ITRI
Industrial Technology
Research Institute

OpenStack HA
架構設計及實務

張裕杰 Yuh-Jye Chang
工研院資訊與通訊研究所 ICL of ITRI
資料中心系統軟體組 F Division
代組長 Acting Division Director

Agenda

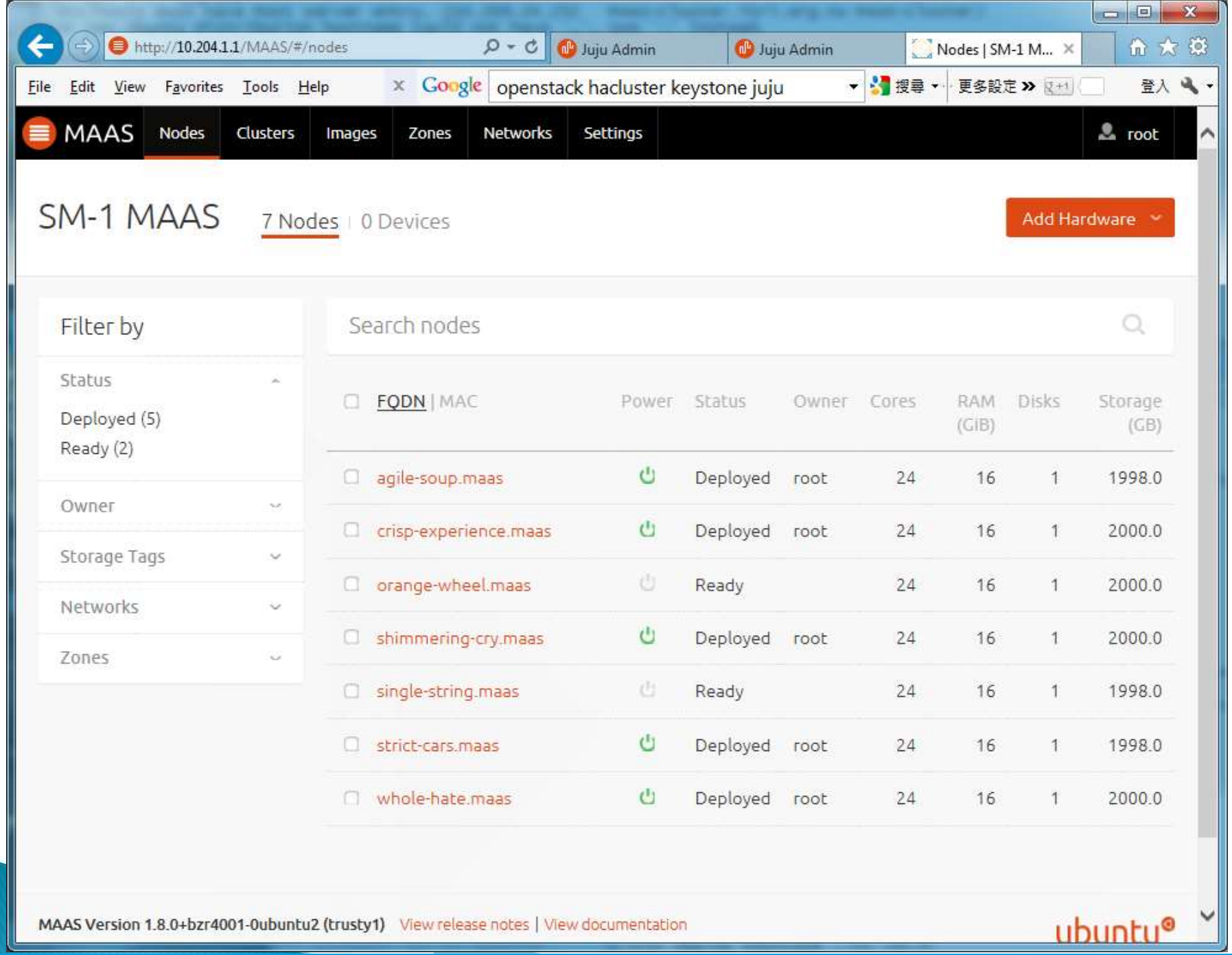
- JUJU + MAAS
- High Availability Design
- OpenStack Components with HA
- Live Maintenance and Upgrade
- ITRI's Cloud OS 2.1
- Q & A

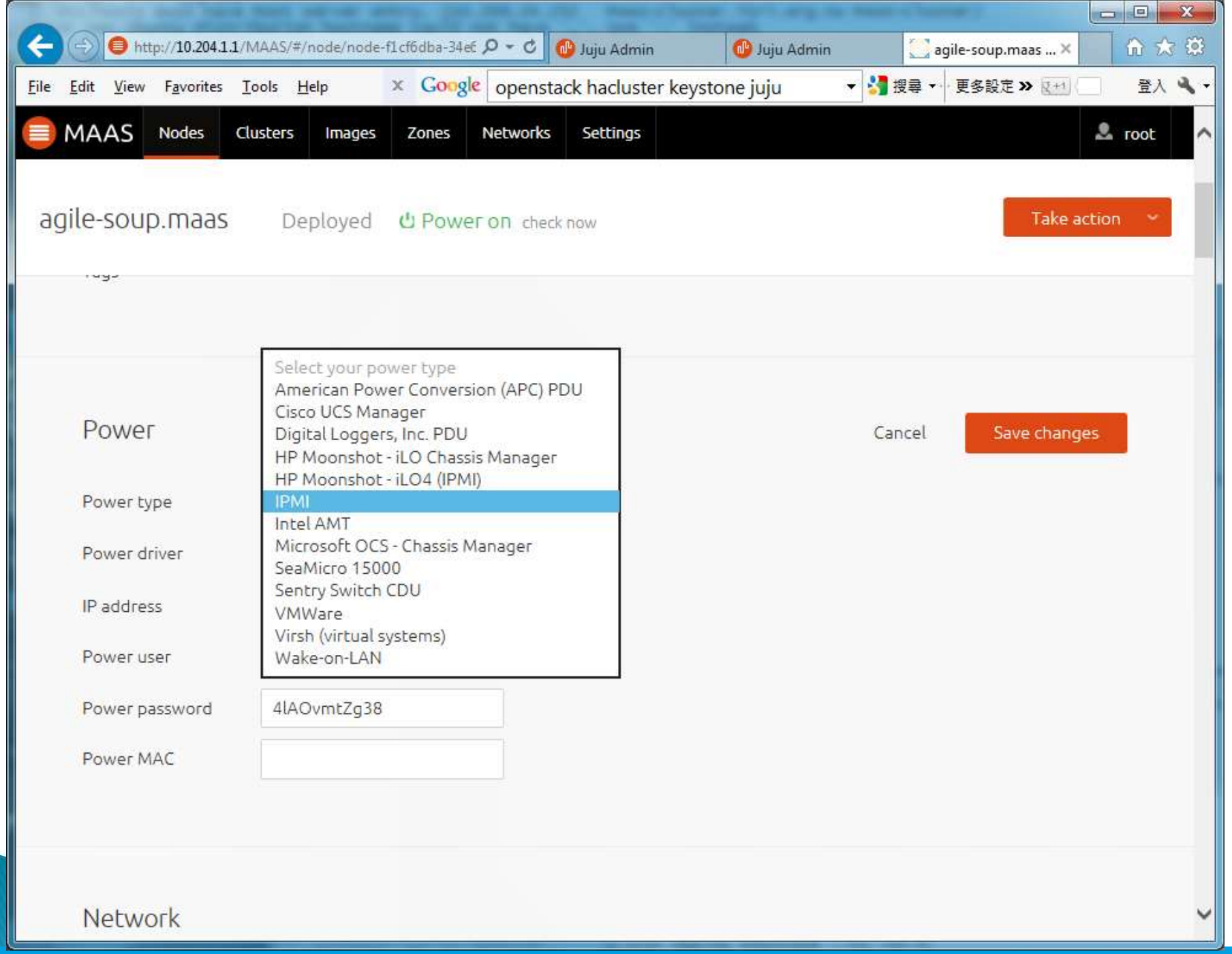
JUJU + MAAS

- JUJU: Model, build and scale your environments on any cloud.
- MAAS: Metal as a Service (MAAS) brings the language of the cloud to physical servers. It makes it easy to set up the hardware on which to deploy any service that needs to scale up and down dynamically

Install MAAS 1.8.0

- Download Ubuntu 14.04 ISO and install on a server.
- Setup hostname, hosts entry, networking, ssh server.
- add-apt-repository ppa:maas-maintainers/stable
- apt-get update
- apt-get dist-upgrade
- apt-get install maas
- Use browser to access http://server-ip/MAAS
- Configure using browser and commend line.



