CSNS Computing Environment Based on OpenStack

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CSNS CHINESE ACADEMY OF SCIENCES

Outline

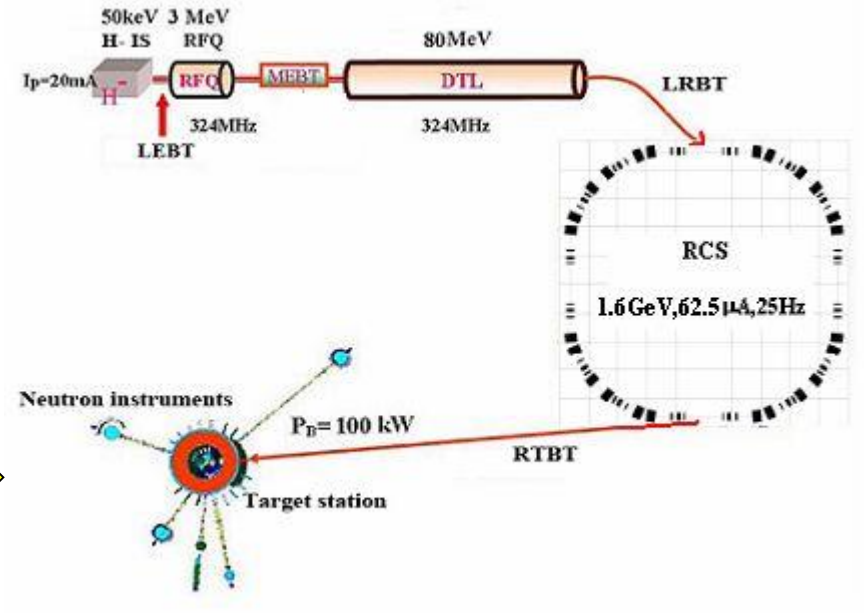
- About CSNS
- Scenarios & Requirements
- Computing Environment based on OpenStack
- R & D
- Summary

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
- Planed for operation in 2018

