KG REDDY College of Engineering & Technology

Cloud Computing

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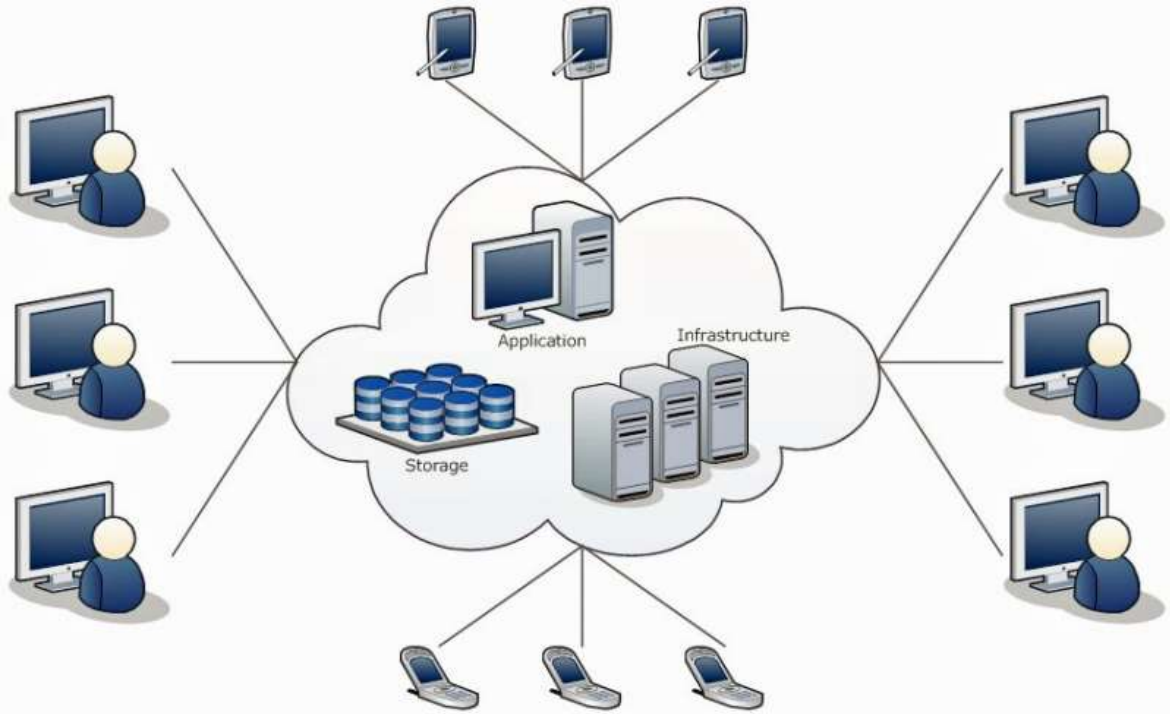
KG REDDY College of Engineering & Technology

Overview

- What is Cloud Computing
- What Can I Use It For
- Choosing Systems
- Images vs. Bare Metal
- Using the Resources

What is a Cloud?

- A “cloud” is a computer system that provides users with shared access to on-demand computing resources via the internet.



Why is it Useful?

- Resource Utilization
- Scalability and Elasticity
- Reproducibility by way of Programmability
- Reliability through redundancy

Cloud vs. HPC

Cloud

- Availability
- Multi-level API Interactions
- On-demand/Interactive Use
- Using Commodity Components

HPC

- Utilization
- Capability or Capacity Science
- Checkpoint/Restart I/O
- Memory/Network Bandwidth & Latency

Who Uses Clouds?

System Administrators

- Help automate operations

Software Developers

- Build applications on cloud servers and platforms

Computational Scientists

- Write codes to analyze scientific data that resides in the cloud

Service Models

- Infrastructure-as-a-service (IaaS)
  - Virtual servers, networks, firewalls, etc. (AWS, Azure)
- Platform-as-a-service (PaaS)
  - Deploy application without managing virtual servers (Google App Engine, Heroku)
- Software-as-a-service (SaaS)
  - Ready to use software applications (Gmail, Office365)
- Functions-as-a-service (FaaS)
  - Run on demand without knowing the infrastructure (hook.io, AWS Lambda)