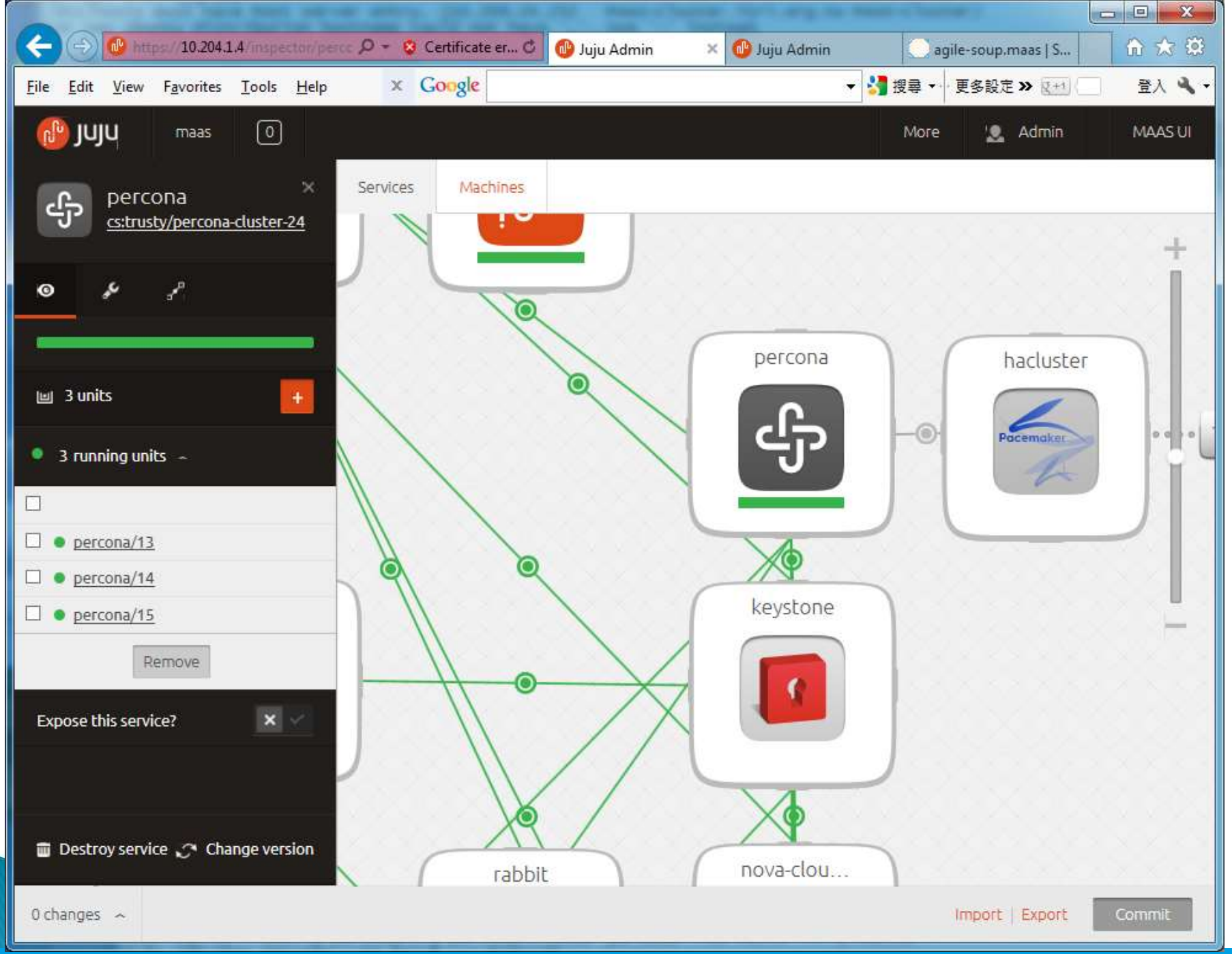


Tips for MAAS

- Configuration for MAAS to work is quite involving and a lot of place could go wrong.
- If ubuntu image import failed, you can follow the quide to setup a local mirror and point your maas boot-source to your local mirror to speed up the process. https://maas.ubuntu.com/docs/sstreams-mirror.html
- MAAS could also control VMs using libvirt. Please follow the guide: http://askubuntu.com/questions/292061/how-to-configure-maas-to-be-able-to-boot-virtual-machines

Install JUJU 1.24.2

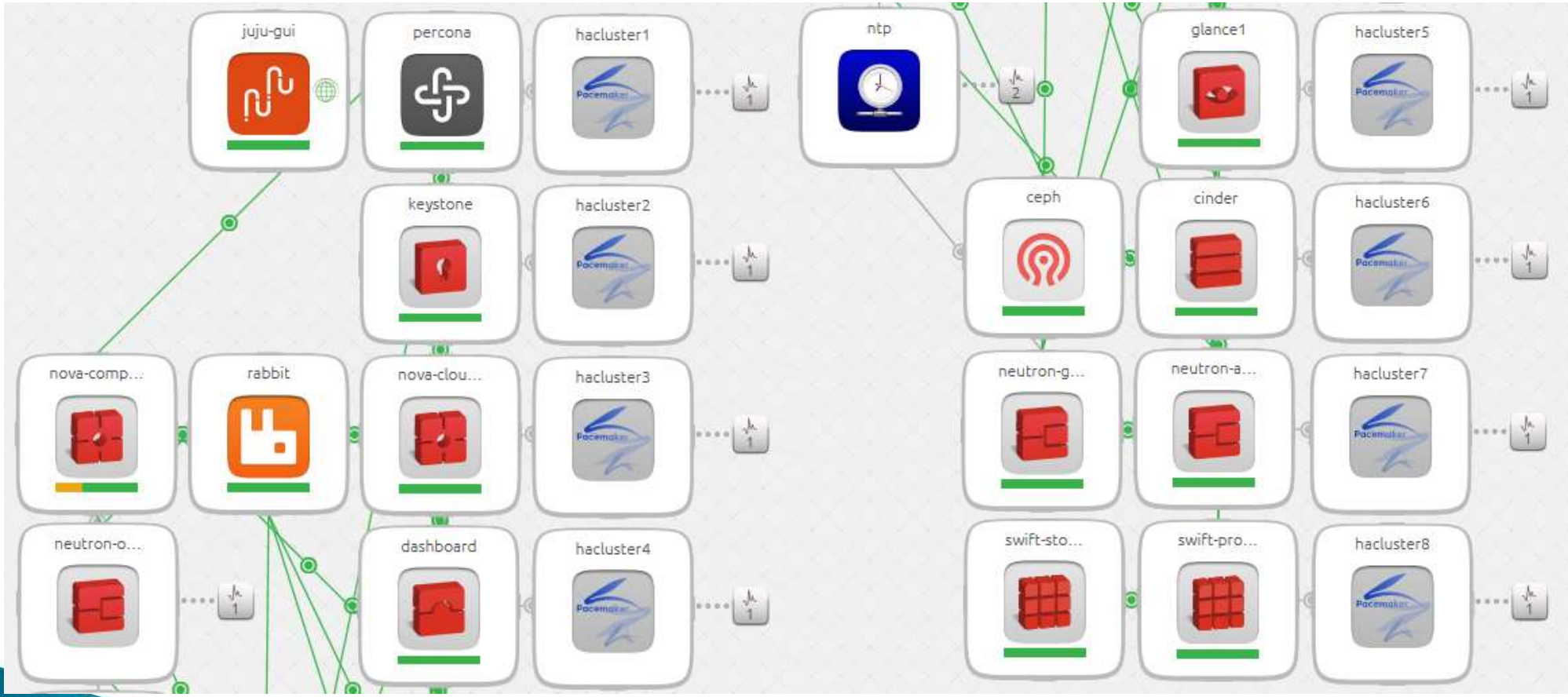
- add-apt-repository ppa:juju/stable
- apt-get update
- apt-get install juju-quickstart
- juju-quickstart (setup with MAAS type, URL, and credentials)
- Juju-status juju-gui (check out the IP of juju-gui)
- Point brower to http://juju-gui-ip/ and use juju



Help! Juju Setup Failed

- Juju quickstart will create juju configuration under ~/.juju directory. Sometime during juju bootstrap, deployment was taken longer than usual.
- You can modify ~/.juju/environments.yaml and add “bootstrap-timeout: 3600” to make the juju bootstrap wait longer.
- What if install failed and you can remove your juju environment using “juju destroy-environment”?
- The last resort is to remove the ~/.juju directory and do juju bootstrap again.

