SSCloud Introduction

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OUTLINE

Intorduction

SSCloud is an IaaS services based on OpenStack. The purpose of SSCloud is similar to Amazon EC2, to provide a virtual machine leasing service. User can easily get a virtual machine online in five minutes.

Software Stack and System Architecture

Currently, SSCloud is using **OpenStack Liberty**. To provide high available service, SSCloud enable HAProxy and other HA mechanism.
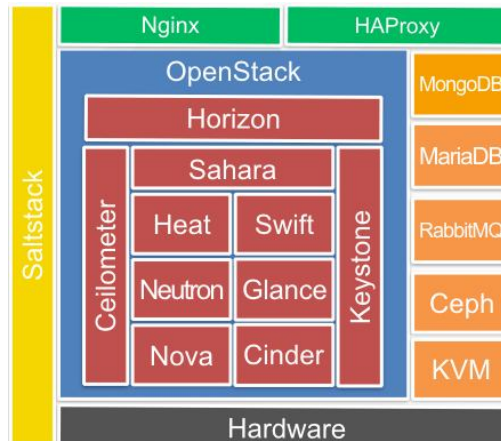

Figure 1 Software Stack
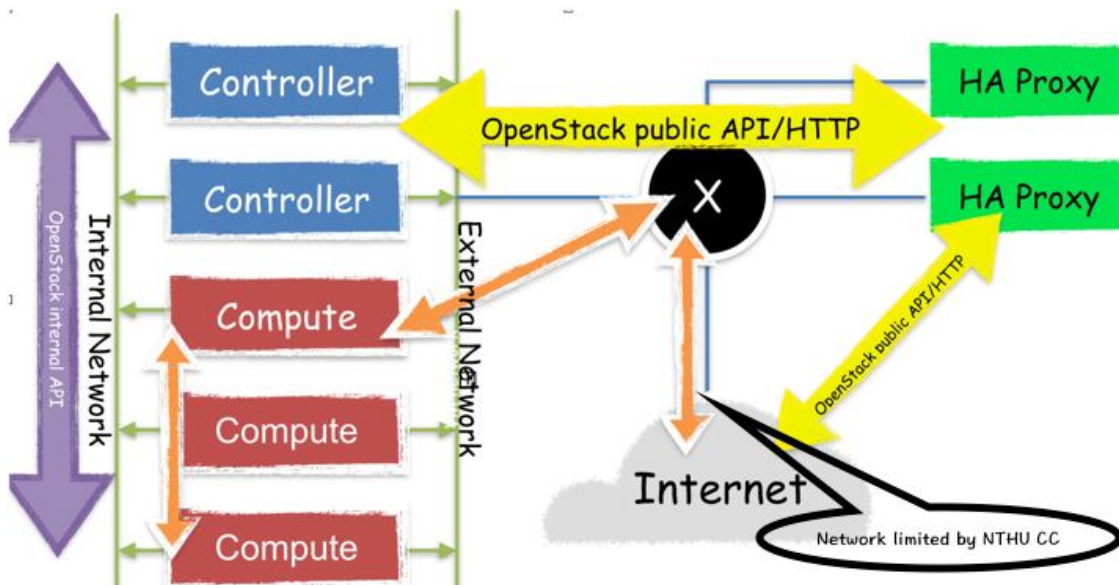
Our system architecture as following:

Figure 2 System Architecture

There is two different physical network:

- External network provides network traffic for instance to Internet or access from Internet to instance. This network is setup with GB Ethernet network.

- Internal network provides instances communication, OpenStack internal API, and data network. This network is setup with Infiniband network.

Features

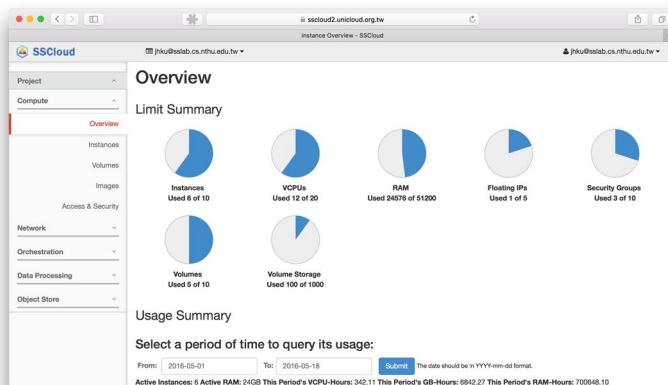- Self-service web portal for VM provisioning and management.

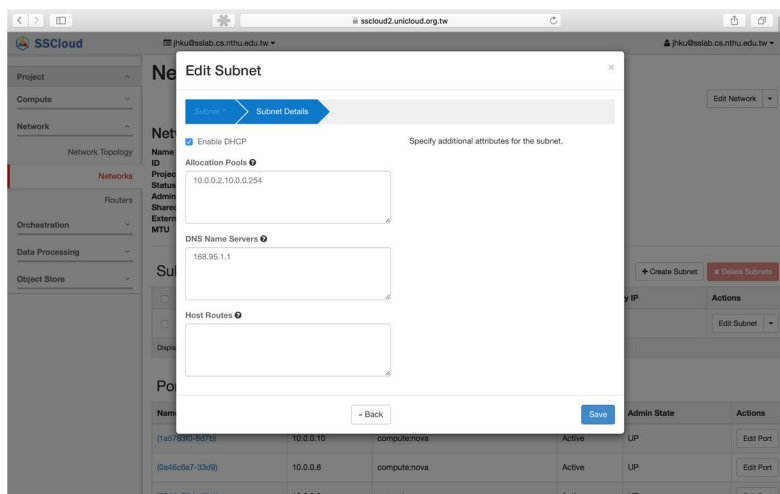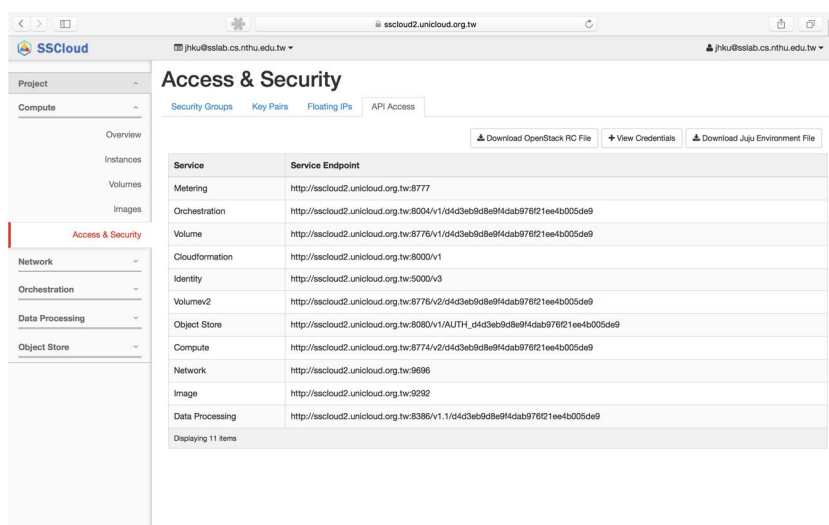**Figure 3 Overview**

- Flexible virtual network configuration.