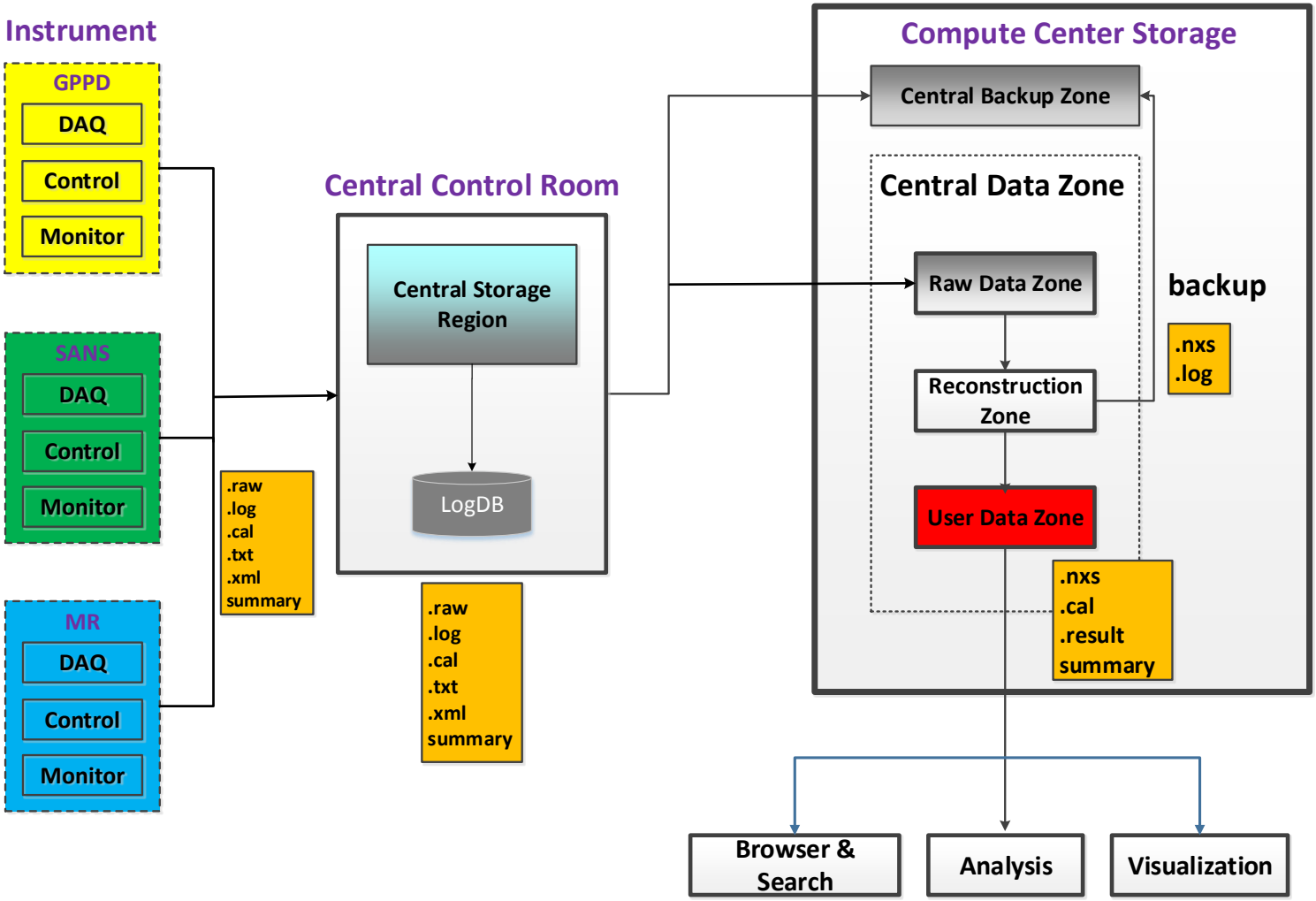
About CSNS

- 80-MeV H^- Linac
- 1.6-GeV proton rapid cycling synchrotron (RCS)
- 25 Hz repetition rate
- tungsten target station
- 3 initial spectrometers