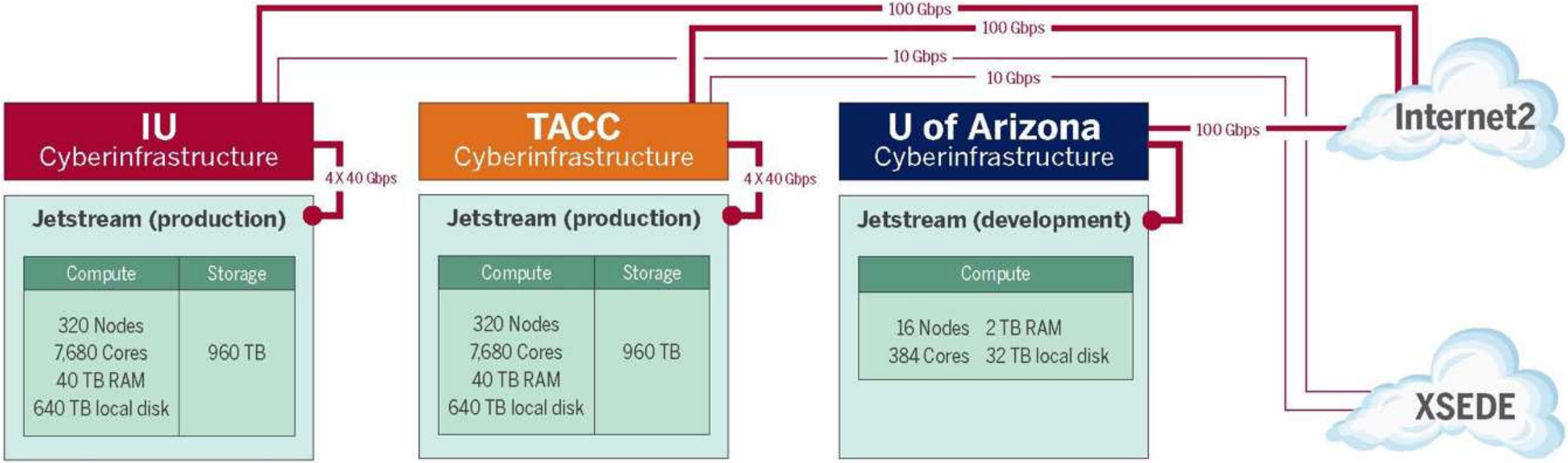
IaaS with Virtual Machines

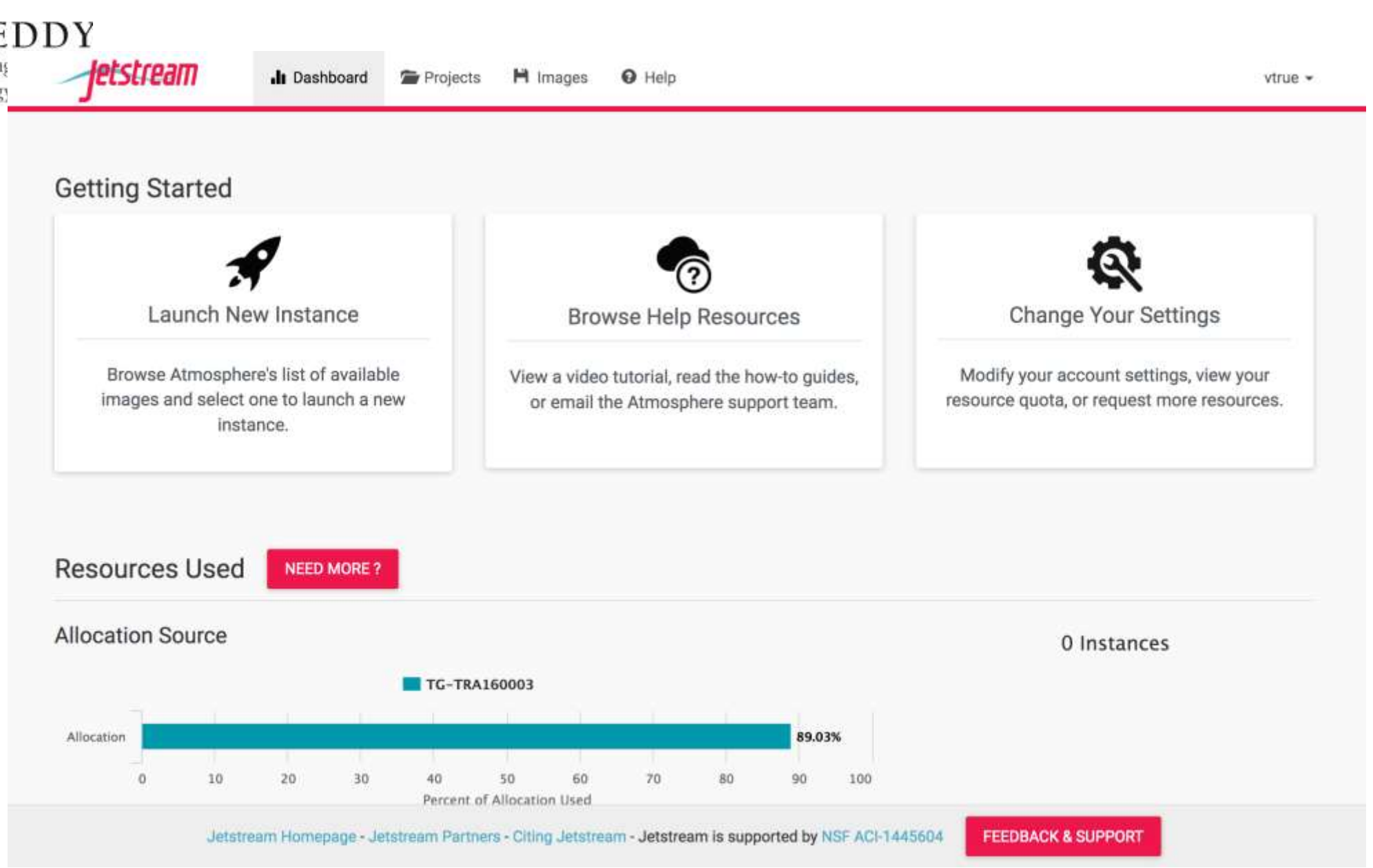
- Emulations
  - Gives the appearance of any typical personal machine
  - Simulates architectures
- Operating Systems
  - Generally Linux in scientific communities but proprietary ones available through branded IaaS options
- Software
  - Allows for installation of software in a way that generally doesn't require building from the binary

Jetstream

- NSF funded production cloud facility
- On-demand interactive computing and analysis
- Configurable environments
- User-friendly, widely accessible cloud environment
- Library of preconfigured virtual machines

Architecture Overview




jetstream
Dashboard
Projects
Images
Help
vtrue
Getting Started
Launch New Instance
Browse Atmosphere's list of available images and select one to launch a new instance.
Browse Help Resources
View a video tutorial, read the how-to guides, or email the Atmosphere support team.
Change Your Settings
Modify your account settings, view your resource quota, or request more resources.
Resources Used
NEED MORE ?
Allocation Source
0 Instances
TG-TRA160003
Allocation
89.03%
0
10
20
30
40
50
60
70
80
90
100
Percent of Allocation Used
Jetstream Homepage - Jetstream Partners - Citing Jetstream - Jetstream is supported by NSF ACI-1445604
FEEDBACK & SUPPORT

Virtual Machines

- These configurations are available when choosing a VM.
- You should always request the smallest VM size that can accommodate your work.
- Local storage is ephemeral and will be lost when your session dies.
- For long term storage you will need an XSEDE-allocated Volume.

VM Size	vCPUs	RAM (GB)	Local Storage (GB)	SU cost per hour*	Can be saved as an *image*?
m1.tiny	1	2	8	1	✔ yes
m1.small	2	4	20	2	✔ yes
m1.medium	6	16	60	6	✔ yes
m1.large	10	30	60	10	✔ yes
m1.xlarge	24	60	60	24	✔ yes
m1.xxlarge	44	120	60	44	✔ yes
s1.large	10	30	120	10	✘ No
s1.xlarge	24	60	240	24	✘ No
s1.xxlarge	44	120	480	44	✘ No

This allocation information may be subject to changes in the future.

Please note that s1.* based customized instances will NOT be able to be used to create images in Atmosphere.