Figure 4 Edit Subnet

- Provide programmable REST APIs that comply with AWS.
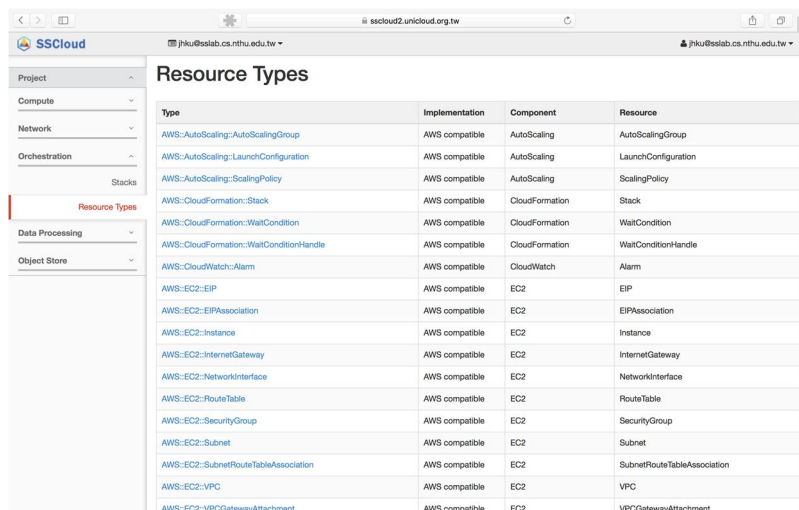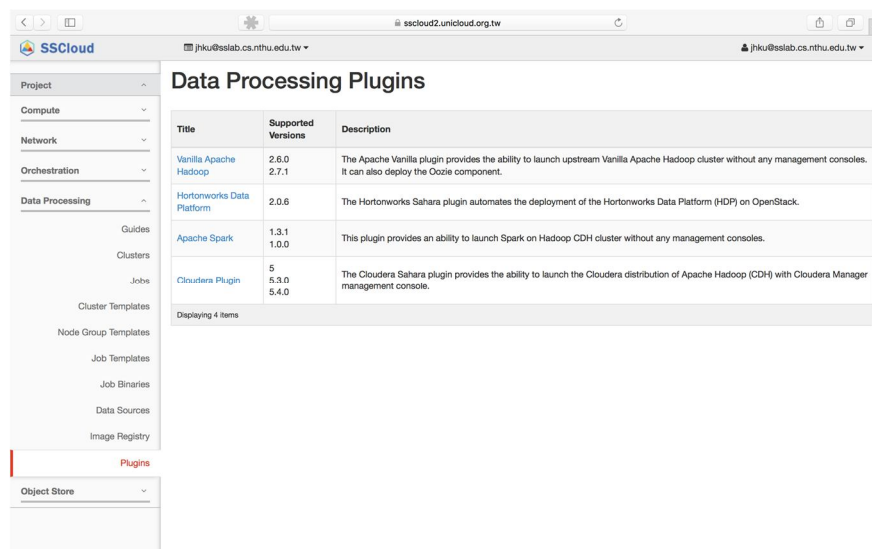

Figure 5 API Access

- A human- and machine-accessible service for managing the entire lifecycle of infrastructure and applications.

Figure 6 Resource Types

- A simple means to provision a data-intensive application cluster (Hadoop or Spark).

Figure 7 Sahara plugin list

- Cloud storage for user to store and retrieve lots of data with a simple API.

Figure 8 Swift Container

Services

SSCloud provide 7 main service: compute, image, network, … , object storage.

Compute

Compute service provide function to manage virtual machine (instances).

Figure 9 Instance List

User can launch instances via web portal or REST APIs.

Figure 10 Create Instance

To access instances, there is two way:

