

Lucia Short
Ryan Glenn
Ross Nordeen

Mentors:
Andree Jacobson ISTI-OFF
David Kennel DCS-1

Building a private cloud with OpenNebula

Why use Virtualized Cloud Computing for HPC?

- Support Legacy Software Stacks
- Flexible Load Balancing and Energy Efficiency
- On-Demand and Dynamic Provisioning of Clusters
- Enhance Failover and Redundancy Solutions

Challenges

- CPU and Memory Overhead
- Network Overhead
 - limitations of TCP/IP overhead
 - Support for Infiniband/Quadrics/Myrinet is missing
- Scalability

Implementing OpenNebula on our cluster

VMM

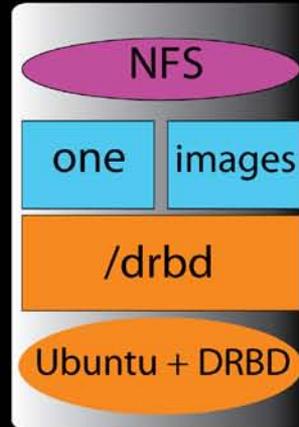
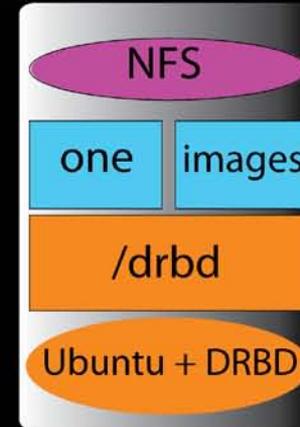
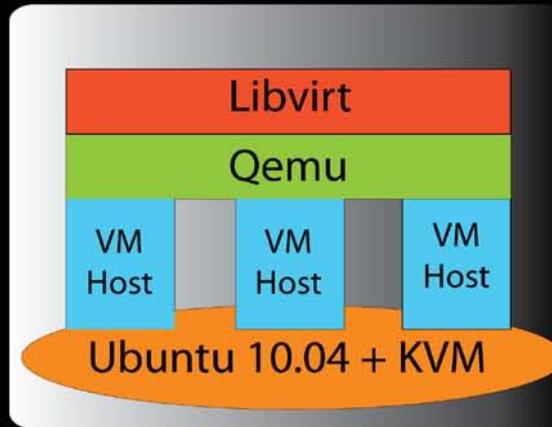
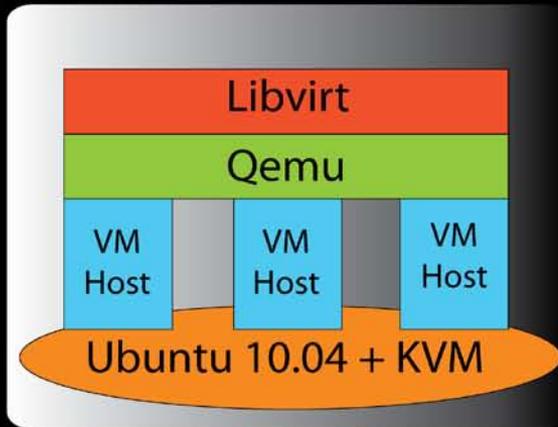


libvirt

Open Nebula

Haizea

Physical Infrastructure



OpenNebula

 HAIZEA

DR:BD[®]

Open Source Technologies Used

ubuntu 

 KVM

KVM and Libvirt (Virtualization Layer)

- KVM is Full Virtualization Solution for Linux
 - Uses VT extensions
 - Loadable kernel module
- Libvirt Provides Libraries to Manage Multiple Hypervisors
 - Provides a GUI and CLI interface

Open Nebula (Management Layer)

- Virtual Infrastructure manager
- Flexible tool to build any cloud environment
- Haizea was used in place of OpenNebula's scheduler

 **HAIZEA**

OpenNebula

DRBD (Storage Layer)

- Distributed storage system for Linux
- Similar to RAID 1, except over the network

The logo for DRBD, featuring the letters 'DR' in orange and 'BD' in black, with a colon between them and a registered trademark symbol (®) to the right.

Results

Management Interface

OpenNebula Management Console

Logged in as oneadmin - logout | version: 1.0.1

vm overview | vm manager | hosts | networks | users

Cloud vm's:

Deploy vm:

| Id | User | Name | VM State | LCM State | Cpu | Memory | Host | VNC Port | Time | | hold |
|----|----------|----------|-----------|-----------|-----|--------|------|----------|------------|---|--------------------------|
| 12 | oneadmin | ubuntuVM | suspended | init | 0 | 524288 | cn2 | 59129 | 0d 23:25:5 | [console] [details] [log] | <input type="checkbox"/> |
| 28 | oneadmin | ubuntuVM | active | running | 0 | 524288 | cn1 | 58921 | 0d 0:43:13 | [console] [details] [log] | <input type="checkbox"/> |
| 29 | oneadmin | ubuntuVM | active | migrate | 0 | 524288 | cn2 | 58922 | 0d 0:10:26 | [console] [details] [log] | <input type="checkbox"/> |
| 30 | oneadmin | ubuntuVM | active | running | 0 | 524288 | cn2 | 58923 | 0d 0:10:2 | [console] [details] [log] | <input type="checkbox"/> |
| 31 | test | ubuntuVM | active | migrate | 0 | 524288 | cn2 | 58924 | 0d 0:4:28 | [console] [details] [log] | <input type="checkbox"/> |
| 32 | test | ubuntuVM | active | running | 0 | 524288 | cn2 | 58925 | 0d 0:2:52 | [console] [details] [log] | <input type="checkbox"/> |

hold

ok

VM Template:

