Moving SNE to the Cloud

RP1i3
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http://www.openstack.org/assets/openstack-logo/

Overview

1. Research Question
2. What's a cloud?
3. Cloud frameworks
4. OpenStack
5. Method
6. Problems
7. Conclusion
8. Discussion
9. Questions

Introduction

- What's a cloud?
  - Wikipedia:

"A platform to enable the delivery of computing as a service rather than product, whereby shared resources, software, and information are provided to computers and other devices as a metered service over a network (typically the Internet)."

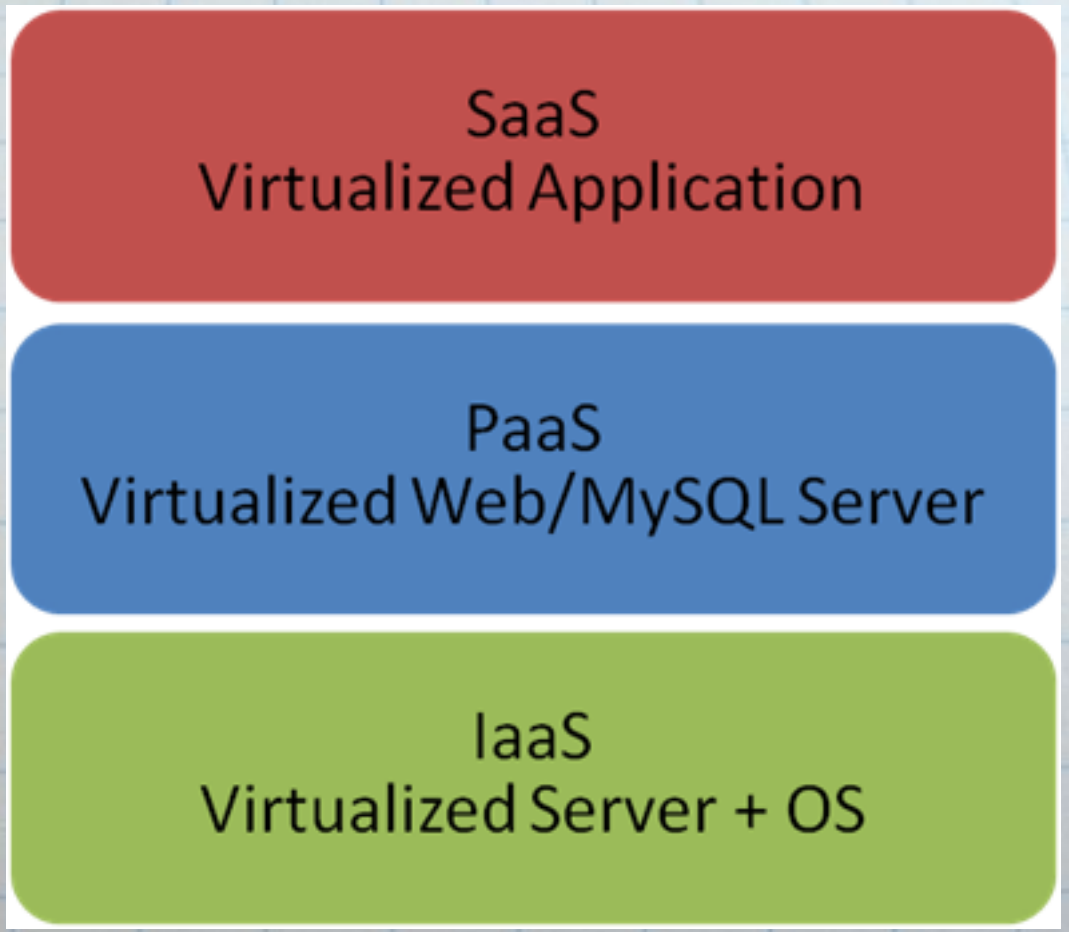
Introduction

- What's a cloud?
  - Me:

"A collection of physical computational resources, presented to external users as a (collection) of virtual resources in order to enable over-committing."