High Availability Design



OpenStack HA Components


hacluster


percona-cluster


keystone


nova-cloud-controller


rabbitmq-server


openstack-dashboard


glance


swift-proxy


swift-storage


cinder


ceph


ceph-osd


quantum-gateway


quantum-api


quantum-openvswitch


ntp

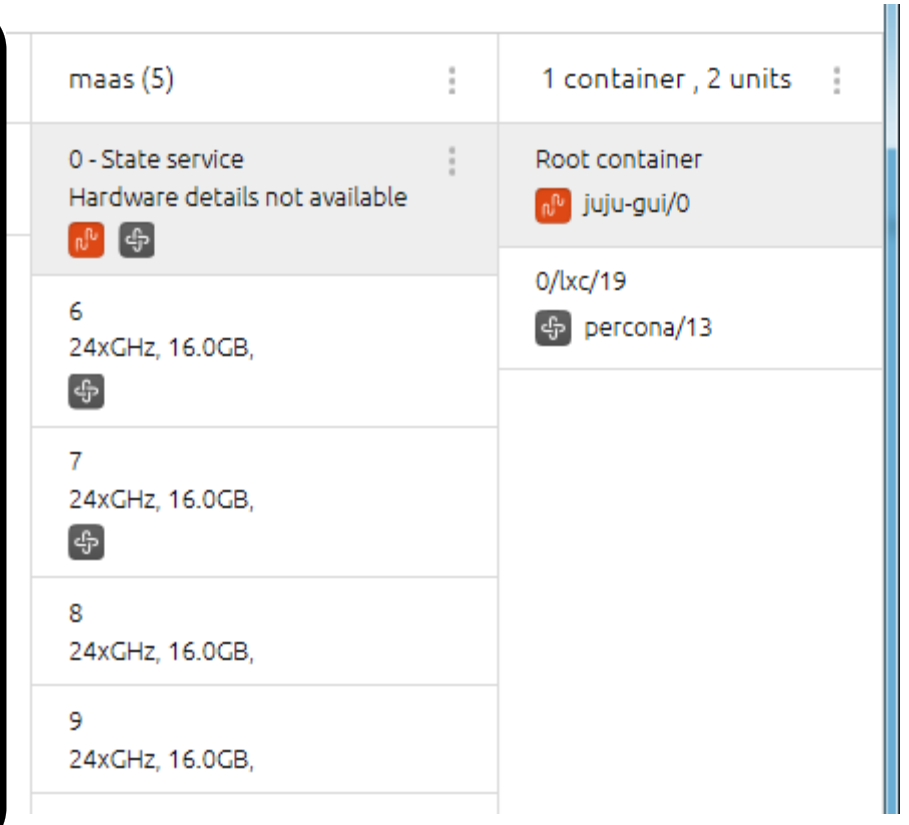
Percona + hacluster

- Percona XtraDB Cluster – Active/Active MySQL
- Hacluster: Corosync Cluster Engine – membership, messaging and quorum
- Prepare 3 machines in MAAS, use JUJU GUI to add 3 machines (for 3 controllers)
- Deploy 1 unit of percona charm into each machines' lxc container
- Deploy hacluster and connect percona

Install Percona


```
percona.cfg
percona:
  vip: '10.204.128.1'
  vip_cidr: 16
  root-password: ccma
  sst-password: cluster
  access-network: 10.204.0.0/16
hacluster:
  corosync_transport: multicast
  corosync_mcastaddr: 226.94.1.1

juju deploy --config percona.cfg percona-cluster
percona --to lxc:0
juju add-unit percona --to lxc:6
juju add-unit percona --to lxc:7
juju deploy --config percona.cfg hacluster
juju add-relation percona hacluster
```



JUJU Status

```
juju status --format tabular percona
[Services]
NAME       STATUS  EXPOSED CHARM
hacluster          false   cs:trusty/hacluster-20
percona    unknown false   cs:trusty/percona-cluster-24

[Units]
ID             WORKLOAD-STATE AGENT-STATE VERSION MACHINE  PORTS PUBLIC-ADDRESS MESSAGE
percona/16     unknown        idle        1.24.2  0/lxc/21       10.204.1.132
  hacluster/11 unknown        idle        1.24.2                 10.204.1.132
percona/17     unknown        idle        1.24.2  6/lxc/2        10.204.1.175
  hacluster/10 unknown        idle        1.24.2                 10.204.1.175
percona/18     unknown        idle        1.24.2  7/lxc/2        10.204.1.177
  hacluster/12 unknown        idle        1.24.2                 10.204.1.177

[Machines]
ID         STATE   VERSION DNS                INS-ID
               SERIES HARDWARE
0          started 1.24.2  whole-hate.maas    /MAAS/api/1.0/nodes/node-e42fe4dc-34e6-11e5-b03
3-0cc47a447444/ trusty arch=amd64 cpu-cores=24 mem=16384M
6          started 1.24.2  agile-soup.maas    /MAAS/api/1.0/nodes/node-f1cf6dba-34e6-11e5-805
7-0cc47a447444/ trusty arch=amd64 cpu-cores=24 mem=16384M
7          started 1.24.2  shimmering-cry.maas /MAAS/api/1.0/nodes/node-e43904fe-34e6-11e5-aff
6-0cc47a447444/ trusty arch=amd64 cpu-cores=24 mem=16384M
```

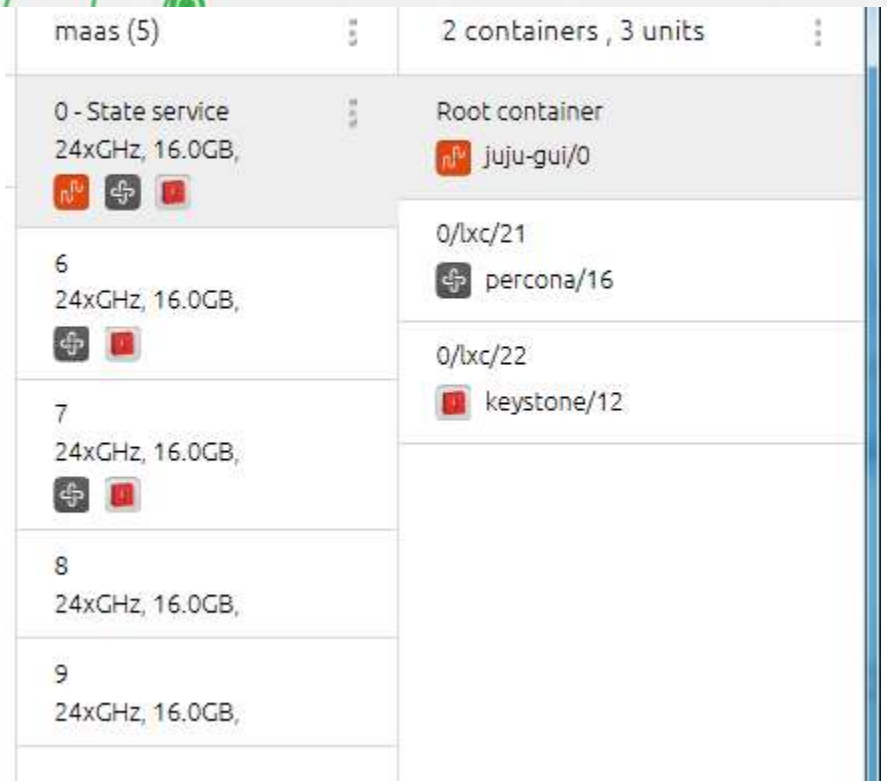
Test MySQL Cluster

```
mysql --host 10.204.128.1 --user root -p
Enter password:
mysql> SHOW STATUS LIKE 'wsrep_%';
+----------------------------+-----------------------------------------------------+
| Variable_name              | Value                                               |
+----------------------------+-----------------------------------------------------+
| wsrep_local_state_uuid     | c328405f-3c9a-11e5-85a7-36fda724abfc                |
| wsrep_protocol_version     | 4                                                   |
| wsrep_last_committed       | 157                                                 |
| wsrep_incoming_addresses   | 10.204.1.132:3306,10.204.1.177:3306,10.204.1.175:3306 |
| wsrep_cluster_conf_id      | 3                                                   |
| wsrep_cluster_size         | 3                                                   |
| wsrep_cluster_state_uuid   | c328405f-3c9a-11e5-85a7-36fda724abfc                |
| wsrep_cluster_status       | Primary                                             |
| wsrep_connected            | ON                                                  |
| wsrep_local_bf_aborts      | 0                                                   |
| wsrep_local_index          | 2                                                   |
| wsrep_provider_name        | Galera                                              |
| wsrep_provider_vendor      | Codership Oy <info@codership.com>                   |
| wsrep_provider_version     | 2.8(r165)                                           |
| wsrep_ready                | ON                                                  |
+----------------------------+-----------------------------------------------------+
```

Install Keystone

```
keystone.cfg
keystone:
  openstack-origin: 'cloud:trusty-kilo'
  vip: '10.204.128.2'
  vip_cidr: 16
hacluster2:
  corosync_transport: multicast
  corosync_mcastaddr: 226.94.1.2

juju deploy keystone --to lxc:0
juju add-unit keystone --to lxc:6
juju add-unit keystone --to lxc:7
juju add-relation keystone percona
juju deploy --config keystone.cfg hacluster
hacluster2
juju add-relation keystone hacluster2
```



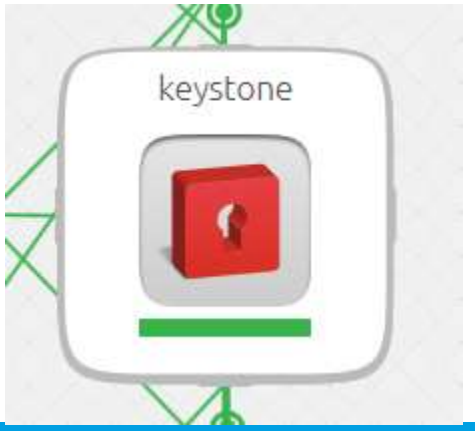
Test Keystone

```
export OS_NO_CACHE='true'
export OS_TENANT_NAME='admin'
export OS_USERNAME='admin'
export OS_PASSWORD='openstack'
export OS_TOKEN='ccma-token'
export OS_AUTH_URL='http://10.204.128.2:5000/v2.0/'
export OS_AUTH_STRATEGY='keystone'
export OS_REGION_NAME='RegionOne'
export CINDER_ENDPOINT_TYPE='publicURL'
export GLANCE_ENDPOINT_TYPE='publicURL'
export KEYSTONE_ENDPOINT_TYPE='publicURL'
export NOVA_ENDPOINT_TYPE='publicURL'
export NEUTRON_ENDPOINT_TYPE='publicURL'
keystone catalog
Service: identity
+-------------+----------------------------------+
|   Property  |              Value               |
+-------------+----------------------------------+
|   adminURL  |  http://10.204.128.2:35357/v2.0  |
|      id     | 54fd9afaca3f48588d8b6fceaa5e94a2 |
| internalURL |  http://10.204.128.2:5000/v2.0   |
|  publicURL  |  http://10.204.128.2:5000/v2.0   |
|    region   |            RegionOne             |
+-------------+----------------------------------+
```

