



CSC cPouta Cloud

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23.5.2016



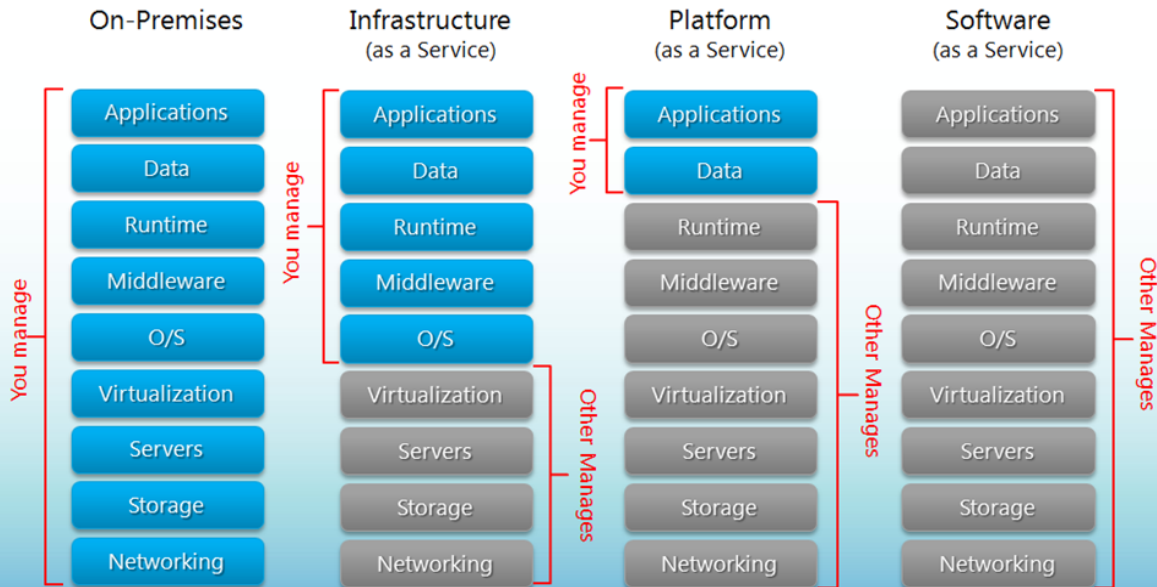
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What cloud?

- Terminology overload, used to mean e.g.:
 - Storage services (Dropbox)
 - Virtual server hosting (Amazon Web Services)
 - Software platforms (Google App Engine)
 - Pretty much any web service
 - The Internet as a whole
- Self-service and automation are the common features

*aaS?

Separation of Responsibilities



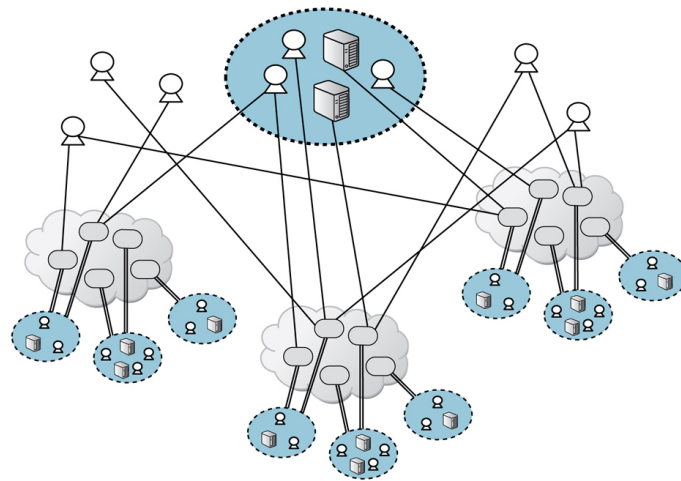
Pouta Clouds in general

- True self-service IaaS
 - Deploy your own virtual machines, storage and network as requirements evolve
- Powered by **OpenStack**
 - CSC does a lot of integration and customization, often based on feedback received from customers
- Simple to create and modify VMs
 - Web UI, CLI & REST API interfaces
- Diverse set of hardware to serve many use cases
 - High Performance Computing nodes
 - General purpose nodes
 - Data Intensive Computing nodes (upcoming)



cPouta use cases

- Running scientific applications
 - Computational clusters
 - Software stacks not available on other CSC platforms
- Building custom services
 - Web servers, file servers etc.
 - Software Defined Infrastructure (DevOps)
 - Rapidly deploying dev/test/prod environments
- Virtual computer class
- Research data/information sharing
- Whatever you can think of. We urge you to experiment!



