SUSE

We adapt. You succeed.

HA for OpenStack, from the control plane to instances

Hands On

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Workshop Environment

Relax ;-)

- We have plenty of time
- Whole build is also automated and idempotent
- You can take home the entire environment afterwards (available online)
- You can run on any machine with at least 20GB RAM

Workshop Environment

- We’ll build a miniature cloud on a single machine
- libvirt + KVM hypervisor
- 5 VMs
  - Administration Server (Crowbar)
  - 2 Control Nodes in an HA cluster
  - 2 Compute Nodes with HA
- Vagrant for rapid deployment

What is Vagrant?

> “Creates and configures lightweight, reproducible, and portable development environments.”

https://www.vagrantup.com/

- Not just for development
- Perfect for “kicking the tyres”, demoing, testing, etc.
- Cross-platform (Linux, MacOS X, Windows)
- Providers for libvirt, VirtualBox, VMware, Hyper-V, Docker, OpenStack, …

Vagrant Inputs

- 1 or more Vagrant “box” – pre-built virtual appliances
- `Vagrantfile`: Ruby DSL file which defines:
  - which box(es) to use
  - virtual hardware required
  - virtual network topology
  - network ports to forward
  - hypervisor-specific settings
  - files to inject into appliance
  - commands to run in appliance
- files to inject

Using Vagrant: Crash Course

- `vagrant box add suse/cloud7-admin`
- https://app.vagrantup.com/suse
- Also possible to add local boxes
- `vagrant up admin`
- `vagrant up controller1`
- `vagrant halt controller2`
- `vagrant destroy compute1`
- https://www.vagrantup.com/docs/getting-started/

Workshop Vagrant Environment

- https://github.com/SUSE-Cloud/suse-cloud-vagrant
- demos/HA/
- vagrant/
  - Vagrantfile and configs/2-controllers-2-computes.yaml
- Libvirt + KVM pre-installed
- 2 boxes pre-installed
- suse/cloud7-admin and suse/sles12sp2
- 5 VMs
- admin (SUSE OpenStack Cloud 6 Administration Server)
- controller1, controller2 (will form an HA cluster)
- compute1, compute2

Starting Point

- `vagrant up` was run
- This was run on the admin server:

```
root@crowbar:~ # /root/bin/setup-node-aliases.sh
root@crowbar:~ # crowbar batch build HA-compute-cloud-demo.yaml
```

- This was run on one controller:

```
root@crowbar:~ # /root/bin/upload-cirros
```

- 2 controllers in HA cluster
- 2 nodes that will serve as compute nodes
- All (relevant) barclamps deployed!

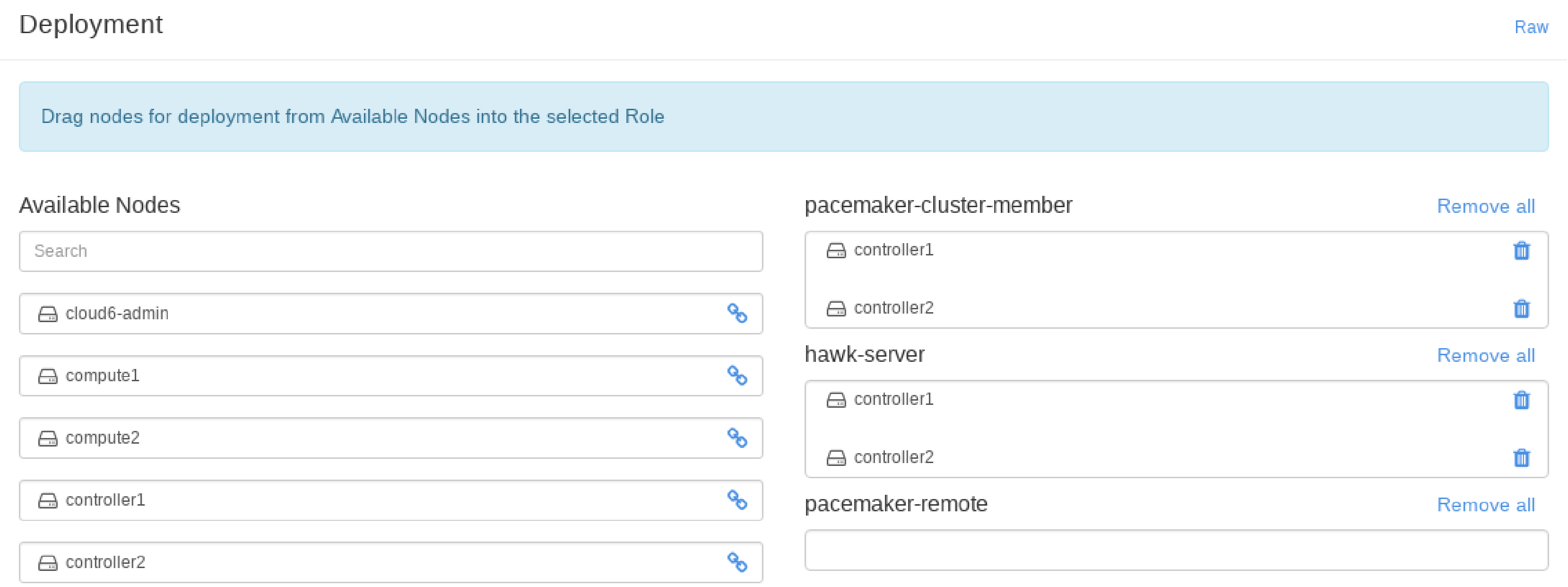
- `cd` to local copy of `git` repository

