



Cloud Design and Deployment on Intel® Xeon® Processor-based Platforms

Huawei SingleCLOUD*



Intel® Xeon® Processor 5500 Series
Intel® Xeon® Processor 5600 Series



AUDIENCE AND PURPOSE

Huawei SingleCLOUD* solution is designed for the cloud computing data centers of Cloud Service Providers and Enterprise Customers. Based on the SingleCLOUD solution, Cloud Service Providers construct network-based office environment which providing “pay as you go” server and storage services for enterprises, especially small and medium enterprises.

The Intel Cloud Builders Program offers a platform to show Huawei SingleCLOUD solution optimized on Intel Xeon® processor-based platforms. Huawei provides the entire cloud computing solutions on hardware architecture, virtualization platform, and cloud software platforms. The use cases described in the white paper can be implemented as a base-solution to build more elastic and complex environment of cloud computing. The audience for this paper is Cloud Service Providers or Enterprise Customers; we provide the actual introduction of how to implement a Virtual Desktop Cloud and Service Providers Cloud.

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Executive Summary

Traditional Data Center deployment of IT service requires a set of independent physical equipment. Such a manner resulted in a serious waste of IT resources. Service deployment cycle is long, and operation & management cost of servers are high.

Huawei SingleCLOUD* solution is a layered architecture. Through the virtualization, distributed storage, and cluster technologies, the devices on the physical layer and network layer are integrated to provide the storage, computing, and network services to upper-layer services. These services are managed uniformly, which assists carriers to build the data center operational capability. Compared with the traditional data center, Huawei SingleCLOUD solution has the following features:

- Quick service deployment
- High security and reliability
- Environmental Protection^[1]

Huawei SingleCLOUD solution provides the following services:

Virtual Desktop Cloud

The virtual desktop cloud service provides office environment of network computers. With the virtual desktop cloud service, IT resources are allocated uniformly to employees, which facilitate the information security management and reduce the IT resource costs.

The traditional office environment requires that one or more physical computers are provided for each

employee. When planning your deployments, optimizing use of IT resources is essential. This mode is not conducive to the information security management and demand changes due to employee's location or position changes.

The SingleCLOUD solution applies the virtualization technology, which divides a physical server to multiple computers virtually. It provides a unified management on the physical servers and network devices. Based on the requirements, different virtual computers can be provided for employees. During the business trip or in the non-office area, employees can do business normally by accessing the virtual desktop cloud.

Virtual Private Server (VPS)

The VPS service enables the carrier to provide leased server services to enterprises to help them meet increased business demand and reduce upfront server infrastructure cost.

During the early days of the enterprises using the VPS service, they do not need to focus on the underlying issues such as server infrastructure construction. They can apply for the virtual servers based on actual situation. The carriers distribute the corresponding VPSs to the enterprises. Then, the enterprises can focus on their business, thus reducing the costs on server construction, achieving business expansion, and gaining revenues. The VPN is applicable to enterprises such as continuous integration and remote game rendering.

The enterprises do not need to focus on the server maintenance, which reduces the costs of human resources and also ensures the server QoS. If server resources are required to increase or decrease due to service changes, enterprises can directly apply for the server resources from the carriers.

Online Virtual Storage Cloud

The online virtual storage cloud enables carriers to provide storage rental service for enterprises. The online virtual storage cloud supports a unified storage and backup of enterprise data. The storage capacity can be distributed based on actual requirements.

Intel® Xeon® processor 5600 series automatically regulates power consumption and intelligently adjusts server performance according to application demand, maximizing both energy cost savings and performance.

The secret to this surprising combination is Intel's new 32nm micro-architecture. Featuring Intel® Intelligent Power Technology, it reduces energy cost over single core servers by automatically shifting the CPU and memory into the lowest available power state, while Intel® Turbo Boost Technology intelligently adjusts performance to application needs.

In addition, built-in hardware-assisted virtualization technology with Intel® Virtualization Technology FlexMigration (Intel® VT FlexMigration) gives you the power and flexibility to virtualizes different generations of

Intel® Xeon® processor-based servers within the same virtualization pool, giving you the ability to migrate

workloads to fewer servers at night to save energy.^[2]

Introduction

As a leading telecom solutions provider, Huawei provides end-to-end advantages in Telecom Network Infrastructure, Application & Software, Professional Services and Devices. Based on these key abilities, Huawei SingleCLOUD solutions construct the complete cloud computing platform to help you and your business benefit from cloud computing.^[3]

Here we list the basic functions by using Huawei SingleCLOUD solutions:

Quick Service Deployment and Flexible Capacity Expansion

Service deployment: With the cloud computing IT resource dynamic allocation technology, the cloud computing data center allocates server resources to deploy services. In this manner, the enterprises reduce the physical service deployment time and achieve quick service deployment.

Flexible capacity expansion: The capacity expansion is convenient. The capacity is not restricted by the storage capacity of individual hardware. Enterprises can directly apply for the resources from the cloud computing data center.

Fast and Customized Rental Services

Internet Service Provider (ISP) or Information Content Provider (ICP) provides elastic computing service and

cloud storage service to enterprises based on the requirements. Multiple resource and traffic charging modes greatly facilitate enterprises.

Authority and Domain Based Management

Based on the domain, role, and authority, carriers provide the authority and domain based management function and automation management function, which improves the OM efficiency.

Enhanced Cloud Security Scheme

With the enhanced basic security capability, various network security protection modes, various service security protection modes, the network and information security is ensured.

- Basic security capability: including operating system reinforcement, patch, anti-virus, and web security.
- Network security protection: including network isolation, anti-attacking, traffic clean, and transmission security.
- Service security protection: including virtual machine security group and service access interface authentication.

Different Levels of SLA Assurance

Based on the service requirements of ISP and ICP, different service level agreements are provided.

Unified and Centralized Resource Distribution

With the cluster management software, a group of loose integrated hardware can be managed uniformly for resource distribution.

Unified resource distribution: The load is automatically balanced based on the server load, which improves the data center resource utilization and realizes green energy saving.

Centralized management: The service load is monitored automatically and resources are distributed automatically, which improves the OM efficiency.

Server Virtualization

Server virtualization indicates that physical resources are considered as logic resources. In this way, a server can be regarded as several or hundreds of virtual servers which are isolated from each other. Virtual servers are not restricted physically. The CPU, Memory, Disk, and I/O can be managed dynamically. Resource pool in this way, the resource utilization is improved, system management is simplified, and power consumption is reduced.

Real-time Monitoring

The resource usage and device running status are monitored in real time and alarms are reported in time.

High Reliability

The system supports the virtual machine automatic migration, online hardware upgrade, and continuous service in case of physical node failure. The reliability is high.

By monitoring the cluster operation status in real time, when a certain physical node is faulty, the system automatically migrate the virtual machine to other physical nodes, thus ensuring seamless service handover. The system has the following advantages:

- Lower the reliability requirement for the single point hardware by the data center.
- Improve the reliability of the service system and ensure continuous service provisioning.
- Lower the OM costs on the data center.

X86-Based New Service Model

Based on the unified X86 architecture; the minicomputer architecture is migrated to X86 architecture.

The original purchase mode (service providers provide the software and hardware) is changed. The hardware platform is built uniformly and only software is purchased from the service providers.

Multiple service systems share resources, which reduces the number of servers. By planning the service resources, the multiple systems can fully use the resources.

Zero-Touch Maintenance

Maintenance engineers can use the PC to connect to the SingleCLOUD OM network through the Internet. Then, they can manage and maintain the SingleCLOUD OM system through the HTTP, Telnet, and FTP.

Centralized Deployment and Management through Desktop

Through the desktop management function, the virtual desktop is centralized deployed and managed, which improves the efficiency of enterprise IT asset management and maintenance.

Quick Account Opening and Quick Application

The virtual desktop cloud supports quick account opening. After a user applies for the account opening, the administrator can provide a virtual desktop with a certain specification for the user within a few minutes. The user can access the virtual desktop to work by using any terminal.

This function shortens the duration for traditional computer application and device migration.

The user can apply for multiple virtual desktops based on the work requirements. These virtual desktops can be accessed through the same terminal, which greatly improves the work efficiency.

Remote Multi-terminal Access

Because the computing resources and storage resources are stored in the data center and users only exchange data with the data center through the virtual desktops, this architecture enables users in different locations to connect to the data center by using different terminals. In this manner, users can start work remotely after entering the account numbers.

This function breaks the limitation on geographical office locations. Users can flexibly choose the office locations and work time.

Unified Data Management and Assured Information Security

Because the computing resources and storage resources are stored in the data center and users do not save data in the terminals, this architecture can effectively prevent the enterprise information assets from malicious intrusion.

Huawei SingleCLOUD Solution Overview

Huawei SingleCLOUD Solution Offering

Huawei SingleCLOUD solution designed for cloud computing data centers of Cloud Service Providers and Enterprise Customers. Based on the SingleCLOUD solution, Cloud Service Providers can construct network-based office environment and provide server rental and storage rental services for enterprises, especially small and medium enterprises.

