Jetstream Security Quick Look
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Jeremy Fischer – Jeremy@iu.edu - Indiana University
Manager, Jetstream Cloud, UITS Research Technologies

HPC vs Cloud

Adapting to a different environment:
• No reservations, no queueing – more interactive usage
• Being your own admin – hey, we have root!**
• You really can have almost any (linux) software you want**

** Here there be dragons...
Jetstream and way of the cloud...

- **Cloudy Technologies**: clouds are more than just virtual machines (VM)
  - **Old way**: robust (expensive) infrastructure, weak (cheap) software
    - You expect the hardware to not fail
    - State in maintained in volatile data structures
  - **Cloudy way**: commodity infrastructure, robust software
    - Expect & plan for infrastructure to fail
    - Put intelligence into the software to handle infrastructure failure
- **And my favorite...**
Thinking about VMs...

Cows, not pets: pets take great amount of care, feeding, and you name them; cows you intend to have high turnover and you give them numbers.

-- Mike Lowe (Jetstream architect)

**some caveats for gateways...
What is Jetstream – a closer look

- **Software layers**
  - **Atmosphere** web interface
    - library of images, generic, domain specific
    - simplify VM administration
  - **OpenStack**: software tools for building and managing cloud computing platforms for public and private clouds.
  - **KVM** hypervisor: what the VMs run on
  - **Ceph**: storage platform that stores data on a single distributed computer cluster, and provides interfaces for object-, block- and file-level storage.
  - **Operating systems**: CentOS, Ubuntu, Windows(?)
  - **Applications**: e.g. software developed by the domain specialist, gateways, etc.
API Access to Jetstream

• What was unexpected
  • Demand for programmable cyberinfrastructure
  • Great platform for learning system administration skills
  • Great platform for teaching & learning cloudy technologies

• Command line clients

• Horizon dashboard very popular; but, incomplete

• Programmatic control; python is popular ([https://docs.openstack.org/openstacksdk/latest/](https://docs.openstack.org/openstacksdk/latest/))

• Slack channel for collaboration API users of Jetstream

• Paved the way for 3rd party interfaces like Exosphere
Using the OpenStack CLI on Jetstream

What an openrc file looks like:

```bash
export OS_PROJECT_NAME="TG-ABC190028"
export OS_USER_DOMAIN_NAME="tacc"
export OS_USERNAME="taccusername"
export OS_IDENTITY_API_VERSION=3
# export OS_PASSWORD='string'
read -sr OS_PASSWORD_INPUT
export OS_PASSWORD=$OS_PASSWORD_INPUT
```

- Please do not publish the AUTH URLs anywhere
- CLI is python based – reads this information from the environment.
- Horizon can generate an openrc file for you (see the Wiki docs)
- **Common pitfall** – make sure you specify the correct Project (allocation) if you have more than one!
Installing the client

- Simple on most Mac OS X and Linux hosts (a single pip command)
- Less simple, but still do-able on Windows
  - Once you have a python installed, becomes a simple pip install
- Latest python-openstackclient (> 4.0.0) works with Python 3
- **Best practice – use a virtual environment like virtenv for your install**
- Docs on the wiki for this!
- Other CLI clients are available – e.g. python-swiftclient (Swift and S3), python-heatclient (Heat templates), etc
  - These are optional and not necessary for basic operations!
### CLI / API Interface

#### OpenStack Server List

<table>
<thead>
<tr>
<th>ID</th>
<th>Name</th>
<th>Status</th>
<th>Networks</th>
<th>Image</th>
<th>Flavor</th>
</tr>
</thead>
<tbody>
<tr>
<td>f1cb3b0f-0a8b-478f-a63e</td>
<td>staff-wiki</td>
<td>ACTIVE</td>
<td>cvmfs-api-net-10.0.0.8, 149.105.172.192</td>
<td>JS-API-Featured-Ubuntu20-Latest</td>
<td>m1.small</td>
</tr>
</tbody>
</table>

#### OpenStack Flavor List

<table>
<thead>
<tr>
<th>ID</th>
<th>Name</th>
<th>RAM</th>
<th>Disk</th>
<th>Ephemeral</th>
<th>VCPUs</th>
<th>Is Public</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>m1.tiny</td>
<td>2048</td>
<td>8</td>
<td>0</td>
<td>1</td>
<td>True</td>
</tr>
<tr>
<td>10</td>
<td>m1.quad</td>
<td>10240</td>
<td>20</td>
<td>0</td>
<td>4</td>
<td>True</td>
</tr>
<tr>
<td>2</td>
<td>m1.small</td>
<td>4096</td>
<td>20</td>
<td>0</td>
<td>2</td>
<td>True</td>
</tr>
<tr>
<td>3</td>
<td>m1.medium</td>
<td>16384</td>
<td>60</td>
<td>0</td>
<td>6</td>
<td>True</td>
</tr>
<tr>
<td>4</td>
<td>m1.large</td>
<td>30720</td>
<td>60</td>
<td>0</td>
<td>10</td>
<td>True</td>
</tr>
<tr>
<td>5</td>
<td>m1.xlarge</td>
<td>61440</td>
<td>60</td>
<td>0</td>
<td>24</td>
<td>True</td>
</tr>
<tr>
<td>6</td>
<td>m1.xxlarge</td>
<td>122880</td>
<td>60</td>
<td>0</td>
<td>44</td>
<td>True</td>
</tr>
</tbody>
</table>
Horizon GUI interface