Data Processing

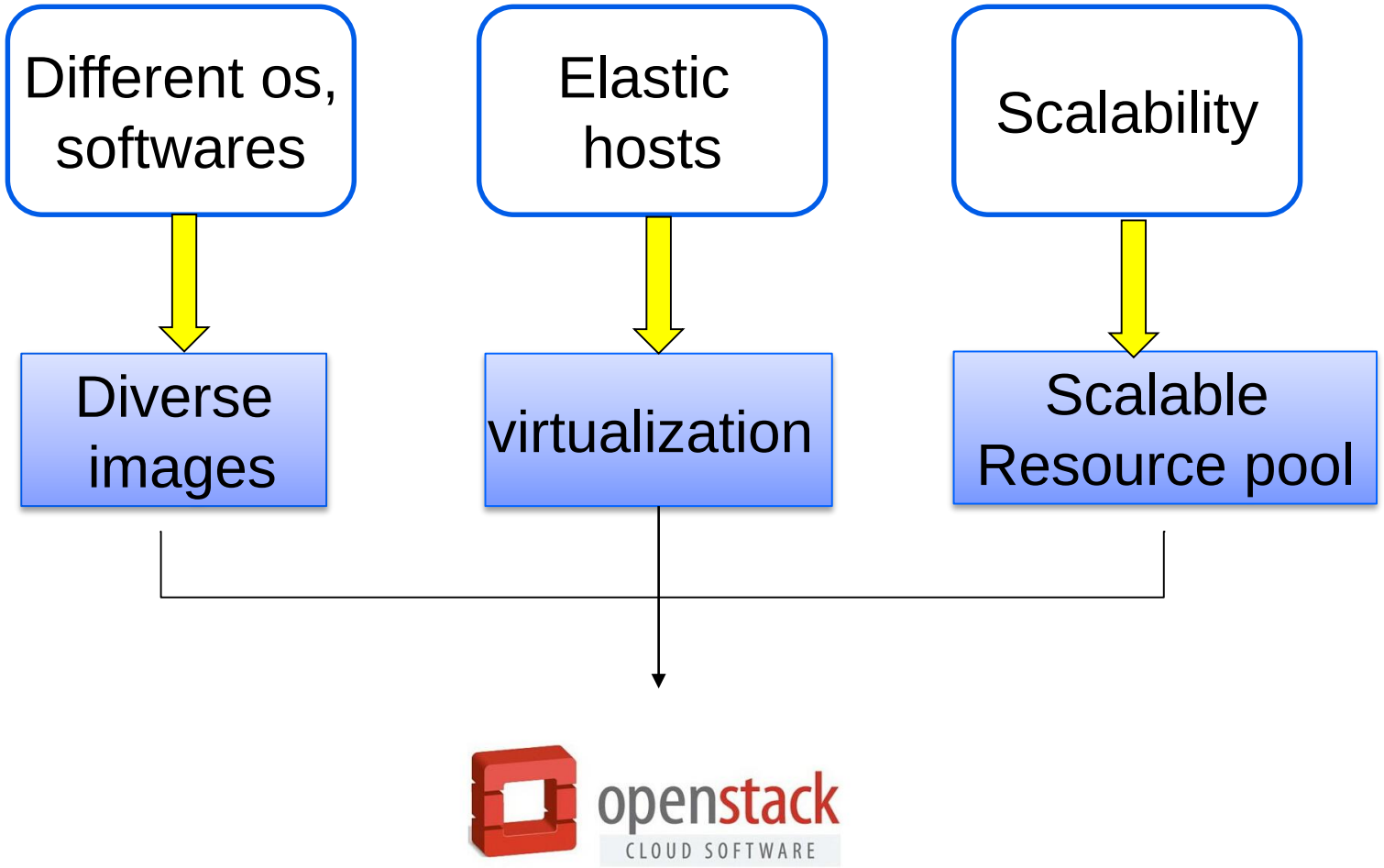
CSNS Data Flow & Storage Policy



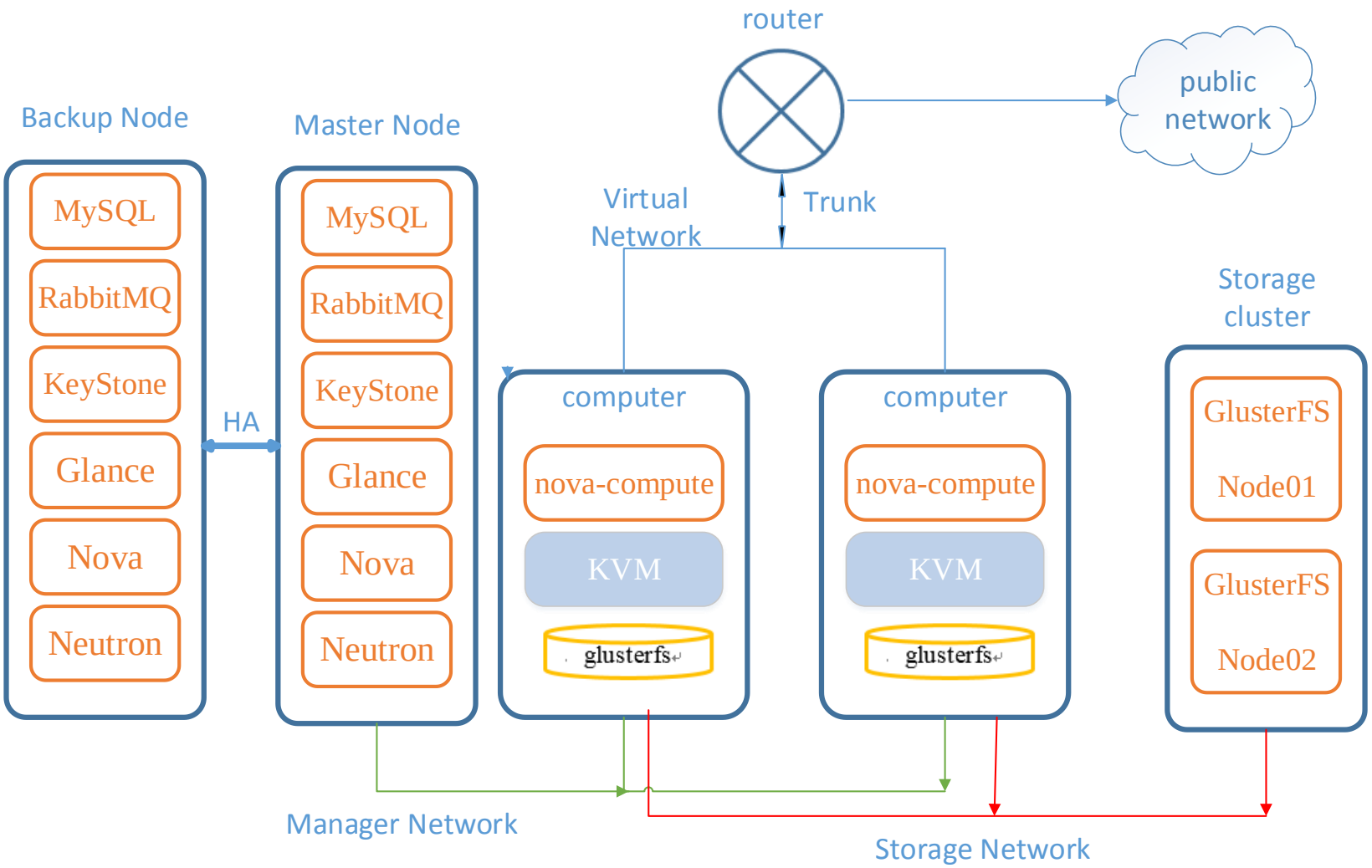
Scenarios & Requirements(1)

Software	• OS(windows & Linux) • Diverse Analysis Softwares
Hardware	• Different Memory requirements • Different CPU requirements
Scalability	• More spectrometers • More data

