Inter Cloud VM Migration
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Objective
The goal is to relocate a virtual machine up and running in one cloud (data center) to another without losing VM's state.

Motivation
- It allows a clean separation between hardware and software.
- Facilitates fault management, load-balancing, and low-level system maintenance.
- Data center can redirect traffic at peak time.

Architecture of an Openstack cloud
- The controller node manages the whole cloud (all other nodes).
- VMs are launched in compute nodes.
- The cloud can communicate with the outside world only through the network node.

Architecture of InterCloud VM migration
Suppose VM1 has to be migrated from cloud A to cloud B.

Cloud A
- Network Node
- Controller Node
- Compute Node
- VM1

Cloud B
- Network Node
- Controller Node
- Compute Node
- VM1

The moment a migration process is triggered:
- The Cloud A's controller will create a snapshot of VM1.
- This memory picture is transferred through the network controller node in an IP tunnel over Internet.
- The Cloud B's controller node spawns a new VM based on the memory snapshot received.
- We reconfigure the router of Cloud A's network node to redirect VM1's traffic to Cloud B's network controller.

Features
- Clouds are deployed through OpenStack, an opensource highly scalable cloud operating system.
- OpenStack's Quantum is used to setup virtual (software defined) network inside the cloud.
- OpenStack's Glance and Keystone modules were used.

Applications
- Cloud Bursting.
- Enterprise IT consolidation.

Evaluation

<table>
<thead>
<tr>
<th>OS Type</th>
<th>Image Size (MB)</th>
<th>Migration Time (seconds)</th>
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<tbody>
<tr>
<td>cirros-0.3.0-x86_64</td>
<td>20</td>
<td>19</td>
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<tr>
<td>ubuntu-12.04-desktop-amd64</td>
<td>732.2</td>
<td>187</td>
</tr>
</tbody>
</table>

Future Work
- Minimize migration time.
- Minimize service down time.

References
- Timothy Wood, Prashant Shenoy, Arun Venkataramani, and Mazin Yousif "Black-box and Gray-box Strategies for Virtual Machine Migration"
- Ezra Silvera, Gilad Sharaby, Dean Lorenz and Inbar Shapira "IP Mobility to Support Live Migration of Virtual Machines Across Subnets"
- Christopher Clark, Keir Fraser, Steven Hand, Jacob Gorm Hansen, Eric Jul, Christian Limpach, Ian Pratt and Andrew Warfield "Live Migration of Virtual Machines"