My JUJU Charm Stuck! Now What?

```
juju status --format tabular keystone/7
ID         WORKLOAD-STATE AGENT-STATE VERSION MACHINE PORTS PUBLIC-ADDRESS MESSAGE
keystone/7 error          idle        1.24.2  6/lxc/0       10.204.1.176   hook failed: "shared-
db-relation-changed" for percona:shared-db
```

- Don't remove it. Remove won't work!
- Try: juju resolved keystone/7
- If still not working, try resolved several times.
- After try several times without success, juju ssh keystone/7 to look at the process with the "shared-db-relation-changed" keyword and kill the process. Then try resolved.
- If nothing works, juju ssh keystone/7 and reboot the container
- The last resort: look at the error logs and debug from there

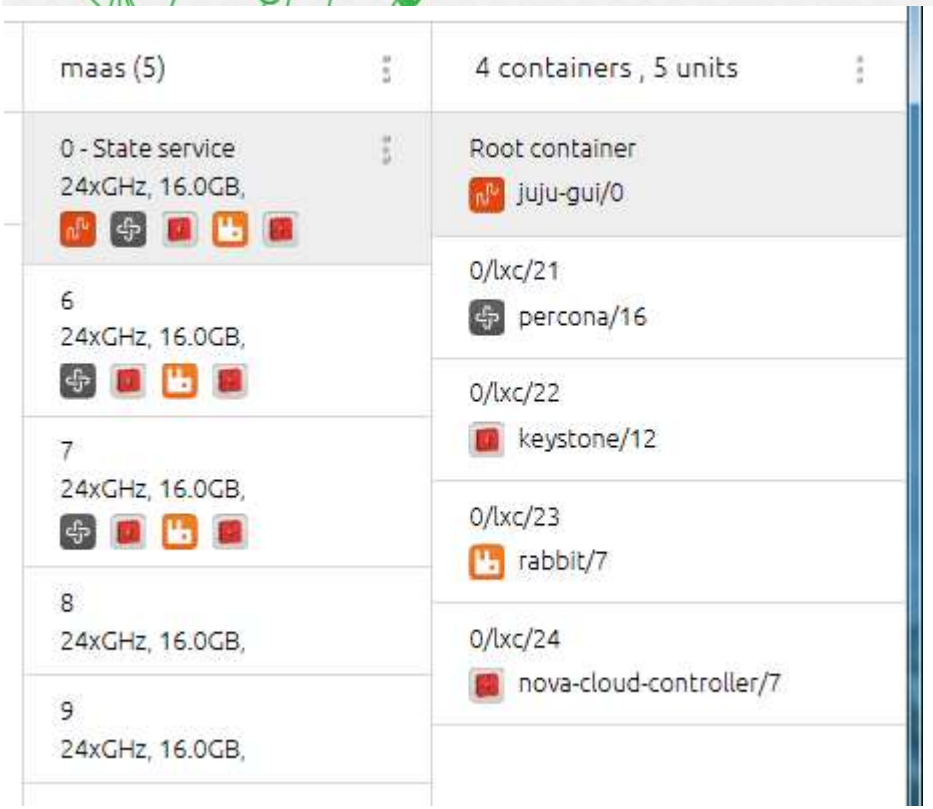


Install Rabbit & Nova

```
juju deploy --config rabbit.cfg rabbitmq-server
rabbit --to 0/lxc/19
juju set rabbit source="cloud:trusty-kilo"
juju add-unit rabbit --to 6/lxc/0
juju add-unit rabbit --to 7/lxc/0

nova-cloud-controller.cfg
nova-cloud-controller:
  openstack-origin: 'cloud:trusty-kilo'
  vip: '10.204.128.3'
  vip_cidr: 16
  network-manager: 'Neutron'
  quantum-security-groups: 'yes'
hacluster3:
  corosync_transport: multicast
  corosync_mcastaddr: 226.94.1.3

juju deploy --config nova-cloud-controller.cfg
nova-cloud-controller --to 0/lxc/19
juju add-unit nova-cloud-controller --to 6/lxc/0
juju add-unit nova-cloud-controller --to 7/lxc/0
juju add-relation nova-cloud-controller percona
juju add-relation nova-cloud-controller keystone
juju add-relation nova-cloud-controller rabbit
```



What we get so far?

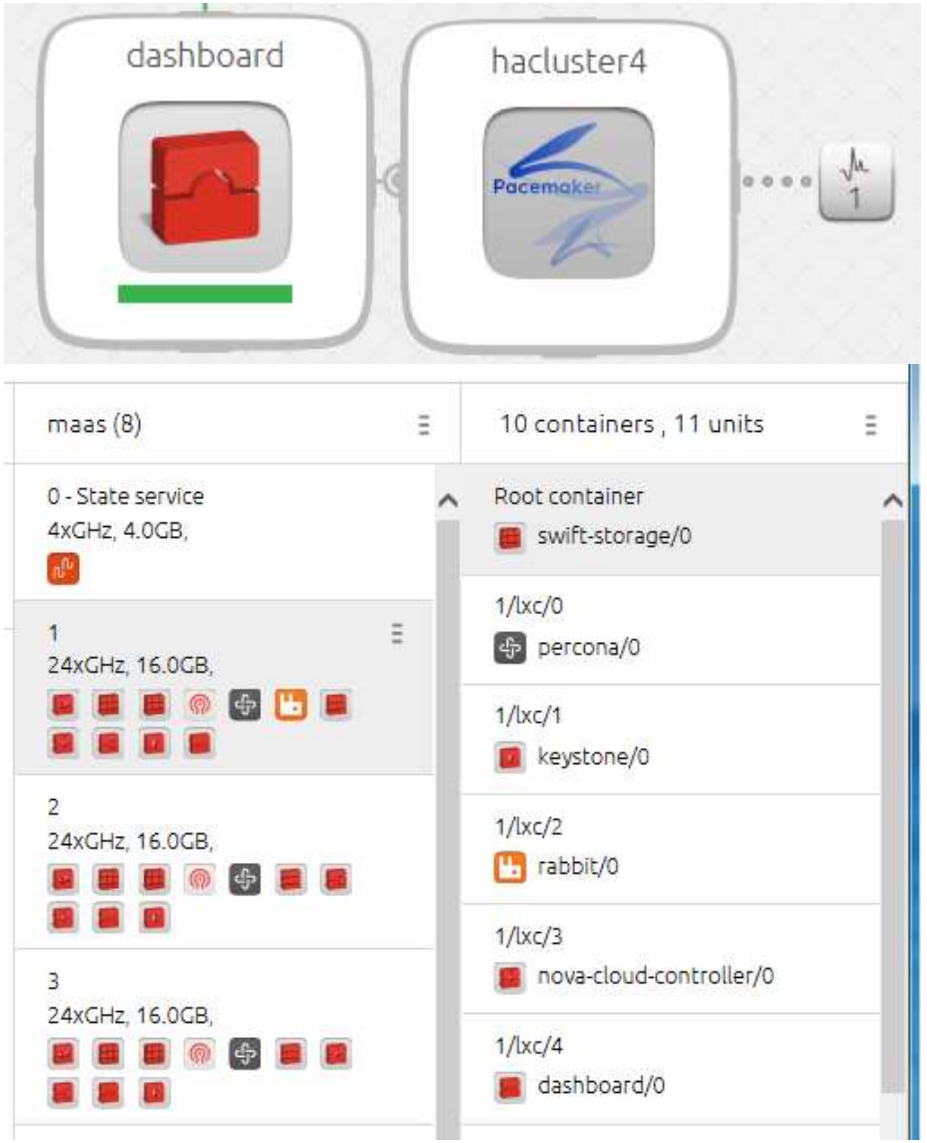
```
cat novarc
#!/bin/sh
export OS_NO_CACHE='true'
export OS_TENANT_NAME='admin'
export OS_USERNAME='admin'
export OS_PASSWORD='openstack'
export OS_TOKEN='ubuntutesting'
export
OS_AUTH_URL='http://10.204.128.1:5000/v2
.0/'
export OS_AUTH_STRATEGY='keystone'
export OS_REGION_NAME='RegionOne'
export CINDER_ENDPOINT_TYPE='publicURL'
export GLANCE_ENDPOINT_TYPE='publicURL'
export
KEYSTONE_ENDPOINT_TYPE='publicURL'
export NOVA_ENDPOINT_TYPE='publicURL'
export NEUTRON_ENDPOINT_TYPE='publicURL'
source novarc
```