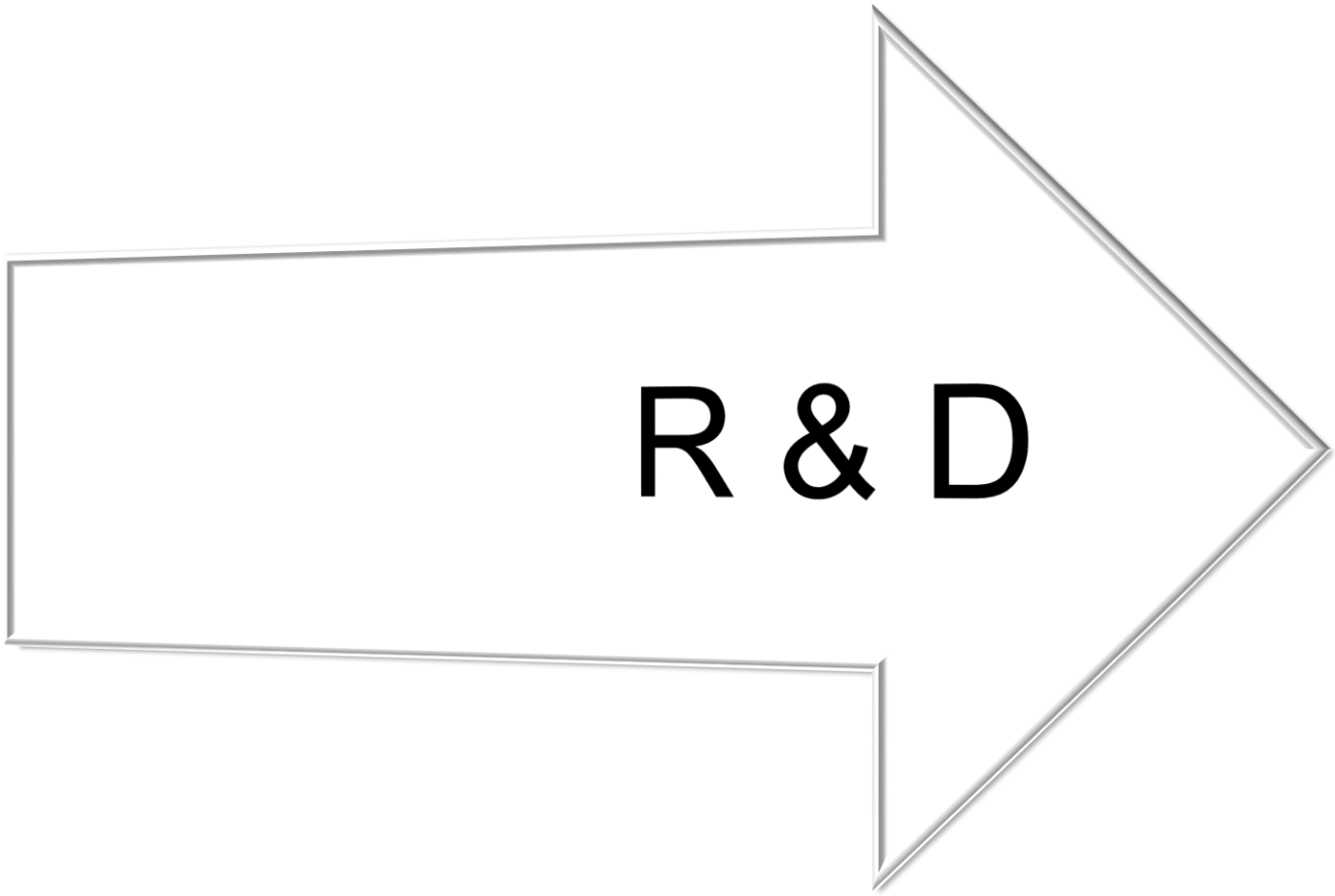
Scenarios & Requirements(2)