1. Access via Web Console after user login to dashboard.

Figure 11 Web Console

2. Access via SSH with floating IP and SSH key
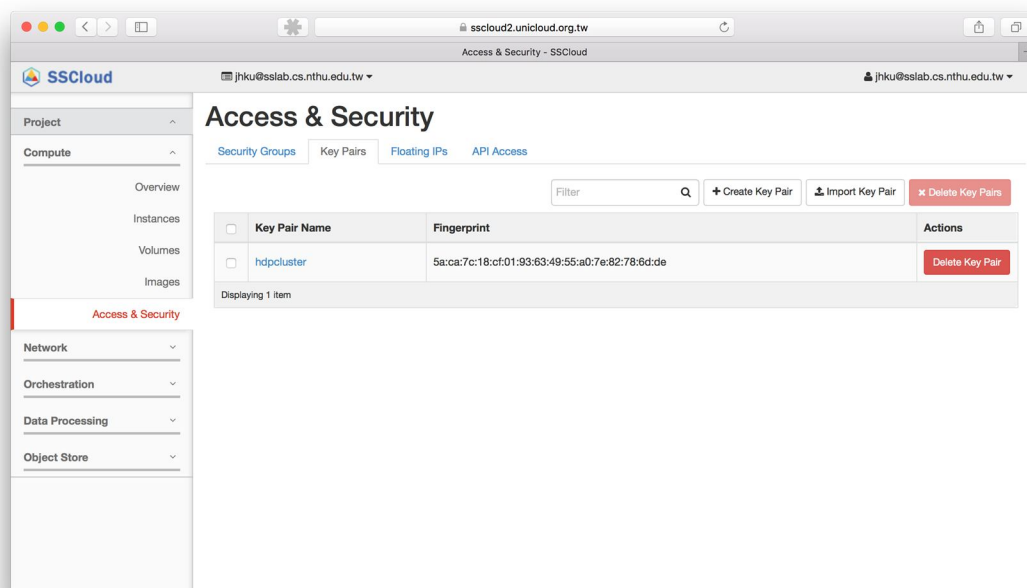
Figure 12 SSH Key

Image

Image service provide operating system for user to create instance.
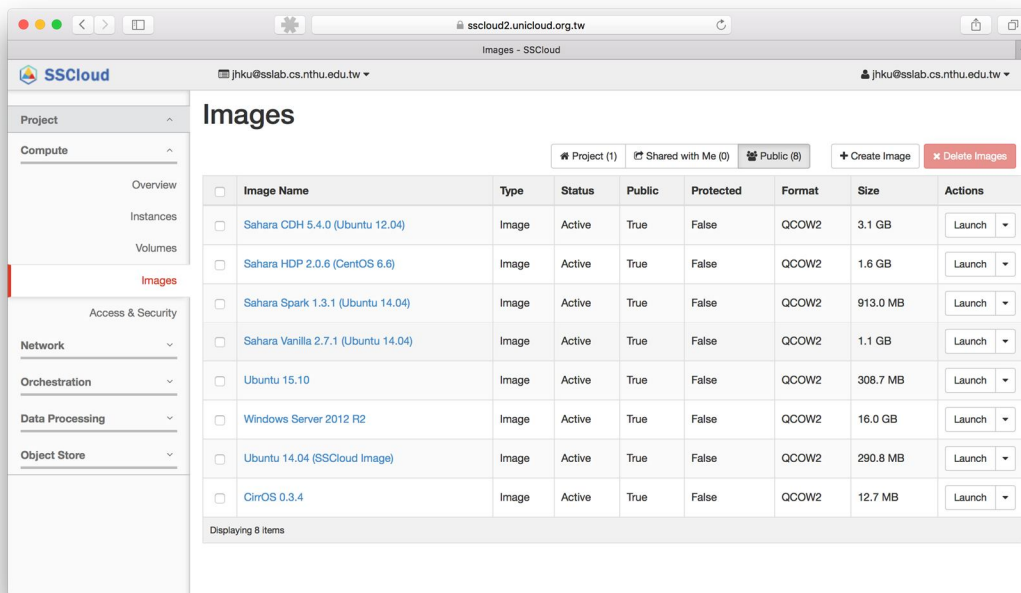
Figure 13 Image List

User can upload own private image or download image from Internet to SSCloud.
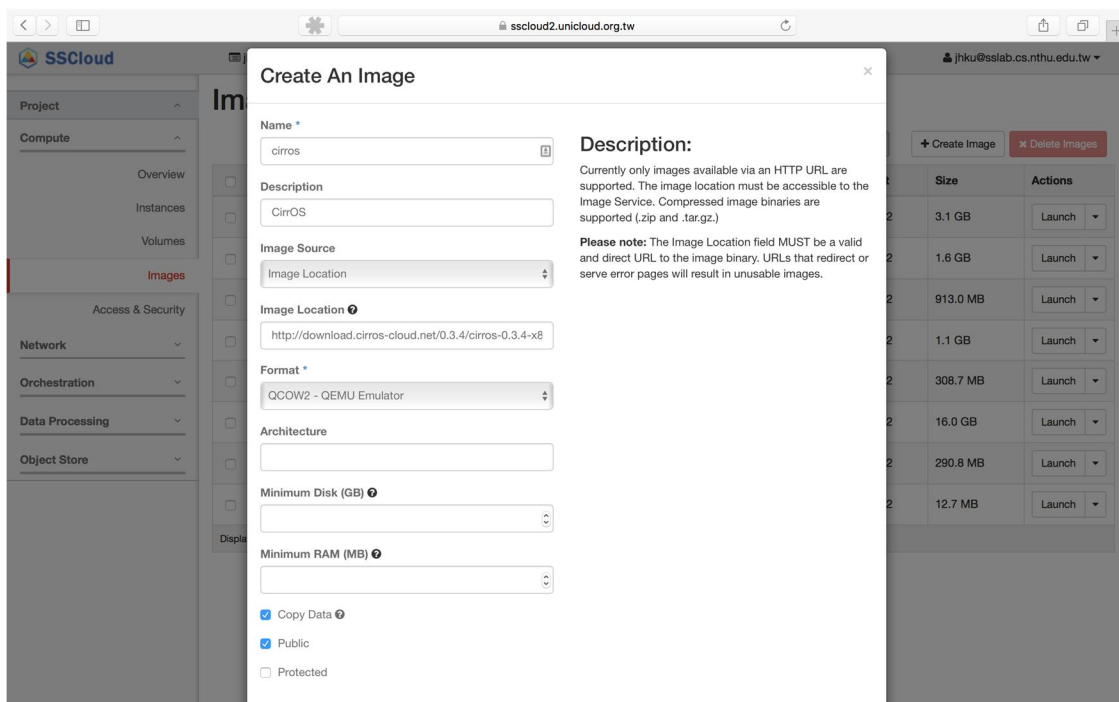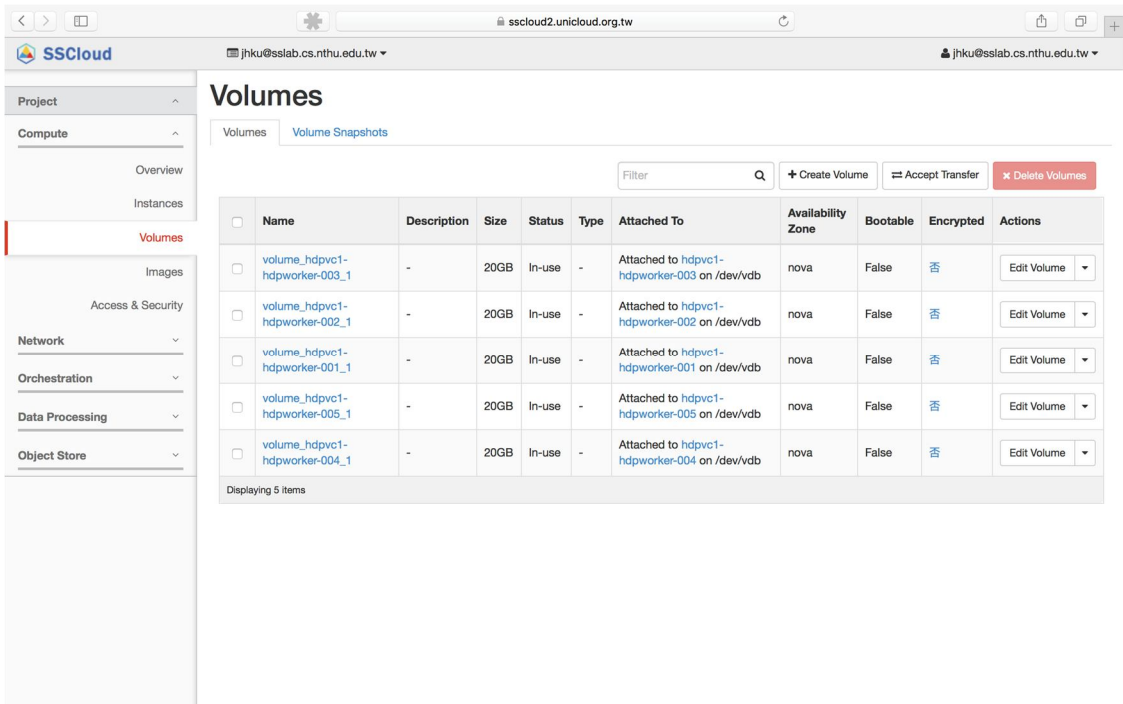
Figure 14 Upload Custom Image

SSCloud support format of image include: **qcow2**(recommands), raw, aki, ami, vmdk, vdi, vhd, ... etc.

