



Huawei OpenStack Case Study

Introduction

Huawei has pioneered cloud computing solutions such as the virtual desktop infrastructure used by 45,000 Huawei engineers as their day-to-day individual development and productivity environment. With this experience, Huawei was quick to recognize the potential benefits of OpenStack Open Source cloud for both internal and marketplace applications.

Use Case: OpenStack Cloud for R&D

The IT organization supporting Huawei's worldwide R&D maintained a complex of several thousand standalone servers, allocated to discrete engineering and software development projects. Lifecycle management for this R&D server complex can be unpredictable and resource intensive, because by definition, R&D projects differ from one another along many dimensions:

User credentials and security configuration, inside and outside the firewall:

- Deployment timetables for planning, provisioning, and decommissioning
- Full-stack workload requirements, from compute hardware to network
- Predictability of these and other attributes, which vary widely over project lifecycles

Huawei recognized that OpenStack's flexibility and agility could help address the challenge of moving parts and permutations. They asked Mirantis, with its proven pool of deep cloud engineering expertise, to help them design and implement a self-service engineering cloud based on OpenStack.

Project Objectives

Working with Mirantis, Huawei set out to build a self-service cloud that allowed engineers to provision, configure, deploy and decommission servers in the cloud without relying on the IT team at every step of the process. It would also allow the IT team better visibility into utilization of the cloud by engineering teams to ensure improved resource utilization.

The goals of the project were to build a configuration to improve:

- Setup, configuration, and management process efficiency
- Utilization of compute resources and administrative personnel
- Extensibility and compatibility of common services and resources
- The matching of capabilities to fluid development team requirements
- Security configuration supporting internal and external users.

"Cloud is a core part of our strategy at Huawei, and OpenStack takes the economies of cloud to the next level, said Haiying Wang, Head of Big Data IT Solutions at Huawei. "By delivering programmable cloud services in open source, OpenStack gives us better flexibility and utilization. Mirantis has the critical combination of skills, expertise, and raw engineering capability we needed to make the most of rapid OpenStack innovation, now and in the future."

Technical Challenges

Based on Huawei requirements, Mirantis specified hardware requirements and a logical deployment architecture of OpenStack components that met these requirements:

- Object storage for large scale BLOBs using OpenStack Swift, integrated with Keystone for authentication
- Integration of OpenStack Keystone with Huawei's existing global authorization service to allow resource access from both internal and external users
- A cloud controller node architecture configured for High Availability (HA).
- Parallel, isolated network address ranges, supporting secure, authenticated access from inside and outside the corporate firewall
- OpenStack Compute (Nova) with a number of pre-configured Ubuntu Images for Huawei-specific use cases.
- Image management with OpenStack Image Service (Glance)
- Up to 16:1 guest OS VM density of Ubuntu guests running on a KVM hypervisor

The hardware platform for the cloud was premised on rack-sized pods, each configured to support:

- 18 multi-core blade servers
- 3 trays of disk drives storage totaling 54 TB of JBOD Disk
- a pair of top-of-rack 10G Ethernet switches providing a high-speed interconnect

At capacity, the OpenStack cloud was designed to provide up to 320 VMs in a single rack configuration.

Key elements of cloud design and implementation

Working in close concert with the Huawei team, Mirantis engineers designed and built an OpenStack cloud with the following key elements.

Object storage and authentication service:

Deployment of the Swift object storage infrastructure was essential to simplify storage of critical project files, including design files, data BLOBs, media files, compressed log files, stored images for the Glance service, and more. Because many of Huawei's projects require tight collaboration with different vendors and contractors outside the Huawei firewall, the OpenStack R&D Cloud provides secure access to items in the object store.

To balance access and authentication, Mirantis integrated the Swift object store with the OpenStack Keystone authentication service. Keystone manages access control lists for Swift; it allows an OpenStack client to identify itself as a user, and responds with a token that should be included in any request from this client to cloud services. Services talk to Keystone to identify whether the requested action is permitted; Keystone also works as a service registry, providing users with a list of available service API endpoints upon authentication.

Keystone integration with native authentication

services: In addition to object store access, Mirantis engineers configured the Keystone service to integrate with centralized corporate name spaces for user and identity management. These external identity services included LDAP and Windows Active Directory. This allowed both LDAP and the Active Directory service to be used for user authentication, with endpoints, tokens, tenants, roles and services data stored in the OpenStack cloud controller's state database.

HA for cloud-controller node: Owing to the criticality of the cloud controller to the healthy functioning of the OpenStack Cluster, Mirantis implemented the cloud controller at the heart of the OpenStack by explicitly configuring key services for high availability as appropriate to each service. Key attributes of the cloud controller HA deployment included:

- API services such as nova-api, glance-api, and Keystone were front-ended with a load balancer
- The RabbitMQ server, as message bus across all compute services, was enhanced with a Mirantis-developed patch for the Nova-RPC library implementation to provide failover to a backup RabbitMQ instance
- The MySQL cluster state database was configured for failover and scalability using the MySQL-MMM
- A library of scripts for adding new nodes and reconfiguring unused environments was developed and implemented, and made available as a set of resource templates to engineering teams.

Configuring network addresses to deliver secure multi-tenancy: A key design constraint for the Huawei OpenStack cloud instance was to make it readily available for management and administration to avoid creation of a ‘cloud island’ isolated from Huawei’s general corporate IT infrastructure. A small, but critical component of the approach was to configure the network to meet this need.

Mirantis configured the OpenStack cloud network to deliver the following three capabilities:

- DNS to provide symbolic name access, so that it could be used for any HA services delivering transparent failover

- Full integration of cloud nodes into the corporate network, without compromising inter-tenant isolation within the cloud
- Secure, isolated access to the network for both internal and external parties, especially for items in the object store

Accommodating rapid cycles of change in VM provisioning:

A key virtue of the OpenStack cloud for the Huawei R&D development platform cloud use case was its support for creating and re-using images. Mirantis configured the cloud to use Swift to deliver the Glance image repository, configuring it to support a high frequency cycle of image snapshot, upload, cache and re-provision. This simplifies the process of managing new server configurations, which are constantly introduced, cycled, and set aside for future use or reference in R&D workloads.