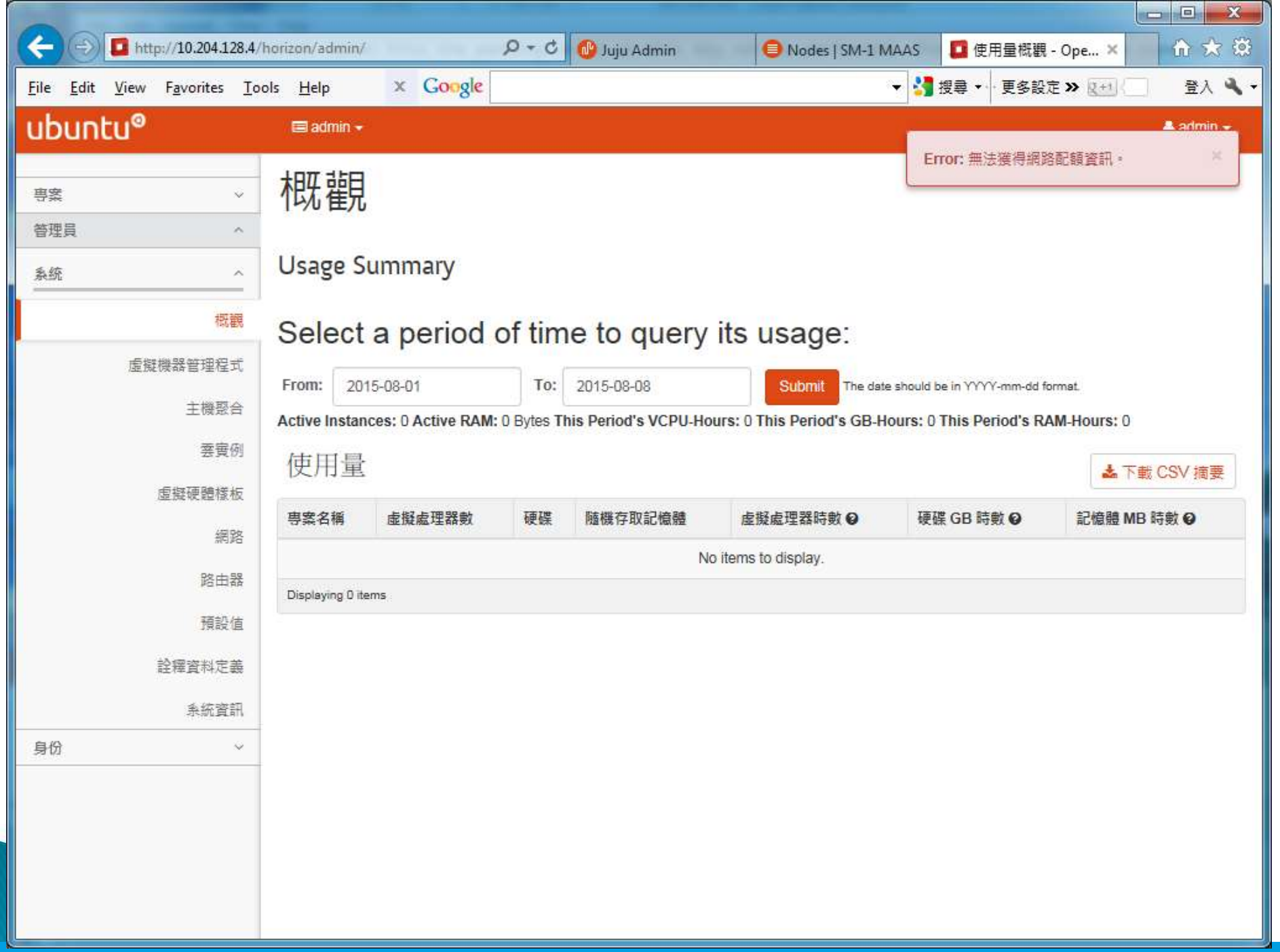
```
keystone catalog
Service: compute
+-------------+----------------------------------------------------------------+
|   Property  |                              Value                             |
+-------------+----------------------------------------------------------------+
|   adminURL  | http://10.204.1.132:8774/v2/104b32dbf7384d8d9f04b95260eca674 |
|      id     |               8ce21dc2c038462bb0e27716c55641de                 |
| internalURL | http://10.204.1.132:8774/v2/104b32dbf7384d8d9f04b95260eca674 |
|  publicURL  | http://10.204.1.132:8774/v2/104b32dbf7384d8d9f04b95260eca674 |
|    region   |                            RegionOne                           |
+-------------+----------------------------------------------------------------+
Service: identity
+-------------+----------------------------------+
|   Property  |              Value               |
+-------------+----------------------------------+
|   adminURL  |  http://10.204.1.132:35357/v2.0  |
|      id     | 3b0f7b86c65d4bcd921560dea47adf69 |
| internalURL |  http://10.204.1.132:5000/v2.0   |
|  publicURL  |  http://10.204.1.132:5000/v2.0   |
|    region   |            RegionOne             |
+-------------+----------------------------------+
```

Install Dashboard

```
dashboard.cfg
dashboard:
  openstack-origin: 'cloud:trusty-kilo'
  vip: '10.204.128.4'
  vip_cidr: 16
hacluster4:
  corosync_transport: multicast
  corosync_mcastaddr: 226.94.1.4

juju deploy --config dashboard.cfg openstack-
dashboard dashboard --to lxc:1
juju add-unit dashboard --to lxc:2
juju add-unit dashboard --to lxc:3
juju deploy --config dashboard.cfg hacluster
hacluster4
juju add-relation dashboard hacluster4
juju add-relation dashboard keystone
```





Install Glance & Swift

```
glance.cfg
glance:
  openstack-origin: 'cloud:trusty-kilo'
  vip: '10.204.128.5'
  vip_cidr: 16
hacluster5:
  corosync_transport: multicast
  corosync_mcastaddr: 226.94.1.5

juju deploy --config=glance.cfg glance --to
lxc:1
juju add-unit glance --to lxc:2
juju add-unit glance --to lxc:3
juju deploy --config glance.cfg hacluster
hacluster5
juju add-relation glance hacluster5
juju add-relation glance percona
juju add-relation glance keystone
juju add-relation glance swift-proxy
juju add-relation glance nova-cloud-
controller
```

```
swift.cfg
swift-proxy:
    openstack-origin: cloud:trusty-kilo
    vip: '10.204.128.8'
    zone-assignment: auto
    replicas: 3
swift-storage:
    openstack-origin: cloud:trusty-kilo
    zone: 1
    block-device: /etc/swift/storage.img|20G
hacluster8:
  corosync_transport: multicast
  corosync_mcastaddr: 226.94.1.8

juju deploy --config=swift.cfg swift-proxy --to
lxc:1
juju add-unit swift-proxy --to lxc:2
juju add-unit swift-proxy --to lxc:3
juju deploy --config swift.cfg hacluster hacluster8
juju add-relation swift-proxy hacluster8
juju deploy --config=swift.cfg swift-storage --to 1
juju add-unit swift-storage --to 2
juju add-unit swift-storage --to 3
juju add-relation swift-proxy swift-storage
juju add-relation swift-proxy keystone
```

Test Glance

```
-+
glance image-create --name cirros-x86_64 --is-public True --
disk-format qcow2 --container-format ovf --file cirros-
0.3.4-x86_64-disk.img --progress
[=============================>] 100%
+------------------+--------------------------------------+
| Property         | Value                                |
+------------------+--------------------------------------+
| checksum         | ee1eca47dc88f4879d8a229cc70a07c6     |
| container_format |
| created_at       |
| deleted          |
| deleted_at       |
| disk_format      |
| id               |
| is_public        |
| name             |
| owner            |
| protected        |
| size             |
| status           | active                               |
| updated_at       | 2015-08-09T02:23:12.000000           |
| virtual_size     | None                                 |
+------------------+--------------------------------------+
```

