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Building a private cloud with OpenNebula

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LA-UR 10-05197

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
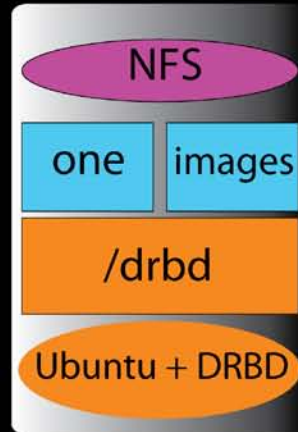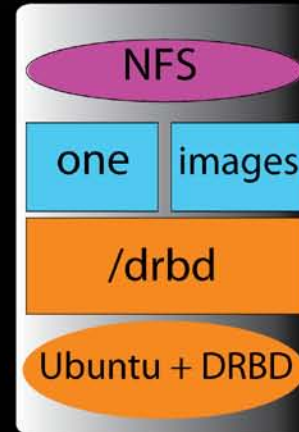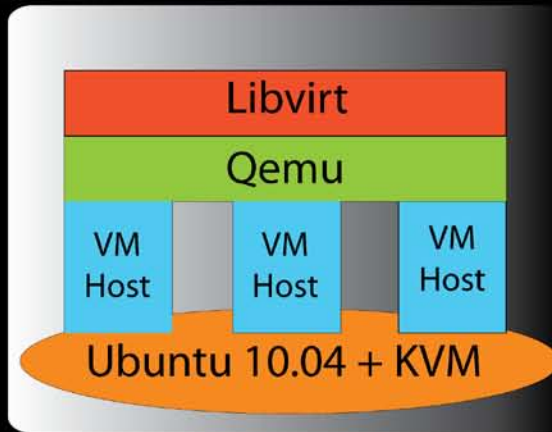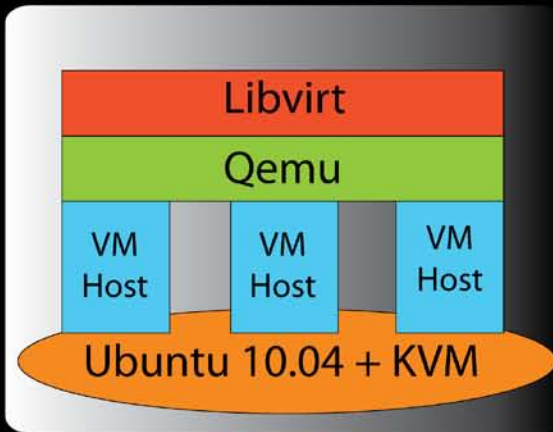
Open Source Technologies Used

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 inplace of OpenNebula's scheduler

≋ HAIZEA

OpenNebula

NNSA

DRBD (Storage Layer)

- Distributed storage system for Linux

- Similar to RAID 1, except over the network

Results

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Management Interface

OpenNebula Management Console

vm overview	vm manager	hosts	networks	users

Cloud vm's:

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

hold ▼
ok

Deploy vm:

VM Template: ubuntuVM ▼

Amount: 1

deploy

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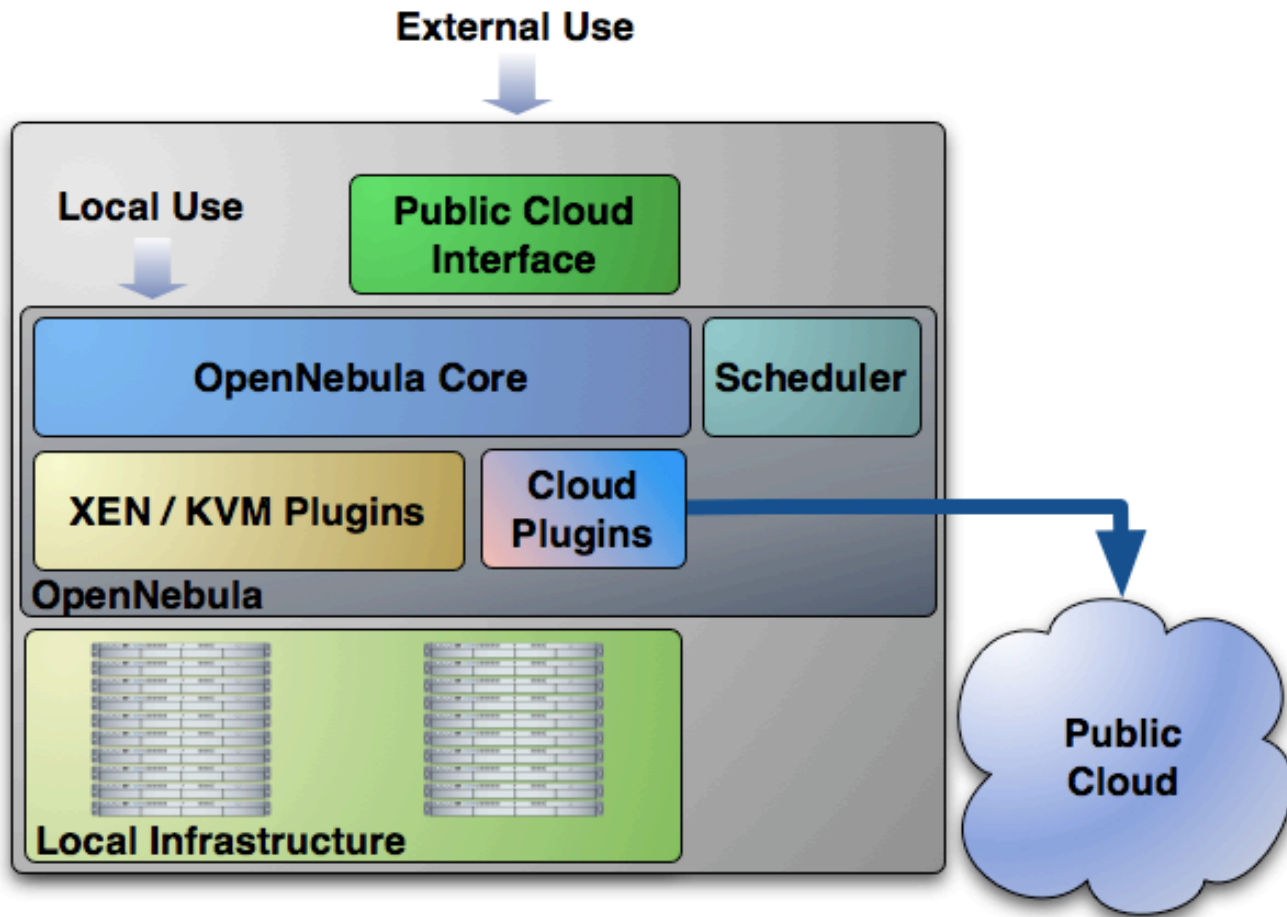
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Reliability and Availability

- Live migration in Open Nebula

- Redundant image repository

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Customer Experience

Future with Open Nebula

- Explore a hybrid cloud with vCloud, EC2, OCCI

- 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

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Questions?

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