How to Access Crowbar

- Connect to admin node
  - `vagrant ssh admin` and `su -` or
  - `ssh root@192.168.124.10` or
  - use VM console in `virt-manager` / VirtualBox
- Root password is `vagrant`
- Accept the EULAs (for each EULA, read it and type `q` then `y`)
- Point a browser at the Crowbar web UI
  - http://localhost:8000
  - Default credentials: `crowbar` / `crowbar`
- Check the 5 nodes are registered, named correctly, and in Ready state (green)

Add remotes to Pacemaker cluster

Pacemaker Barclamp Clusters, Nodes, and Roles



Deployment

Raw

Drag nodes for deployment from Available Nodes into the selected Role

Available Nodes

Search

- cloud6-admin
- compute1
- compute2
- controller1
- controller2

pacemaker-cluster-member — Remove all

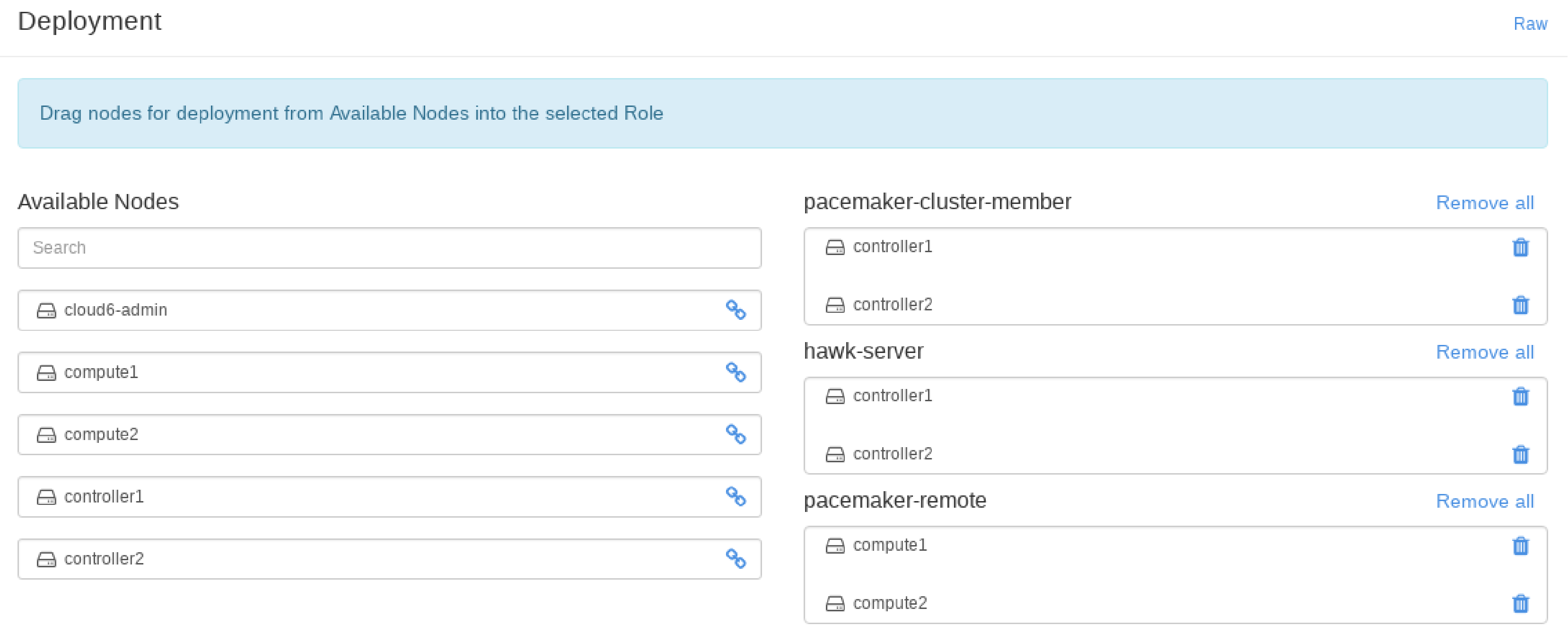
- controller1
- controller2

hawk-server — Remove all

- controller1
- controller2

pacemaker-remote — Remove all

Pacemaker Role Assignment



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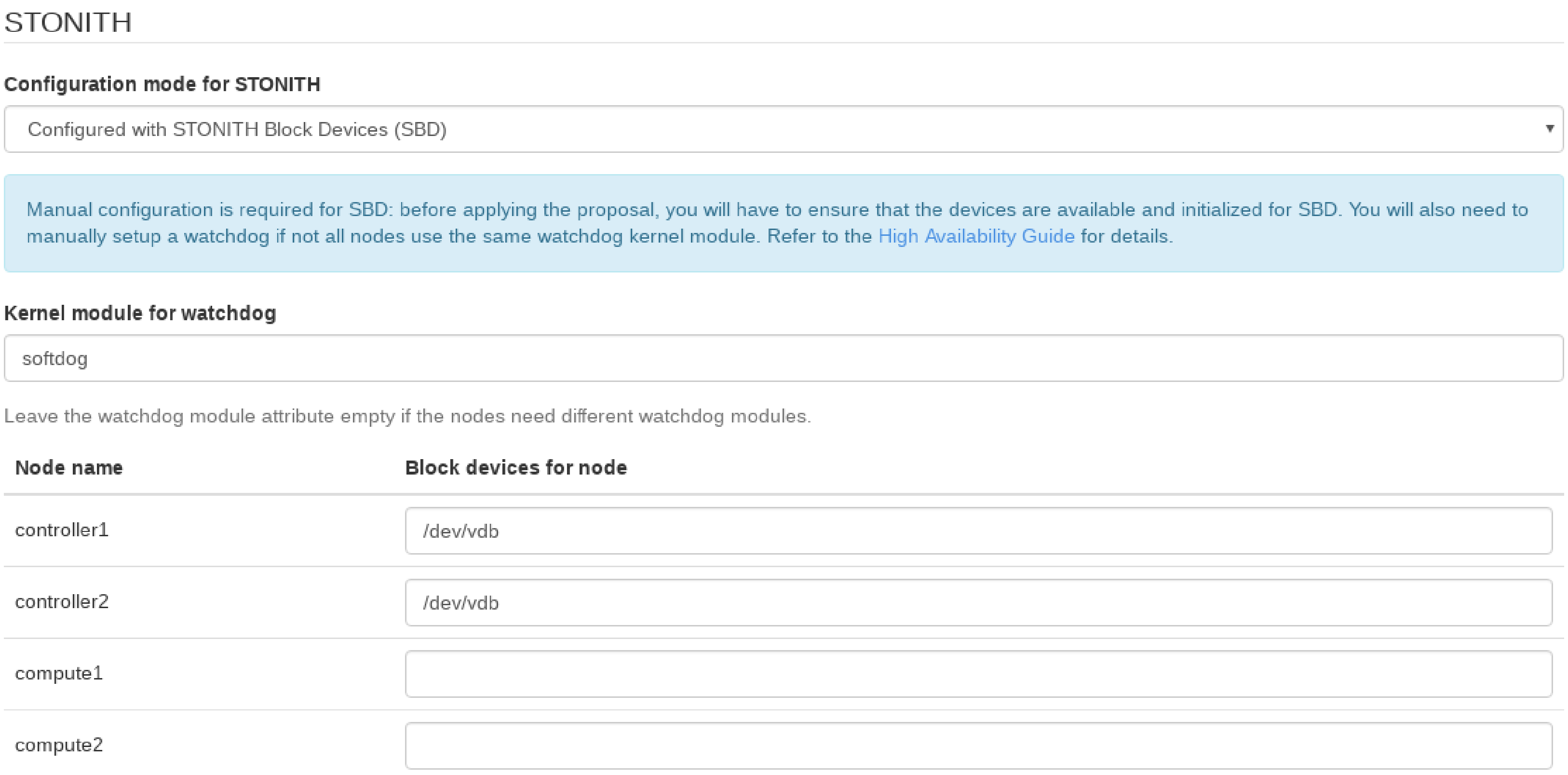
pacemaker-remote

- compute1
- compute2

Pacemaker STONITH Configuration



STONITH

Configuration mode for STONITH

Configured with STONITH Block Devices (SBD) ▾

Manual configuration is required for SBD: before applying the proposal, you will have to ensure that the devices are available and initialized for SBD. You will also need to manually setup a watchdog if not all nodes use the same watchdog kernel module. Refer to the High Availability Guide for details.