Amount:

deploy



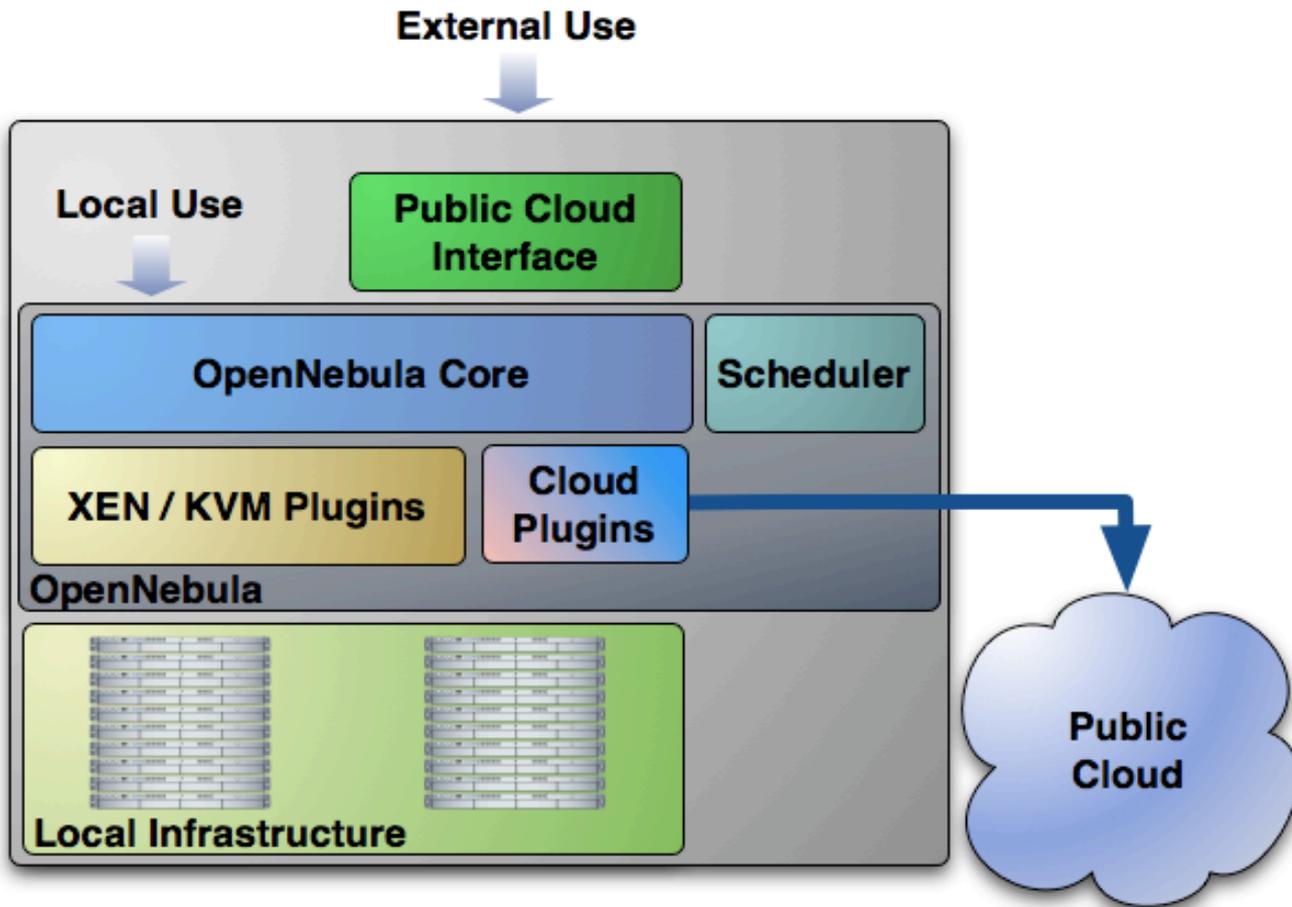
UNCLASSIFIED



Reliability and Availability

- Live migration in Open Nebula
- Redundant image repository

Customer Experience



Future with Open Nebula

- Explore a hybrid cloud with vCloud, EC2, OCCl
- A management interface for HPC clusters will be ready in Sept
- OFED support to come soon
- Open Nebula 2.0 released a week ago
 - Cluster support, load aware scheduling

Conclusion

- Virtualization will not replace conventional clusters
 - will always be overhead
- OpenNebula is a feasible option
 - For capacity and legacy systems
- Great potential in the field
 - However not capable of solving all of HPC's needs



Questions?