Research and application of OpenStack in CSNS Computing environment

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Agenda

About CSNS

Scenarios & Requirements

Computing Environment based on OpenStack

R & D

Summary
About CSNS

- **Accelerator-based neutron source**
- **Designed to provide multidiscipline research platforms with neutron scattering**
- **Operated by the Institute of High Energy Physics, CAS**
- **Located at Dongguan in Guangdong province of China**
- **Will be complete in 2018**
About CSNS

- 80-MeV HLInac
- 1.6-GeV proton rapid cycling synchrotron (RCS)
- beam transport lines
- tungsten target station
- 3 initial spectrometers
Scenarios & Requirements

Appliaction
- OS (windows & Linux)
- Diverse Softwares

Diverse Host
- More Memory
- More CPUs

Expansibility
- More spectrometers
- More data
Computing Environment based on OpenStack

• What is OpenStack?

[Diagram showing the components of OpenStack]
Computing Environment based on OpenStack

- Heat
- Nova
- Neutron
- Glance
- Cinder
- Swift
- Keystone
- Horizon
- Ceilometer
- Keystone
Computing Environment based on OpenStack

Overall Architecture:
- **MySQL**, **RabbitMQ**, **KeyStone**, **Glance**, **Nova**, **Neutron**
- **MySQL**
- **RabbitMQ**
- **KeyStone**
- **Glance**
- **Nova**
- **Neutron**

**HA GlusterFS**
- **Node 01**
- **Node 02**

**Networks**:
- **Manager Network**
- **Storage Network**

**Virtual Network**

**Public Network**

**Storage Cluster**

**Master Node**

**Backup Node**

**KVM**

**router**

**Trunk**

**Virtual Network**
Research and development

R & D
Unified Authentication

- **Existing integration schema doesn't meet the requirement**
  - All stores in ldap
  - Too much change to ldap

- **Loosely coupled schema**
  - Local user and common user
  - To common users, only authenticate username and password by ldap service
  - Other information authenticate through keystone local DB
Network

- **Virtual Network**
  - **Disable L3-agent**
  - Physical gateway replace virtual router
  - VMs directly connect to the trunk mode switch

- To ensure the performance and stability of the network
- To achieve seamless communication directly with local network
Images & instances

- **Images storage**
  - Stored in glusterfs ssd volume

- **Cloud-init**
  - Configuring instances at boot time
  - Set a instance hostname
  - Generate instance ssh private keys
  - Automatically register in puppet, DNS, IPDB

- **Live Migration**
  - All instances shared storage with glusterfs volume
  - Completed within a few seconds
  - Instance will not stop in the migration process
Distributed Messaging System

- RPC Messaging is critical for OpenStack
- Default Messaging System
  - RabbitMQ
- Problems
  - Single point failure
  - Difficult to scale out
  - Performance bottleneck

How to implement a broker-less architecture for OpenStack RPC
Distributed Messaging System

ØMQ
Distributed Messaging System

Source: Going brokerless, the transition from qpid to 0mq.
Dashboard

• **RealTime Notification -> WebSocket Push**

• **Use socket.io running inside a NodeJS loop.**

• **A high performance websocket (RFC 6455) implementation has been added**

• **Using Redis as a message queue.**

• **Two instances of a uWSGI server:**
  – one to handle normal HTTP requests for Django
  – one to handle WebSocket requests
Summary

• The overview about CSNS;

• OpenStack and virtualization technology are good solution according to the computing scenarios and requirements of CSNS;

• The overall architecture of computing environment based on OpenStack is introduced;

• Some R&D points are mainly demonstrated from the aspects of unified authentication, network, messaging system, etc;

• More advice, suggestion and helps are strongly expected
Thank You!

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CSNS