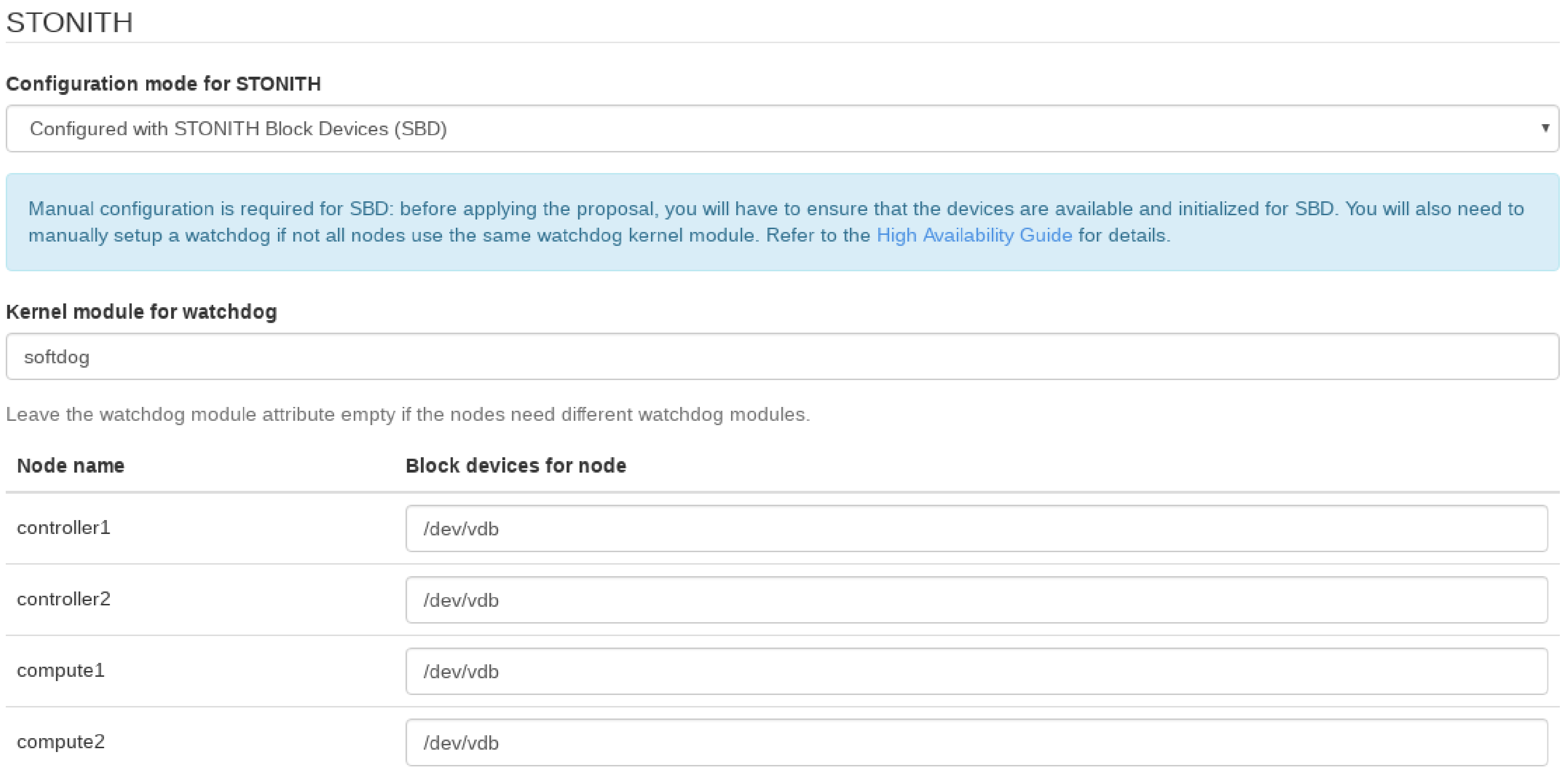
Kernel module for watchdog

softdog

Leave the watchdog module attribute empty if the nodes need different watchdog modules.

Node name	Block devices for node
controller1	/dev/vdb
controller2	/dev/vdb
compute1	
compute2	

Pacemaker STONITH Configuration



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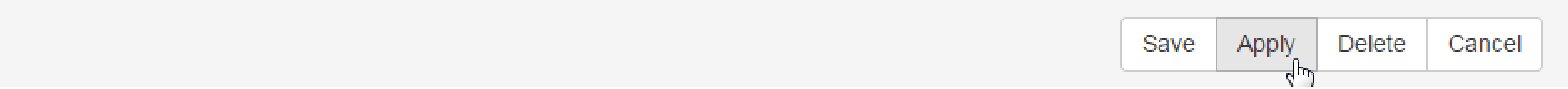
compute1	/dev/vdb
compute2	/dev/vdb

