.9.1.245 \
    --fixed-ip subnet=ipv6-nornet-uninett-simula,ip-address=2001:700:4100:101::f5 \
    --fixed-ip subnet=ipv6-nornet-kvantel-simula,ip-address=2001:700:4100:201::f5 \
    --fixed-ip subnet=ipv6-nornet-telenor-simula,ip-address=2001:700:4100:401::f5 \
    --fixed-ip subnet=ipv6-nornet-powertech-simula,ip-address=2001:700:4100:901::f5 \
    --security-group default
openstack server delete vm-test3
openstack server create vm-test3 \
    --wait --flavor "Amiga 4500" \
    --image "Install-Kubuntu-Desktop-17.04-amd64" \
    --port port-test3 \
    --security-group default \
    --key-name mykey
openstack server list
openstack console url show vm-test3
```

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