Volume

Volume service provide block storage for instance. User can create and attach a large storage to instance.

Figure 15 Volume List

The data stored in block storage will not be removed even instance has been deleted. And it can be re-use in another instance.

User also can use volume as main disk for instance if user want a large space in root disk. **But data will be removed when instance has been deleted by user.**

Network

Network service allow users who like to have their own virtual LANs to manage the network.
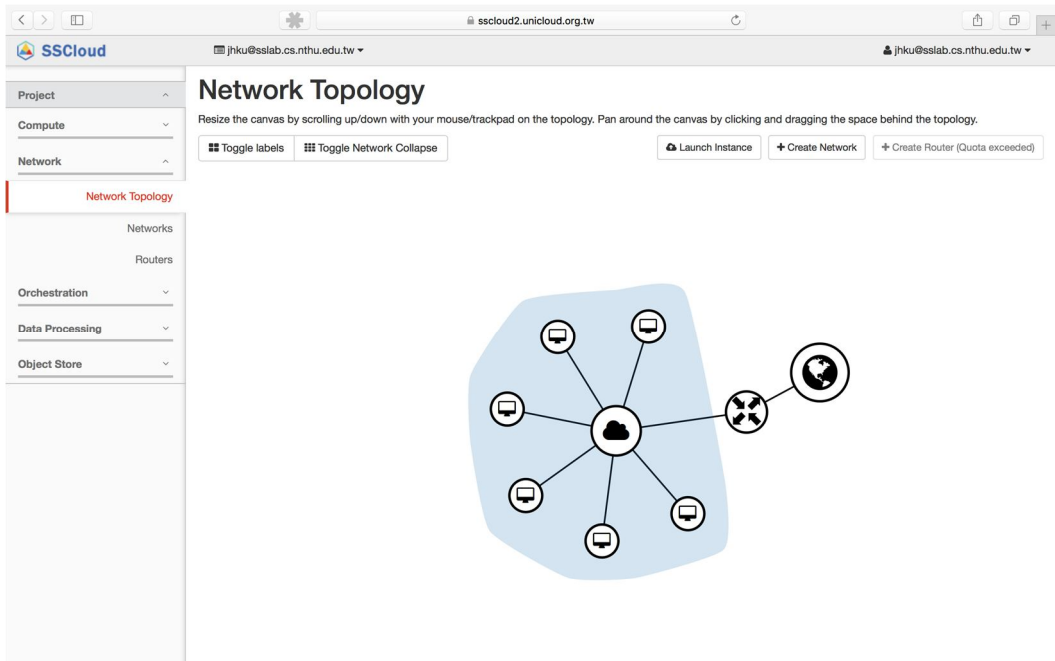
Figure 16 Network Topology

There has firewall function provide by **Security Groups** which can protect instance, Users can limit the access of instance by manage the rule of security groups.
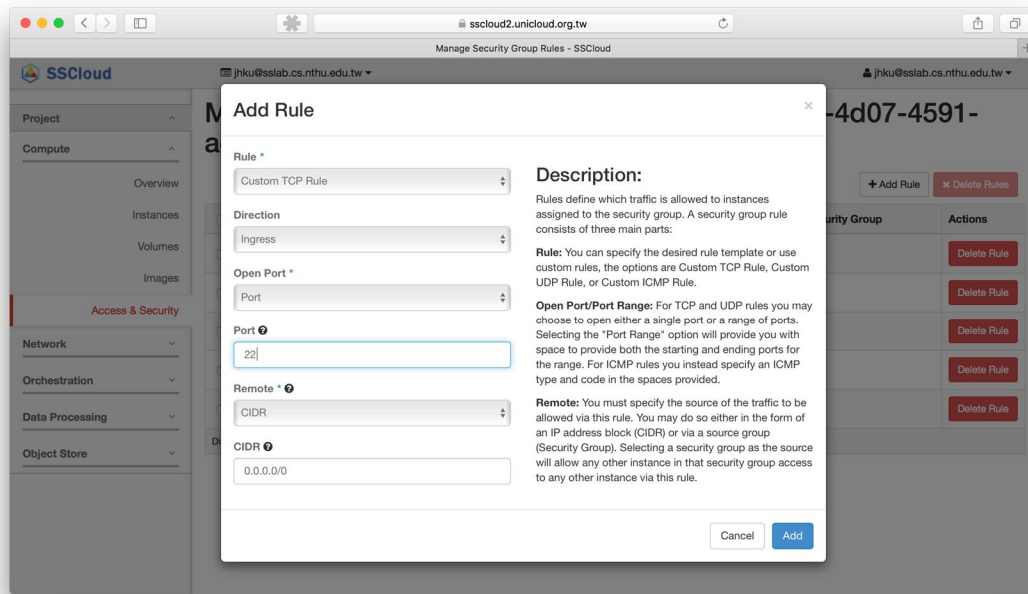
Figure 17 Add Rule for Security Group