Introduction

- Cloud layers:
- Cloud types:
  - Public
  - Private
  - Hybrid



http://www.canadiancloud.com/wp-content/uploads/2011/04/Cloud-Services-Stack.png

Introduction

- Benefits for the education:
  - Offer services to more students
  - Scales better with more students
  - More flexible
  - Possibly cheaper

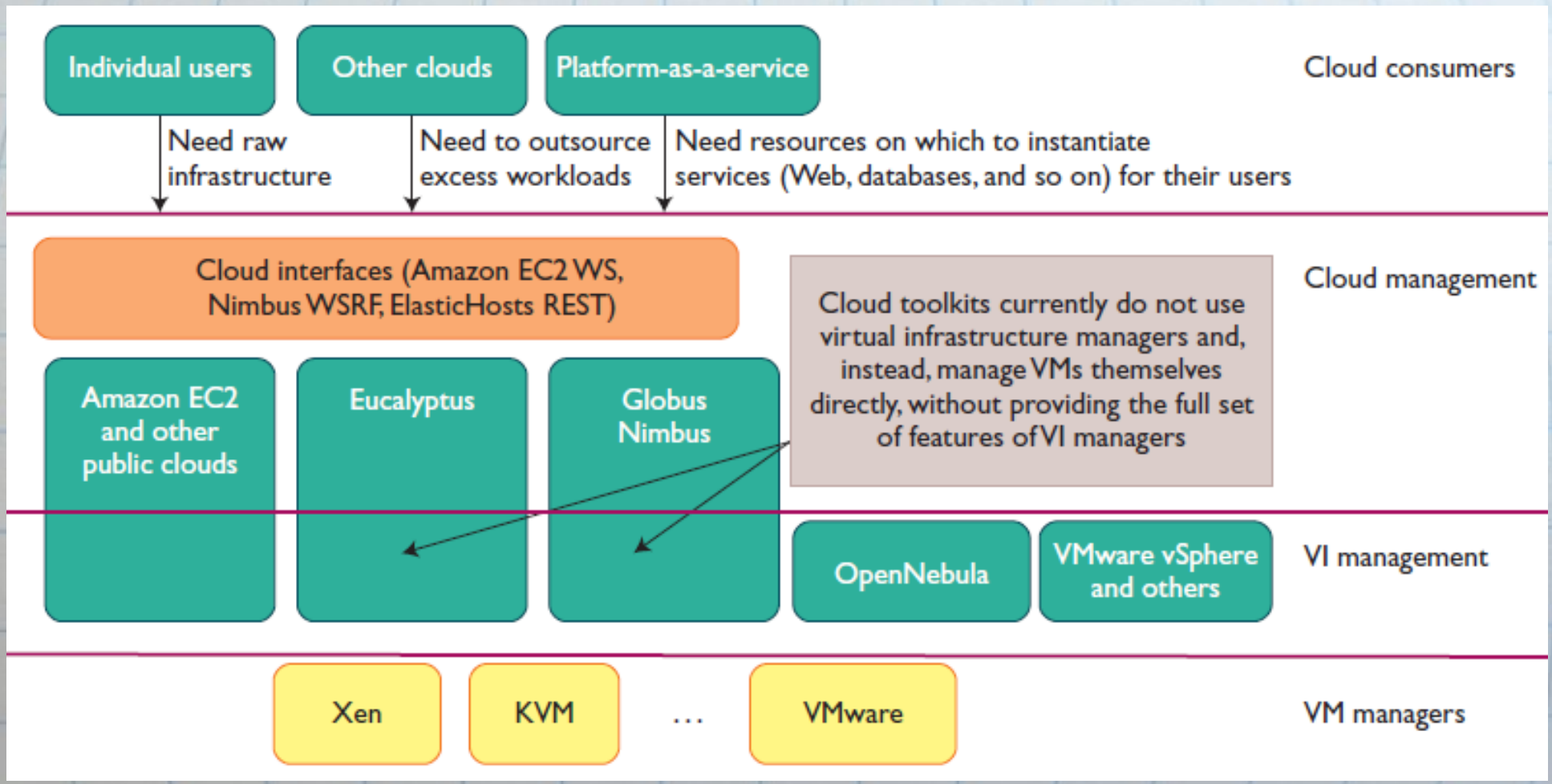
Introduction

- Requirements for the education:
  - Run (virtual) machines
  - Setup (virtual) networks
  - Delegate IP-space
  - Run internet services (web,dns, mail, ...)
  - Secure and administer environments