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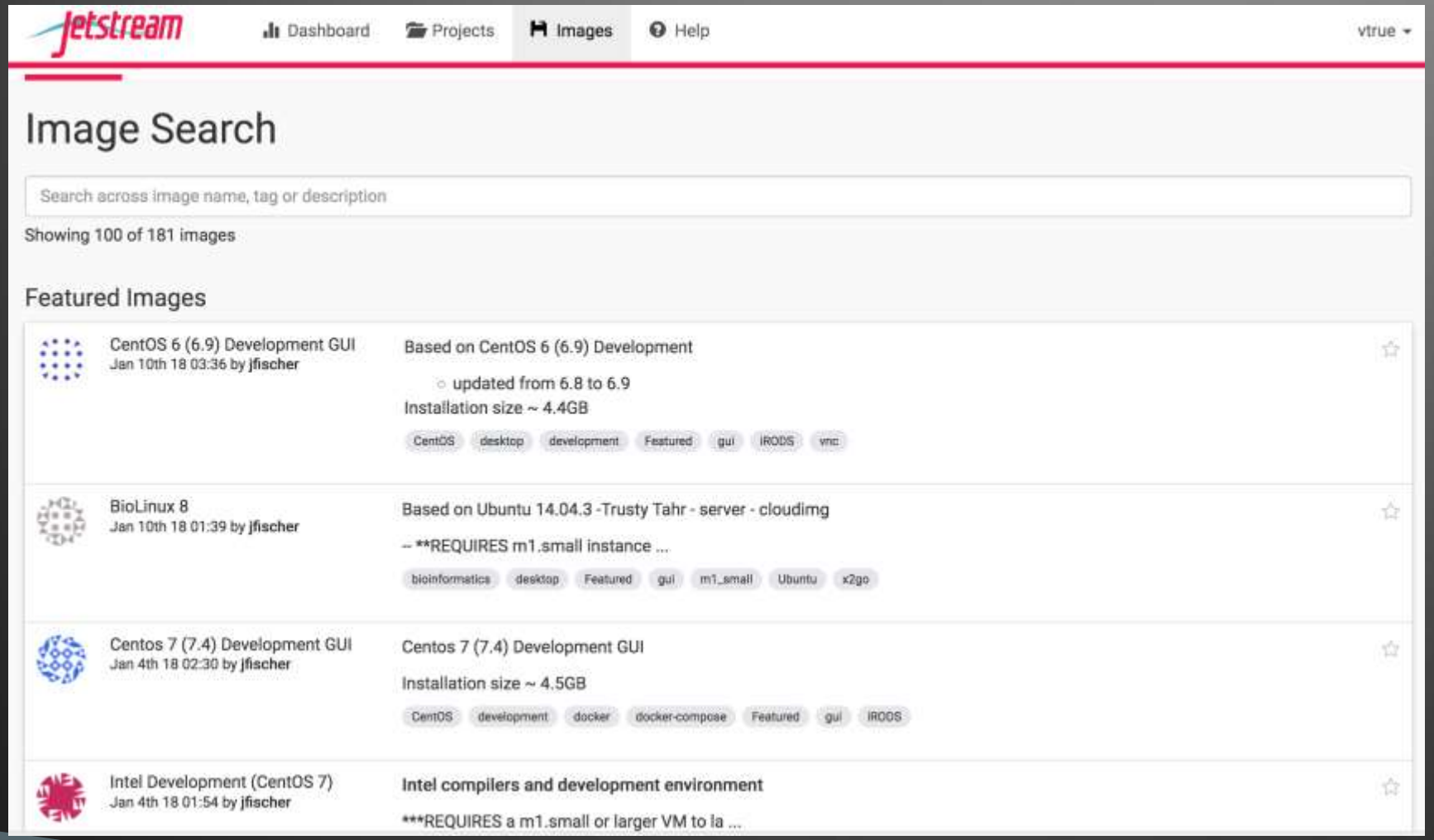
Images



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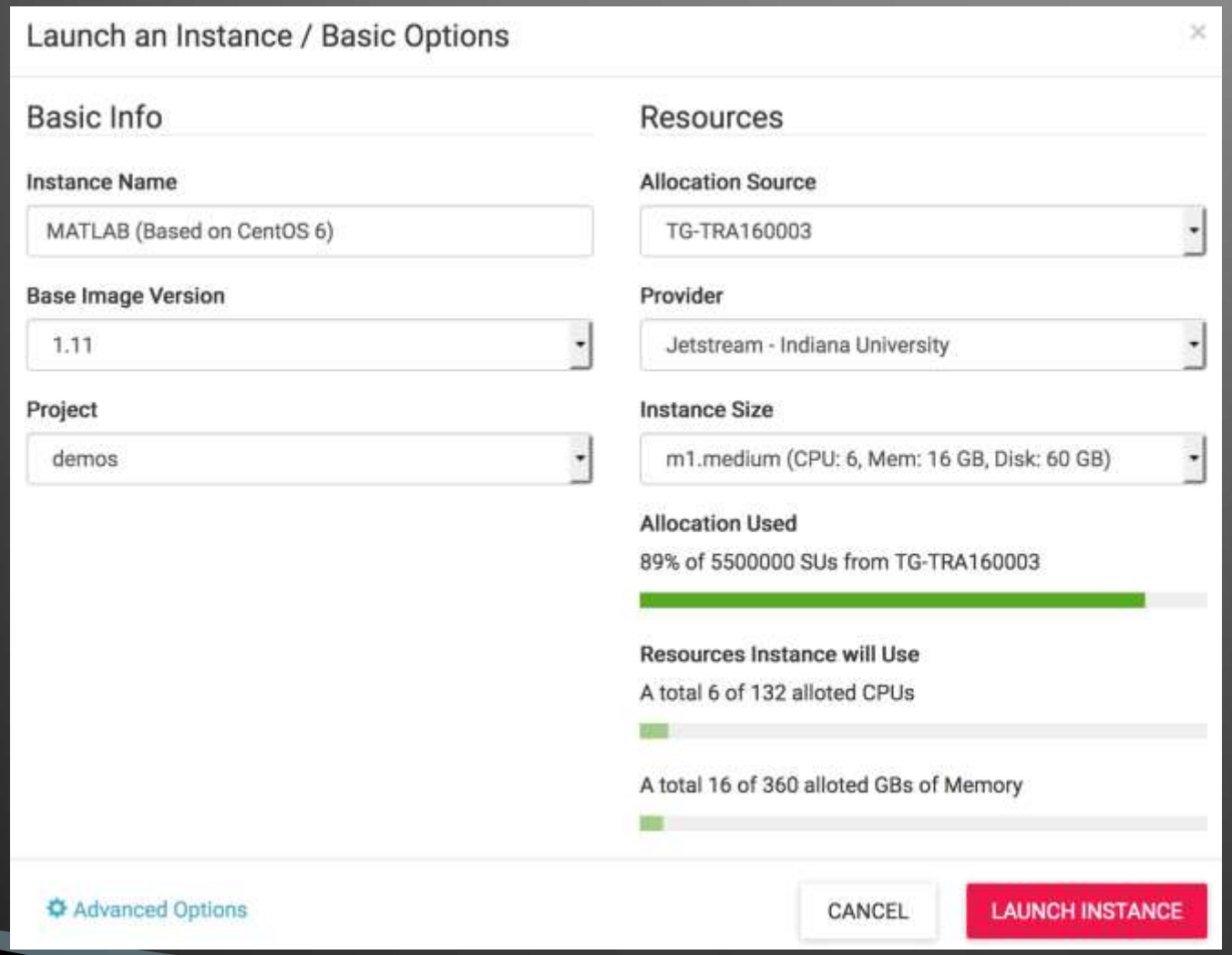
Images cont.