Orchestration

Orchestration service is a human- and machine-accessible service for managing the entire lifecycle of infrastructure and applications.
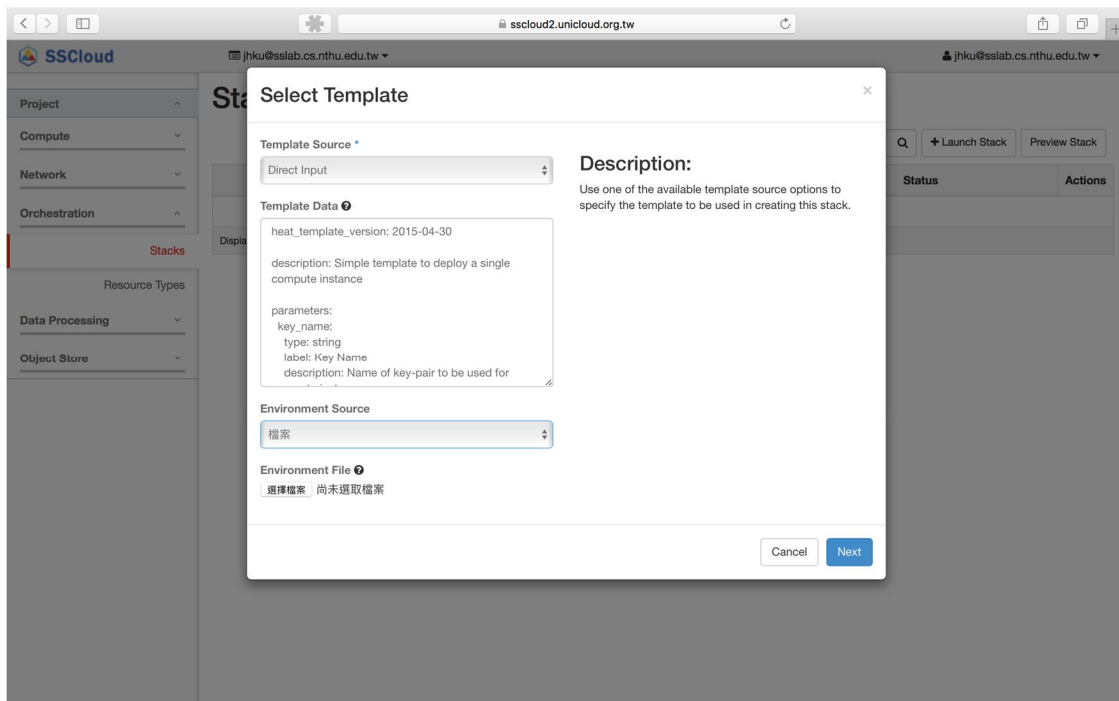
Figure 18 Resource types of Orchestration

Data Processing

Data Processing Service provide a simple means to provision a data-intensive application cluster (Hadoop or Spark).

SSCloud provide four different types cluster:

Title(Plugin name)	Supported Versions	Description
Vanilla Apache Hadoop	● 2.6.0 ● 2.7.1	The Apache Vanilla plugin provides the ability to launch upstream Vanilla Apache Hadoop cluster without any management consoles. It can also deploy the Oozie component.
Hortonworks Data Platform	● 2.0.6	The Hortonworks Sahara plugin automates the deployment of the Hortonworks Data Platform (HDP) on OpenStack.
Apache Spark	● 1.0.1 ● 1.3.0	This plugin provides an ability to launch Spark on Hadoop CDH cluster without any management consoles.
Cloudera Plugin	● 5 ● 5.3.0 ● 5.4.0	The Cloudera Sahara plugin provides the ability to launch the Cloudera distribution of Apache Hadoop (CDH) with Cloudera Manager management console.

Table 1 SSCloud support Sahara plugin

User can define the template of master node or work node.
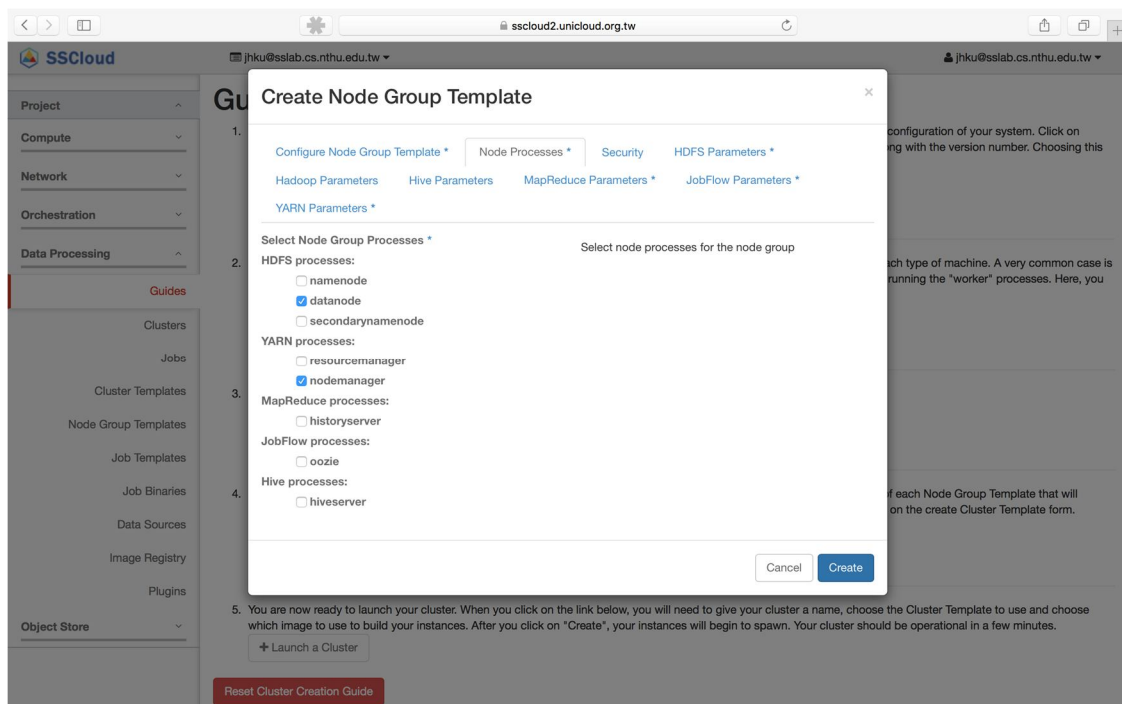
Figure 19 Sahara Node Template