Research Questions

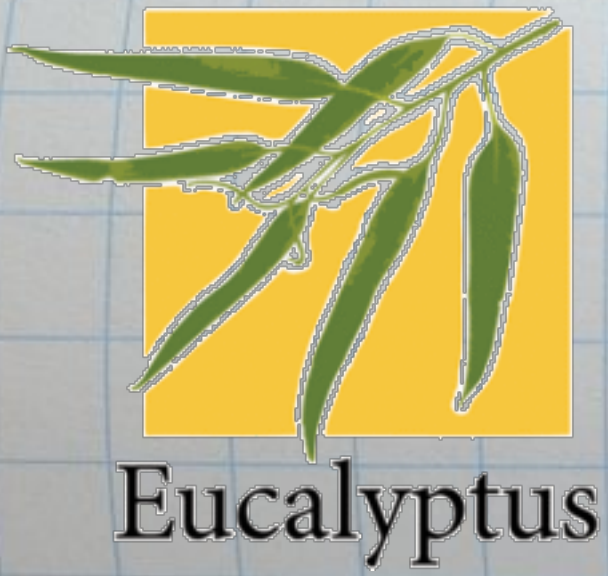
- Is it possible to execute SNE-education experiments in the cloud?
- Can layer 2 connectivity be achieved?
- Can full cloud transparency be achieved? (VM's in public/private cloud behave similar

Frameworks



B.Sotomayor, R.S.Montero, I.M.Llorente and I.Foster, "Virtual Infrastructure Management in Private and Hybrid Clouds," Internet Computing, vol. 13, no. 5, pp. 14-22, 2009.

Cloud frameworks vs VIM's



OpenStack

- Cloud framework
  - Supports users and projects
  - Little configuration needed (expected)
- Major support
  - Rackspace
  - NASA
  - Citrix
  - Fedora
  - Ubuntu