Virtual machine flavors in cPouta

| VM type | Description | Use |
|----------------|---|--|
| standard.* | Oversubscribed "traditional" cloud virtual machines. | All non-CPU, non-IO intensive workloads |
| hpcgen1.* | Non-oversubscribed, non-HT Sandy Bridge nodes (Taito) | CPU intensive HPC/HTC workloads |
| hpcgen2.* | Non-oversubscribed, HT Haswell large memory nodes | Memory and CPU intensive HPC/HTC workloads |
| io.* (H1/2016) | SSD-backed high IOPS nodes | IOPS intensive workloads |

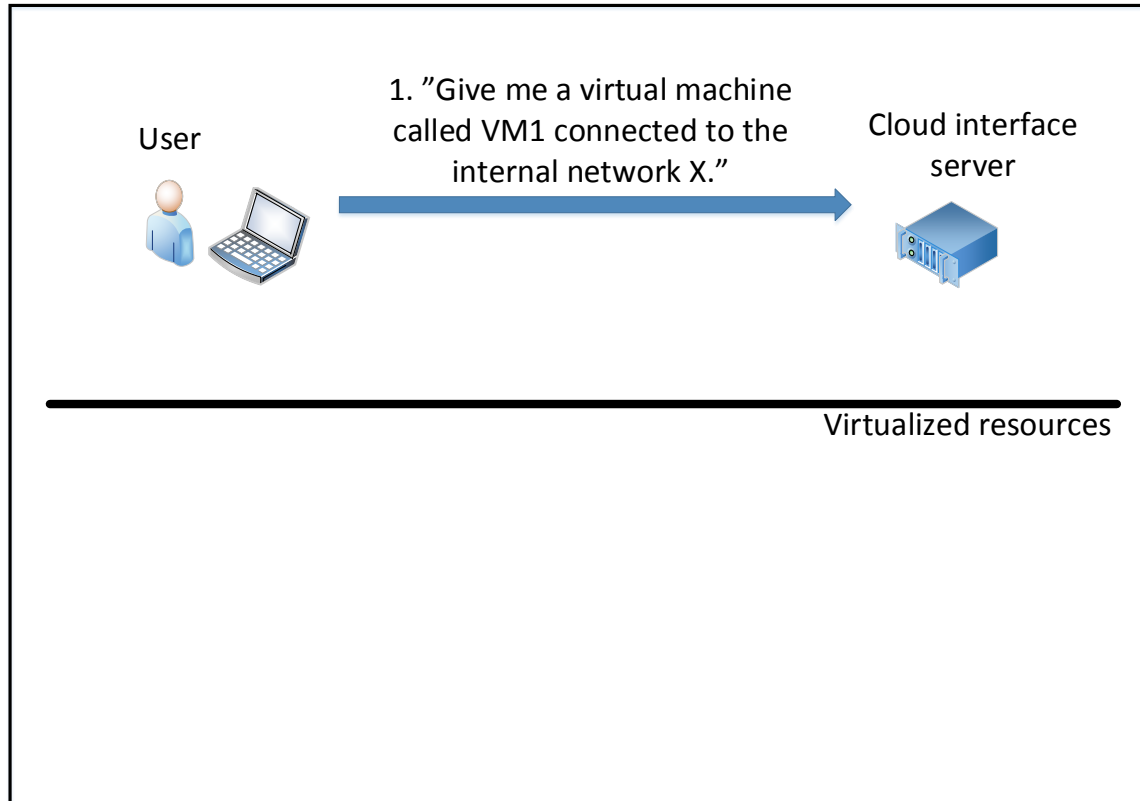
