Pulse Secure®

Pulse Connect Secure Virtual Appliance on Alibaba Cloud

Deployment Guide

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Pulse Secure, LLC
2700 Zanker Road,
Suite 200 San Jose
CA 95134

https://www.pulsesecure.net

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Revision History

Revision and Date	Added/Updated/Removed	Remarks
1.0, January 2020	NA	Initial publication for 9.1R4 release

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Overview

About This Guide

This guide helps in deploying the Pulse Connect Secure Virtual Appliance on Alibaba Cloud (Aliyun). In this release a Pulse Connect Secure administrator can manually upload the Pulse Connect Secure Virtual Appliance image (KVM) into Alibaba Cloud storage account. Once the package is available in the storage account, the Pulse Connect Secure administrator can deploy Pulse Connect Secure on Alibaba Cloud.

Assumptions

The basic understanding of deployment models of Pulse Connect Secure on a data center and basic experience in using Alibaba Cloud is needed for the better understanding of this guide.

Pulse Connect Secure on Alibaba Cloud

Prerequisites and System Requirements on Alibaba Cloud

To deploy the Pulse Connect Secure Virtual Appliance on Alibaba Cloud, you need the following:

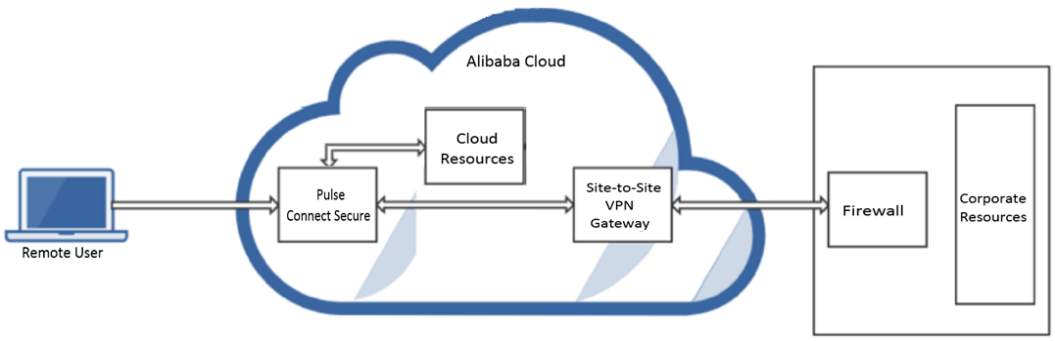
- An Alibaba Cloud account
- Access to the Alibaba Cloud portal (https://account.alibabacloud.com/login/login.htm)*
- Pulse Connect Secure Virtual Appliance Image (file)
- Alibaba Cloud Terraform template
- Pulse Connect Secure (PSA-V) licenses
- Site-to-Site VPN between Alibaba Cloud and the corporate network (optional)

  Note: This is needed only if the Pulse Connect Secure users need to access corporate resources
- Pulse Connect Secure configuration in XML format (optional)

Deploying Pulse Connect Secure on Alibaba Cloud

As depicted in the below diagram, a remote user can use Pulse Connect Secure to securely access cloud resources as well as corporate resources. To access corporate resources, the Pulse Connect Secure administrator needs to ensure that site-to-site VPN is already established between Alibaba Cloud and the corporate network.

Figure 1: Pulse Connect Secure on Alibaba Cloud



Supported Platform Systems

This section helps you in choosing the instance types that should be deployed with Pulse Connect Secure for Alibaba Cloud.

- PSA7000v is equivalent to ecs.g6.2xlarge in Beijing region.

Model	Region	vCPU	Memory (GB)
ecs.g6.2xlarge	Beijing	8	32

Deploying Alibaba Cloud PCS using Alibaba Cloud Portal

This section describes Alibaba Cloud PCS deployment with two NIC cards.