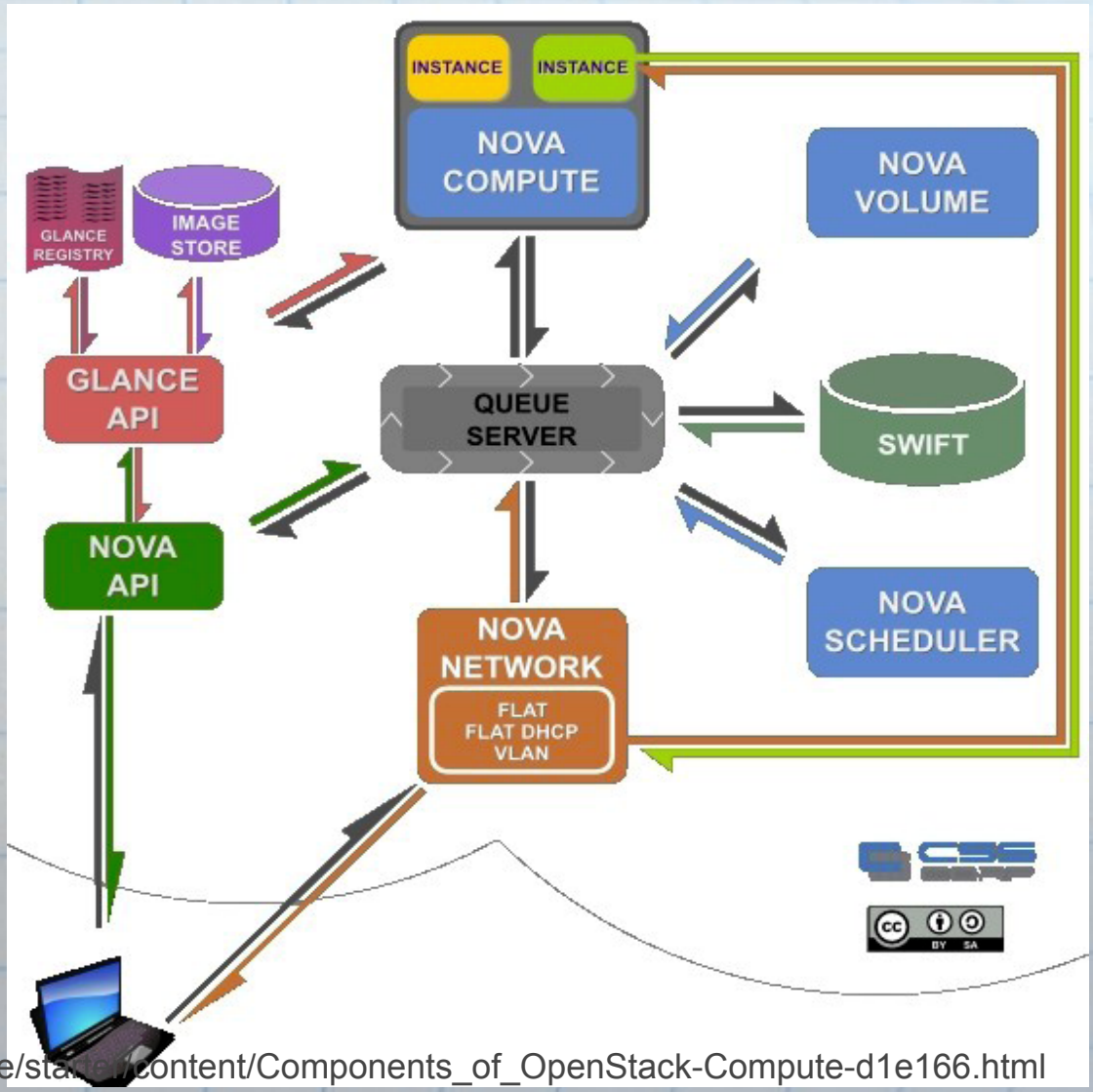
OpenStack

Release history:

Release name	Release date
Austin	21 October 2010
Bexar	3 February 2011
Cactus	15 April 2011
Diablo	22 September 2011

OpenStack Design

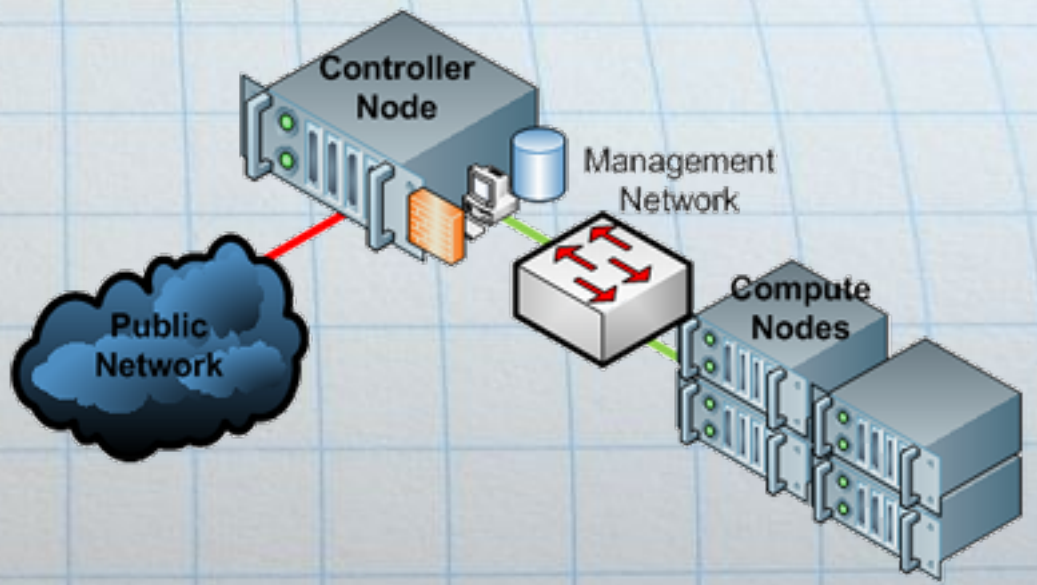
- Nova (Compute)
  - nova-compute
  - nova-volume
  - nova-scheduler
  - nova-network
- Glance (provisioning)
- Swift (storage)