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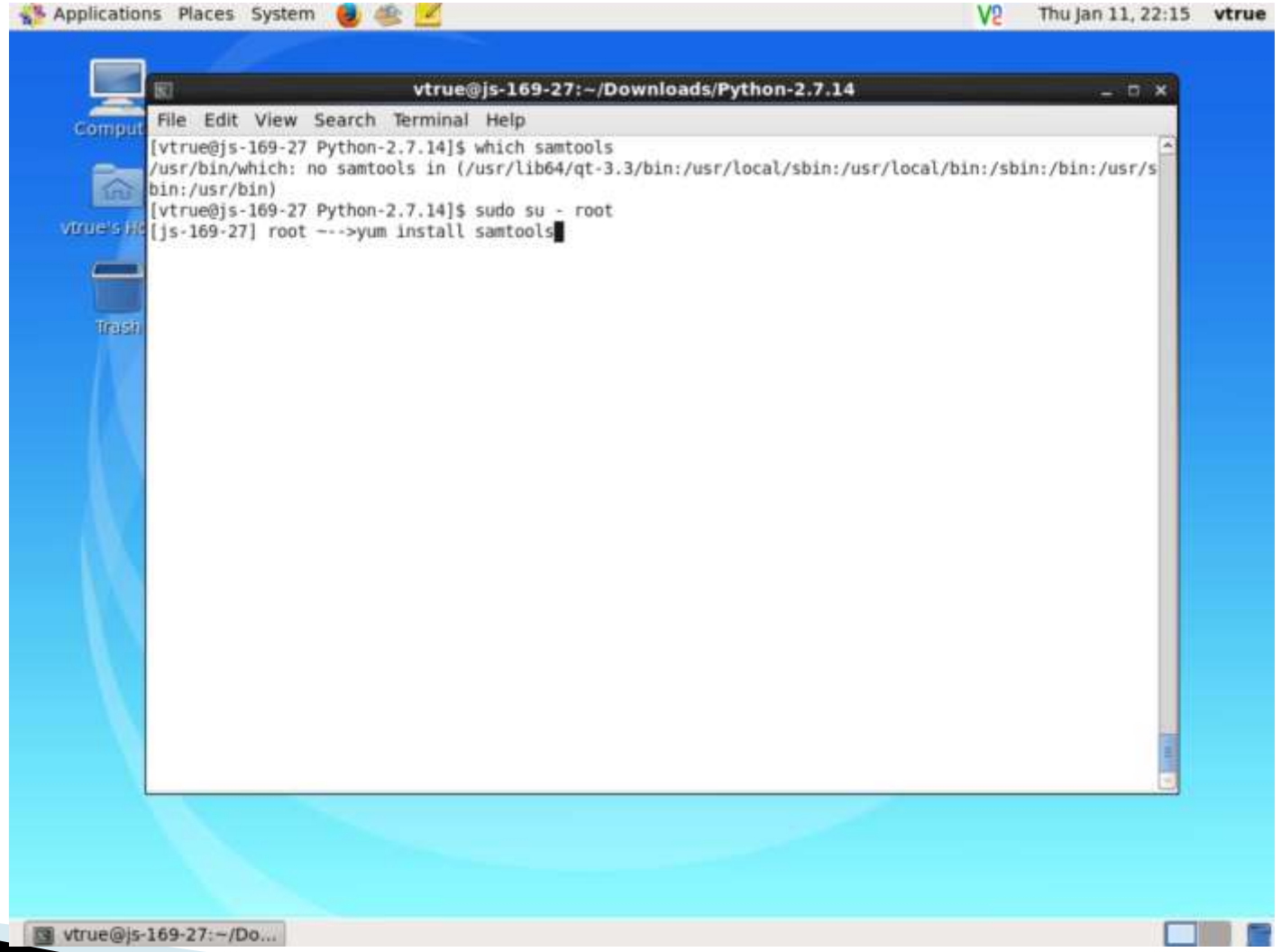
Images cont.