OpenStack

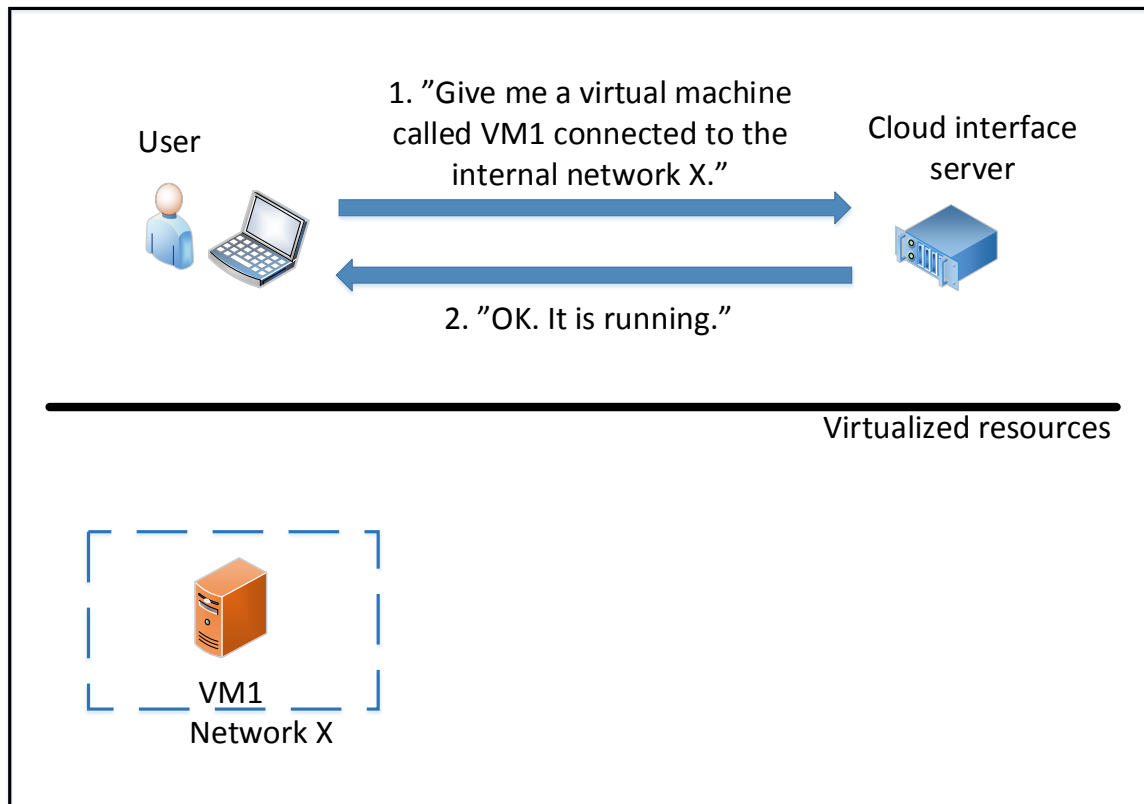


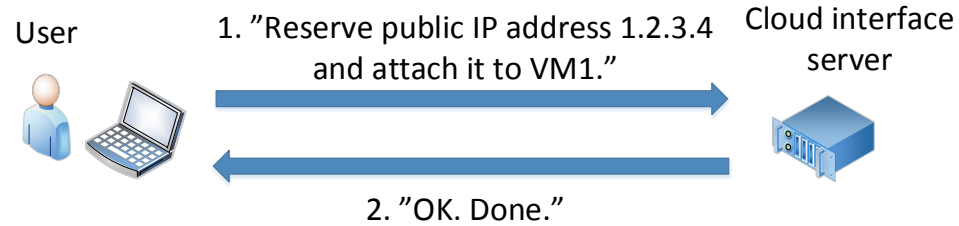
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What OpenStack?

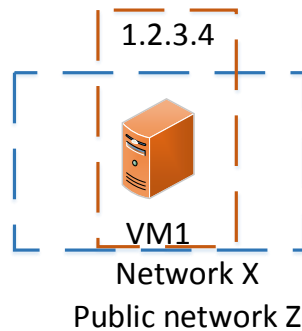
- Set of tools to build an IaaS cloud for creating virtualized
 - servers
 - networks
 - storage
- OpenStack is to the datacenter what Linux is to a server - an operating system
- Just like there are many Linux distributions, there are many OpenStack distributions
- Full end-user control – and responsibility – of their infrastructure