And group those node templates become a cluster template.
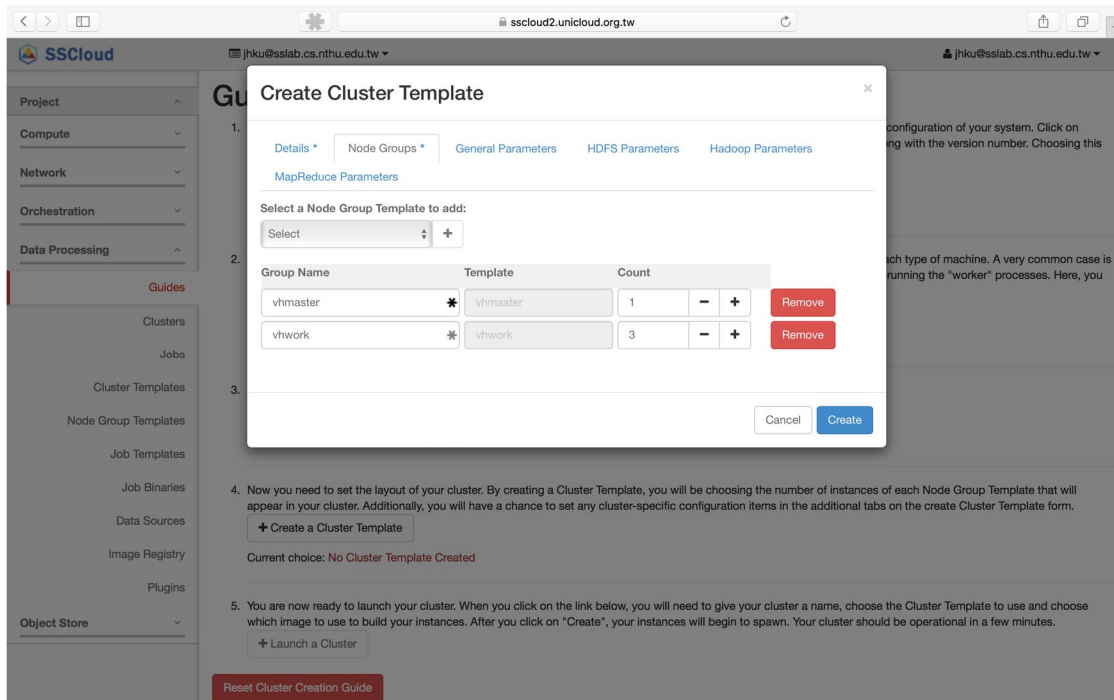
Figure 20 Sahara Cluster Template

There has a guide program provide user can easily create cluster following step by step.
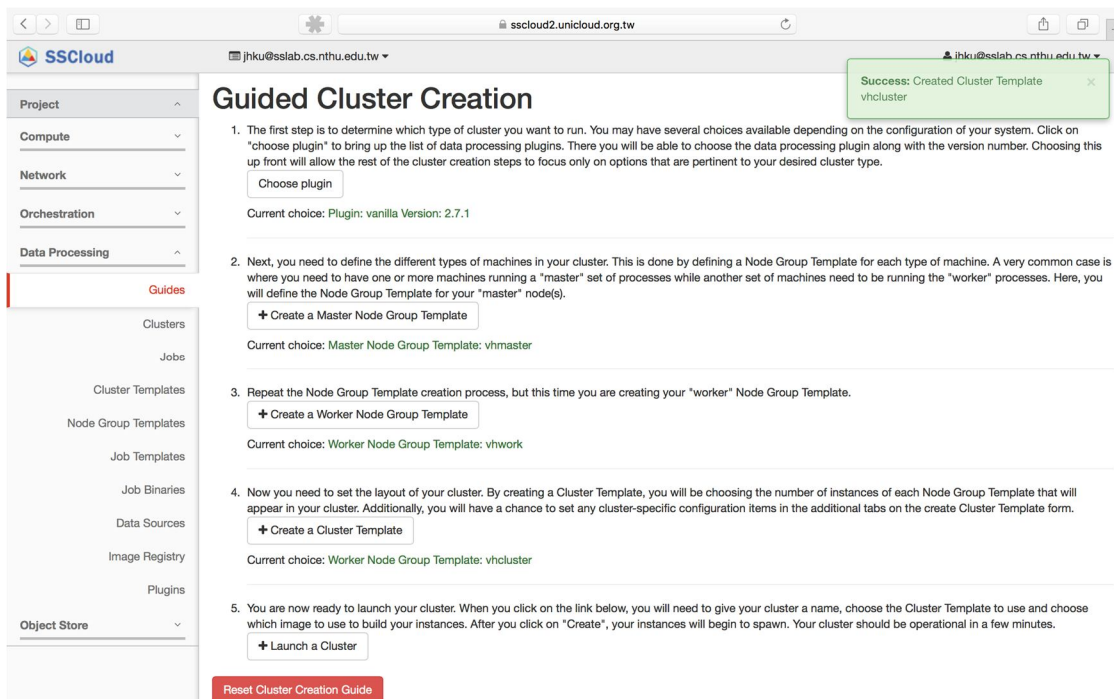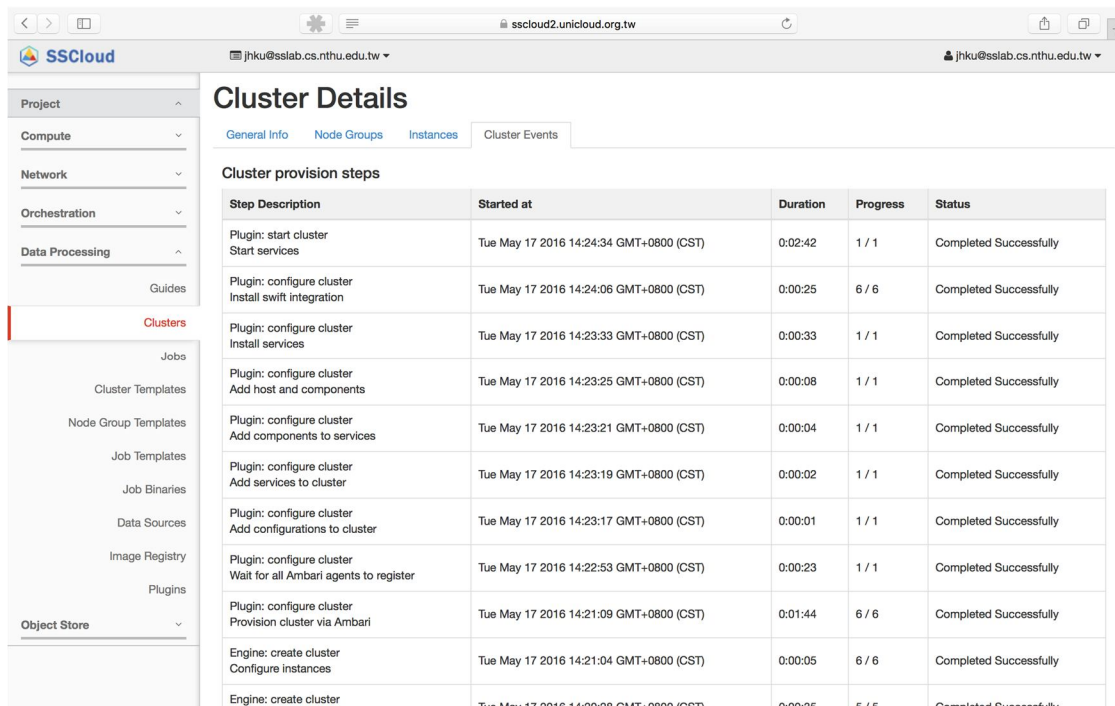
Figure 21 Sahara Guides

While building cluster, user can view the event of cluster

Figure 22 Sahara Cluster Event

User also can use data processing service with job-oriented.