Modifying an Image



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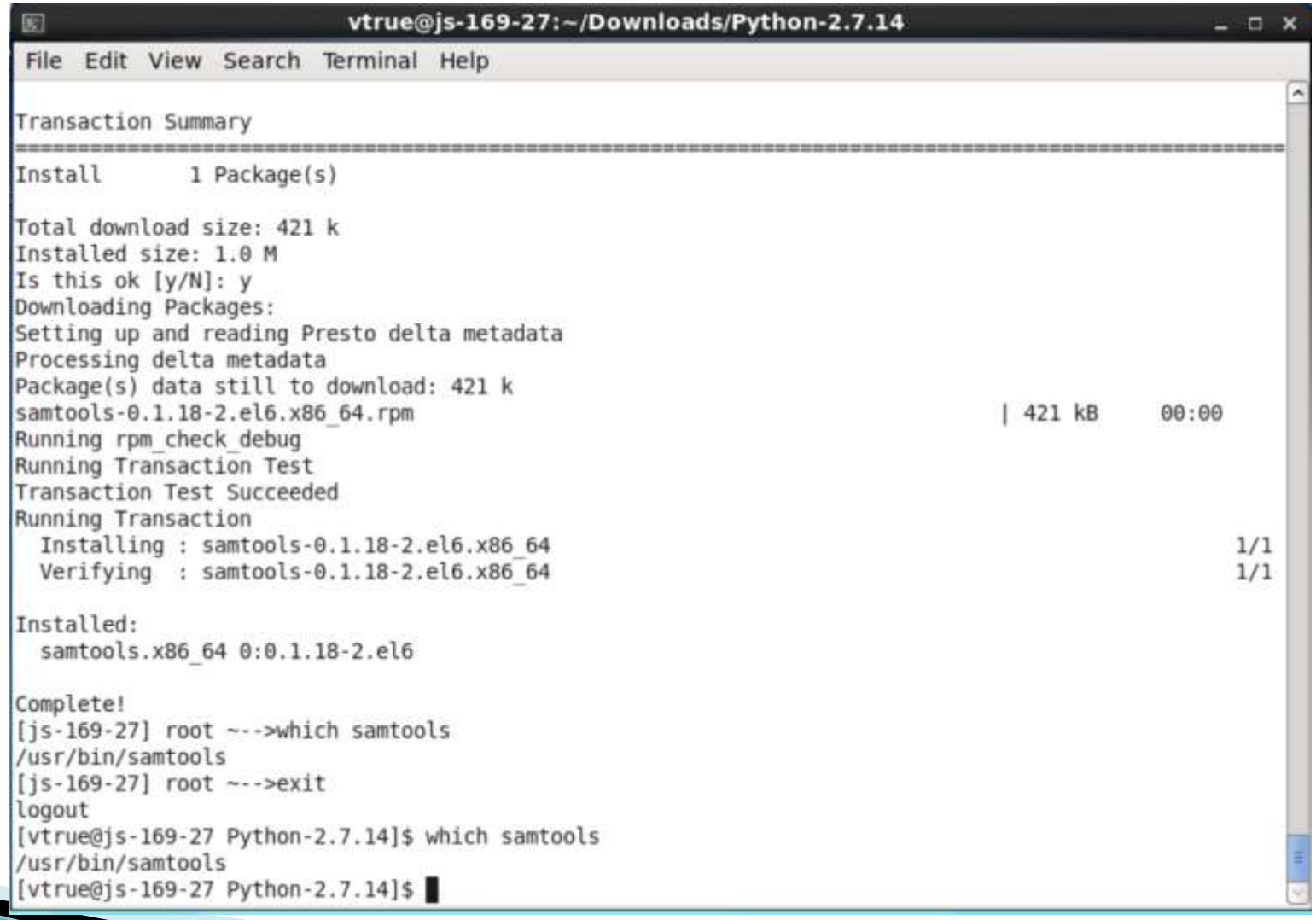
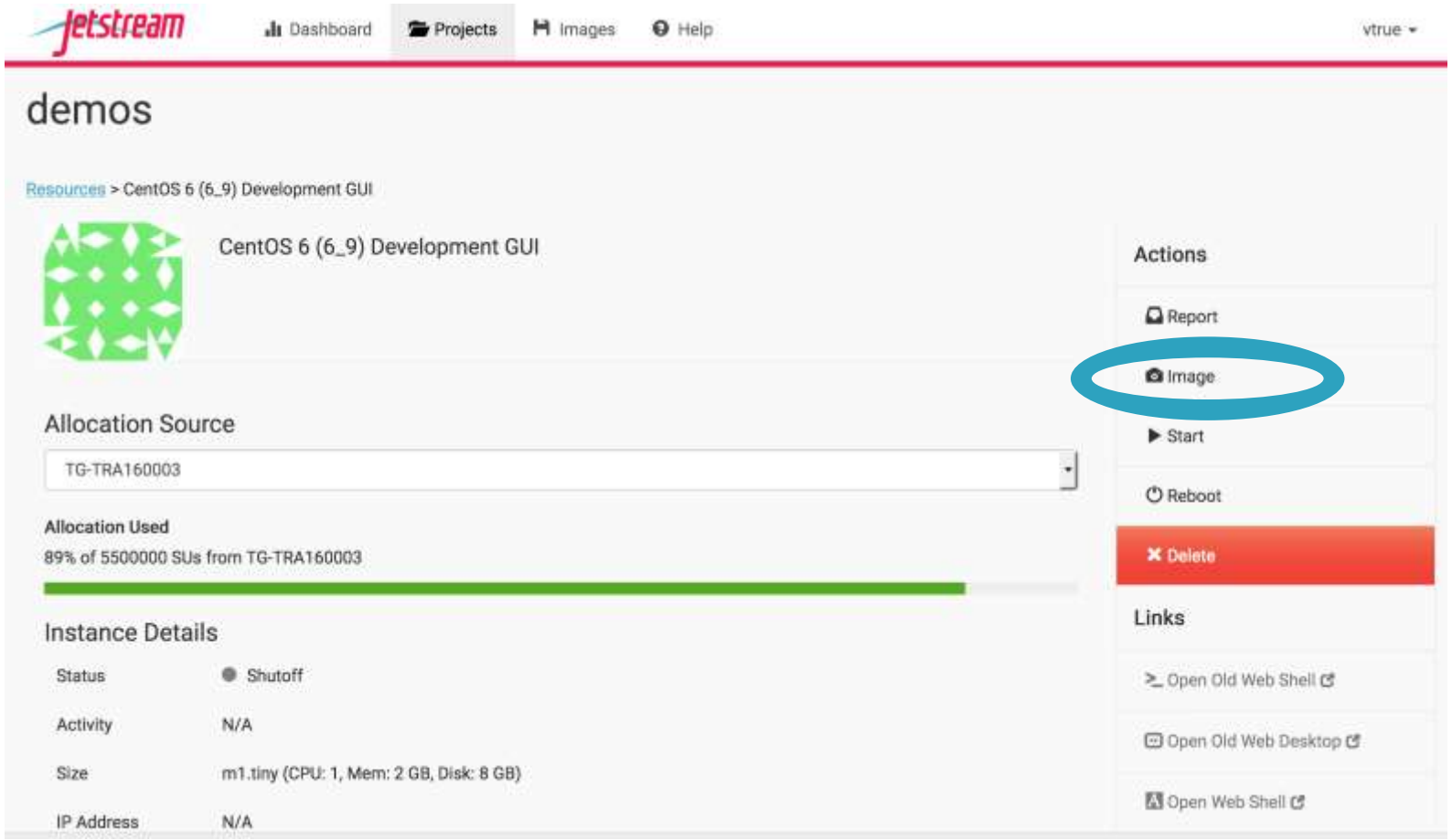
Modifying an Image cont.



Saving an Image



In Summary

- The longer your instance runs the more SUs you consume
- Be aware that you are on a shared resource
- You have root access, but the original image stays intact
- This is only the basic level of what you can do with Jetstream; there are many more options available in the Wiki