- Allows most things you can do from the CLI
- Nice for some tasks
  - Network visualizer is something we tend to use as a troubleshooting tool
  - Easier to look at security groups on Horizon (IMHO)
- Downsides:
  - considerably slower than using CLI
  - not all features are present that are in CLI
  - can’t do things programmatically
Exosphere

Jetstream Cloud

lu

tacc

Add Allocation

lu.jetstream-cloud.org - TG-TRA160003

Instances

Instances used: 26 of 200 total
Cores used: 72 of 664 total
RAM used: 183296 of 1480000 MB

Select All

- VideoTest
- tutorial-ip-holder
- wiki5

Hiding 23 instances created by other users

Volumes

Volumes used: 37 of 200 total
Storage used: 1830 of 4000 GB

- manilatest02 100 GB
- manilatest01 100 GB
- This is a Demo volume 10 GB
- gpus-gc-jet-vol 100 GB
- 40percentmorestill 50 GB
- js_docker_vol 10 GB
Exosphere GUI interface

• 3rd party GUI interface for OpenStack clouds
• Developers have a past connection to Jetstream but are working with multiple cloud providers
• Attempting to fill the gap between interfaces built for system administrators like OpenStack Horizon, and intuitive-but-proprietary services like DigitalOcean
• More about Exosphere:
  • https://gitlab.com/exosphere/exosphere
Getting started with the API

Things you’ll set up once (hopefully):
• SSH keys
• Security groups (though you’ll build on the basics as you do more advanced things)
• Create a network
• Create a subnet
• Create a router

Things you’ll likely do many times:
• Create and launch instances
• Screw up and delete instances
• Launch more instances
• Expand security groups

API CLI Tutorial walkthrough: https://github.com/jlf599/JetstreamAPITutorial
API Horizon walkthrough: http://wiki.jetstream-cloud.org/Using+the+OpenStack+Horizon+GUI+Interface
API General Best Practices

• Jetstream-specific – don’t use Atmosphere images on the API side (start with JS-API-Featured-* images)

• Think about your security groups and only open what you REALLY need to open.

• Give objects unique and descriptive names

• When in doubt, use the universally unique identifier (UUID)

• When deleting items, use the universally unique identifier (UUID)

• Before deleting anything, though, “measure twice, cut once”

• Understand that an allocation/tenant lets you see everyone else’s things. Be aware and be ware of deleting things – do unto others...

• Put your toys away if you’re done with them
Security Best Practices

• Think about your security groups and only open what you REALLY need to open. (yes, it’s in the slides twice...on purpose...)

• In a production system, you’d likely want to also run a host-based firewall in addition to security groups (defense in depth!)

• Update often! Unattended security upgrades should be turned on in JS-API-Featured-* images...but still...

• Turn off any services/listeners you do not need

• For any service you run on a host, limit the access as much as possible – if it’s world accessible, make sure permissions and privileges are as limited as possible

• Limit the number of people that interactively login – and create accounts for them instead of using shared accounts (e.g. centos or ubuntu account)

• Monitor the logs – lots of tools out there to help with this!
Security groups...some thoughts

- Security groups layer – best to do in small, logical chunks for readability and management
- Security group updates happen in REAL TIME!
- Security group rules are OPPOSITE of traditional unix firewalls
- Make changes in small bites
- Conflicting rules can happen (and will)
- When restricting by network (slash) notation, that last number is crucial!
- It’s tempting to just completely open access – think carefully
- Security groups from the command line can be daunting at first
Troubleshooting and verifying your rules

- Starting simple usually works
  - Ping, ssh, telnet
- Tools like nmap (Network Mapper) are your friends
  - [https://nmap.org/](https://nmap.org/)
Where can I get help?

• Wiki / Documentation: http://wiki.jetstream-cloud.org
• API CLI Tutorial: https://github.com/jlf599/JetstreamAPITutorial
• User guides: https://portal.xsede.org/user-guides
• XSEDE KB: https://portal.xsede.org/knowledge-base
• Email: help@xsede.org
Questions?

- Project website: http://jetstream-cloud.org/
- Project email: help@jetstream-cloud.org Direct email: jeremy@iu.edu

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