http://docs.openstack.org/diablo/openstack-compute/starter/content/Components_of_OpenStack-Compute-d1e166.html

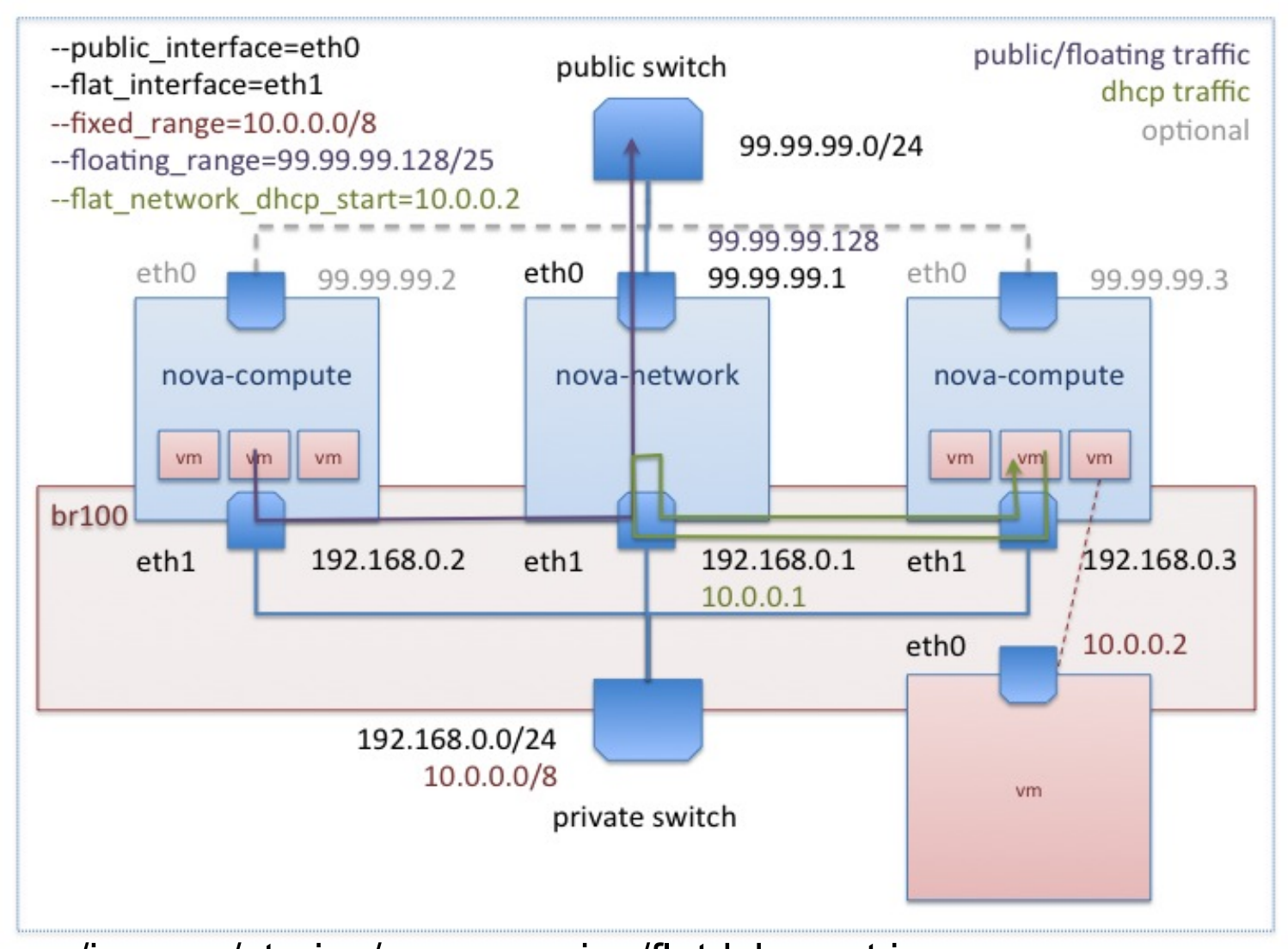
Initial Approach

- Local OpenStack install
  - 2 servers
    - Central Node
      - network
      - volume
      - scheduler
    - Compute Node
      - compute
- Remote Amazon
  - 1 server
    - Compute Node



http://docs.stackops.org/display/doc03/Dual+node+deployment

Networking in OpenStack



http://unchainyourbrain.com/images/stories/programming/flatdchp-net.jpg

Problems

No IP-addresses
No connectivity
No routing rules
Not possible to upload images remotely

Why?

- Documentation errors
- Configuration errors
- Bugs in the software

StackOps

Examples

- Documentation error:
  - network setup

```
auto eth0
iface eth0 inet static
address 10.10.10.2
netmask 255.255.255.0
broadcast 10.10.10.255
gateway 10.10.10.1

auto eth1
iface eth1 inet static
address 192.168.3.1
netmask 255.255.255.0
network 192.168.3.0
broadcast 192.168.3.255
```

configuration file setup:

```
--vlan_interface=br100
--public_interface=eth0
```

There is no bridge!

Examples

- Address assignment logic:
  - Administrator associate addresses with project

nova-manage floating create **"hostname"** 145.100.106.160/28

  - User allocates addressess to a project

```
[svjethoe@sudeshtarga ~]$ euca-allocate-address 145.100.106.160/28
ADDRESS 145.100.106.164
[svjethoe@sudeshtarga ~]$ euca-allocate-address 145.100.106.160/28
ADDRESS 145.100.106.165
[svjethoe@sudeshtarga ~]$ euca-allocate-address 145.100.106.160/28
ADDRESS 145.100.106.166
```

  - One by one ...

Examples

- Then:

```
[svjethoe@sudeshtarga ~]$ euca-associate-address 145.100.106.161 -i i-00000012