Huawei SingleCLOUD Solution Typical Application Scenario

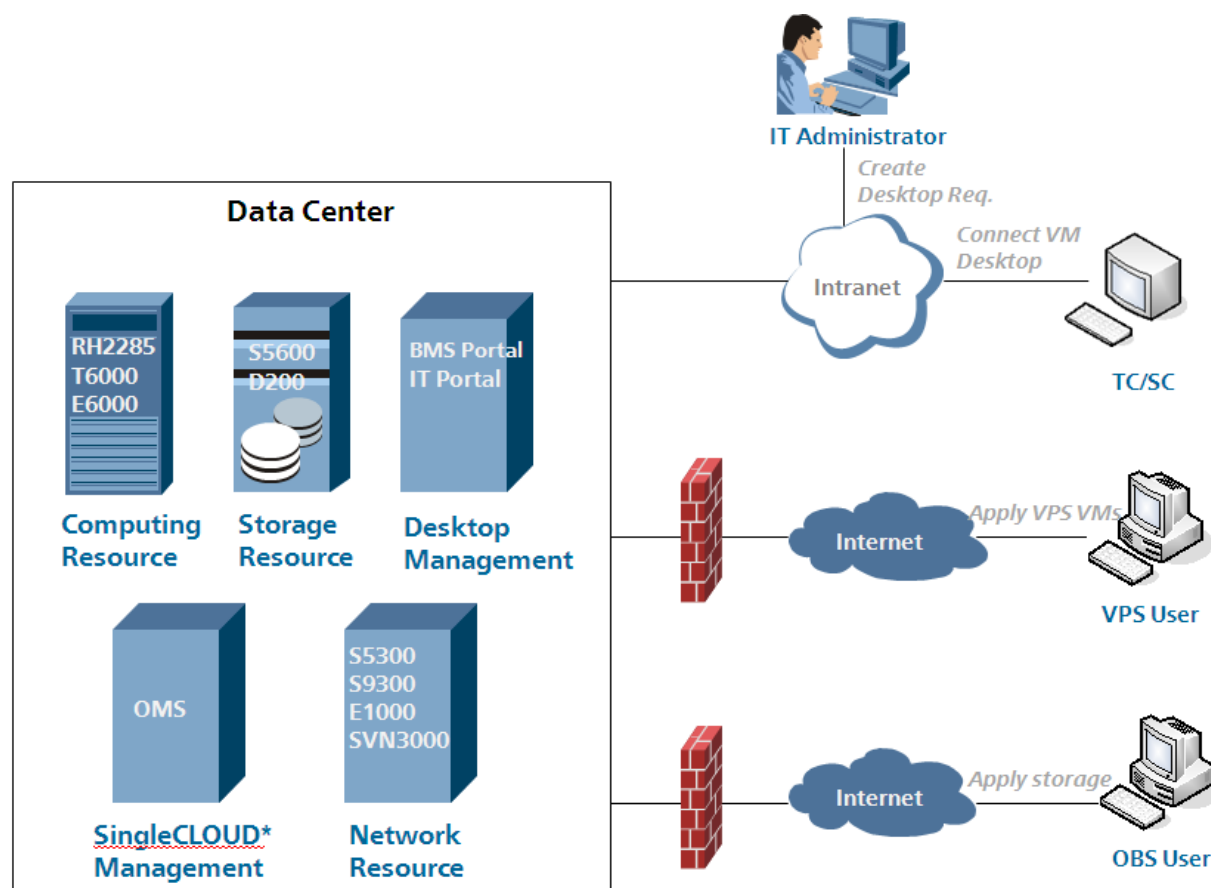


Figure 1-1: Huawei SingleCLOUD Solution Typical Application Scenario

The data center build by Huawei SingleCLOUD solution which shows in Figure 1-1 provides service to different enterprise end users.

The data center in Figure 1-1 provides the SingleCLOUD service to end users.

- IT resource administrator: The IT resource administrator manages the data center.
- Thin Client (TC) terminal: In the virtual desktop scenario, the IT resource administrator creates TC terminal users and allocates virtual computer resources. TC terminal users access the data center through the TC terminals and implement office tasks by using the virtual desktop.
- VPS user: In the VPS service scenario, the enterprise rents servers from the data center.

- Object Storage Service (OBS) user: In the online virtual storage scenario, the OBS user rents storage services from the data center.

Table 1-1 shows the functions which provided by data center in Figure 1-1.

Module	Function
Computing Resource	It provides the computing function for the entire data center.
Storage Resource	It provides the storage function for the entire data center.
Desktop Management	It is used in the virtual desktop scenario and provides the virtual desktop management and access functions.
Cloud Platform Management	It manages and maintains the entire data center.
Network Resource	It provides the network access function for the entire data center, including internal network convergence and external network connection functions.

Table 1-1: Huawei SingleCLOUD Solution provided service in Data Center

Hardware Description

Huawei SingleCLOUD Solution hardware appliance is orderable and flexible in variety configuration sizes to meet different requirement of Cloud Service Providers.

The hardware framework also is orderable and flexible, the typical hardware components of SingleCLOUD solution shows as below Table 1-2:

Hardware Types	Sub-system Name	Available Types	Parameters [△]
Cloud Servers	Management Server	RH2285	Intel® Xeon® Processor 5600*2, Core 2 96GB Memory, 6*GE NICs, 500G*2 SATA
		E6000	10*1 BH620 Blades Intel® Xeon® Processor 5600*2, Core 2 96GB Memory, 6*GE NICs, 600G*2 SAS
		T6000	Intel® Xeon® Processor 5600*2, Core 4 or 6 144GB Memory, 8*GE NICs, 500G*3 SATA
	Computing Server	RH2285	Intel® Xeon® Processor 5600*2, Core 2 96GB Memory, 6*GE NICs, 500G*2 SATA
		E6000	10*1 BH620 Blades Intel® Xeon® Processor 5600*2, Core 2 96GB Memory, 6*GE NICs, 300G*4SAS
		T6000	Intel® Xeon® Processor 5600*2, Core 4 or 6 144GB Memory, 8*GE NICs, 500G*3 SATA
	Storage Server	RH2285	Intel® Xeon® Processor 5600*2, Core 2 96GB Memory, 6*GE NICs, 500G*2 SATA

Hardware Types	Sub-system Name	Available Types	Parameters ^Δ
Cloud Storages	-	S5600	500G*24 SATA HDD, (Option: FC/SSD)
Cloud Network	Core Switch	S9312	-
		S9306	-
	Assemble Switch	S9306	-
		S9303	-
	Access Switch	S5352C-EI	-
		S5328C-EI	-
	Firewall	Eudemon 1000E	-
		Eudemon 8080E	-
	Gateway	SVN3000	-

Table 1-2: Huawei SingleCLOUD typical hardware components

SingleCLOUD Server: RH2285, E6000, T6000

RH2285 Server is a 2U server product which design by Huawei; it can be used for management, computing and storage server, the detail technical parameters as below:

- Intel® Xeon® Processor 5600*2(Core 2), 8G*12=96GB memory 6*GE NICs, 500G*2 SATA

E6000 Server^[4] is a 8U blade server product which design by Huawei; it can be used for management and computing server, the detail technical parameters as below:

- 10*1 BH620 Blades
- 1 Blade: Intel® Xeon® Processor 5600*2(Core 2), 8G*12=96GB Memory, 6*GE NICs, 600G*2 SAS

T6000 Server is a 2U server product which design by Huawei; it usually used as computing server, the detail technical parameters as below:

- Intel® Xeon® Processor 5600*2(Core 4 or 6), 8G*18=144GB Memory, 6*GE NICs, 500G*3SATA

SingleCLOUD Storage: OceanStor* S5600

OceanStor S5600 Server^[5] is a 4U server product which design by Huawei-Symantec; it can be used for SAN storage server, the detail technical parameters as below:

- 500G*24=12T SATA HDD (Option: /FC/SSD)

Software Description

Huawei SingleCLOUD solution provides powerful, friendly, and easily usage software platform to Cloud Service Provider managing and deploying the IaaS resource.

SingleCLOUD Software Architecture

Huawei SingleCLOUD solution software architecture can be described as below Figure 1-2:

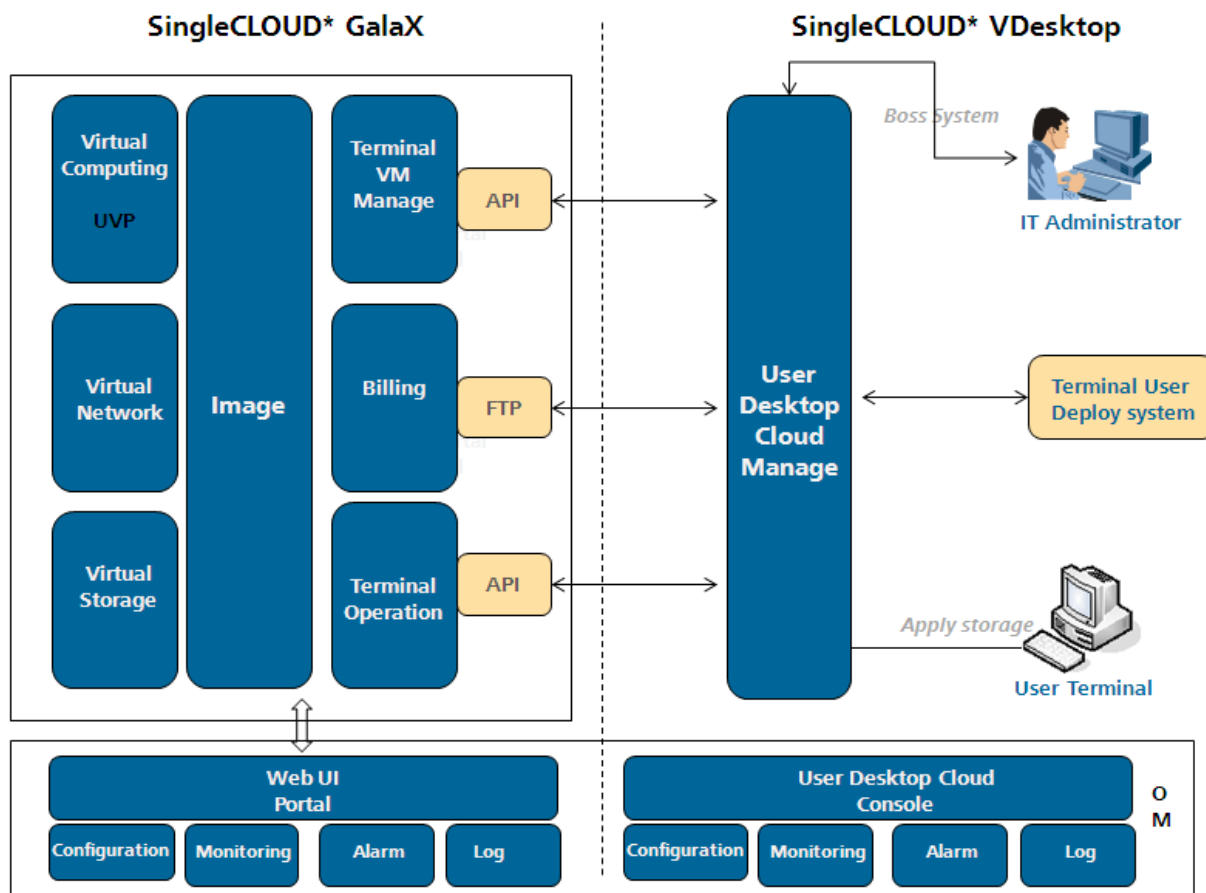


Figure 1-2: Huawei SingleCLOUD Solution Software Architecture

SingleCLOUD Software Components Introduction

The detail introduction of the Huawei SingleCLOUD Solution Software Architecture components as below Table 1-3:

Software Platform	Sub-system	Function
SingleCLOUD GalaX	Virtual Computing	Implement virtual computing function.
	Virtual Network	Implement virtual network function, provide network access ability, and support different networking case.
	Virtual Storage	Implement virtual storage function, provide disk capacity for VMs.
	Image	Implement image management function, includes VM image create, upload, register, and using, the image used by create user VMs.
	Terminal User Manage	Provide API interface to outside, implement terminal user VM deployment.
	Billing	Implement billing function, provide FTP interface to outside, SingleCLOUD as FTP client.
	Terminal User Operation	Provide API interface to outside, receive message from terminal users, and deal with it.
	Web UI (Portal)	Operation Maintenance system, implement VM related configuration, monitoring, alarm, and log management.
SingleCLOUD VDesktop	User Desktop Cloud Management	Implement virtual desktop creating and management function, terminal users can log in VMs by virtual desktop.
	User Desktop Cloud Console	Human-Machine interface, implement user virtual desktop and session connection management.
SingleCLOUD OM System	Operation Maintenance	SingleCLOUD operation and maintenance module
	Configuration	Implement configuration management function on billing, alarm, and image.
	Monitoring	Implement performance monitoring function, including performance monitor and state monitor.
	Alarm	Implement alarm generation, display, and management.
	Log	Implement log management function.