Steps to Deploy Pulse Connect Secure on Alibaba Cloud

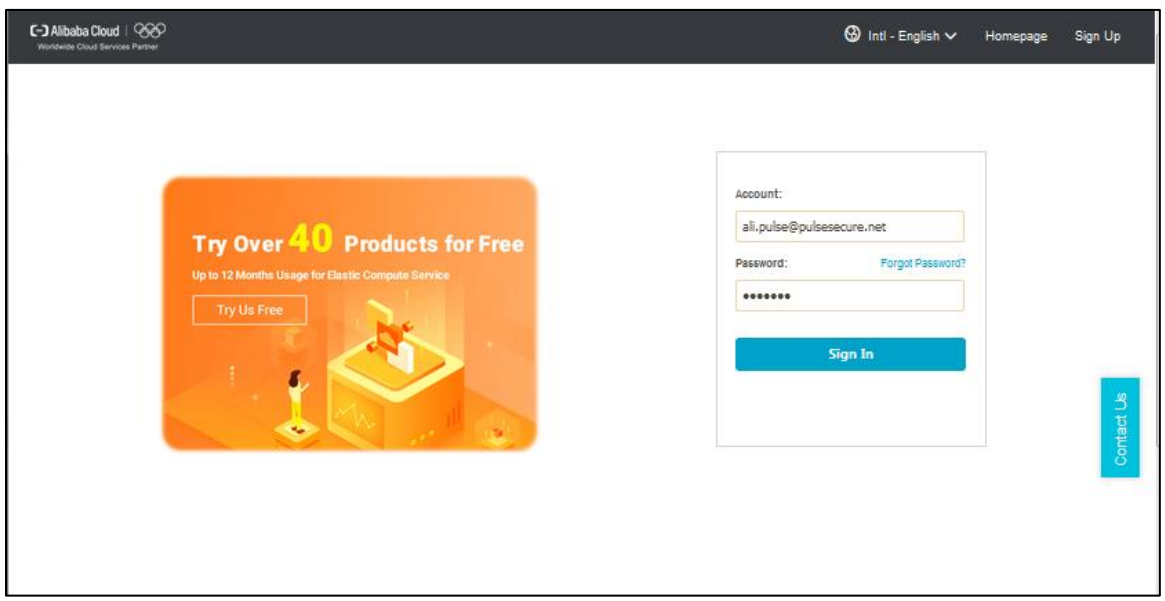
- Creating Alibaba Cloud PCS Image
- Creating Virtual Private Cloud
- Creating Security Groups
- Creating PCS-VA Instance

Creating Alibaba Cloud PCS Image

To create Alibaba Cloud PCS image, do the following:

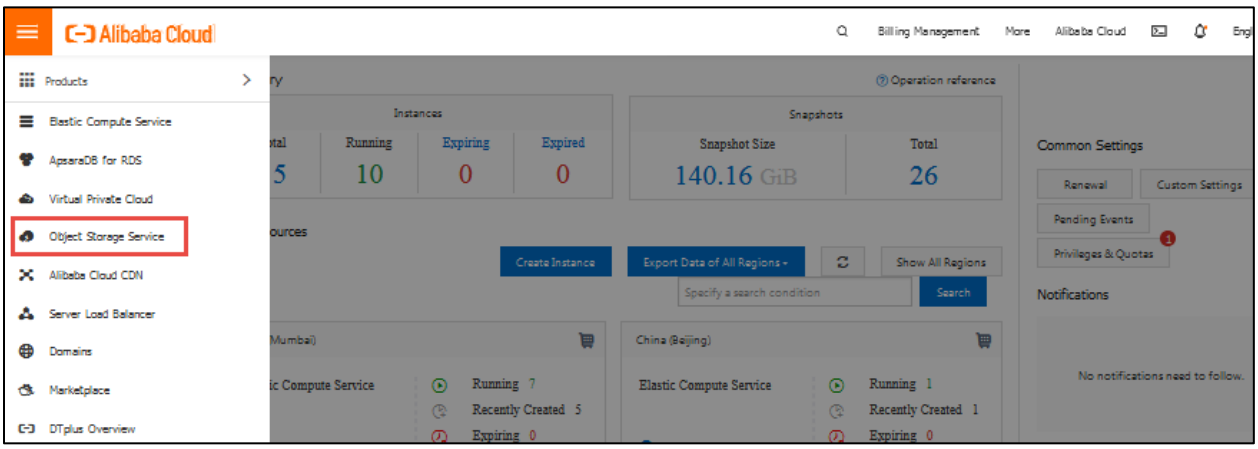
1. Download Alibaba Cloud PCS image, which is in the zip format, from the Pulse Secure Support site.
2. Unzip the file.
3. Log in to Alibaba Cloud with your account and credentials.