Figure 23 Sahara Job Template

Object Storage

Object Storage Service offer cloud storage for user to store and retrieve lots of data with a simple API.
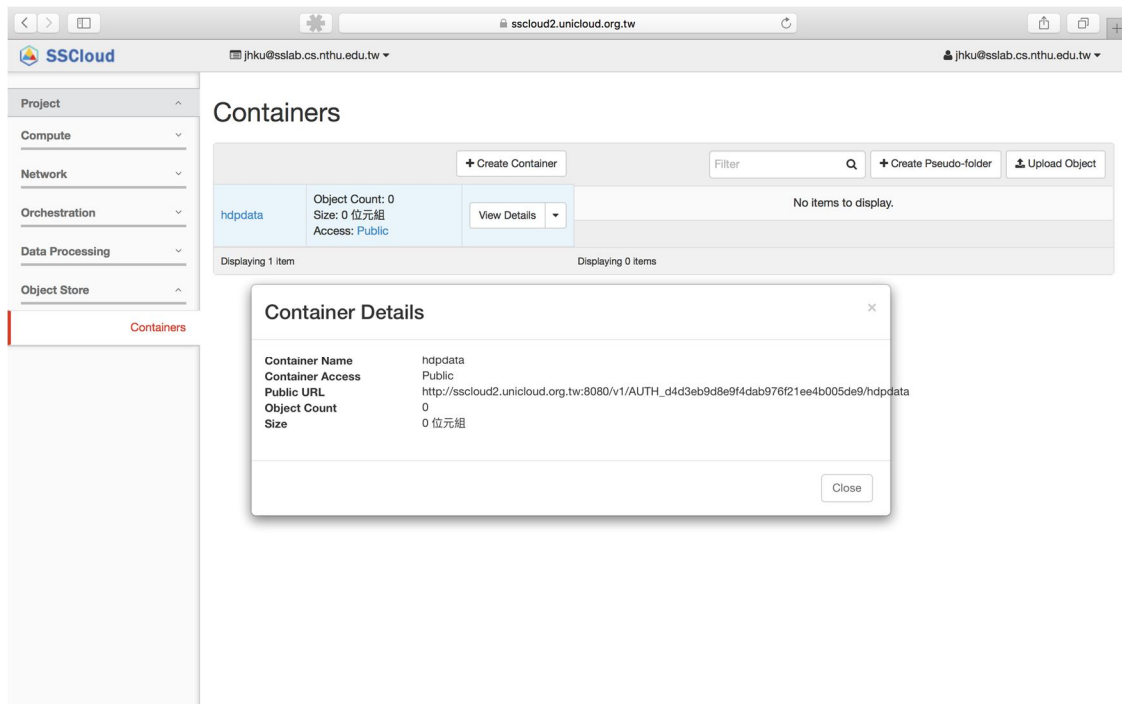
Figure 24 Swift Container

This service is also can provide data source for cluster in Data Processing Service.
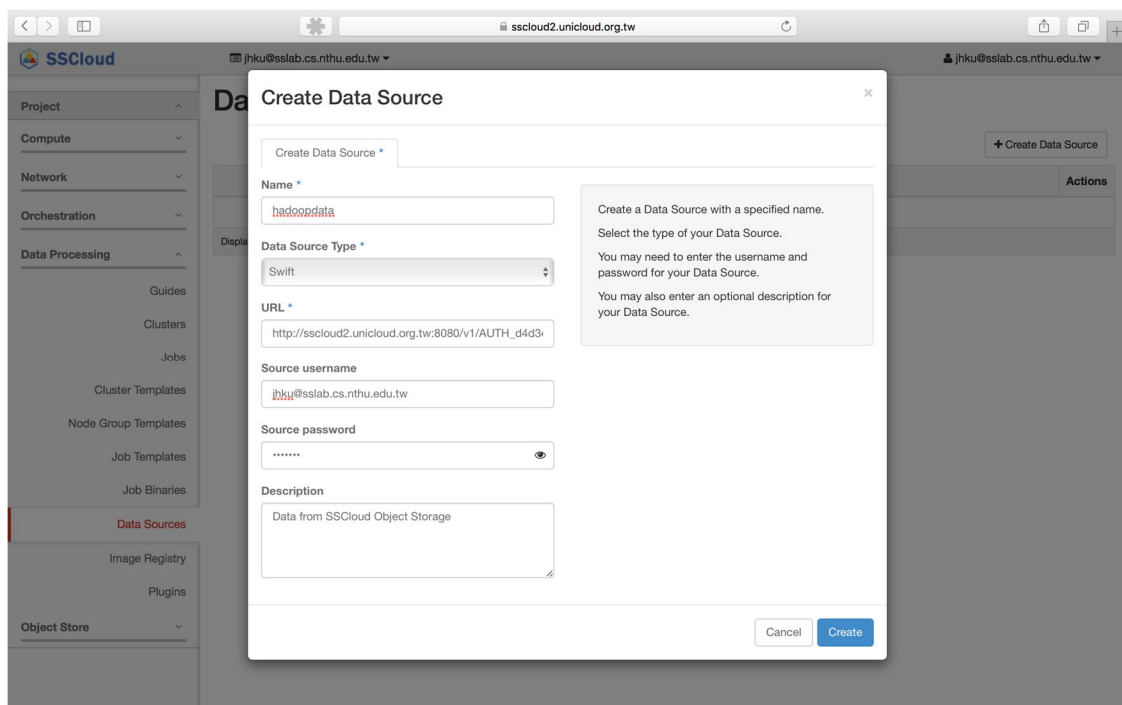
Figure 25 Sahara Data Source

Performance

Network performance

- Benchmark software: **Iperf** (version 2.0.5)

- Transfer size: 10 GBytes

Senario	Time	Bandwidth
VM to VM	70.13 sec	1.23 Gbits/sec
VM to Internet	15.6 min	92.92 Mbits/sec
Internet to VM	16.8 min	85.3 Mbits/sec