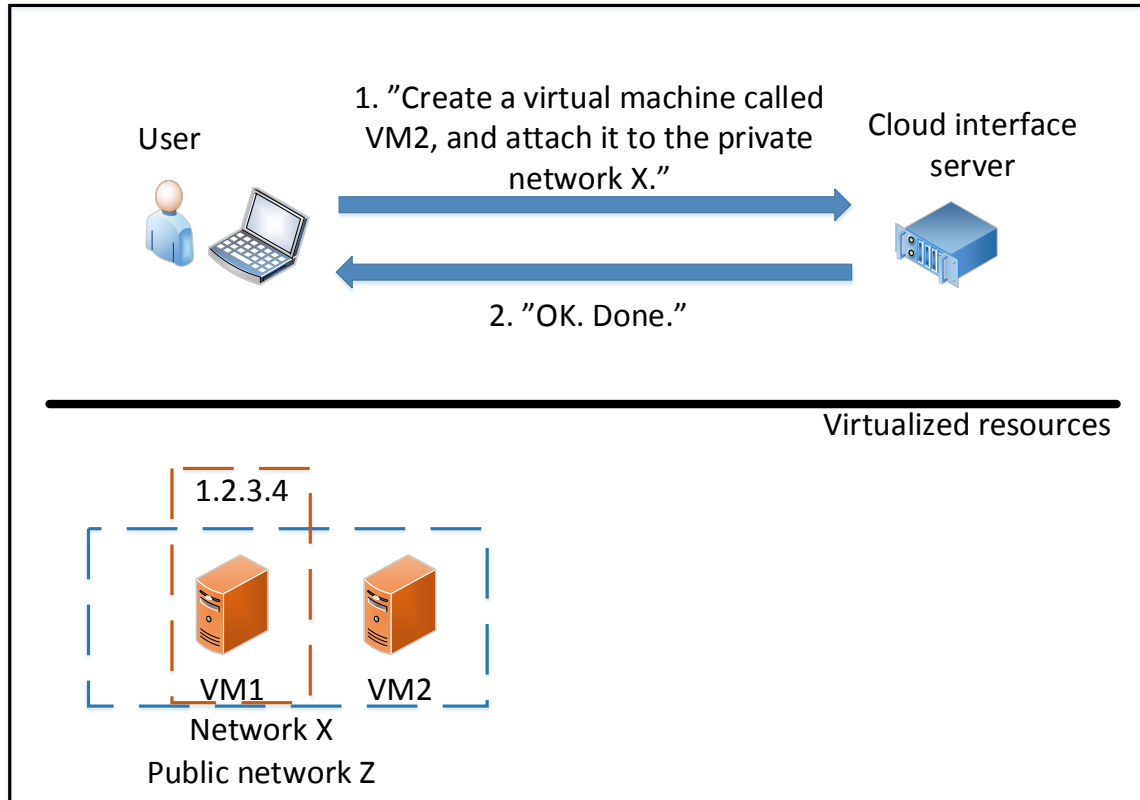


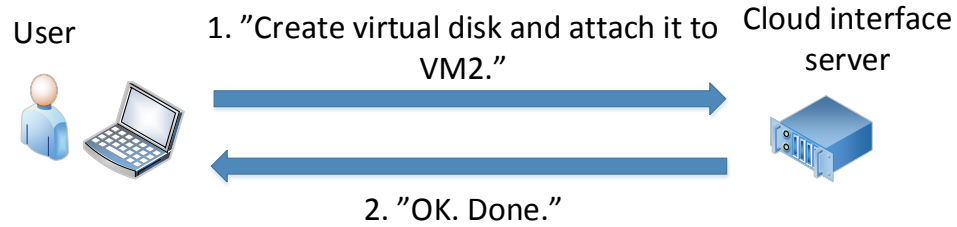




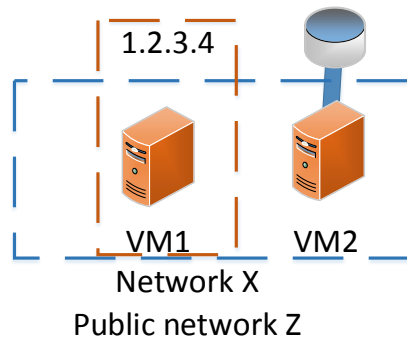
Virtualized resources

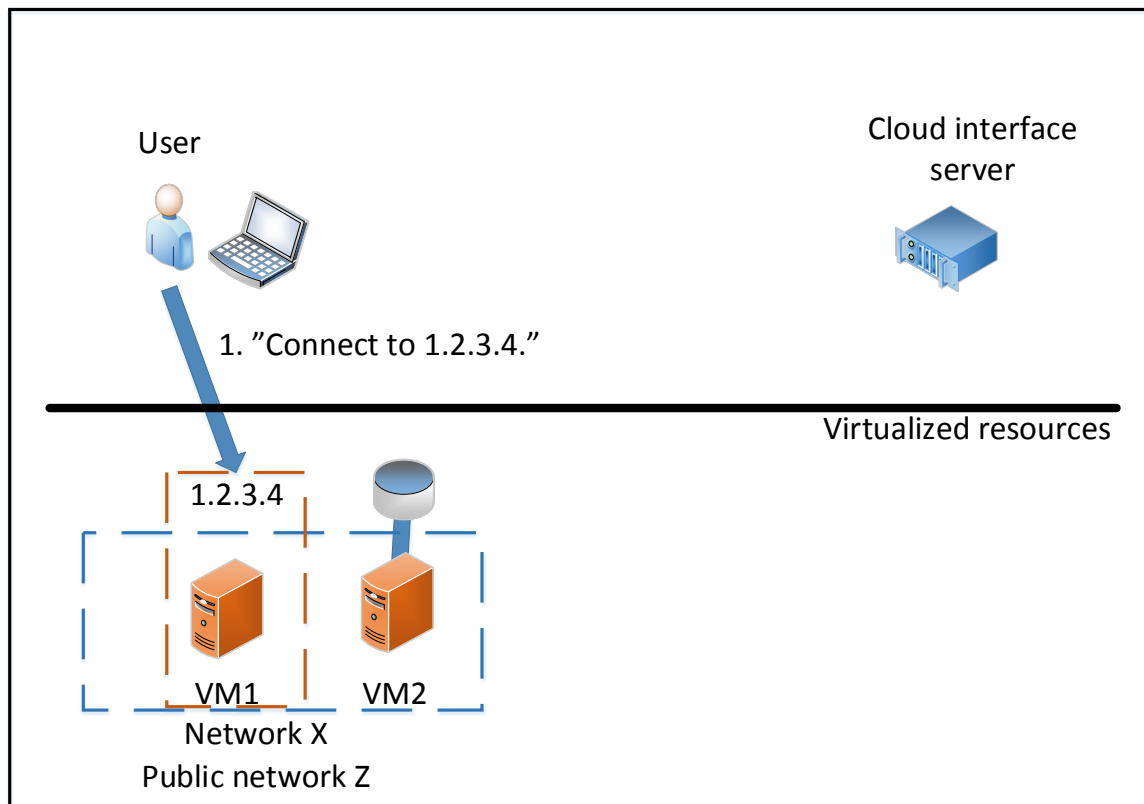







Virtualized resources





Interfaces

- Web
 - Works from any modern browser
 - Launch, list, terminate servers
 - Server console in the browser
 - Manage storage and networks
- Command line
 - Can do all the same things as the web interface and more
- API
 - Management through a programmable interface



Project

Admin

CURRENT PROJECT

CSC

Manage Compute

Overview

Instances

Volumes

Images & Snapshots

Access & Security

Manage Network

Networks

Routers

Network Topology

Overview

Logged in as: rlaurika

Settings

Help

Sign Out

Quota Summary

Used 26 of 501 Available Instances

Used 170 of 256 Available vCPUs

Used 623,200 MB of 1,024,000 MB Available RAM

Used 16 of 100 Available volumes

Used 3,541 GB of 10,000 GB Available volume storage

Select a month to query its usage:

January

2014

Submit

Active Instances: 25

Active RAM: 563GB


This Month's VCPU-Hours: 16232.76

This Month's GB-Hours: 5223808.40

Usage Summary

Download CSV Summary

| Instance Name | VCPUs | Disk | RAM | Uptime |
|------------------|-------|------|------|----------|
| Galaxy-test | 16 | 210 | 58GB | 6 months |
| karan-ceph-admin | 1 | 10 | 1GB | 3 months |
| karan-ceph-mon2 | 4 | 230 | 15GB | 3 months |