Install Cinder & Ceph

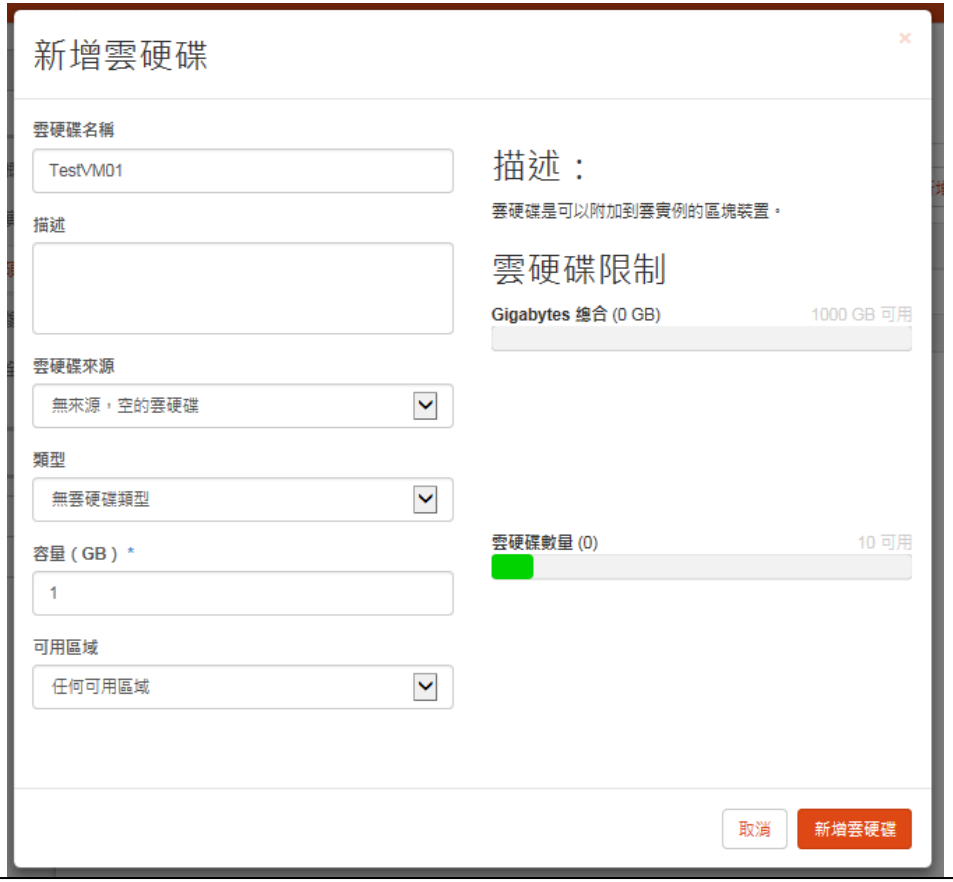

```
ceph.cfg
ceph:
  fsid: '6547bd3e-1397-11e2-82e5-
53567c8d32dc'
  monitor-count: 3
  monitor-secret:
'AQCXrnZQwI7KGBAAiPofmKEXKxu5bUzoYLVkbQ=='
  osd-devices: '/etc/ceph/data'
  osd-reformat: 'yes'
  source: 'cloud:trusty-kilo'

juju deploy --config=ceph.cfg ceph --to
lxc:1
juju add-unit ceph --to lxc:2
juju add-unit ceph --to lxc:3
```

```
swift.cfg
cat cinder.cfg
cinder:
  openstack-origin: cloud:trusty-kilo
  vip: '10.204.128.6'
  vip_cidr: 16
  block-device: 'None'
hacluster6:
  corosync_transport: multicast
  corosync_mcastaddr: 226.94.1.6

juju deploy --config cinder.cfg cinder --to lxc:1
juju add-unit cinder --to lxc:2
juju add-unit cinder --to lxc:3
juju deploy --config cinder.cfg hacluster
hacluster6
juju add-relation cinder hacluster6
juju add-relation cinder ceph
juju add-relation cinder percona
juju add-relation cinder keystone
juju add-relation cinder rabbit
juju add-relation cinder nova-cloud-controller
juju add-relation swift-proxy keystone
```

Test Create Cinder Volume



Install Neutron


```
neutron-api.cfg
neutron-api:
  openstack-origin: cloud:trusty-kilo
  vip: '10.204.128.7'
  vip_cidr: 16
hacluster7:
  corosync_transport: multicast
  corosync_mcastaddr: 226.94.1.7

juju deploy --config neutron-api.cfg neutron-api --
to lxc:1
juju add-unit neutron-api --to lxc:2
juju add-unit neutron-api --to lxc:3
juju deploy --config neutron-api.cfg hacluster
hacluster7
juju deploy neutron-openvswitch
juju add-relation neutron-api hacluster7
juju add-relation neutron-api percona
juju add-relation neutron-api keystone
juju add-relation neutron-api rabbit
juju add-relation neutron-api neutron-openvswitch
juju add-relation neutron-api nova-cloud-controller
juju add-relation neutron-openvswitch rabbit
```

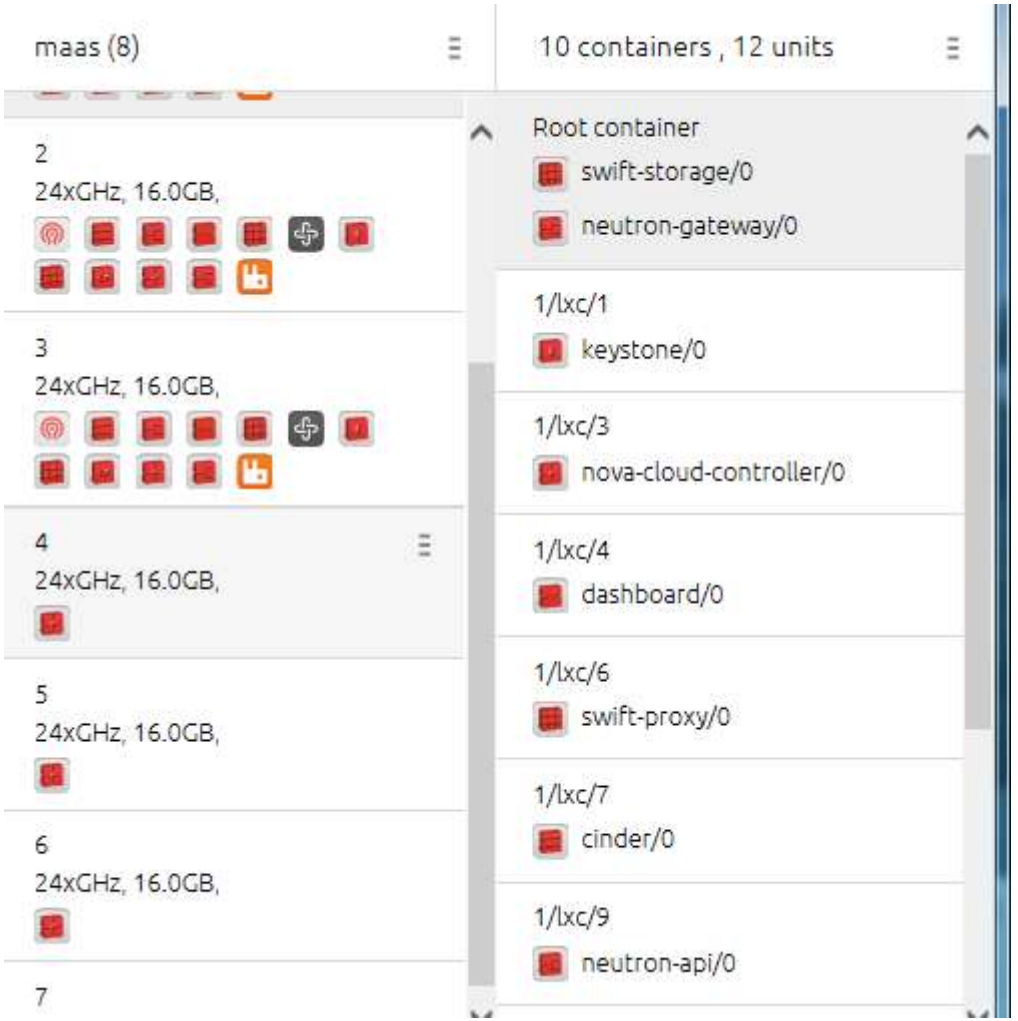
```
neutron-gateway.cfg
neutron-gateway:
  openstack-origin: cloud:trusty-kilo
  ext-port: 'eth1'

juju deploy --config neutron-gateway.cfg quantum-
gateway neutron-gateway --to 1
juju add-unit neutron-gateway --to 2
juju add-unit neutron-gateway --to 3
juju add-relation neutron-gateway percona
juju add-relation neutron-gateway:amqp rabbit:amqp
juju add-relation neutron-gateway neutron-api
juju add-relation neutron-gateway nova-cloud-
controller
```