Table 2 Network Benchmark

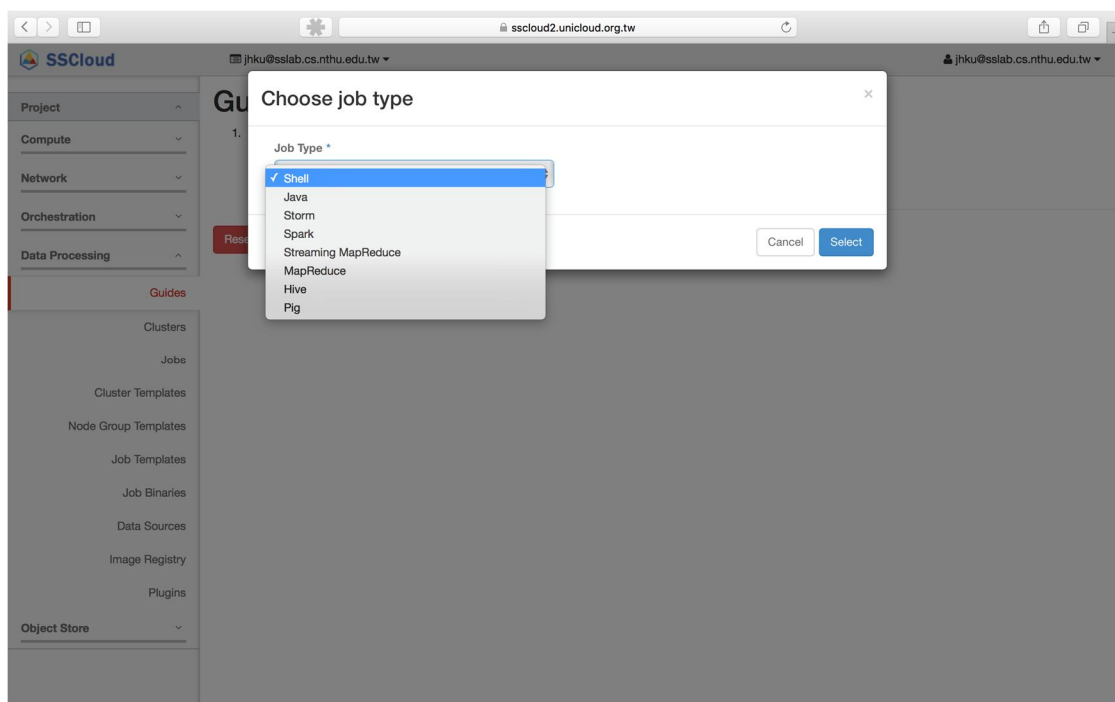There has network bandwidth limited by NTHU Computer and Communication Center, current limit is 100Mbits/sec.

Storage performance

Test target:

- Ephemeral storage (CephFS)

- Block storage (Ceph RBD)

Method 1

- Benchmark software: **Linux DD command**

- Test size: **10 GB** *(parameters: bs=4k, count=2560000, EXT4)*

Item	Ephemeral storage	Block storage
Time	70.7 sec	172.8 sec
Bandwidth	148 MB/s	60.9 MB/s

Table 3 Storage Bechmark (1)

Method 2

- Benchmark software: **FIO** (test IOPS)

- Read/Write block size: 128k

Item	Ephemeral storage	Block storage
Read (IOPS)	5857	1510
Write (IOPS)	2962	364

Table 4 Storage Benchmark (2)

Resources and Quota

Hardware Resources

There is 16 nodes provide SSCloud service, the hardware resource of each node:

Item	Resource
CPU	Intel(R) Xeon(R) CPU X5670 2.93GHz * 24 cores
Memory	96GB
Network	GB Ethernet * 1, Infiniband *1	

Table 5 Hardware Resource

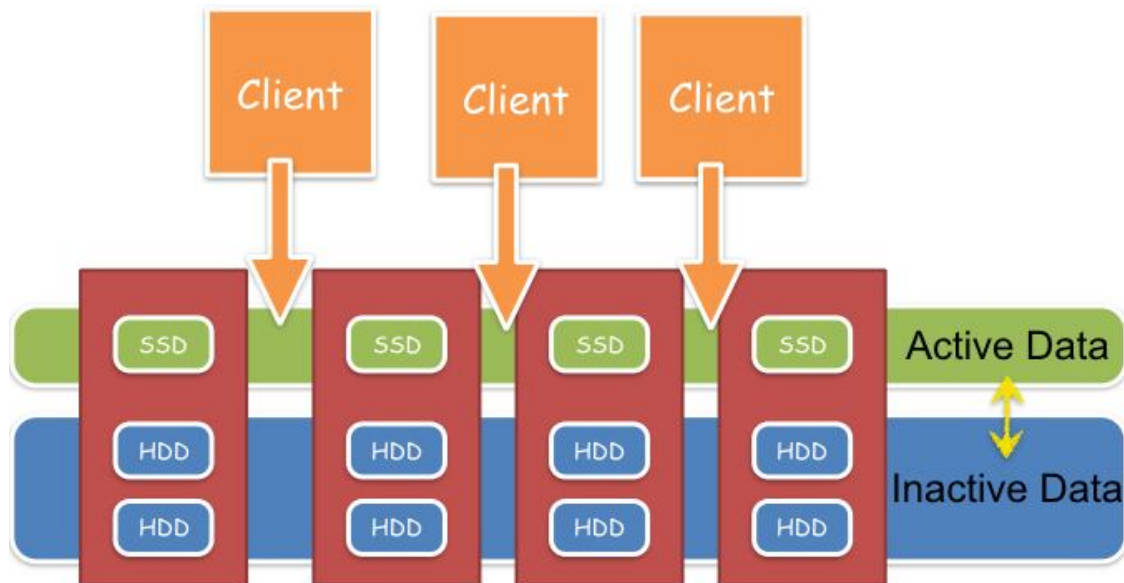The storage of SSCloud is SSD-HDD hybrid, provide by Ceph Storage System.

Figure 26 SSCloud Hybrid Storage

User Quota

Item	Education User	Enterprise User
CPU cores	20	120
Memory	10 GB	240 GB
Instances	10	No limited
Data storage	1 TB	5TB
Public IP	0	1

Table 6 User Quota

How to access SSCloud

There three ways to access SSCloud:

1. Web dashboard (https://sscloud2.unicloud.org.tw)

2. REST APIs

3. OpenStack client program (https://wiki.openstack.org/wiki/OpenStackClients#OpenStack_Clients)

Web dashboard is recommended for normal user. But user also can access REST APIs or using OpenStack client program for programming or command line job.