Cloud Deployment at KEK

Wataru Takase
Computing Research Center, KEK, Japan
Background: KEK Linux Cluster

- 10000 CPU cores
- Scientific Linux 6
- IBM Spectrum LSF

Interactive work and job submission

Remote login

Batch service

work server
work server
work server

LSF

calc. server
calc. server
calc. server
calc. server

calc. server
calc. server
calc. server
calc. server

...
Background: Need Workload Management for Different Groups

• Requirements on specific system
  • Develop an application on the other OS.
  • Test for newer OS/Libraries.
  • Stick to old OS.

• Efficient management of limited resources

Take advantage of Cloud computing
IBM Cloud Manager with OpenStack (CMO) [1]

• CMO
  • IBM Cloud software based on OpenStack

• Additional features:
  • Simplified service portal
  • IBM Platform Resource Scheduler
  • Simplified Cloud deployment by Chef

CMO: Simplified Service Portal

- Quick summary of all of relevant projects
- Activity logs
- Launching instance
- Request for launching instance (optional)

• Extends Nova compute scheduler.
• Policy based VM deployment / reallocation.
  • Packing policy
    • Pack VMs to minimum number of compute nodes as much as possible.
  • CPU load balance policy
    • Balance CPU load among compute nodes.

CMO: Simplified Cloud deployment by Chef

- Automate deployment by predefined Cloud topologies.
  - e.g. Minimal, Controller + N compute nodes

CMO Deployment at KEK

• OpenStack version
  • Kilo: The latest version supported by CMO

• Used OpenStack components
  • Keystone (Identity)
  • Nova (Compute)
  • Glance (Image Storage)
  • Horizon (Dashboard)
  • Neutron (Networking)

• Compute nodes
  • Scientific Linux 7
  • KVM
  • 75 CPU cores
The Cloud Covers 2 Use Cases

• Batch integration
  • LSF + OpenStack
  • Prepares requested data analysis environment triggered by job submission.

• Self-service provisioning
  • Provides customizable servers for experimental groups.
1. Submit job with resource request

2. Request to launch instances

3. Launch instances

4. Dispatch job

Interactive work and job submission

Batch Integration

Linking to OpenStack image and flavor

Physical machines (SL6)

Batch service

Interactive work and job submission

Work server

Work server

Work server

Virtual machines

calc. server

calc. server

calc. server

calc. server

calc. server

(calc. server)

(calc. server)

(calc. server)
Self-Service Provisioning

• Provide Simplified Service Portal.
• Control allowed actions by OpenStack role.

1. Request to launch instances
2. Launch instances
3. Log in

Physical machines (SL6)

Interactive work and job submission

Virtual machines

Log in for generic work

work server

work server

work server
Planned Usage of the Cloud

• Cloud admin prepares base images
  • SL6, CentOS7, Ubuntu16

• Self-service

1. Create image
2. Launch instance
3. Log in

• Batch integrated cloud

End user → Submit job → LSF → Distach → calc. server (VM) → Add LSF configuration
Integration with Existing System: LDAP

- LDAP authentication is used for the cluster.
- Use the LDAP service as OpenStack authentication backend.
- Use the LDAP for Linux accounts on a VM.
Integration with Existing System: GPFS

• GPFS is used for home directories and group shared directories.

• Don’t GPFS mount from VM to avoid additional GPFS operation.
  • GPFS requires node registration to the cluster.

• Each compute node mounts GPFS and exposes the directories to VM via NFS.
Group based Management: SSH Access Control

• OpenStack project is mapped to Linux group.
• Instance in a project only allows SSH access from users on the project.

1. Launch instance
2. SSH access control in cloud-init
3. Log in

User on group01

The other user
Group based Management: Launch Instances on Specific Nodes

• Plan to partially deploy physical servers provided by a group as compute nodes.
  • The resource is only for the group.
• Use "Host Aggregate" feature.

1. Aggregate compute nodes
2. Create a flavor binding to the aggregation group01 specific flavor
3. Launch instance using the flavor

Resource provided by group01

The other user

The group01 user
## Current Status

<table>
<thead>
<tr>
<th>Work item</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create common base images for work and calc. instances</td>
<td>Done</td>
</tr>
<tr>
<td>Create LSF configuration script for the common images</td>
<td>WIP</td>
</tr>
<tr>
<td>Integrate with existing systems (LDAP, GPFS)</td>
<td>WIP</td>
</tr>
<tr>
<td>Implement group based management (SSH access &amp; resource)</td>
<td>Done</td>
</tr>
<tr>
<td>Test by cloud admins</td>
<td>WIP</td>
</tr>
<tr>
<td>Test by group managers</td>
<td>Being started</td>
</tr>
</tbody>
</table>
Near-future Plan: Public Clouds Integration

- Supplement the shortage of existing resource.
- Add temporal resource for intensive data analysis in a certain period.
Summary

• CMO based Cloud service at KEK is now test phase.
• Our Cloud will cover 2 use cases:
  • Batch integration
  • Self-service provisioning
• We are integrating the Cloud with existing LDAP and GPFS.
• Group based SSH access control and resource allocation have been implemented.
• We are investigating the way to integrate batch service with public clouds for more flexible workload management.