Apply Pacemaker Proposal

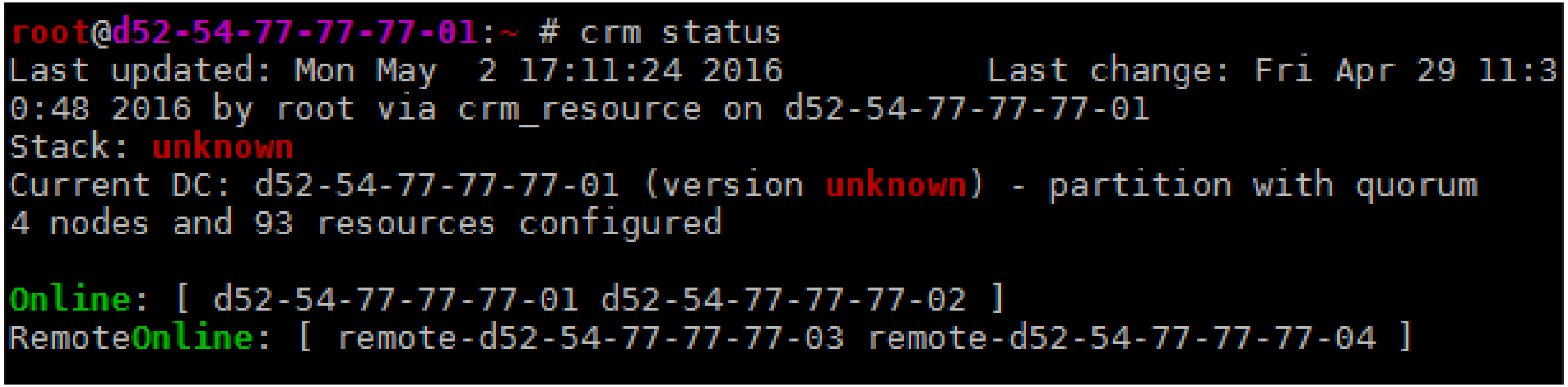


Check Progress of Proposal

```
root@crowbar:~ # tail -f /var/log/crowbar/production.log
root@crowbar:~ # tail -f /var/log/crowbar/chef-client/*.log
```

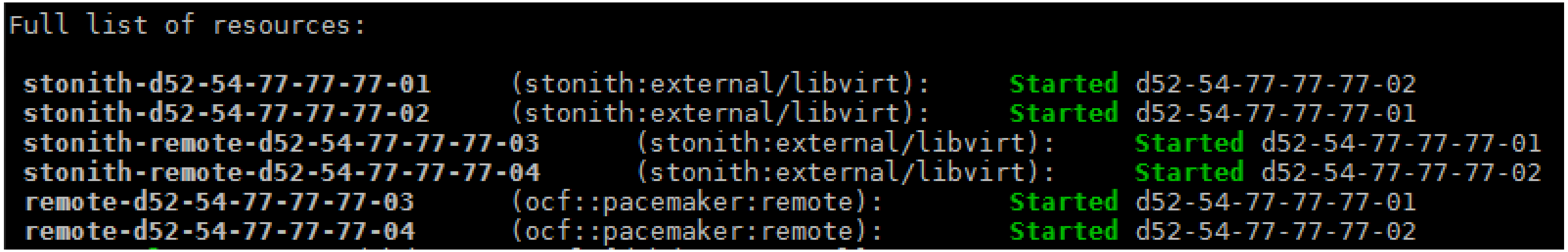
Check Status of Cluster Nodes and Remotes

Login to one of the controller nodes, and do:



```
root@d52-54-77-77-77-01:~ # crm status
Last updated: Mon May  2 17:11:24 2016          Last change: Fri Apr 29 11:3
0:48 2016 by root via crm_resource on d52-54-77-77-77-01
Stack: unknown
Current DC: d52-54-77-77-77-01 (version unknown) - partition with quorum
4 nodes and 93 resources configured

Online: [ d52-54-77-77-77-01 d52-54-77-77-77-02 ]
RemoteOnline: [ remote-d52-54-77-77-77-03 remote-d52-54-77-77-77-04 ]
```

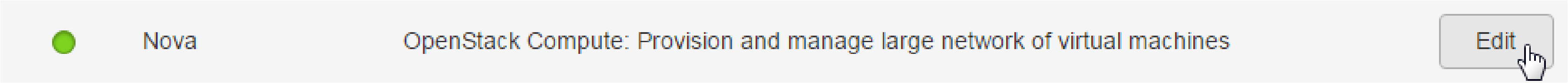


```
Full list of resources:

 stonith-d52-54-77-77-77-01     (stonith:external/libvirt):     Started d52-54-77-77-77-02
 stonith-d52-54-77-77-77-02     (stonith:external/libvirt):     Started d52-54-77-77-77-01
 stonith-remote-d52-54-77-77-77-03      (stonith:external/libvirt):     Started d52-54-77-77-77-01
 stonith-remote-d52-54-77-77-77-04      (stonith:external/libvirt):     Started d52-54-77-77-77-02
 remote-d52-54-77-77-77-03      (ocf::pacemaker:remote):        Started d52-54-77-77-77-01
 remote-d52-54-77-77-77-04      (ocf::pacemaker:remote):        Started d52-54-77-77-77-02
```