Figure 2: Alibaba Cloud Account Login Page



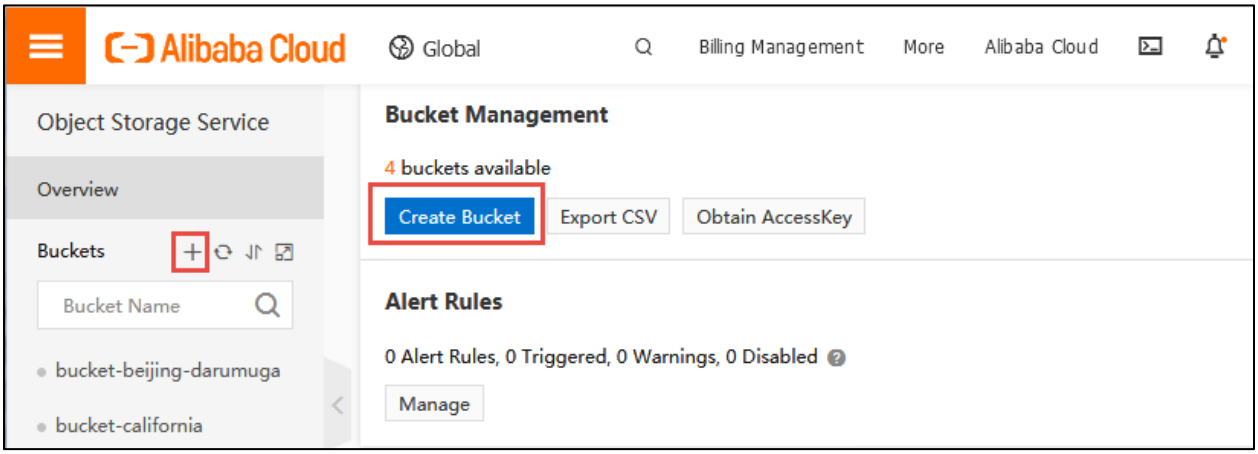
4. In the ECS Console displayed, select **Object Storage Service**. The Object Storage Service page allows OSS bucket management such as store and retrieve a variety of unstructured data files, including text files, images, audio files, and video files, over the network at any time.

Figure 3: Object Storage Service Option



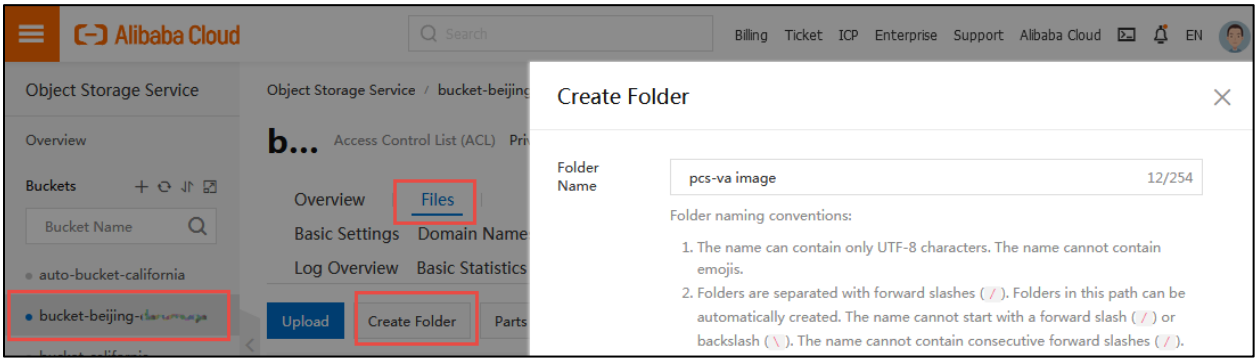
5. Sign up for OSS and create one or more OSS buckets. For details, refer to Alibaba Cloud Documentation.