Computing Environment based on OpenStack

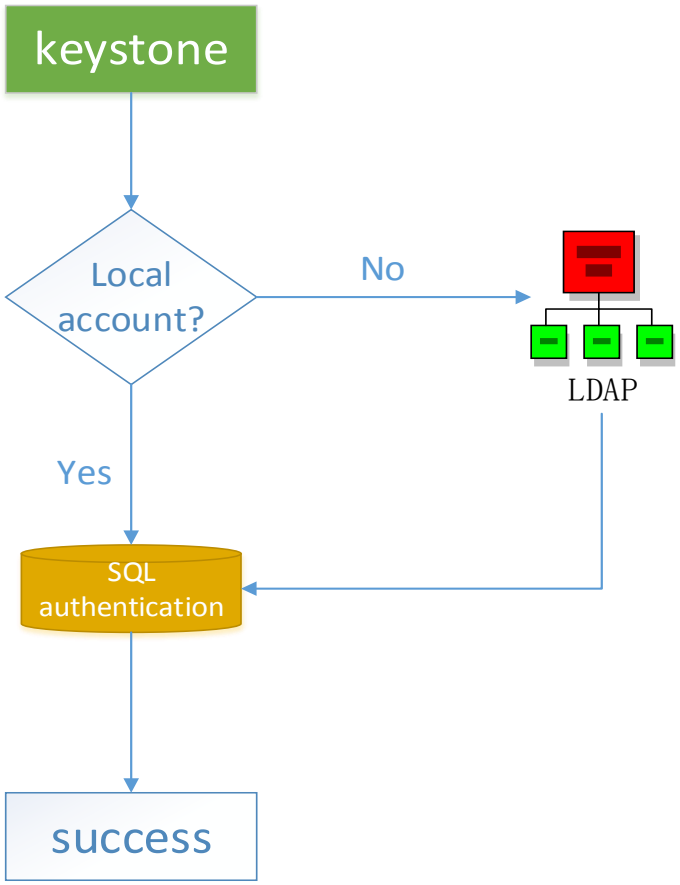


Research and development



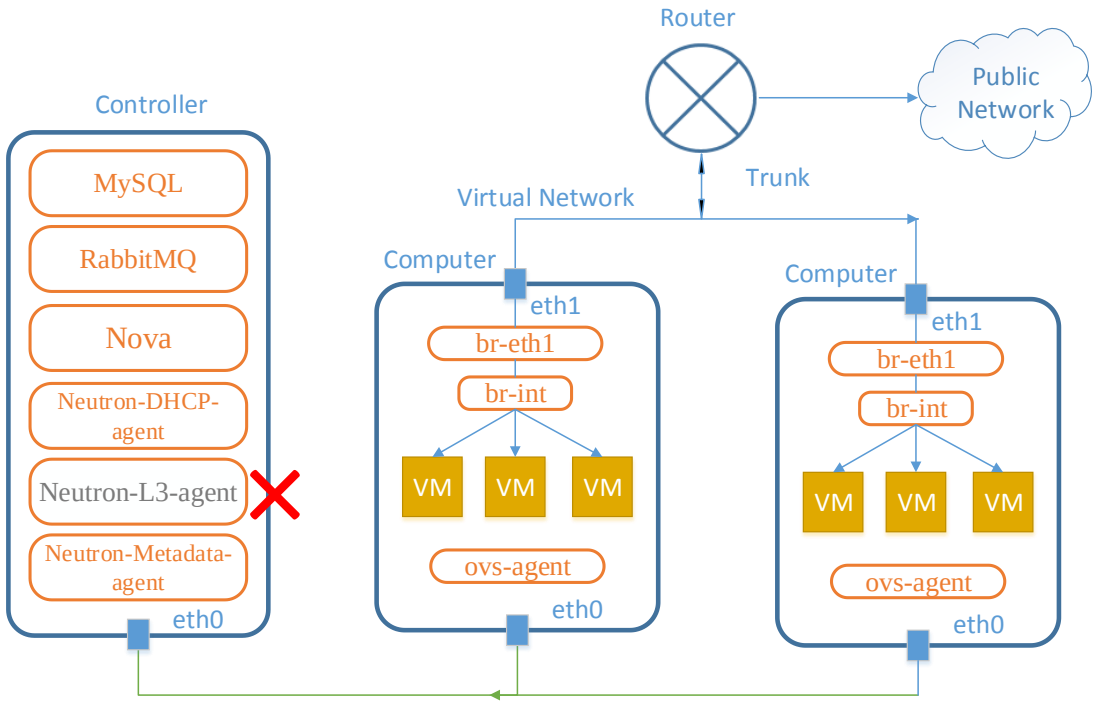
Unified Authentication

- **Existing intergration schema doesn't meet the requirement**
  - All stores in ldap
  - Too much change to ldap
- **Loosely coupled schema**
  - Local user and common user
  - For common users , only username and password are authencated by ldap service
  - Other information will be authenticated and authorized through keystone local DB



Network

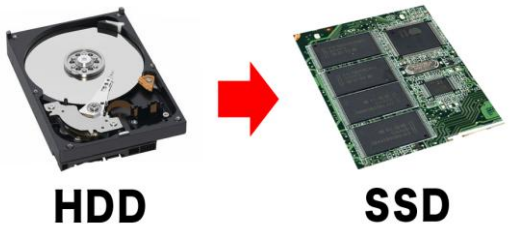
- **Virtual Network**
  - **Disable L3-agent**
  - Replace virtual router with physical gateway
  - VMs directly connecte to the trunk mode switch