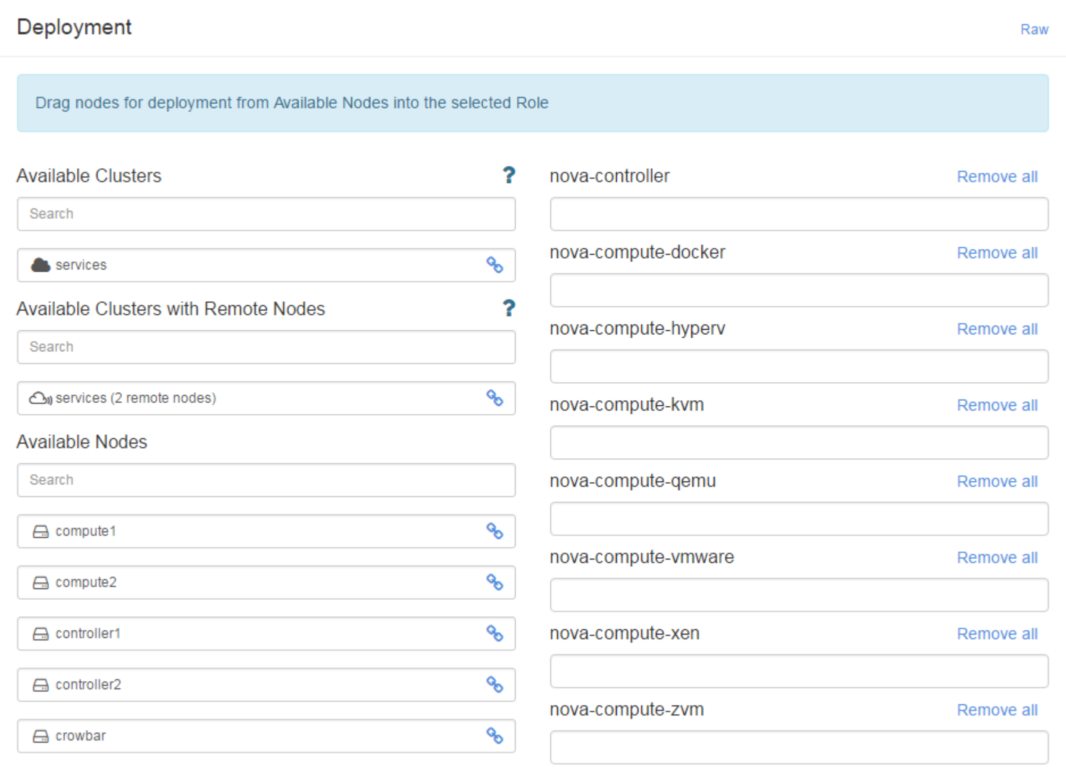
nova setup

Edit Nova Proposal



● Nova OpenStack Compute: Provision and manage large network of virtual machines

Nova Proposal: Clusters Available



Deployment

Drag nodes for deployment from Available Nodes into the selected Role

Available Clusters ?

- services

Available Clusters with Remote Nodes ?

- services (2 remote nodes)