Table 1-3: Huawei SingleCLOUD Solution Software Components

Network Description

Huawei SingleCLOUD Solution provides multiple networking methods, Cloud Service Providers can choose the most economic method from the available scheme; here we list all the case as below:

- Network Sub-system + RH2285 Cloud Management + Desktop Management + RH2285 Computing + IP SAN Storage
- Network Sub-system + Cloud Management Sub-system + Desktop Management + T6000 Computing + IP SAN Storage
- Network Sub-system + Cloud Management Sub-system + Desktop Management + RH2285 Computing + RH2285 Storage
- Network Sub-system + Cloud Management Sub-system + Desktop Management + T6000 Computing + RH2285 Storage
- Network Sub-system + E6000 Management Sub-system + E6000 Computing + IP SAN Storage

Physical Network Architecture

The most important point on this white paper leads to describe how to design, deployment, and implement the clouding computing solutions; we use the following architecture to execute the test:

- Network Sub-system + RH2285 Cloud Management + Desktop Management + RH2285 Computing + IP SAN Storage
- The physical networking figure show as below Figure 1-3:

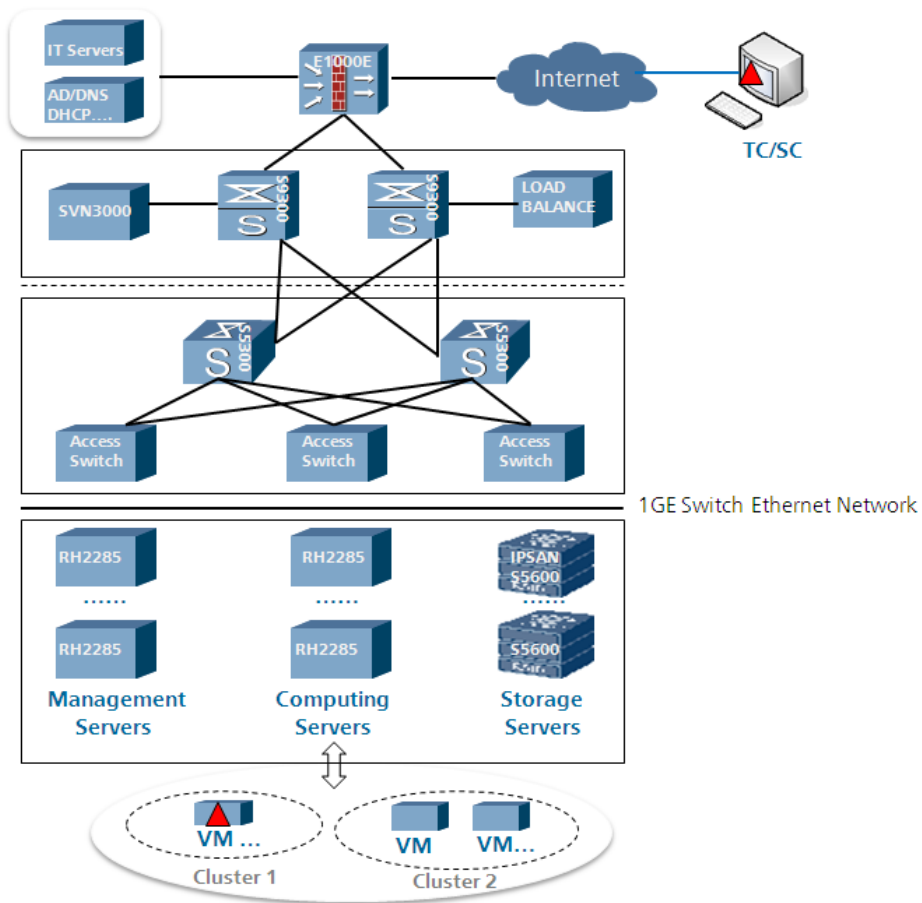


Figure 1-3: Huawei SingleCLOUD Solution Physical Networking Figure

VM Network Architecture

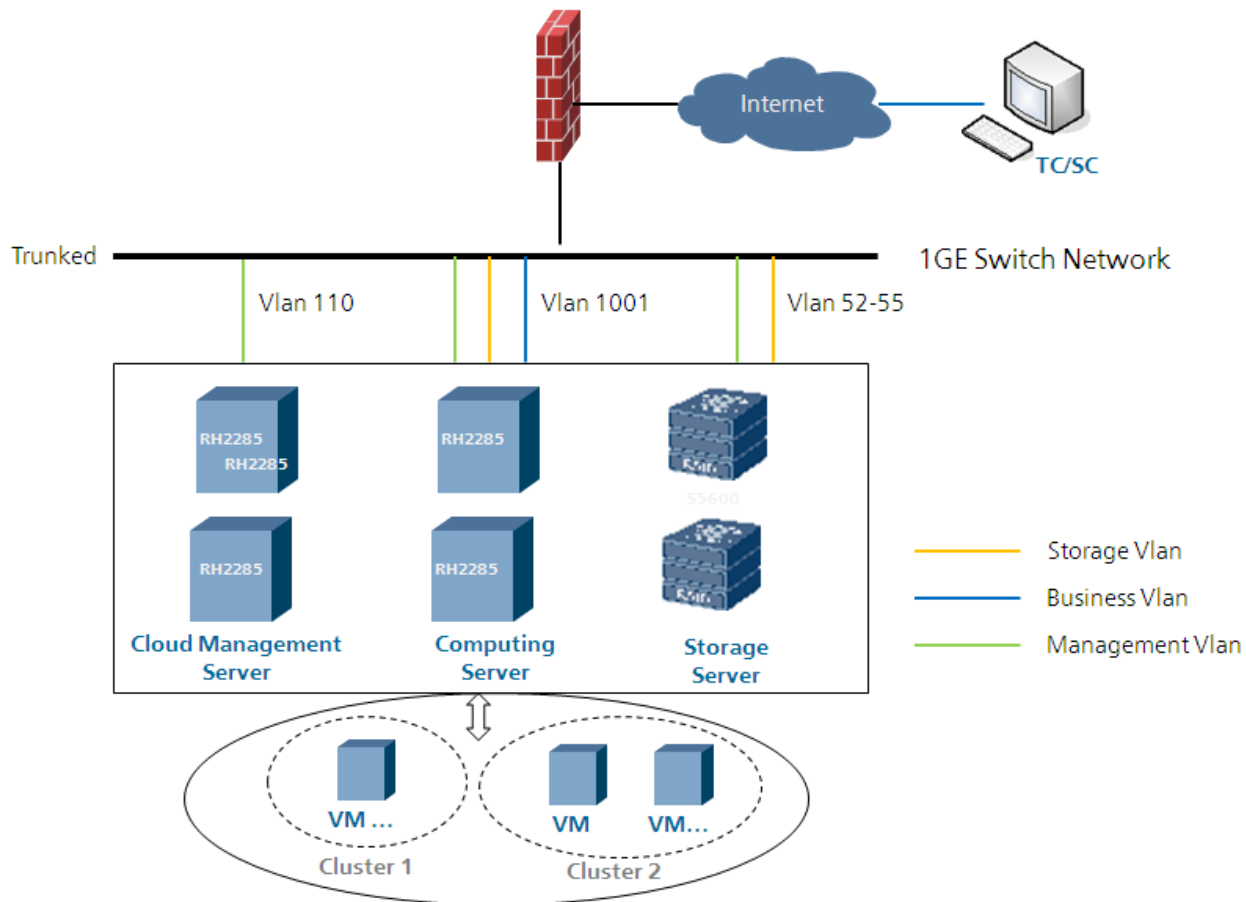


Figure 1-4: Huawei SingleCLOUD Solution VM Networking Figure

Huawei SingleCLOUD Solution designs multiple Virtual network for cloud management, business access, network traffic load balance, and network security. From the Figure 1-4, we can see the Virtual Local Network designed as three individual VLANs: VLAN 110, 1001, 52-55. The user VMs also can be deploying in private VLAN to logical separate different cluster users.

Technical Review

Huawei SingleCLOUD Test Bed Requirements

A cloud hardware infrastructure requires management server, virtual computing server, virtual resource management server, and storage servers, here we design a small hardware test environment to describe how Huawei SingleCLOUD Solution works, which shows in Figure 2-1.