Figure 4: Bucket Management



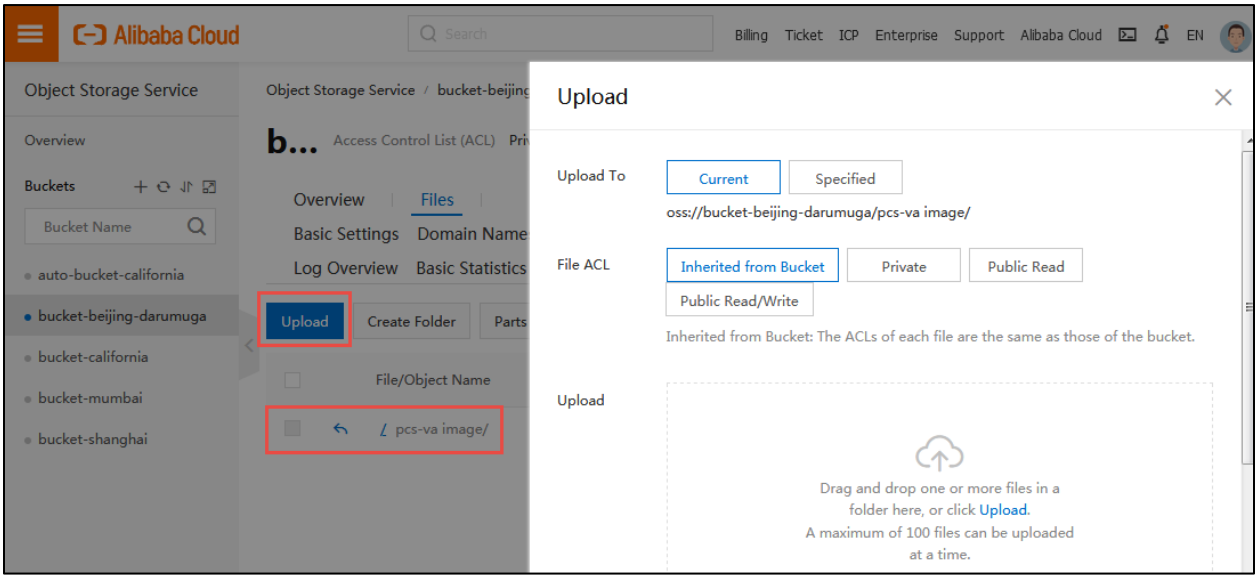
6. From the buckets list, click on the name of the created bucket.
7. In the window displayed, select the **Files** tab and then click **Create Folder** to create a folder for the Alibaba Cloud PCS-VA image.

Figure 5: Create Folder



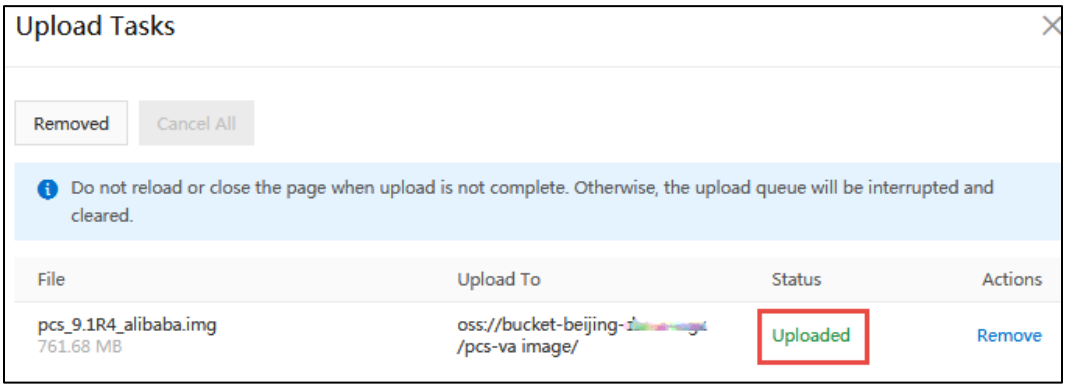
8. After creating the folder, change to the newly created folder and then click **Upload**.
9. In the Upload section, drag and drop one or more Alibaba Cloud PCS-VA images.