Available Nodes

- compute1
- compute2
- controller1
- controller2
- crowbar

nova-controller

nova-compute-docker

nova-compute-hyperv

nova-compute-kvm

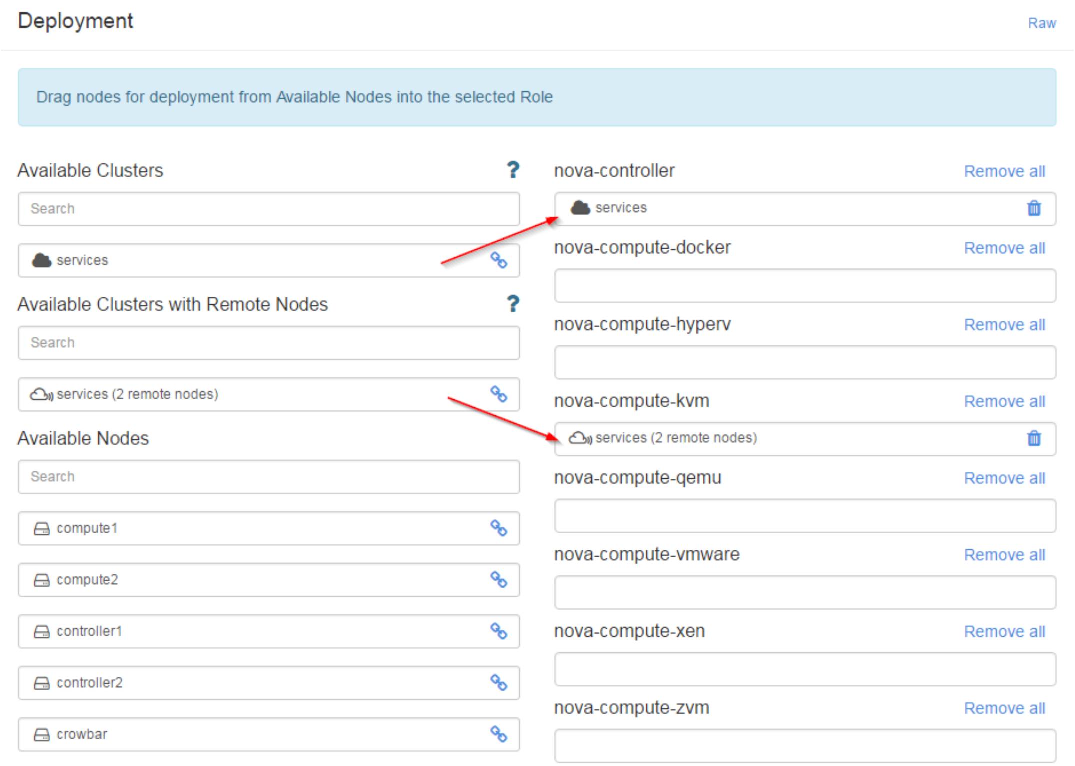
nova-compute-qemu

nova-compute-vmware

nova-compute-xen

nova-compute-zvm

Nova Proposal: Role Assignment



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services

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services (2 remote nodes)

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compute1

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controller2

crowbar

nova-controller — Remove all

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services (2 remote nodes)

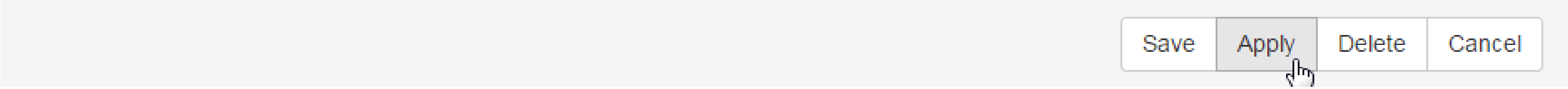
nova-compute-qemu — Remove all

nova-compute-vmware — Remove all

nova-compute-xen — Remove all

nova-compute-zvm — Remove all

Apply Nova Proposal

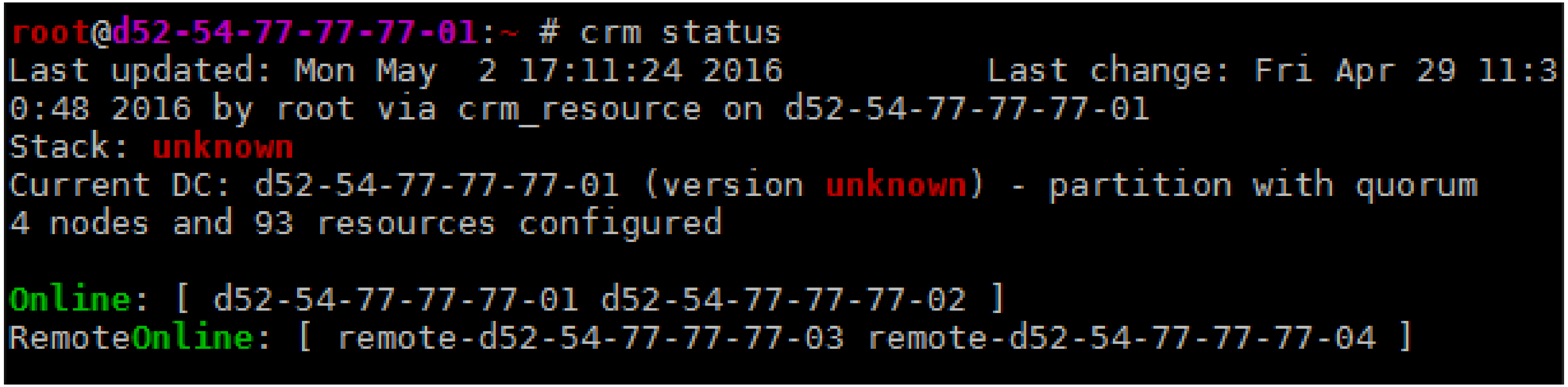


Check Progress of Proposal

```
root@crowbar:~ # tail -f /var/log/crowbar/production.log
root@crowbar:~ # tail -f /var/log/crowbar/chef-client/*.log
```

Check Status of nova resources in Cluster

Login to one of the controller nodes, and do:



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Current DC: d52-54-77-77-77-01 (version unknown) - partition with quorum
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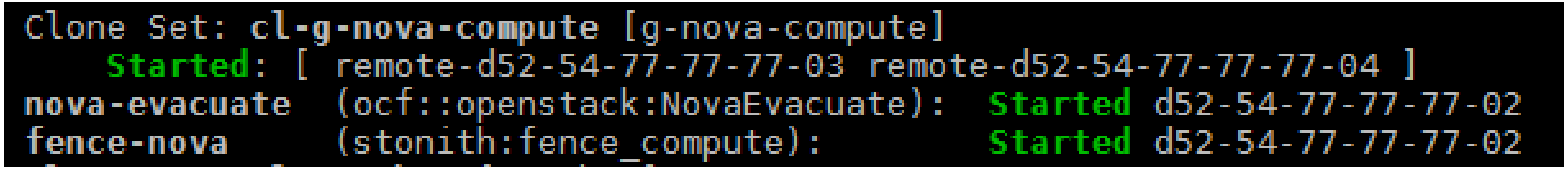
```