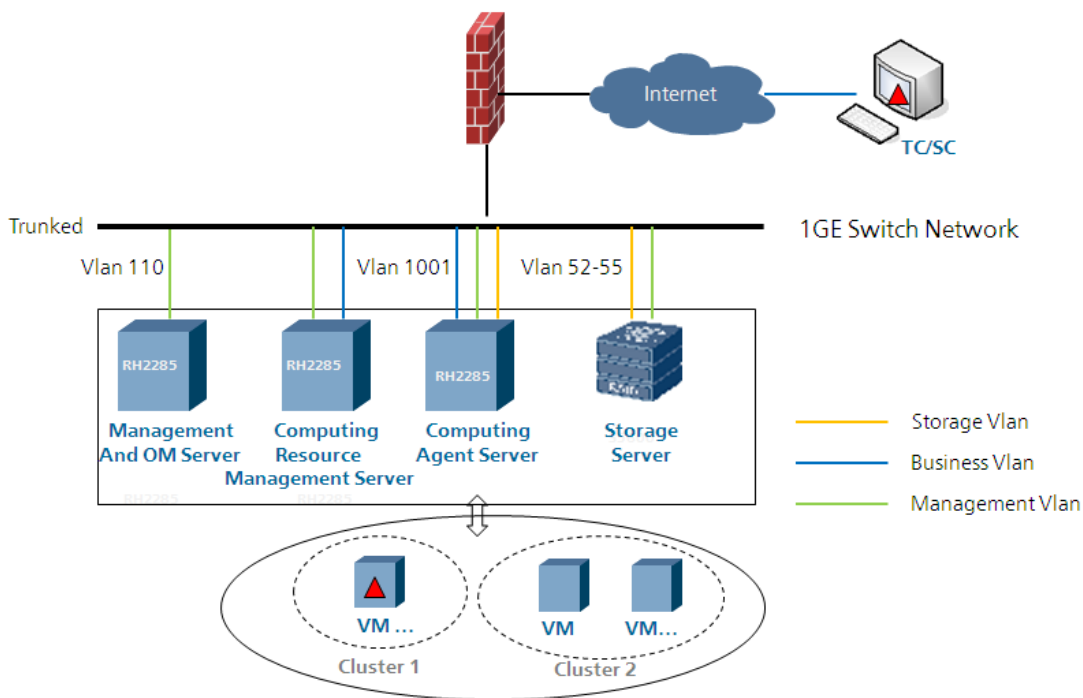


Figure 2-1: Tested Physical Architecture

IP Address Scheme

Networks are usually configured as Class C subnets but this is not required (limits total number of IP addresses to 254).

The public IP address and elastic public IP address also have been provided for customer access cloud resources.

- All SingleCLOUD servers use private IP address, usually configured as different Class C address, and physically shall be assigned static IP address. For examples, 2 Computing Agent Server needs $2*3 = 6$ Class C address, 2 for management, 2 for business, 2 for storage
- Business platform use private IP address, usually configured as Class A address, VMs are assigned IPs automatically via DHCP, DHCP server should be configured to provide enough private IP address for VMs. For examples, 1000 customer VM needs 1000 Class A address.
- Storage platform use private IP address, usually configured as Class C address, physically shall be assigned static IP address. For examples, 1 IPSAN storage server need $2*4 = 8$ Class C address.
- The virtual LAN design must consider cloud management, cloud computing, and cloud storage; here we provide the example of VLAN design in Figure 2-1.

Storage Requirements

At least one dedicated storage server acts as the virtual machine (VM) image data store. Storage can be SAS (Serial Attached SATA) or a SAN (Storage Area Network) may be used, iSCSI or NFS are preferred LAN storage protocols.

When calculating storage requirements assume each VM requires ~ 10-80GB of storage.

Server Requirements

A minimum of 2 identical physical hosts used as virtualized compute nodes. For compute nodes, our recommendation is to use the latest Intel® Xeon® processor-based servers e.g. Intel® Xeon® 5620 series-based servers. Infrastructure nodes can use Intel® Xeon® 5620 series-based servers.

Infrastructure services such as DHCP and Active Directory services are not considered part of the test infrastructure and can be supported or simulated as required.

Use Case Details

Test bed Accounts

1. Cloud Operation Maintenance Admin (OMA)
2. Cloud Operation Maintenance Account for Service Providers (OMP)
3. Cloud Resource Manager (RM)
4. Cloud Self-service Users (SU1)

Use Case Pre-conditions

1. The physical network which designed for SingleCLOUD test bed has been configured completely and running normally.
2. The cloud test bed has been installed Huawei SingleCLOUD GalaX, SingleCLOUD VDesktop, and SingleCLOUD OM software packages successfully.

Registering and Provisioning Infrastructures

A Registering and Provision Infrastructures test case shows the basic function of the cloud computing, the scenarios may include:

- Create Admin Accounts
- Configure OM User cluster resources
- Create New Users
- Configure VM templates
- Configure User Network
- Create Multiple VMs

Use Case 1: Create Admin Accounts

1. A successful login as "admin" through the Web UI portal, shows as below Figure 2-2 (<http://192.168.180.12:8080/OmsPortal/>)



Figure 2-2: Login for Huawei SingleCLOUD OM system by admin account

2. Enter System-> Account Management; create a new admin account, details show as below Figure 2-3.

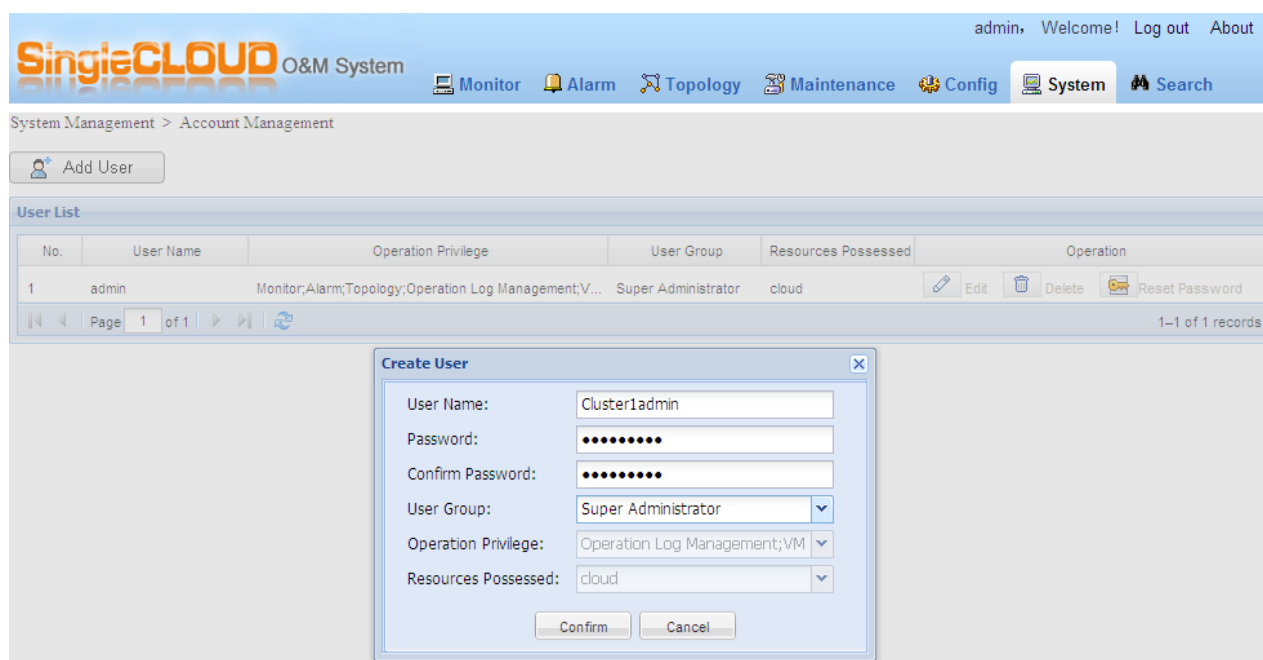


Figure 2-3: Create a new admin account by OM Web Portal

3. Login for Huawei SingleCLOUD OM system by new created admin account, login successfully show as Figure 2-4.

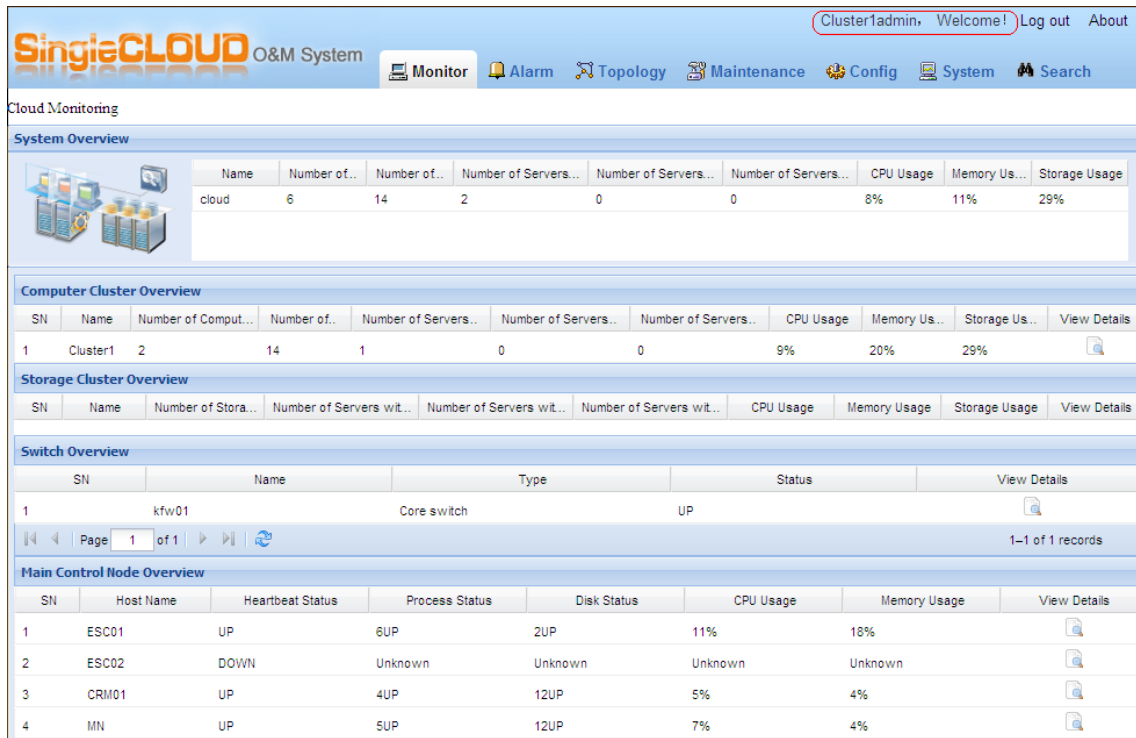


Figure 2-4: Login for Huawei SingleCLOUD OM system by new created admin account

Use Case 2: Configure cluster resources for OM user

1. Create a OMP account and successful login through the Web UI portal (<http://192.168.180.12:8080/OmsPortal>)
2. Enter System-> Account Management; modify the account attribution to allow this user operate cluster1 resources, Figure 2-5:

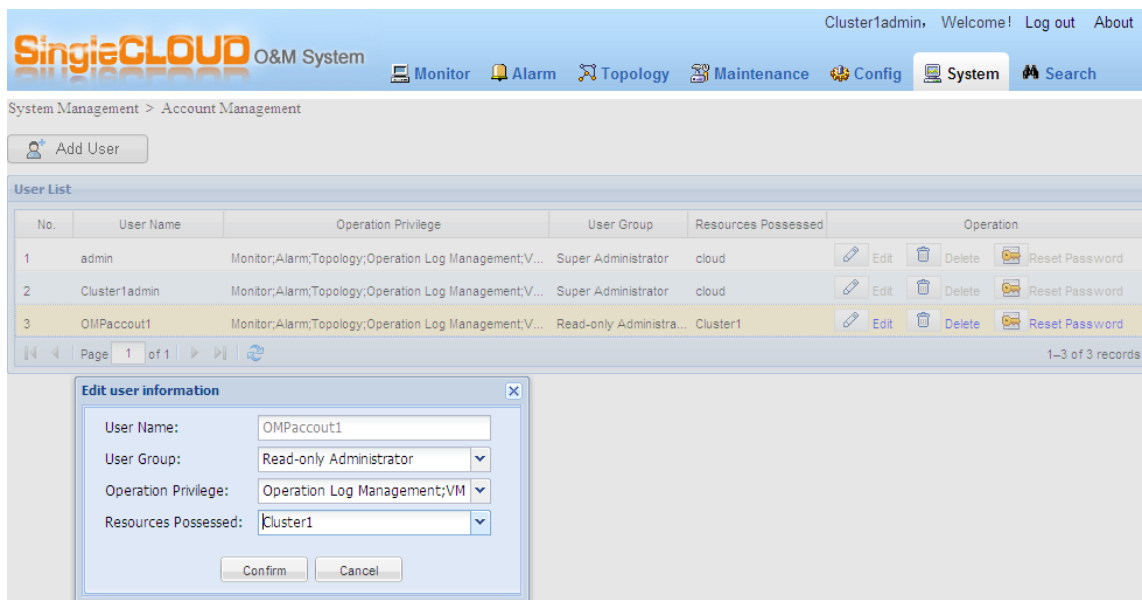


Figure 2-5: OM admin modify OMP account resources possessed range

3. Log in by OMP account OMPaccout1, check the account possessed resources.

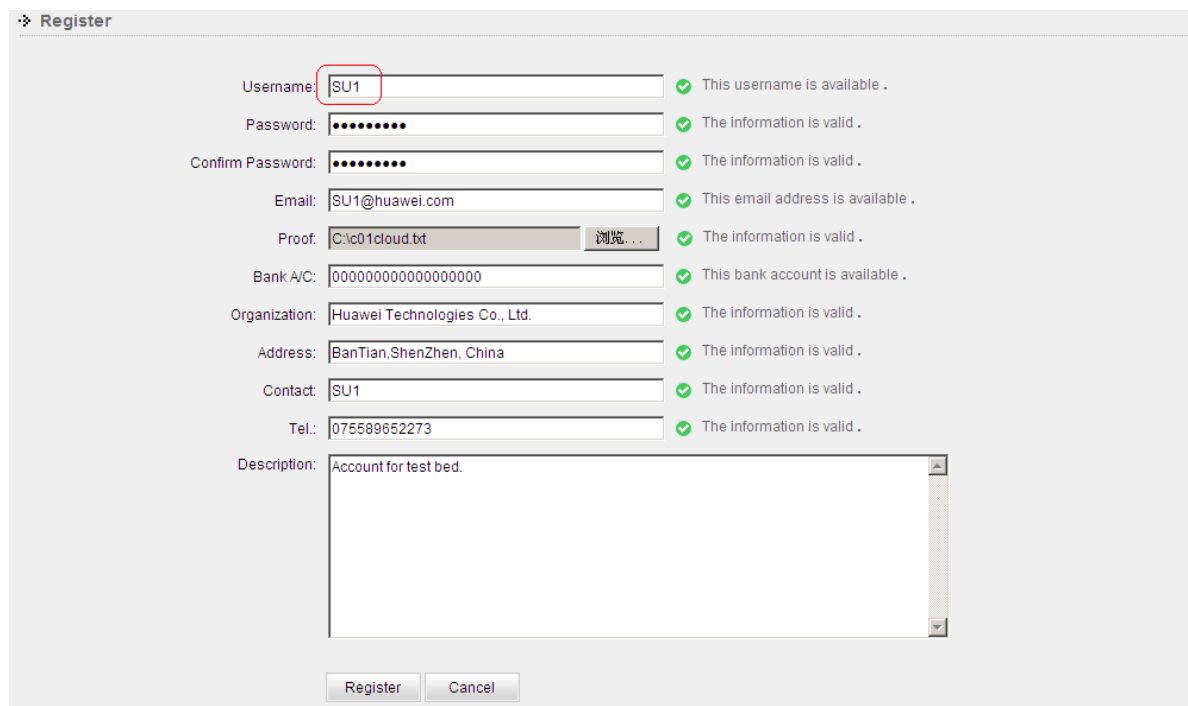
Use Case 3: Create New Users for Self-services

1. Register a cloud Self-services account SU1 by user himself, RM account would deal with the SU1 account application.
2. When the SU1 account be available, log in through the Web portal (<http://192.168.180.12:8080/BMS/>), Figure 2-6:



The screenshot shows the login interface of the 'Cloud Computing Self-Service System'. At the top, there is a decorative graphic of colorful squares. Below it, the title 'Cloud Computing Self-Service System' is displayed. The login form includes fields for 'Username:', 'Password:', and 'Language:'. The 'Language:' field is a dropdown menu with 'Please select language' as the current selection. To the right of the password field is a 'Forget Password' link. Below the fields are 'Login' and 'Register' buttons. At the bottom, there is a Huawei logo and the text 'Huawei Technologies Co., Ltd. Copyright 1998-2010, All rights reserved.'

Figure 2-6-1: After approved by RM account, SU1 account log in from the web portal



The screenshot shows the 'Register' form in the Cloud Computing Self-Service System. The form is titled 'Register' and contains several input fields with validation status indicators (green checkmarks). The fields and their values are: 'Username:' (SU1), 'Password:' (masked with dots), 'Confirm Password:' (masked with dots), 'Email:' (SU1@huawei.com), 'Proof:' (C:\c01cloud.txt), 'Bank A/C:' (00000000000000000000), 'Organization:' (Huawei Technologies Co., Ltd.), 'Address:' (BanTian,ShenZhen, China), 'Contact:' (SU1), and 'Tel.:' (075589652273). The 'Description:' field is a text area containing 'Account for test bed.' At the bottom, there are 'Register' and 'Cancel' buttons.

Figure 2-6-2: Fill in SU1 registration information



Figure 2-6-3: After approved by RM account, SU1 account can log in from the Web portal

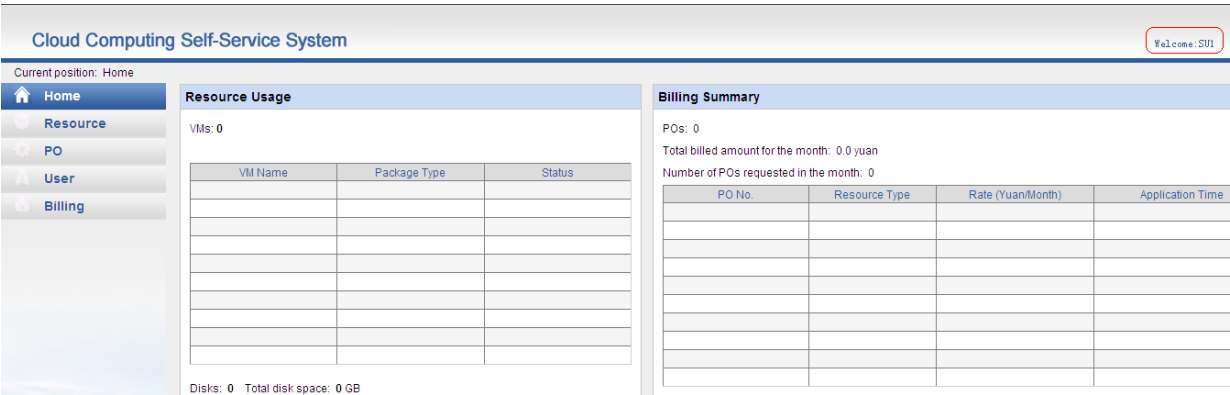


Figure 2-6-4: SU1 account login successful

Use Case 4: Configure VM templates

1. Log in Cloud Computing Operation Support System by admin account (<http://192.168.180.12:8080/BMS/>), enter into Service Management-> Package; Create a VM templates, the example shows as below Figure 2-7:

VCPU 8, Memory 4096MB, System Disk 80GB, HA Yes, NICs 8;

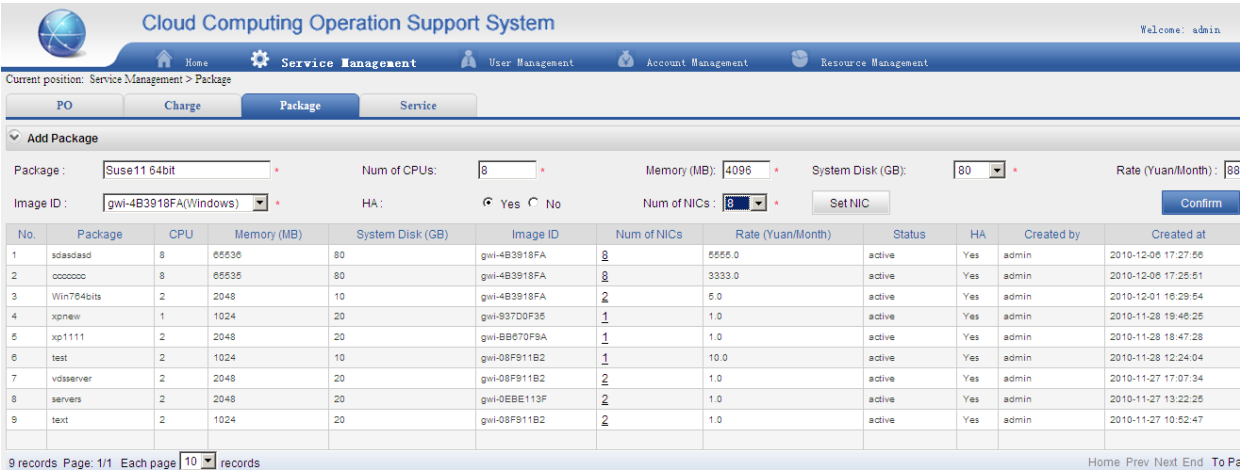


Figure 2-7: OM admin modify OMP account resources possessed range

Use Case 5: Configure User Network

1. Log in Cloud Computing Operation Support System by self-service user account (<http://192.168.180.12:8080/BMS/>), enter into Resource-> VPC; user can apply for virtual private cloud, it means a private local network for this Cloud user. The example shows as below Figure 2-8, the Cloud user can use VLAN 3011-3014 for private network.