- 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**
  - Initialize instances at boot time
  - Set an instance hostname
  - Generate instance ssh private keys
  - Automatically register in puppet , DNS, etc

- **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

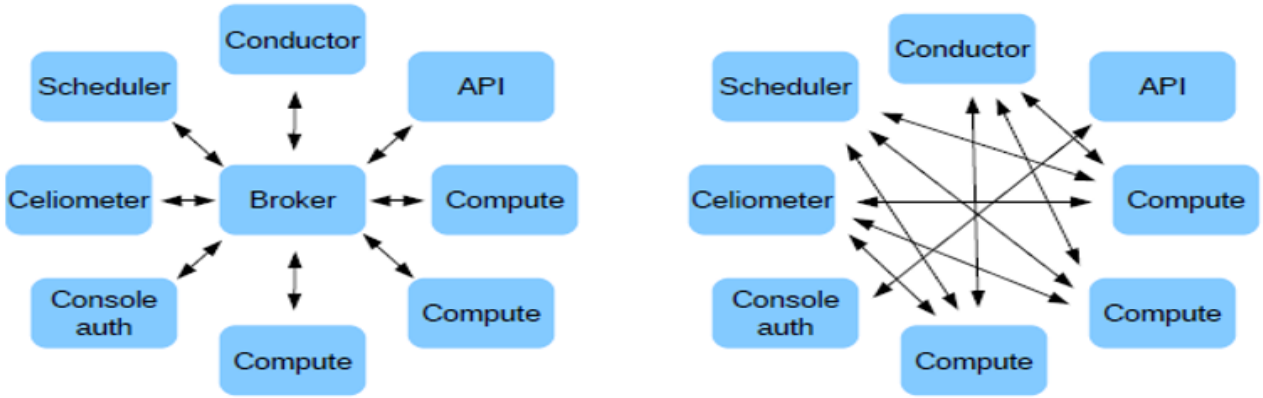
RabbitMQ

How to implement a broker-less architecture for OpenStack RPC

Distributed Messaging System

ZeroMQ is a high performance asynchronous messaging library aimed at used in scalable distributed or concurrent applications.