```
 Clone Set: cl-g-nova-compute [g-nova-compute]
     Started: [ remote-d52-54-77-77-77-03 remote-d52-54-77-77-77-04 ]
 nova-evacuate  (ocf::openstack:NovaEvacuate):  Started d52-54-77-77-77-02
 fence-nova     (stonith:fence_compute):        Started d52-54-77-77-77-02
```

Shared Storage

How is Shared Storage Setup for the Workshop?

We're using the admin server's NFS server:

- Only suitable for testing purposes!
- In production, use SES / SAN

Verify Setup of Shared Storage

- Locate shared directories via `nfs_client` barclamp
- Check `/etc/exports` on admin server
- Check `/etc/fstab` on controller / compute nodes
- Run `mount` on controller / compute nodes

Boot a VM

Boot a VM

Let's boot a VM to test compute node HA!

Connect to one of the controller nodes, and get image / flavor / net names:

```
source .openrc
openstack image list
openstack flavor list
neutron net-list
```

Boot the VM using these ids:

```
nova boot --image image --flavor flavor --nic net-id=net testvm
```

Test it's booted:

Assign a Floating IP

Create floating IP:

```
neutron floatingip-create floatingnet
```

Get VM IP:

```
nova list
```

Get port id:

```
neutron port-list | grep vmIP
```

Associate floating IP with VM port:

```
neutron floatingip-associate floatingipID portID
```

Allow ICMP and SSH for VMs

The VMs use the `default` security group (by default).

Make sure it has ICMP:

```
openstack security group rule create --proto icmp default
```

Also allow SSH:

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

Set Up Monitoring (1/2)

- Recommended in separate windows/terminals
- From either of the controller nodes

Ping VM:

```
    ping vmFloatingIP
```

Ping host where the VM is running:

```
    nova list --fields host,name
    ping host
```

Set Up Monitoring (2/2)

Find node running `nova-evacuate`:

```
crm resource show nova-evacuate
```

On that node, check log messages for NovaEvacuate workflow:

```
tail -f /var/log/messages | grep NovaEvacuate
```

Monitor cluster status:

```
crm_mon
```

Test Compute Node Failover (the exciting bit!)

Simulate Compute Node Failure

Login to compute node where VM runs, and type:

```
    pkill -9 -f pacemaker_remoted
```

This will cause fencing! (Why?)

Verify Recovery

- Ping to the VM is interrupted, then resumed
- Ping to the compute node is interrupted (then resumed)
- Log messages show:

```
NovaEvacuate [...] Initiating evacuation
NovaEvacuate [...] Completed evacuation
```

- `crm status` shows compute node offline (then back online)
- Verify compute node was fenced
- Check `/var/log/messages` on DC
- Verify VM moved to another compute node

```
nova list --fields host,name
```

Troubleshooting

Verifying Compute Node Failure Detection

Pacemaker monitors compute nodes via `pacemaker_remote`.

If compute node failure detected:

1. compute node is fenced
   - `crm_mon` etc. will show node unclean / offline
2. Pacemaker invokes `fence-nova` as secondary fencing resource

```
crm configure show fencing_topology
```

Find node running `fence_compute`:

```
crm resource show fence-nova
```

Verifying Secondary Fencing

`fence_compute` script:

1. tells `nova` server that node is down
2. updates attribute on compute node to indicate node needs recovery

Log files:

- `/var/log/nova/fence_compute.log`
- `/var/log/messages` on DC and node running `fence-nova`

Verify attribute state via:

```
attrd_updater --query --all --name=evacuate
```

Verifying Compute Node Failure Recovery Process

1. `NovaEvacuate` spots attribute and calls `nova evacuate`

```
root@controller1:~ # crm resource show nova-evacuate
resource nova-evacuate is running on: d52-54-77-77-77-02
```

2. `nova` resurrects VM on other node

```
root@controller2:~ # grep nova-evacuate /var/log/messages
NovaEvacuate [...] Initiating evacuation
NovaEvacuate [...] Completed evacuation
```

Warning: no retries if resurrection fails!

Process Failures

`pacemaker_remote` looks after key compute node services.

Exercise:

- Use `crm` on `cl-g-nova-compute` to find out which services it looks after
- Try killing a process and see what happens
- nothing, thanks to bsc#901796
- Try *stopping* a process and see what happens
- Try breaking a process (e.g. corrupt config file and restart)

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We adapt. You succeed.