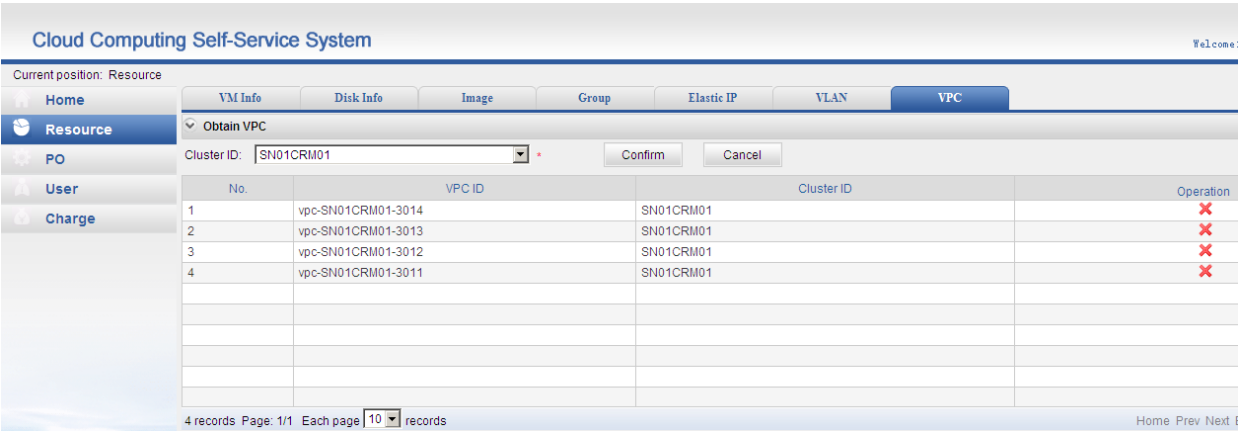


Figure 2-8: OM admin modify OMP account resources possessed range

Use Case 6: Create Multiple VMs

1. Log in Cloud Computing Operation Support System by self-service user account (<http://192.168.180.12:8080/BMS/>), enter into PO; user can apply for user VMs, The example shows as below Figure 2-9, 2-10, the Cloud user can applied for four Windows 7 64bit VMs by exist package.

Cloud Computing Self-Service System

Current position: PO

Home Resource PO User Charge

Status: All Applied from: To: Search

Add PO

Resource Type: Package Spec

Num of VMs: 4 Cluster ID: CRM01

Type: VPC VPC: vpc-CRM01-3005 Set VLAN

Choose	Package	Num of CPUs	Memory (MB)	System Disk (GB)	Num of NICs	Image ID
<input type="radio"/>	sdasdasd	8	65536	80	8	gwi-4B3918FA
<input type="radio"/>	ccccccc	8	65535	80	8	gwi-4B3918FA
<input checked="" type="radio"/>	Win764bits	2	2048	10	2	gwi-4B3918FA
<input type="radio"/>	xpnew	1	1024	20	1	gwi-937D0F35
<input type="radio"/>	xp1111	2	2048	20	1	gwi-BB670F9A
<input type="radio"/>	test	2	1024	10	1	gwi-08F911B2
<input type="radio"/>	vdserver	2	2048	20	2	gwi-08F911B2
<input type="radio"/>	servers	2	2048	20	2	gwi-0EBE113F
<input type="radio"/>	text	2	1024	20	2	gwi-08F911B2

9 records Page: 1/1 Each page 10 records

New Cancel Save as Draft

Figure 2-9: Cloud user applied for four VMs by self-service system

Cloud Computing Self-Service System

Current position: PO

Home Resource PO User Charge

Status: All Applied from: To: Search

Add PO

PO No.	Service Type	Service Name	Rate (Yuan/Month)	Qty	Application Time	Status	Reviewer	Review Time
R201012090001	Package	Win764bits	20.00	4	2010-12-09 11:30:38	Pending Review		
R201012060001	Package	text	1.00	1	2010-12-06 15:38:06	Approved and Allocated	admin	2010-12-06
R201012020001	Package	xpnew	2.00	2	2010-12-02 14:20:49	Approved and Allocated	admin	2010-12-02
R201012010005	Package	Win764bits	5.00	1	2010-12-01 17:38:32	Approved and Allocated	admin	2010-12-01
R201012010003	Package	Win764bits	5.00	1	2010-12-01 16:33:12	Approved and Allocated	admin	2010-12-01
R201012010002	Package	xpnew	2.00	2	2010-12-01 11:28:28	Approved and Allocated	admin	2010-12-01
R201011290001	Package	servers	1.00	1	2010-11-29 11:58:11	Approved and Allocated	admin	2010-11-29
R201011280003	Package	xpnew	1.00	1	2010-11-28 19:46:39	Approved and Allocated	admin	2010-11-28
R201011280002	Package	xp1111	1.00	1	2010-11-28 18:50:51	Approved and Allocated	admin	2010-11-28
R201011270011	Package	vdserver	2.00	2	2010-11-27 17:21:23	Approved and Allocated	admin	2010-11-27

20 records Page: 1/2 Each page 10 records

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Figure 2-10: The PO submitted successfully, need approval from Cloud RM account

Using and Monitoring Clouding Services

Using and Monitoring Clouding Services test case shows how to manage the cloud resources, monitoring SingleCLOUD platform statuses, check logs, alarm, license management, and operate cloud infrastructures and VMs. The scenarios may include:

- User Access VMs using Web Portal
- Monitoring state of SingleCLOUD
- Remove VM Services
- Generate Utilization Report
- Balance Compute Resource Utilizations
- Remove VMs (Scale Down Service)
- Failure Scenario

Use Case 7: User Access VMs using Web Portals

1. Enter Web Interface address of Desktop Cloud, pop up VM user log in windows, input cloud user name and password, start log in Desktop VM. The log in UI shows as below Figure 2-11.



Figure 2-11: User access VM by Web Portal

Use Case 8: Monitoring state of SingleCLOUD

1. Use OMP account and successful login through the Web UI portal, enter into Monitor and Topology page, it shows the whole SingleCLOUD topology currently and real-time resource status graph, details as Figure 2-12, 2-13.

