Moving SNE to the Cloud

RP1i3
Sudesh Jethoe

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

1. Research Question
2. What's a cloud?
3. Cloud frameworks
4. OpenStack
5. Method
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7. Conclusion
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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

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)
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:

<table>
<thead>
<tr>
<th>Release name</th>
<th>Release date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Austin</td>
<td>21 October 2010</td>
</tr>
<tr>
<td>Bexar</td>
<td>3 February 2011</td>
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<tr>
<td>Cactus</td>
<td>15 April 2011</td>
</tr>
<tr>
<td>Diablo</td>
<td>22 September 2011</td>
</tr>
</tbody>
</table>
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

--public_interface=eth0
--flat_interface=eth1
--fixed_range=10.0.0.0/8
--floating_range=99.99.99.128/25
--flat_network_dhcp_start=10.0.0.2

Problems

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

Why?
- Documentation errors
- Configuration errors
- Bugs in the software
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 addresses 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-000000012
ADDRESS 145.100.106.161 i-000000012

[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
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?