IaaS with Bare Metal

Direct access to the node

- Choose how you want to interact with the system

Build your own interface

- Select and install your own OS
- Install software to your exact specifications

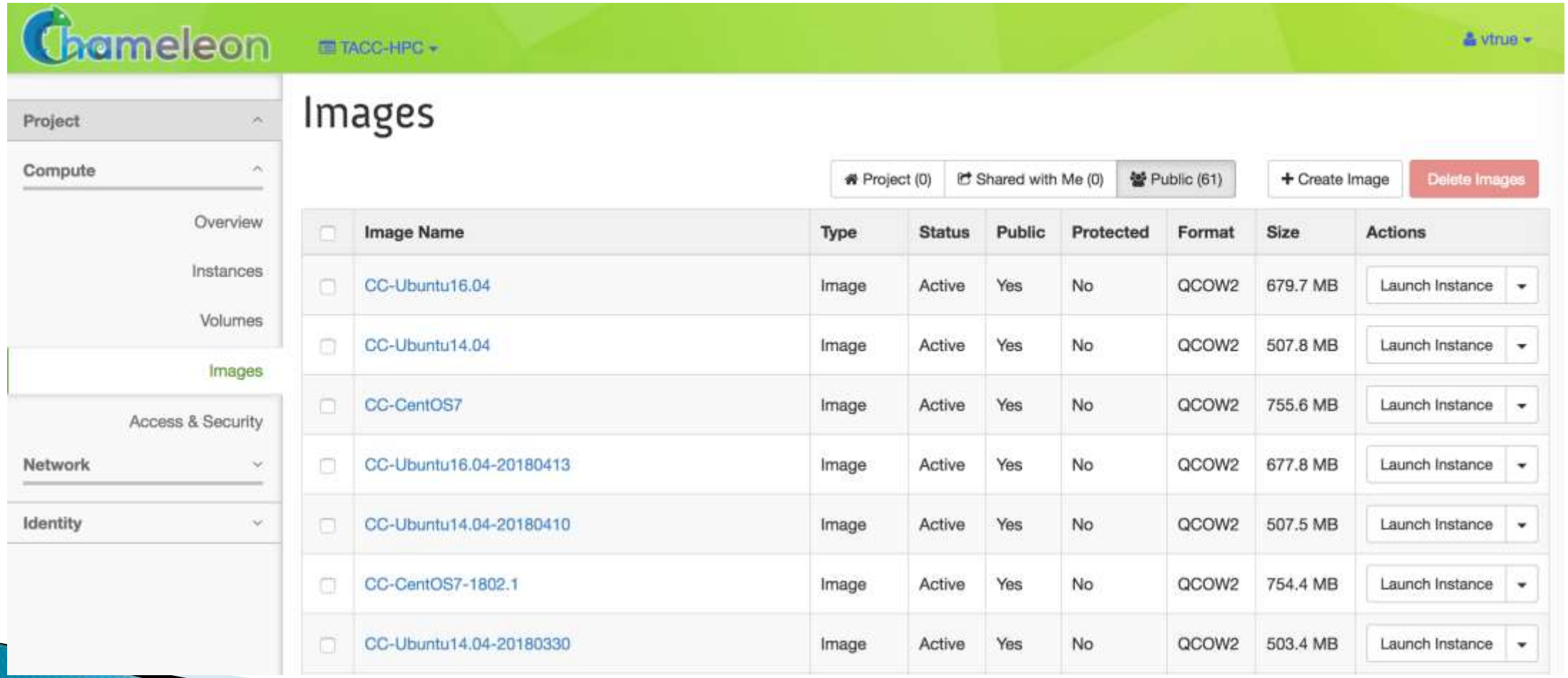
OpenStack

- Cloud based OS to help control your environment
- Provides dashboard based management in addition to command line

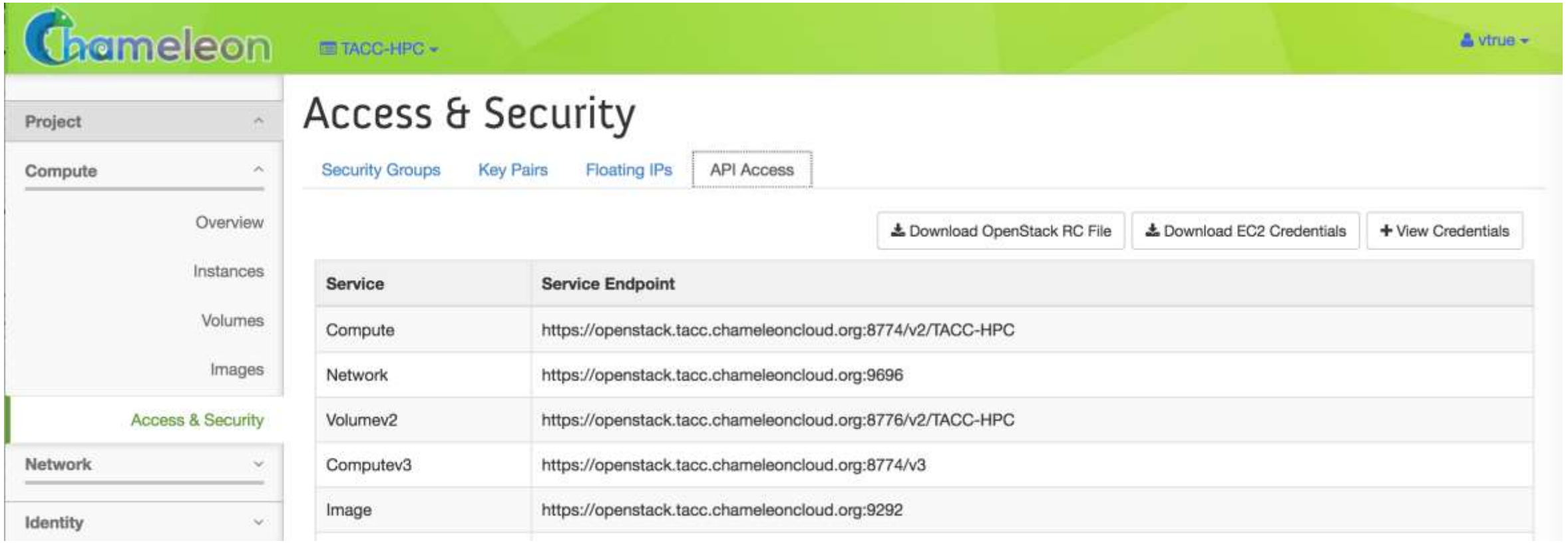
Chameleon

- Select the hardware you want
  - Instead of images you can select ‘flavors’ to determine memory, cpus, root disk, etc
- Network options
  - Generate IPs for external access
- Develop APIs
  - Use APIs to provide dashboards, monitor activity, etc

OpenStack


Chameleon
TACC-HPC
vtrue
Project
Compute
Overview
Instances
Volumes
Images
Access & Security
Network
Identity
Images
Project (0)
Shared with Me (0)
Public (61)
+ Create Image
Delete Images
Image Name
Type
Status
Public
Protected
Format
Size
Actions
CC-Ubuntu16.04
Image
Active
Yes
No
QCOW2
679.7 MB
Launch Instance
CC-Ubuntu14.04
Image
Active
Yes
No
QCOW2
507.8 MB
Launch Instance
CC-CentOS7
Image
Active
Yes
No
QCOW2
755.6 MB
Launch Instance
CC-Ubuntu16.04-20180413
Image
Active
Yes
No
QCOW2
677.8 MB
Launch Instance
CC-Ubuntu14.04-20180410
Image
Active
Yes
No
QCOW2
507.5 MB
Launch Instance
CC-CentOS7-1802.1
Image
Active
Yes
No
QCOW2
754.4 MB
Launch Instance
CC-Ubuntu14.04-20180330
Image
Active
Yes
No
QCOW2
503.4 MB
Launch Instance

APIs, SSH, and IPs



Command Line Access

- Install OpenStack
  - Install python
  - `pip install python-openstackclient`
- Download an RC File
  - Pull from your Chameleon account
  - `source <path/to/openstack_rc_file>`
  - If you are a Windows user you'll need to manually provide environment variables

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For Mac

```
vtrue-mbpr:~ vtrue$ python --version
Python 2.7.15
vtrue-mbpr:~ vtrue$ pip install python-openstackclient
Collecting python-openstackclient
  Downloading
https://files.pythonhosted.org/packages/33/84/c739b13aacc47d887cae58acc7dd921240918aa20a9
add6ab64d932d1a6a/python_openstackclient-3.15.0-py2.py3-none-any.whl (823kB)
    100% |████████████████████████████████| 829kB 8.0MB/s
Collecting oslo.utils>=3.33.0 (from python-openstackclient)
  Downloading
https://files.pythonhosted.org/packages/6c/bb/308293b06400625b721795657c0c50c8a5942fde58d
9532b40f57758a158/oslo.utils-3.36.2-py2.py3-none-any.whl (91kB)
    100% |████████████████████████████████| 92kB 4.6MB/s
Collecting osc-lib>=1.8.0 (from python-openstackclient)
  Downloading
https://files.pythonhosted.org/packages/de/b7/91ed1a58756390fa006a5777ceb44578f021a9b67ff
ec0729f5037fff51a/osc_lib-1.10.0-py2-none-any.whl (81kB)
    100% |████████████████████████████████| 81kB 17.4MB/s
Collecting python-glanceclient>=2.8.0 (from python-openstackclient)
```