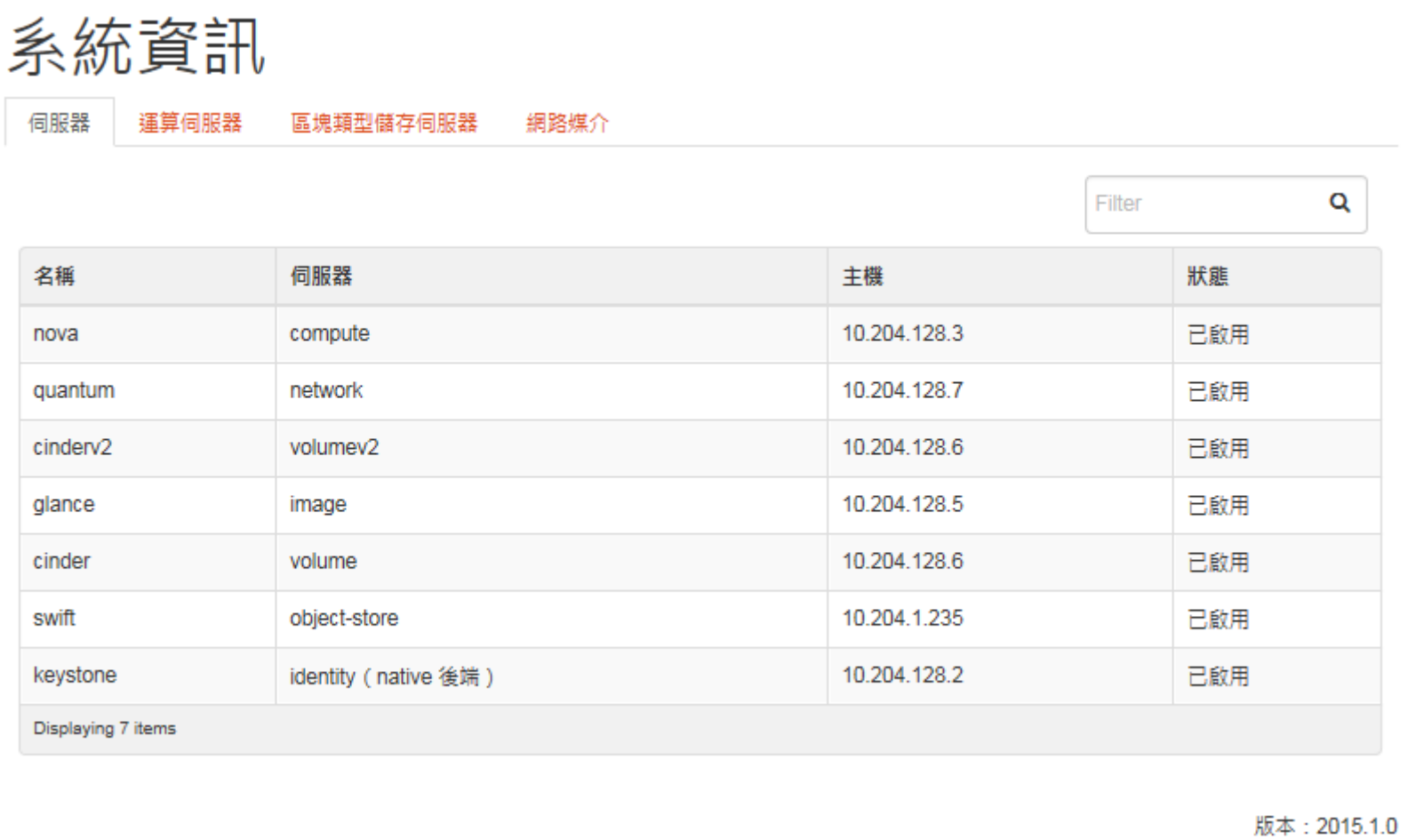
Install Nova Compute

```
nova-compute.cfg
nova-compute:
  openstack-origin: cloud:trusty-kilo
  enable-live-migration: 'True'
  migration-auth-type: 'ssh'

juju deploy --config nova-compute.cfg nova-
compute --to 4
juju add-unit nova-compute --to 5
juju add-unit nova-compute --to 6
juju add-relation nova-compute neutron-
openvswitch
juju add-relation nova-compute nova-cloud-
controller
juju add-relation nova-compute rabbit
juju add-relation nova-compute glance
juju add-relation nova-compute ceph
juju add-relation nova-compute percona
juju add-relation nova-compute cinder
```



Verify all Components



Verify all Compute Services

系統資訊

伺服器 | 運算伺服器 | 區塊類型儲存伺服器 | 網路媒介

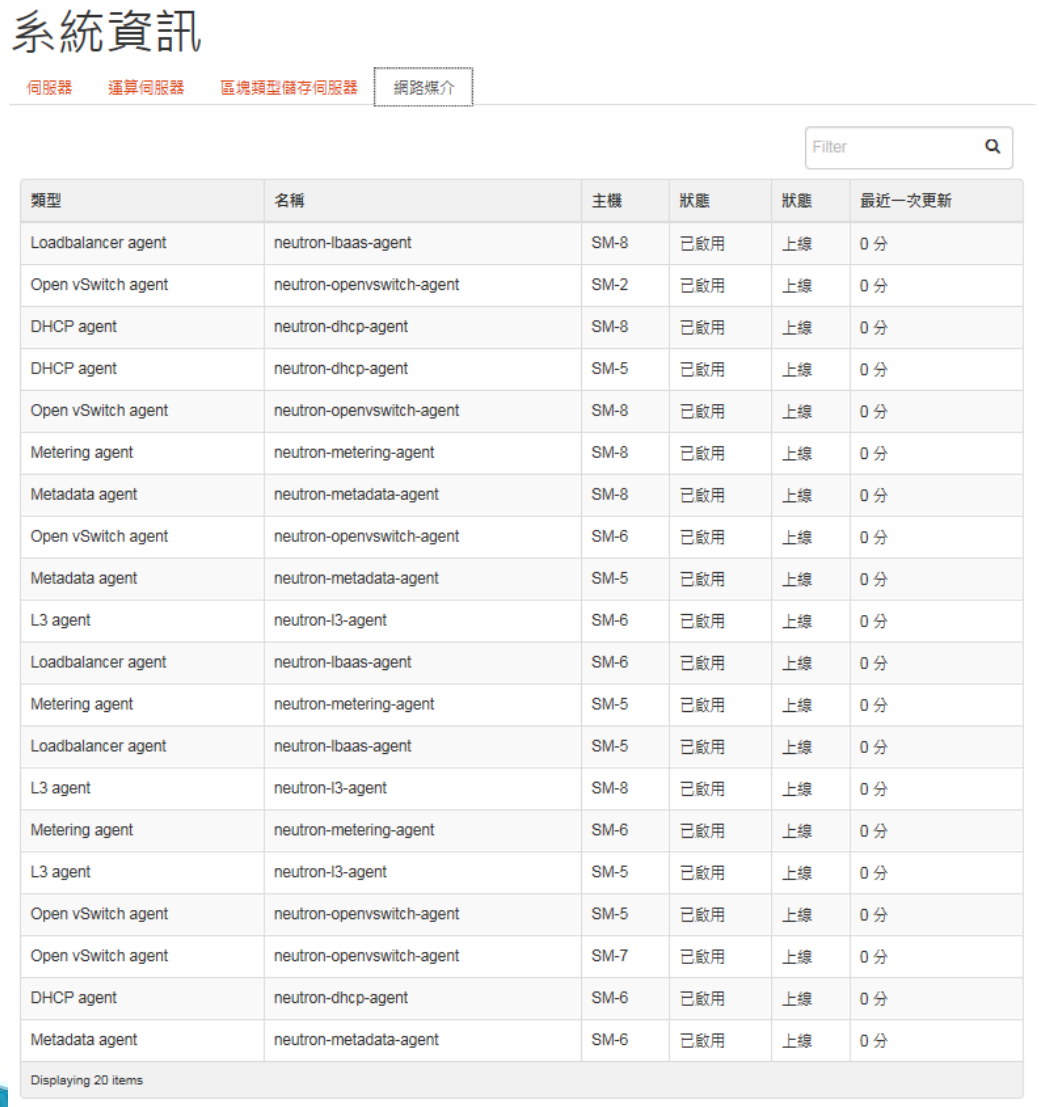
Filter

名稱	主機	區域	狀態	狀態	最近一次更新
nova-cert	juju-machine-2-lxc-2	internal	已啟用	上線	0 分
nova-conductor	juju-machine-2-lxc-2	internal	已啟用	上線	0 分
nova-scheduler	juju-machine-2-lxc-2	internal	已啟用	上線	0 分
nova-conductor	juju-machine-3-lxc-2	internal	已啟用	上線	0 分
nova-conductor	juju-machine-1-lxc-3	internal	已啟用	上線	0 分
nova-cert	juju-machine-3-lxc-2	internal	已啟用	上線	0 分
nova-scheduler	juju-machine-1-lxc-3	internal	已啟用	上線	0 分
nova-cert	juju-machine-1-lxc-3	internal	已啟用	上線	0 分
nova-scheduler	juju-machine-3-lxc-2	internal	已啟用	上線	0 分
nova-compute	SM-2	nova	已啟用	上線	0 分
nova-compute	SM-7	nova	已啟用	上線	0 分