ADDRESS 145.100.106.161 i-00000012

[svjethoe@sudeshtarga ~]$ euca-allocate-address 145.100.106.166
UnknownError: An unknown error has occurred. Please try your request again.
```

Conclusion (1/3)

- Is it possible to execute SNE-education experiments in the cloud?
  - /
- Can layer 2 connectivity be achieved?
  - yes, private networks are connected through virtual bridges
- Can full cloud transparency be achieved? (VM's in public/private cloud behave similar
  - no

Conclusion (2/3)

- What can we do, when looking at the requirements?:
  - Run (virtual) machines
    - yes
  - Setup (virtual) networks
    - not possible due to bugs
  - Delegate IP-space
    - possible, but requires extra configuration inside VM's
  - Run internet services (web,dns, mail, ...)
    - yes
  - Secure and administer environments
    - yes

Conclusion (3/3)

- OpenStack lacks options for advanced lower layer configuration
- OpenStack still has too many bugs to be useful
- OpenStack lacks essential documentation on networking

Discussion

- OpenStack
  - High level software, still immature
  - Basic elements are still not well developed
  - Debugging interactions of components takes time
  - Requires extensive knowledge of the framework

Future work

- Virtual Infrastructure Managers ++
  - OpenNebula
    - Extensive documentation
    - More real world deployments
    - Small scale deployments
    - Matured technology
- Cloud Frameworks
  - Wait (until the bugs are solved)
  - Focus on small components first (instead of a full cloud)

Questions?

http://www.cloudxperience.nl/cloudxperience/blog/wp-content/uploads/2011/02/cloudcomputing.png