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+ Launch Instance

Terminate Instances

| <input type="checkbox"/> | Instance Name | IP Address | Size | Keypair | Status | Task | Power State | Actions |
|--------------------------|---------------------------|------------------------------|--|---------------|--------|------|-------------|--|
| <input type="checkbox"/> | olli_test3 | 192.168.1.19 86.50.168.30 | medium 30GB RAM 8 VCPU 10GB Disk | olli_bombay | Active | None | Running | <div>Create Snapshot</div> <div>More</div> |
| <input type="checkbox"/> | kalletest | 192.168.1.22 | tiny 1GB RAM 1 VCPU 10GB Disk | kalle | Active | None | Running | <div>Create Snapshot</div> <div>More</div> |
| <input type="checkbox"/> | lalves_test | 192.168.1.21 | tiny 1GB RAM 1 VCPU 10GB Disk | lalves | Active | None | Running | <div>Create Snapshot</div> <div>More</div> |
| <input type="checkbox"/> | pj-ubuntu | 192.168.1.2 86.50.168.10 | small 15GB RAM 4 VCPU 10GB Disk | pj-keys | Active | None | Running | <div>Create Snapshot</div> <div>More</div> |
| <input type="checkbox"/> | HarriPerformanceTests_1_4 | 192.168.1.29 86.50.168.26 | tiny 1GB RAM 1 VCPU 10GB Disk | keypair-harri | Active | None | Running | <div>Create Snapshot</div> <div>More</div> |
| <input type="checkbox"/> | HarriPerformanceTests_1_3 | 192.168.1.26 86.50.168.22 | tiny 1GB RAM 1 VCPU 10GB Disk | keypair-harri | Active | None | Running | <div>Create Snapshot</div> <div>More</div> |



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Instance Detail: olli_test3

Logged in as: raurikaSettingsHelpSign Out

OverviewLogConsole

Instance Console

If console is not responding to keyboard input: click the grey status bar below. [Click here to show only console](#)

Connected (encrypted) to: QEMU (instance-000017bd)Send CtrlAltDel

```
CentOS release 6.5 (Final)
Kernel 2.6.32-431.3.1.el6.x86_64 on an x86_64

192-168-1-19 login: _
```