Displaying 11 items

Verify all Cinder Services

Verify all Neutron Services



系統資訊

伺服器 運算伺服器 區塊類型儲存伺服器 網路媒介

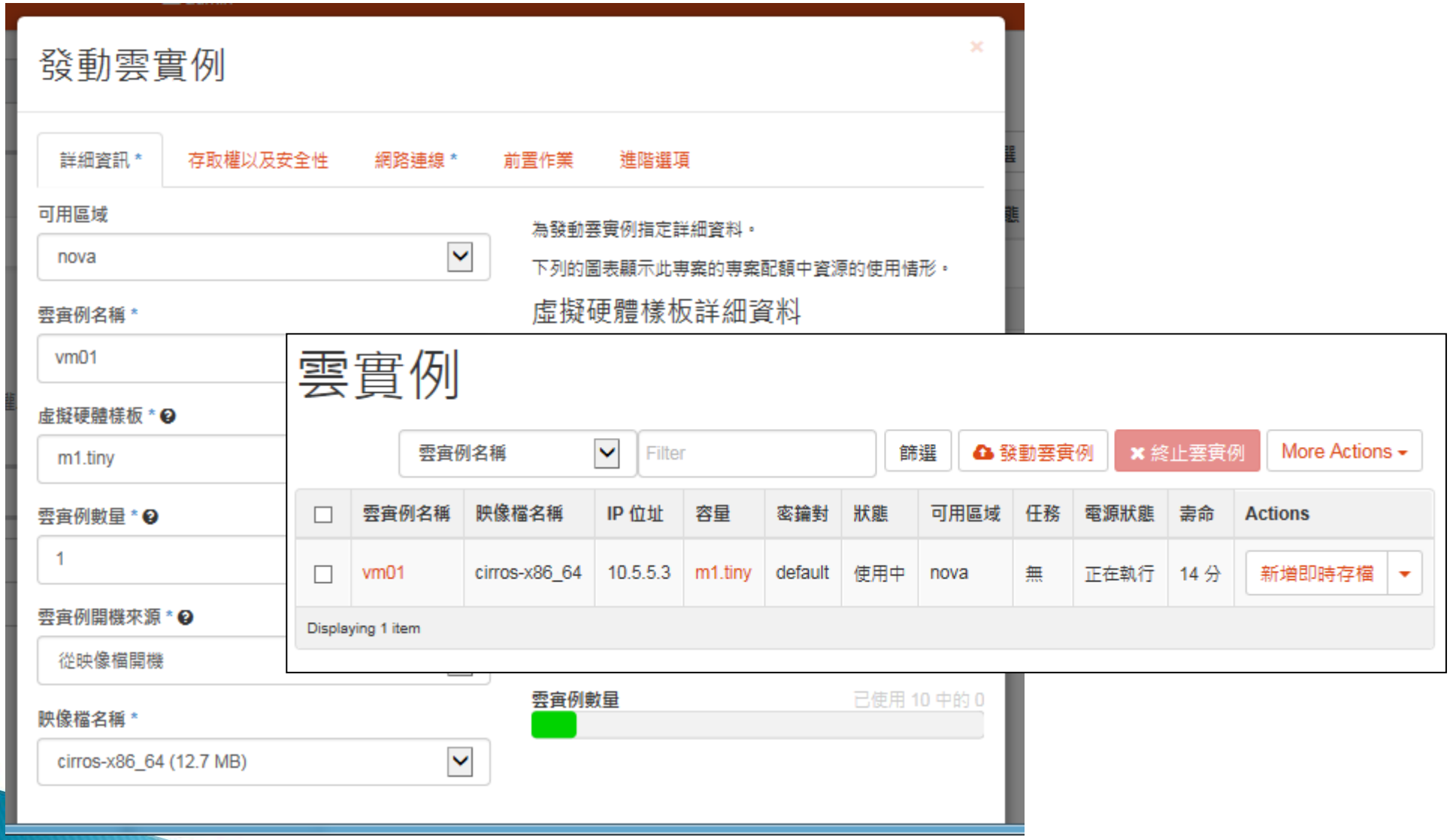
Filter

類型	名稱	主機	狀態	狀態	最近一次更新
Loadbalancer agent	neutron-lbaas-agent	SM-8	已啟用	上線	0 分
Open vSwitch agent	neutron-openvswitch-agent	SM-2	已啟用	上線	0 分
DHCP agent	neutron-dhcp-agent	SM-8	已啟用	上線	0 分
DHCP agent	neutron-dhcp-agent	SM-5	已啟用	上線	0 分
Open vSwitch agent	neutron-openvswitch-agent	SM-8	已啟用	上線	0 分
Metering agent	neutron-metering-agent	SM-8	已啟用	上線	0 分
Metadata agent	neutron-metadata-agent	SM-8	已啟用	上線	0 分
Open vSwitch agent	neutron-openvswitch-agent	SM-6	已啟用	上線	0 分
Metadata agent	neutron-metadata-agent	SM-5	已啟用	上線	0 分
L3 agent	neutron-l3-agent	SM-6	已啟用	上線	0 分
Loadbalancer agent	neutron-lbaas-agent	SM-6	已啟用	上線	0 分
Metering agent	neutron-metering-agent	SM-5	已啟用	上線	0 分
Loadbalancer agent	neutron-lbaas-agent	SM-5	已啟用	上線	0 分
L3 agent	neutron-l3-agent	SM-8	已啟用	上線	0 分
Metering agent	neutron-metering-agent	SM-6	已啟用	上線	0 分
L3 agent	neutron-l3-agent	SM-5	已啟用	上線	0 分
Open vSwitch agent	neutron-openvswitch-agent	SM-5	已啟用	上線	0 分
Open vSwitch agent	neutron-openvswitch-agent	SM-7	已啟用	上線	0 分
DHCP agent	neutron-dhcp-agent	SM-6	已啟用	上線	0 分
Metadata agent	neutron-metadata-agent	SM-6	已啟用	上線	0 分

Displaying 20 items

Build Network Topology

Start VM



Live Maintenance

- Juju add-unit <service> to a new machine.
- Wait for the new unit to become ready
- Juju remove-unit <service>
- After old machine's all service units removed, you can now shutdown the machine for maintenance.

Live Upgrade

- Juju deploy <new service> to a new machine.
- Wait for the new unit to become ready
- Connection the new service's relations.
- After new services are all up and running and participate with HA cluster, you can now shutdown the old service units.

ITRI's Cloud OS 2.1

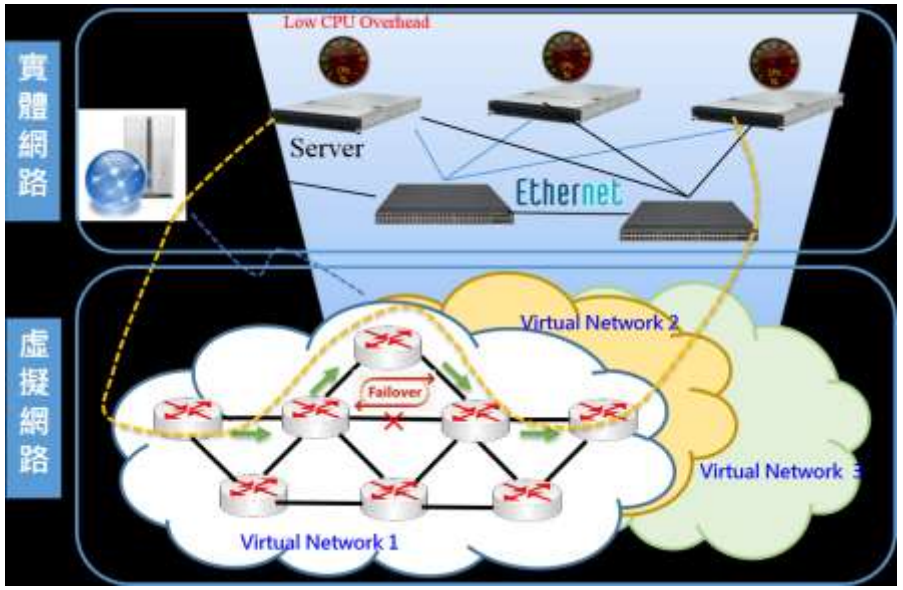
- When: 2015/10 with Kilo
- What:
  - HA with live maintenance/upgrade
  - Network Hardware Redundancy
  - DISCO Cinder Plugin
  - Peregrine Neutron Plugin

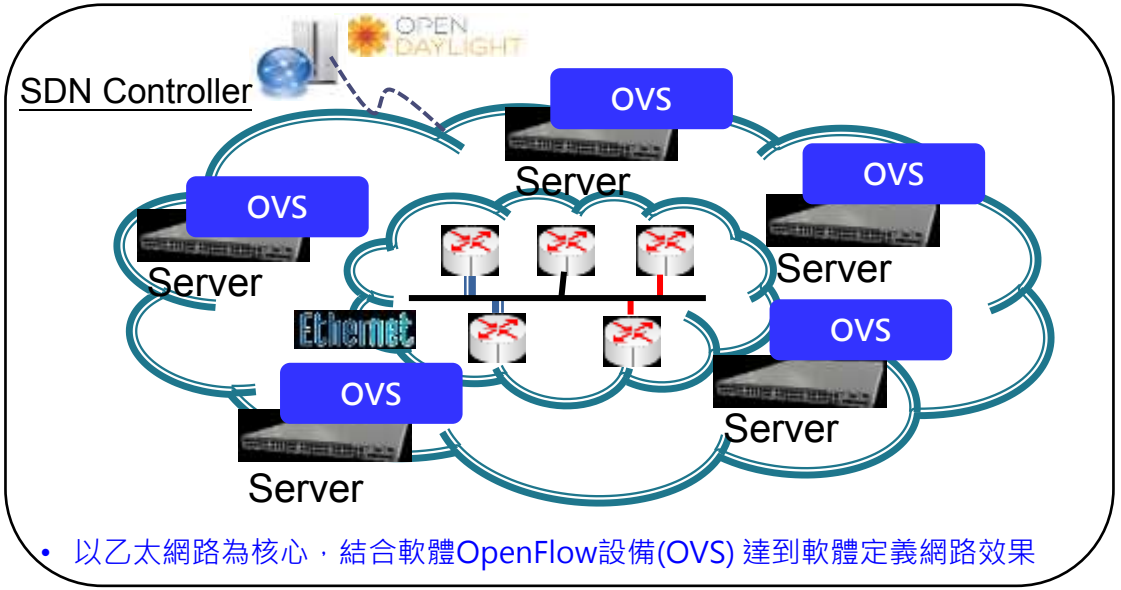
DISCO Cinder Plugin

- Distributed block storage solution providing:
  - Self-healing and High-availability
  - N-way replication
  - Deduplication
  - Snapshot, restore and fast volume cloning
  - Datacenter to Datacenter backup
  - Monitoring and diagnostic interface
- Coming soon
  - Erasure coding
  - Quality of Service

Peregrine Neutron Plugin

- Provide low CPU overhead, L2 traffic engineering, fast failover and compatible with commercial Ethernet switches.





Q & A

- Email: Yuh-Jye.Chang@itri.org.tw
- Phone: +886 3 591 8468