For Windows

```
openstack --os-auth-url <OS_AUTH_URL> \
--os-project-id <OS_PROJECT_ID> \
--os-project-name <OS_PROJECT_NAME> \
--os-user-domain-name <OS_USER_DOMAIN_NAME> \
--os-username <OS_USERNAME> \
--os-password <OS_PASSWORD> \
--os-region-name <OS_REGION_NAME> \
--os-interface <OS_INTERFACE> \
--os-identity-api-version <OS_IDENTITY_API_VERSION>
```

On the Command Line

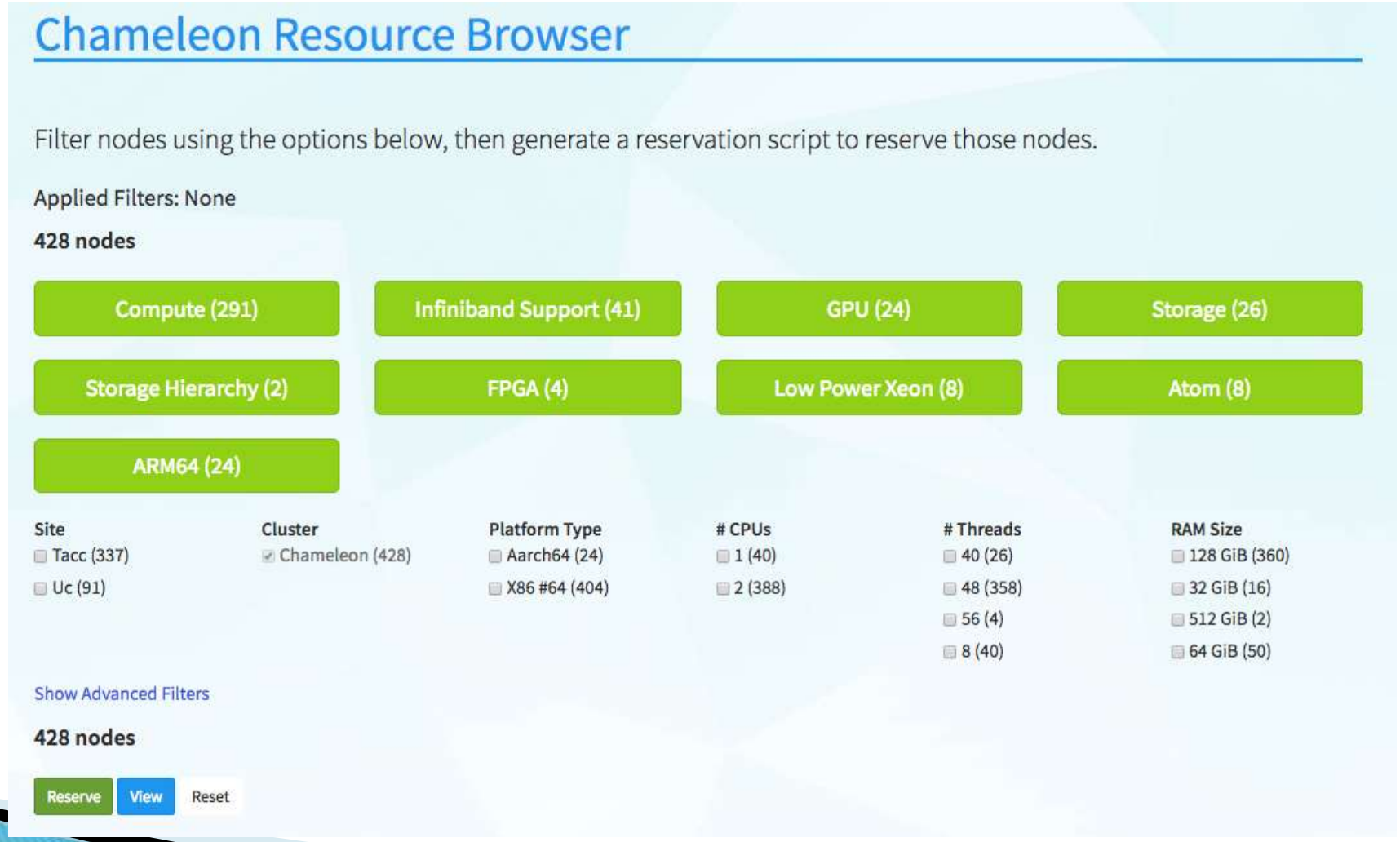
```
vtrue-mbpr:~ vtrue$ openstack
Readline features including tab completion have been disabled since no
supported version of readline was found. To resolve this, install
pyreadline on Windows or gnureadline on Mac.


(openstack)
```

There are options available in the command line that are not available in the GUI