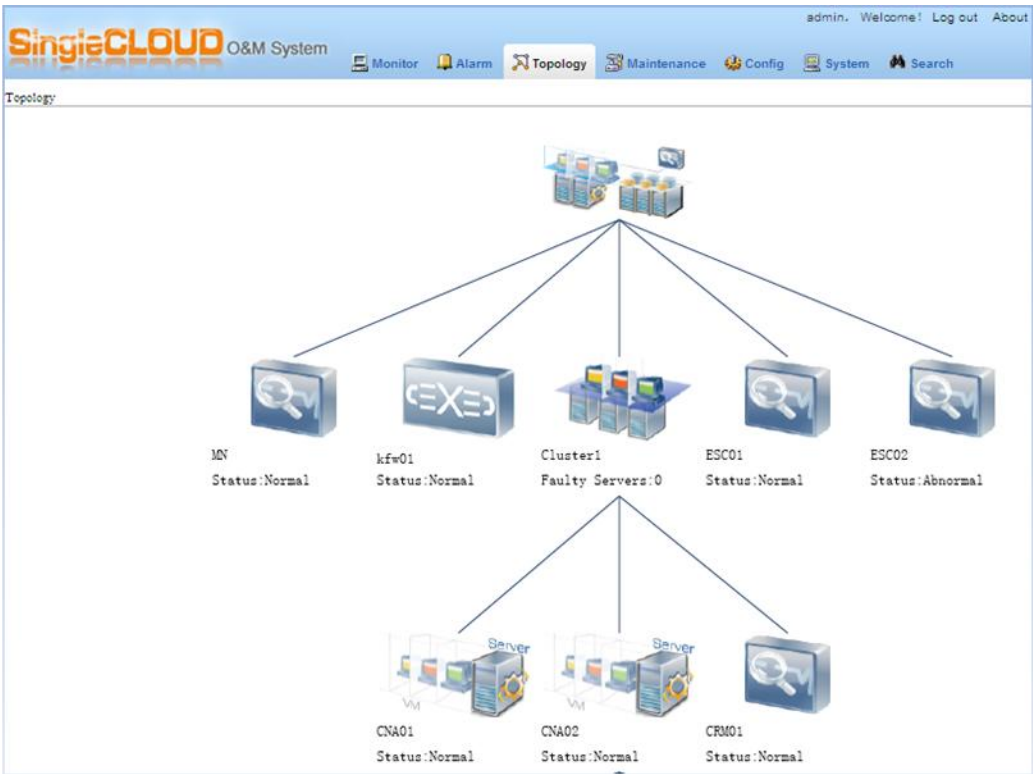


Figure 2-12: SingleCLOUD topology graph

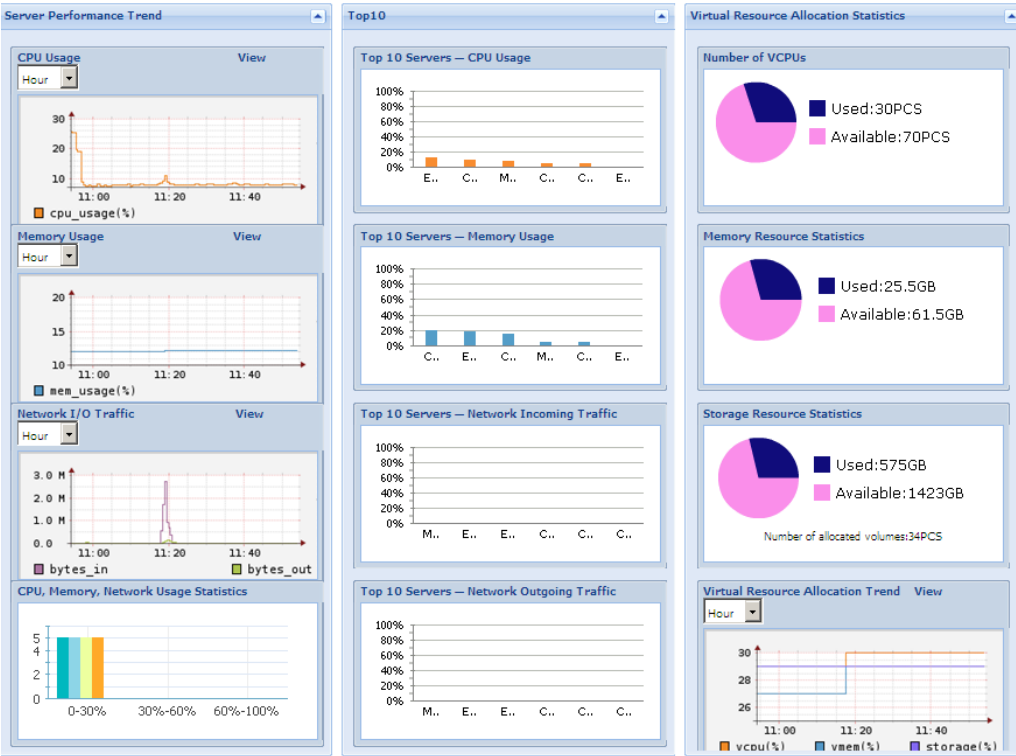


Figure 2-13: SingleCLOUD real-time cloud resource status graph

Use Case 9: Remove VM Service

1. Log in Cloud Computing Self-service System by SU1 account (Test bed <http://192.168.180.12:8080/BMS/>), enter into Resources Management; currently user applied service as user disk space 300G and attached to specific VM. It shows as below Figure 2-14, 2-15

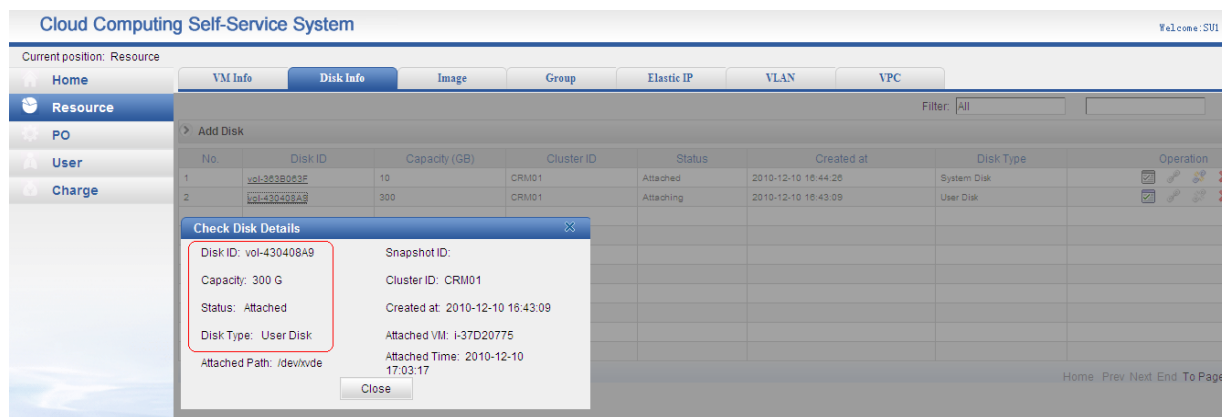


Figure 2-14: Currently VM user applied 300G user disk

2. If user no needs this user disk anymore, the SU1 manager can release the 300G disk from the specific VM;

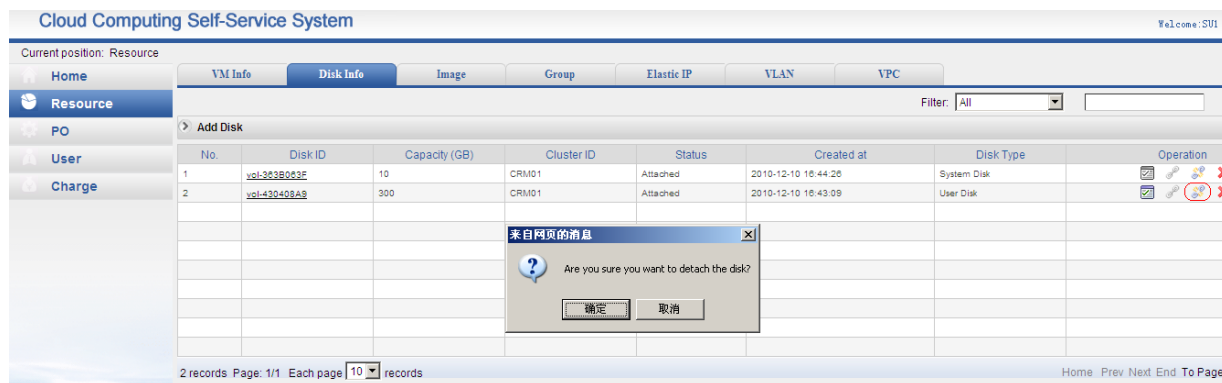


Figure 2-15: Remove user disk service from specific VM

Use Case 10: Generate Utilization Report

1. Log in Cloud Computing Self-service system by SU1 account (<http://192.168.180.12:8080/BMS/>), enter into Charge Page; user can check his own billing information. The example shows as below Figure 2-16.

Cloud Computing Self-Service System							
Current position: Charge							
Num of current PCs: 19 Total: 32.0 yuan							
No.	PO No.	Resource Type	Rate (Yuan/Month)	Resource User	Start Time	Total (Yuan)	
1	R201012060001	Package	1.0	wangyouzhen	2010-12-08 18:46:08	1.0	
2	R201012020001	Package	2.0	wangyouzhen	2010-12-02 14:30:16	2.0	
3	R201012010005	Package	5.0	wangyouzhen	2010-12-01 17:57:12	5.0	
4	R201012010003	Package	5.0	wangyouzhen	2010-12-01 16:56:12	5.0	
5	R201012010002	Package	2.0	wangyouzhen	2010-12-01 11:37:11	2.0	
6	R201011280001	Package	1.0	wangyouzhen	2010-11-29 12:08:01	1.0	
7	R201011280003	Package	1.0	wangyouzhen	2010-11-28 20:03:58	1.0	
8	R201011280002	Package	1.0	wangyouzhen	2010-11-28 19:07:58	1.0	
9	R201011270011	Package	2.0	wangyouzhen	2010-11-27 17:29:53	2.0	
10	R201011270010	Package	2.0	wangyouzhen	2010-11-27 17:16:53	2.0	

Figure 2-16: Generate cloud utilization report, such as billing information

Use Case 11: Balance Compute Resource Utilizations

1. Log in Cloud OM system by admin account, select one cluster and we can see two computing server which running some VMs, CNA01 server got high loading currently(CPU Usage 90%, Memory 92%), which shows as below Figure 2-17.

admin, Welcome! Log out About

SingleCLOUD O&M System

Monitor Alarm Topology Maintenance Config System Search

Cloud Monitoring > Computer Cluster computerCluster2

System Overview

Name	Number of Comput...	Number of ...	Number of Server...	Number of Server...	Number of Server...	CPU Usage	Memory Us...	Storage Usage
computerCL...	2	17	0	0	0	49%	53%	23%

Computer Server Overview

SN	Host Name	Number of VMs	Heartbeat Sta...	Process Status	Disk Status	CPU Usage	Server Memory Usage	Virtual Memory Usage	View Details
1	SN02CNA01	12	UP	3UP	12UP	90%	92%	58%	
2	SN02CNA02	5	UP	3UP	12UP	9%	15%	22%	

Page 1 of 1 1-2 of 2 records

Switch Overview

SN	Name	Type	Status	Uplink Traffic	View Details
1	S5328_12	Access switch	UP	645 Byte	

Page 1 of 1 1-1 of 1 records

Main Control Node Overview

SN	Host Name	Heartbeat Status	Process Status	Disk Status	CPU Usage	Memory Usage	View Details
1	SN02CRM01	UP	4UP	12UP	3%	3%	

Server Performance Trend Top10 Virtual Resource Allocation Statistics

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Figure 2-17: Before load balance, CNA01 server got high loading

2. Enter into VM Scheduling, here we can scheduling VM strategy, such as Load Balancing, when we define the scheduling condition as light, normal, or radical case, the SingleCLOUD platform would execute the VM migration according to the pre-defined strategy. The example shows as below Figure 2-18, currently set radical condition.

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SingleCLOUD O&M System

Monitor Alarm Topology Maintenance Config System Search

Maintenance > VM Scheduling > Add Strategy

Scheduling Strategy

Scheduling Scope: Cluster1 Scheduling Strategy: Load Balancing

Scheduling Condition

Scheduling Threshold: Light Normal Radical

Light: The load threshold for scheduling system resources is low. The resource utilization is low.

Normal: The load threshold for scheduling system resources is moderate. The resource utilization is moderate.

Radical: The load threshold for scheduling system resources is high. The resource utilization is high.

Append

List Scheduling Strategy

No.	Scheduling Scope	Scheduling Threshold	Operation
-----	------------------	----------------------	-----------

Figure 2-18: Balance compute resource utilizations by VM scheduling strategy

- After the load balancing strategy implementation, the CNA01 server would migrate some VMs to the light usage server so as to decrease the loading of CPU and memory usage, it would stop migrating VMs when the CNA01 server equal to the scheduling threshold value. The details show as below Figure 2-19.