rlaurika@pilkasiipi ~ \$ nova list

| ID | Name | Status | Networks |
|--------------------------------------|---------------------------|-----------|--------------------------------|
| ca02b61d-656e-479f-bde2-7bb8b58add0f | Galaxy-test | SUSPENDED | csc=192.168.1.18 |
| b1884673-3844-4c22-825e-4a0567ed8b3b | HarriPerformanceTests_1_3 | ACTIVE | csc=192.168.1.26, 86.50.168.22 |
| e37bb795-57de-4e88-93bc-e91b65a5f77a | HarriPerformanceTests_1_4 | ACTIVE | csc=192.168.1.29, 86.50.168.26 |
| a4a94367-971f-4ec4-af8d-18384dd9bb84 | Image builder | ACTIVE | csc=192.168.1.25, 86.50.168.6 |
| 393c4f74-0964-4029-94f9-f871e8ace721 | JarnoTest | ACTIVE | csc=192.168.1.20, 86.50.168.64 |
| df5dee5f-76df-4f91-b3c4-1c6112f9dfec | TestUserTest | SHUTOFF | csc=192.168.1.44 |
| 82fd0a09-9fc7-449f-843b-1298cad52bbe | ceph-node4 | ACTIVE | csc=192.168.1.45 |
| 37efdee1-11a6-4b0a-9297-2682ced4f681 | ceph-node5 | ACTIVE | csc=192.168.1.46 |
| 7ca99cd8-c9ec-45bc-ad6c-09013049b8cd | ceph-node6 | ACTIVE | csc=192.168.1.47 |
| 71adc582-6d4c-4bb2-ae03-a3feec5213c3 | chipster-test | ACTIVE | csc=192.168.1.5, 86.50.168.39 |
| 6f3c82af-7f42-40dd-98da-db4ba12b960c | chipster-test-from-image | ERROR | |
| 9300313c-338a-4327-890e-4d02d1821bf2 | fail2ban-test Johan | ACTIVE | csc=192.168.1.27, 86.50.168.8 |
| c250a4ee-6323-4246-a18e-5b5ab1f1882d | kalletest | ACTIVE | csc=192.168.1.22 |
| 51c0a65d-1aba-4cc0-b565-ca85bd19c61b | karan-RD0 | ACTIVE | csc=192.168.1.49, 86.50.168.33 |
| 1e1999c5-b6fe-44f8-8960-91d47e300727 | karan-ceph-admin | ACTIVE | csc=192.168.1.28, 86.50.168.70 |
| 2373fa4f-95e9-4bb2-b80e-feb2b0379415 | karan-ceph-client1 | ACTIVE | csc=192.168.1.40 |
| 0db4f304-3cd2-4337-b0e2-934ff74082fd | karan-ceph-mon1 | ACTIVE | csc=192.168.1.38 |
| 5825e7f5-fe91-4889-a32d-298b24168c20 | karan-ceph-mon2 | ACTIVE | csc=192.168.1.33 |
| aea288a5-2042-4311-9010-dbf686070246 | karan-ceph-mon3 | ACTIVE | csc=192.168.1.31 |
| b88b0360-9557-4942-8a2d-e2a597f93f9f | karan-ceph-node1 | SUSPENDED | csc=192.168.1.34 |
| 28242b30-8b64-4186-9dc3-6834e5037d84 | karan-ceph-node2 | ACTIVE | csc=192.168.1.37 |
| 618e23e5-f8d0-49a0-89da-2b89c4a008de | karan-ceph-node3 | ACTIVE | csc=192.168.1.41 |
| 2b8164d8-cbe2-4143-85f6-67f1598ccdce | karan-ceph-puppetmaster | ACTIVE | csc=192.168.1.4 |
| 20dd95ad-4178-4e5b-9097-912a396bc6bd | lalves_test | ACTIVE | csc=192.168.1.21 |
| c7eb0d54-12b9-4124-baf5-7cf2459320d4 | oilli_test3 | ACTIVE | csc=192.168.1.19, 86.50.168.30 |
| fade122d-d763-4354-ae7d-79e235421baf | pj-ubuntu | ACTIVE | csc=192.168.1.2, 86.50.168.10 |

rlaurika@pilkasiipi ~ \$

Storage types in OpenStack

- OS image
 - The root disk of the VM
 - Usually not very large for efficiency reasons
- Ephemeral disk = scratch
 - Throw-away scratch disk
 - Disappears when VM instance is deleted
- Volumes = persistent block storage
 - Persistent disk for storing hot data
 - Can be attached and detached to/from a running VM
- Swift = reliable object storage (Coming 2016)
 - Replicated storage for cold data
 - Accessed over HTTP
- Still missing: shared file system (CIFS,NFS,...)



Efficient use of IaaS



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The most obvious workflow when using a cloud



1. Start a virtual machine
2. Login
3. Configure some software using the command line
 - Install some packages
 - Edit a few configuration files
 - Make a few changes to the firewall
 - Start some services
4. Done!

What needs to fail for this workflow to fail? Just one of these:



Some recommendations

- Automate as much as possible
- Separate configuration from state

Automate as much as possible

- If something goes wrong, manual recovery may be difficult or impossible
- Make it easy to recreate your VMs from scratch
- Configuration management helps. Some tools for that:
 - Ansible
 - Puppet
 - Chef

Separate configuration from state

- Configuration is installed software, configuration files, firewall rules etc.
- State is e.g. data in a database or data produced by a computation
- Where to store each:
 - Configuration: VM's local filesystem
 - State: persistent volume (like a virtual hard drive attached to the VM)
- You should have a backup of both your state and your configuration

Ansible (<http://www.ansible.com>)

- Free and open source software for automating configuration tasks
- Easy to use
- No need to install anything on the machine to be configured - SSH is enough
- For an example, see:
 - <https://github.com/CSC-IT-Center-for-Science/pouta-ansible-demo>

Hands on exercises

Documentation:

<https://research.csc.fi/pouta-user-guide>

1. Setup prerequisites
 - SSH key
 - Security group
2. Launch a virtual machine (use CentOS 7)
3. Assign a floating IP to the VM
4. Login to the VM
5. Attach block storage