- Gnocchi metrics
- Advanced networking

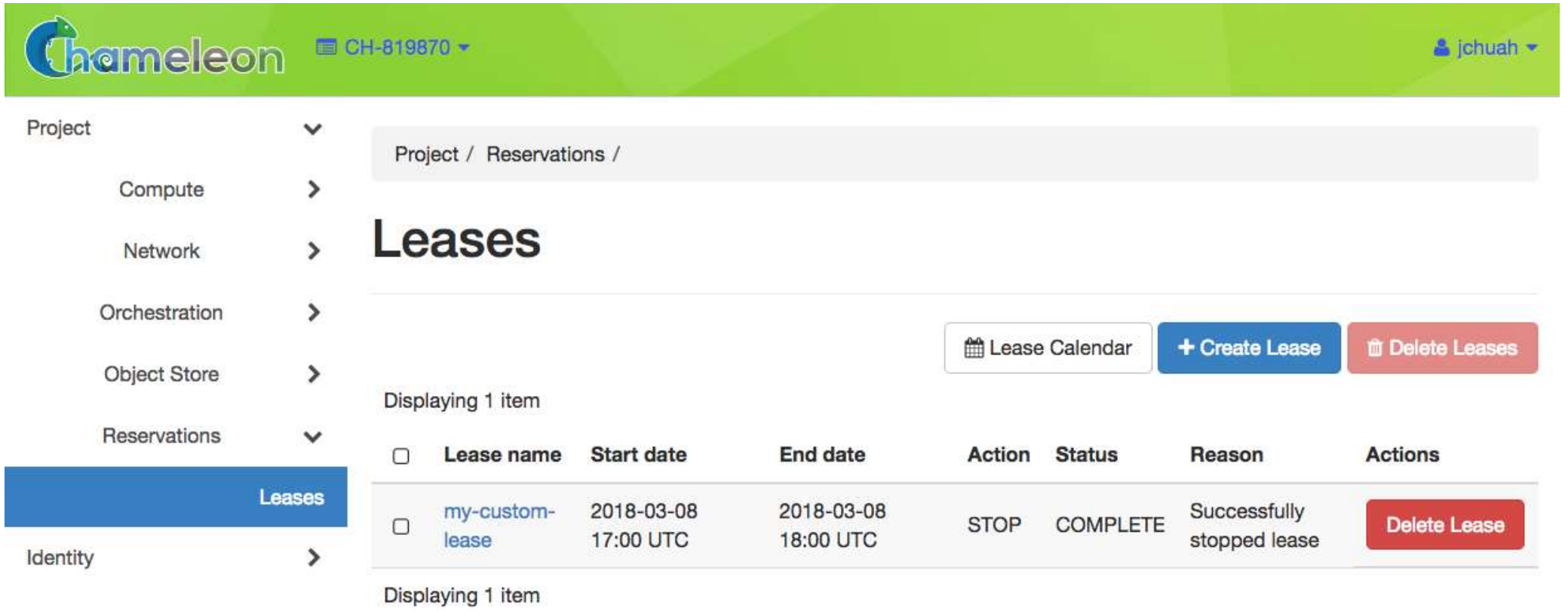
Selecting Hardware



Check on Resources with REST API

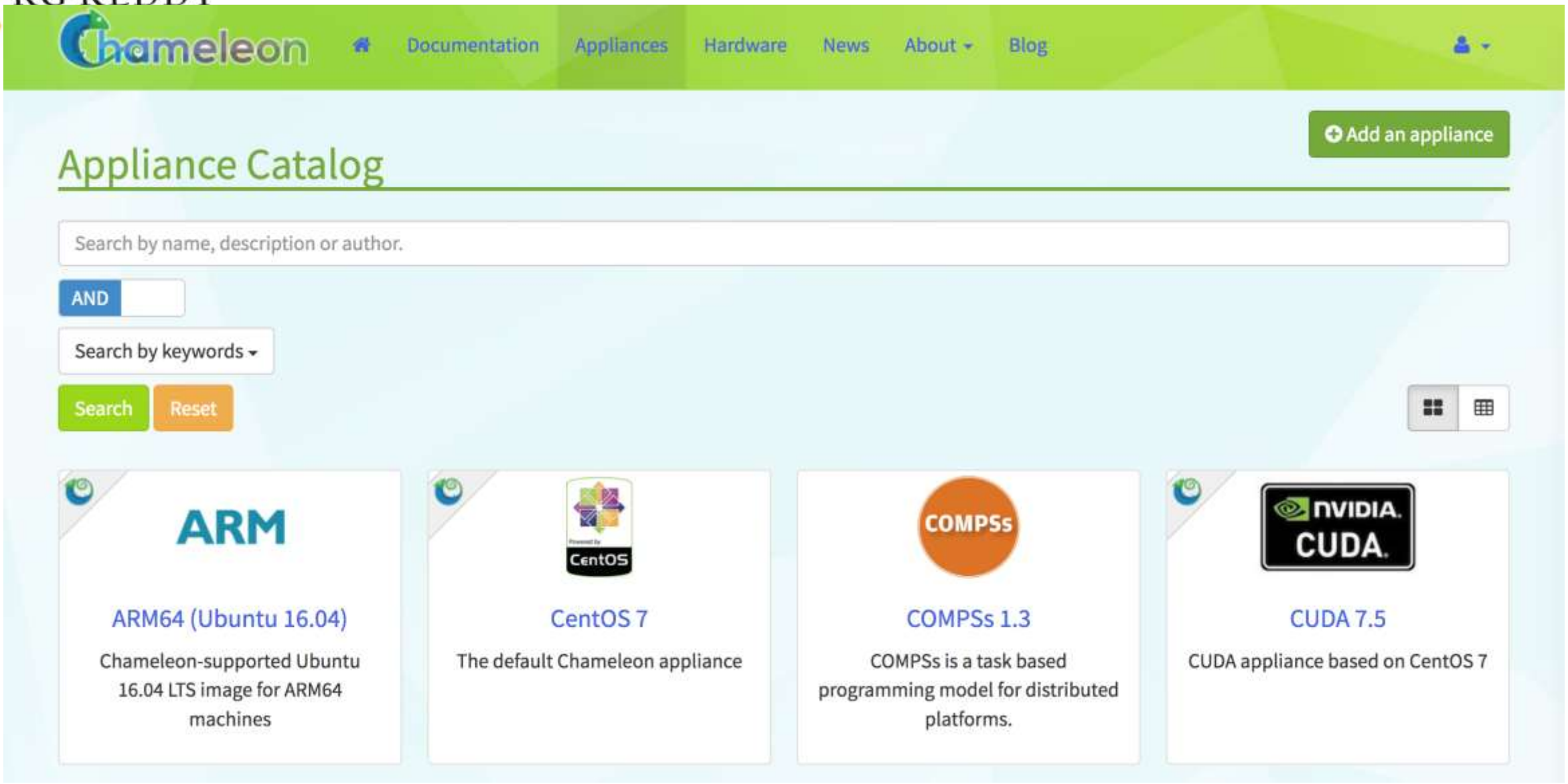
```
vtrue-mbpr:~ vtrue$ curl -i https://api.chameleoncloud.org/
HTTP/1.1 200 OK
Server: nginx/1.6.2
Date: Tue, 12 Jun 2018 22:35:34 GMT
Content-Type: application/vnd.grid5000.item+json; charset=utf-8
Content-Length: 757
Connection: keep-alive
Allow: GET
...
{"type":"grid","uid":"chameleoncloud","version":"0aa787fa5c97c34bd0b7a583
d4e2fab693010daa","release":"3.5.7","timestamp":1528842934,"links":[{"rel
":"sites","href":"/sites","type":"application/vnd.grid5000.collection+jso
n"},{"rel":"self","type":"application/vnd.grid5000.item+json","href":"/"
```

Reservations



Complex Appliances

- *Complex Appliances* allow you to specify not only what image you want to deploy but also on how many nodes you want to deploy that image, what roles the deployed instances should boot into (such as e.g., head node and worker node in a cluster), what information from a specific instance should be passed to another instance in that *Complex Appliance*, and what scripts should be executed on boot so that this information is properly used for configuring the “one click” cluster.


Chameleon
Documentation
Appliances
Hardware
News
About
Blog
Add an appliance
Appliance Catalog
Search by name, description or author.
AND
Search by keywords
Search
Reset
ARM
ARM64 (Ubuntu 16.04)
Chameleon-supported Ubuntu 16.04 LTS image for ARM64 machines
CentOS
CentOS 7
The default Chameleon appliance
COMPSs
COMPSs 1.3
COMPSs is a task based programming model for distributed platforms.
NVIDIA CUDA
CUDA 7.5
CUDA appliance based on CentOS 7

Managing and Monitoring

- Need to be launched the same way an Image is
- Select the Stack from the GUI once it is up
- SSH to it with a floating IP just like with an Image
- You can also do this from the command line with OpenStack