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SingleCLOUD O&M System

Monitor Alarm Topology Maintenance Config System Search

Cloud Monitoring > Computer Cluster computerCluster2

System Overview

Name	Number of Comput...	Number of ...	Number of Server...	Number of Server...	Number of Server...	CPU Usage	Memory Us...	Storage Usage
computerCL...	2	17	0	0	0	11%	28%	23%

Computer Server Overview

SN	Host Name	Number of VMs	Heartbeat Sta...	Process Status	Disk Status	CPU Usage	Server Memory Usage	Virtual Memory Usage	View Details
1	SN02CNA01	7	UP	3UP	12UP	14%	41%	34%	
2	SN02CNA02	10	UP	3UP	12UP	8%	15%	46%	

Page 1 of 1 1-2 of 2 records

Switch Overview

SN	Name	Type	Status	Uplink Traffic	View Details
1	S5328_12	Access switch	UP	599 Byte	

Page 1 of 1 1-1 of 1 records

Main Control Node Overview

SN	Host Name	Heartbeat Status	Process Status	Disk Status	CPU Usage	Memory Usage	View Details
1	SN02CRM01	UP	4UP	12UP	3%	3%	

































Server Performance Trend Top10 Virtual Resource Allocation Statistics

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Figure 2-19: Balance compute resource utilizations implemented successfully

Use Case 12: Remove VMs (Scale down)

1. Log in Cloud Computing Self-service System by self-service user account (<http://192.168.180.12:8080/BMS/>), enter into Resources Management; user can choose one own VM to stop and terminate from SingleCLOUD. The example shows as below Figure 2-20, the Cloud user can terminate chosen Windows 7 64bit VM.

VM Info		Disk Info	Image	Group	Elastic IP	VLAN	VPC
Created by: <input type="text"/>		VM ID: <input type="text"/>		Status: All		<input type="button" value="Search"/> <input type="button" value="Export Report"/>	
VM ID	Created by	Image ID	VM Status	Num of NICs	VM Type	Created at	Operation
I-3C8897F7	wangyouzhen	gwi-08F911B2	Running	2	text	2010-12-06 15:39:08	   
I-52870943	wangyouzhen	gwi-937D0F35	Running	1	xpnew	2010-12-02 14:23:16	   
I-441C08D2	wangyouzhen	gwi-937D0F35	Running	1	xpnew	2010-12-02 14:23:16	   
I-4EFD087A	wangyouzhen	gwi-4B3918FA	Running	2	Win764bits	2010-12-01 17:39:12	   
I-4A0F09AB	wangyouzhen	gwi-4B3918FA	Running	2	Win764bits	2010-12-01 16:38:12	   
I-49380887	wangyouzhen	gwi-937D0F35	Running	1	xpnew	2010-12-01 11:29:11	   
I-2B91062A	wangyouzhen	gwi-937D0F35	Stopped	1	xpnew	2010-12-01 11:29:11	   
I-4F7B087E	wangyouzhen	gwi-937D0F35	Running	1	xpnew	2010-11-30 09:31:09	   
I-47A809AB	wangyouzhen	gwi-0EBE113F	Running	2	servers	2010-11-29 11:59:01	
I-46EB09EA	wangyouzhen	gwi-937D0F35	Stopped	1	servers	2010-11-29 10:10:37	

24 records Page: 1/3 Each page 10 records

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Figure 2-20: Terminate user VMs

Use Case 13: Failure Scenario

The failure scenario design as below steps:

1. In test bed, there are two computing server CNA01/CNA02 working normally, each server running a user VM, which show in Figure 2-21


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SingleCLOUD O&M System

[MONITOR](#) [ALARM](#) [TOPO](#) [MAINTENANCE](#) [CONFIG](#) [SYSTEM](#) [SEARCH](#)



[Cloud Monitoring](#) > Computer Cluster computerCluster2

System Overview




Name	Number of Compu...	Number of ...	Number of Server...	Number of Server...	Number of Server...	CPU Usage	Memory Us...	Storage Usage
computerCluster2	2	2	0	0	0	4%	18%	1%

Computer Server Overview

SN	Host Name	Number of VMs	Heartbeat Sta...	Process Status	Disk Status	CPU Usage	Server Memory Usage	Virtual Memory Usage	View Details
1	SN02CNA01	1	UP	3UP	12UP	4%	18%	2%	
2	SN02CNA02	1	UP	3UP	12UP	5%	18%	5%	

[Page 1 of 1](#) [1-2 of 2 records](#)

Switch Overview

SN	Name	Type	Status	Uplink Traffic	View Details
1	S5328_12	Access switch	UP	617 Byte	

[Page 1 of 1](#) [1-1 of 1 records](#)

Main Control Node Overview


SN	Host Name	Heartbeat Status	Process Status	Disk Status	CPU Usage	Memory Usage	View Details
1	SN02CRM01	UP	4UP	12UP	3%	3%	

Figure 2-21: Simulate failure scenarios, shutdown one server

2. Shutdown one computing server CNA01 manually, the operation step shows as below Figure 2-22.

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SingleCLOUD O&M System

MONITOR ALARM TOPO MAINTENANCE CONFIG SYSTEM SEARCH

Cloud Monitoring > Computer Cluster computerCluster2 > Computing Server SN02CNA01

System Overview

Host Name	Number of V...	Heartbeat...	Process ...	Disk Status	CPU Usage	Server Memory U...	Virtual Memory ...	Operation
SN02CNA01	1	UP	3UP	12UP	4%	18%	2%	Restart Power-on Power-down

VM Overview

SN	VM ID	Number of CPUs	Memory Limit	Actual Memory	CPU Usage	Memory Usage	Status	View Details
1	i-4E69094F	1	1024MB	1024MB	0%	100%	Running	

Page 1 of 1 1-1 of 1 records

Figure 2-22: Simulate failure scenarios, shutdown one server

3. After a few minutes, the CNA01 has been shutdown, and the VM which running on CNA01 has been migrating to CNA02, which show in Figure 2-23, 2-24. The failure scenario has been simulated successfully.

admin, Welcome! Logout About

SingleCLOUD O&M System

Monitor Alarm Topology Maintenance Config System Search

Cloud Monitoring > Computer Cluster computerCluster2

System Overview

Name	Number of Comput...	Number of ...	Number of Server...	Number of Server...	Number of Server...	CPU Usage	Memory Us...	Storage Usage
computerCl...	2	2	0	0	0	5%	18%	1%

Computer Server Overview

SN	Host Name	Number of VMs	Heartbeat Status	Process Status	Disk Status	CPU Usage	Server Memory Usage	Virtual Memory Usage	View Details
1	SN02CNA01	0	POWEROFF	Unknown	Unknown	Unknown	Unknown	Unknown	
2	SN02CNA02	2	UP	3UP	12UP	5%	19%	7%	

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Figure 2-23: The CNA01 server has been shutdown

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SingleCLOUD O&M System

Monitor Alarm Topology Maintenance Config System Search

Cloud Monitoring > Computer Cluster computerCluster2 > Computing Server SN02CNA02

System Overview

Host Name	Number of V...	Heartbeat ...	Process S...	Disk Status	CPU Usage	Server Memory Us...	Virtual Memory ...	Operation
SN02CN...	2	UP	3UP	12UP	6%	18%	7%	Restart Power-on Power-down

VM Overview

SN	VM ID	Number of CPUs	Memory Limit	Actual Memory	CPU Usage	Memory Usage	Status	View Details
1	i-46D107CE	1	2048MB	2048MB	0%	13%	Running	
2	i-4E69094F	1	1024MB	1024MB	0%	100%	Starting	

Page 1 of 1 1-2 of 2 records

Figure 2-24: Check on CNA02, the VM which running on CNA01 just now has been migrated to CNA02 successfully

Next Steps

Huawei SingleCLOUD Solutions mainly focus on below features in the days to come:

Opening

- Support DMTF standard of cloud management

High security

- Automatic patch service
- VM anti-virus interface
- Huawei-Symantec security equipment integrated

High availability

- Distributed memory

- Data center migration

High performance

- Computing/storage server deployment combination

Self-organization

- Inter-operation with environment system, implement power saving automatically
- Enhanced working engine, powerful intelligence automation execution
- Automation monitoring and motion

Things to Consider

Scalability

The scalability of the cloud solution could be impacted by:

- Network technology (e.g., 10GigE) and architecture
- Selected storage architecture
- Choice of server hardware for compute nodes and management nodes

Another interesting option to consider is the use of solid-state drives (SSDs) as hard disk replacements, since SSDs can significantly improve the performance in a cloud. In addition, when planning cloud implementations, security should be of primary concern. These topics are each discussed briefly below.

Hardware Considerations

A full discussion of processor and overall server performance considerations is beyond the scope of this paper. However, it is important to note that the performance of virtual machines running on the cloud platform is heavily influenced by factors of processor architecture, and specific feature sets available in the processor such as Intel® VT-d. The use of high-performance server processors equipped with virtualization and IO support feature sets, the Intel Xeon processor 5600 series, is strongly recommended.

Security Considerations

Security is a key consideration in the selection and management of IaaS. A complete discussion of best practices for cloud security, from the perspective of both the Service Provider and the end-user organization, is beyond the scope of this document. However, the following points should be considered:

- **More advanced power management**

Fine grained dynamic power management technology like Intel Intelligent Power Node Manager could be valuable to management platform power for optimized performance without putting systems to sleep. Combining with the hibernation-based dynamic power management described in this paper, it could further enhance SingleCLOUD power management.

- **Variety terminal accessing**

Future Huawei SingleCLOUD solutions could support different types of “cloud-aware” client devices from smart phone to regular PC and laptops to access cloud resources anywhere. SingleCLOUD should provide differentiated services based on the device capacity, user profile, and location & connectivity of the device, so that to deliver maximum SingleCLOUD customer experience for given devices and network conditions.

Glossary

GalaX – Huawei SingleCLOUD Solution software sub-system, it provides virtual computing, virtual network, and virtual storage.

GE – Gigabit Ethernet

HA – High Availability

IMG – Image Server

LVM – Logical Volume Manager

OM – Operation and Management system, Huawei SingleCLOUD Solution software sub-system, which provide resource management, state monitoring, and load balance etc.

SC – Software Client

TC – Thin Client

VM – Virtual Machine

VLAN – Virtual LAN

VDesktop – Huawei SingleCLOUD Solution software sub-system, it provides user VM resource access, VM allocates, and VM related resources management.

References

- [1] http://www.huawei.com/cn/convergence_transformation/cloud_computing/computing/green_data_center_solution.do
- [2] [http://www.intel.com/itcenter/products/xeon/5600/index.htm?wapkw=\(5600\)](http://www.intel.com/itcenter/products/xeon/5600/index.htm?wapkw=(5600))
- [3] http://www.huawei.com/cn/convergence_transformation/cloud_computing/computing/cloud_computing_data_center.do
- [4] http://www.huawei.com/storage_networks_security/storage/simpleres.do?id=1464&type=general_catalog
- [5] http://www.huawei.com/storage_networks_security/server/e6000_server.do?card=o

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