Distributed Messaging System

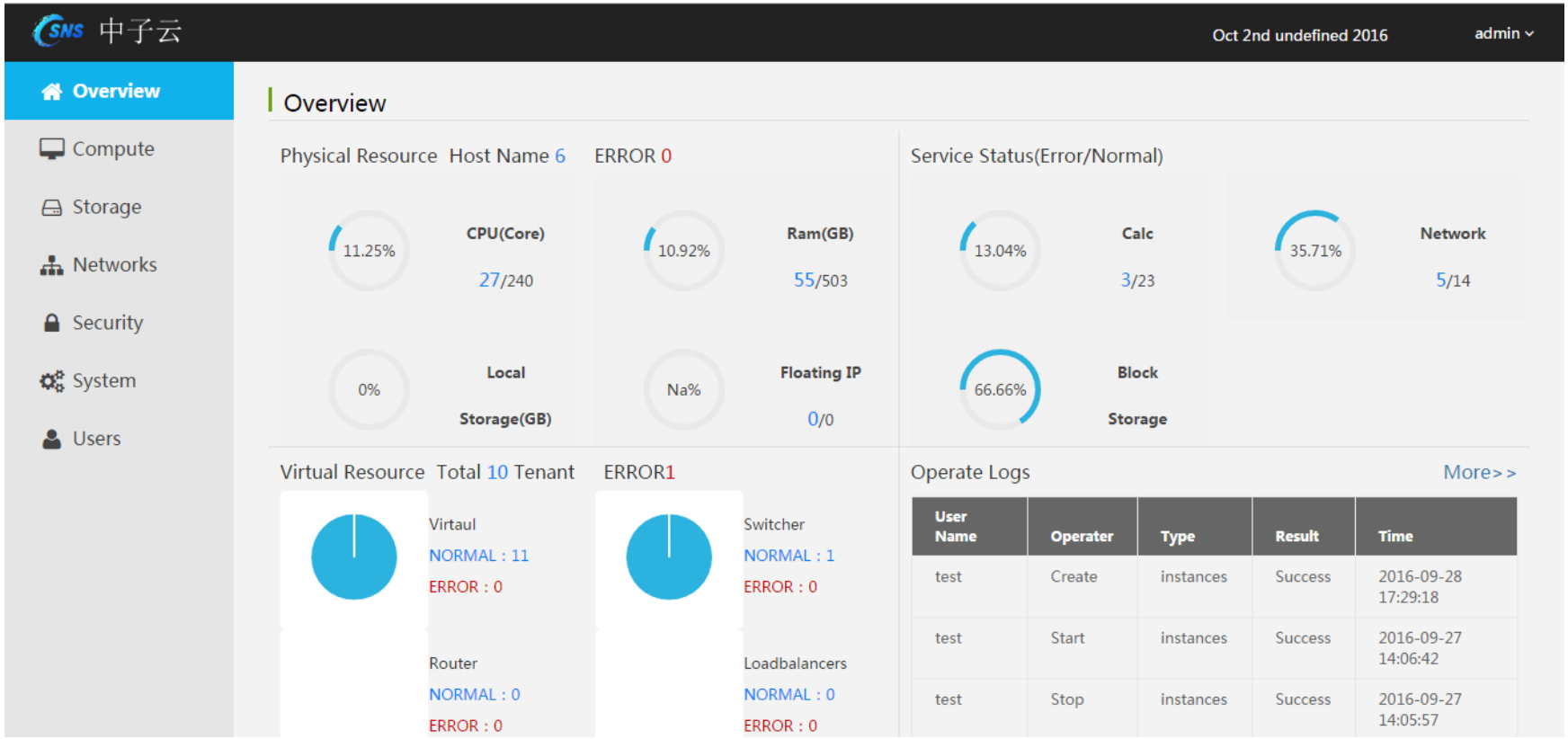


Source: Going brokerless, the transition from qpid to 0mq.

each host needs to listen to a certain TCP port for incoming connections and directly connect to other hosts simultaneously

zeroMQ Receiver running on every component

Dashboard


SNS 中子云
Oct 2nd undefined 2016
admin
Overview
Compute
Storage
Networks
Security
System
Users
Overview
Physical Resource Host Name 6 ERROR 0
11.25%
CPU(Core)
27/240
10.92%
Ram(GB)
55/503
0%
Local Storage(GB)
Na%
Floating IP
0/0
Service Status(Error/Normal)
13.04%
Calc
3/23
35.71%
Network
5/14
66.66%
Block Storage
Virtual Resource Total 10 Tenant ERROR1
Virtaul
NORMAL : 11
ERROR : 0
Switcher
NORMAL : 1
ERROR : 0
Router
NORMAL : 0
ERROR : 0
Loadbalancers
NORMAL : 0
ERROR : 0
Operate Logs
More>>
User Name | Operater | Type | Result | Time
test | Create | instances | Success | 2016-09-28 17:29:18
test | Start | instances | Success | 2016-09-27 14:06:42
test | Stop | instances | Success | 2016-09-27 14:05:57

Dashboard

- **RealTime Notification(polling mode) -> 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

- OpenStack and virtualization technology are good solution according to the computing scenarios and requirements of CSNS;
- Computing environment based on OpenStack is deployed and running well;
- Some R&D points are made from the aspects of unified authentication, network, messaging system, etc;
- More advices, suggestions and helps are strongly expected

Thank You !

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