Figure 6: Upload Alibaba Cloud PCS VA Image



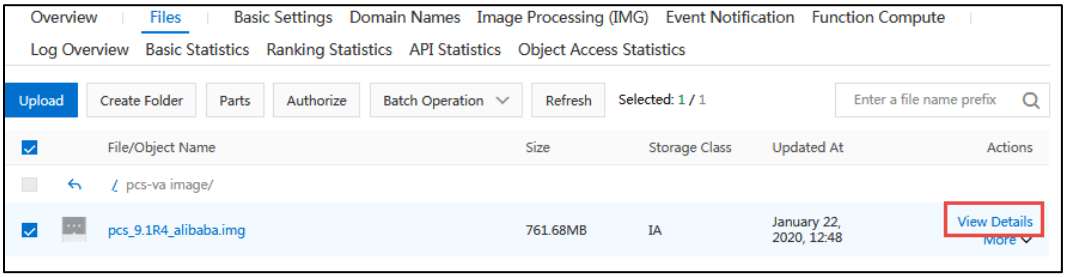
10. Wait for the upload to complete.

Figure 7: Upload Tasks



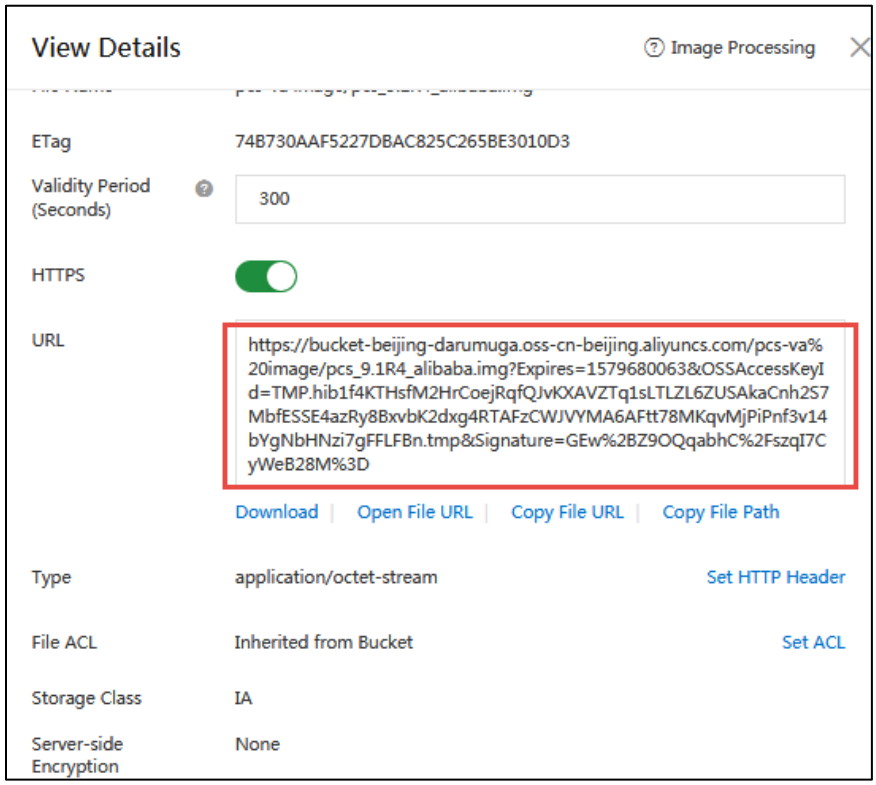
11. Click on the **View Details** link corresponding to the uploaded file.

Figure 8: View Details



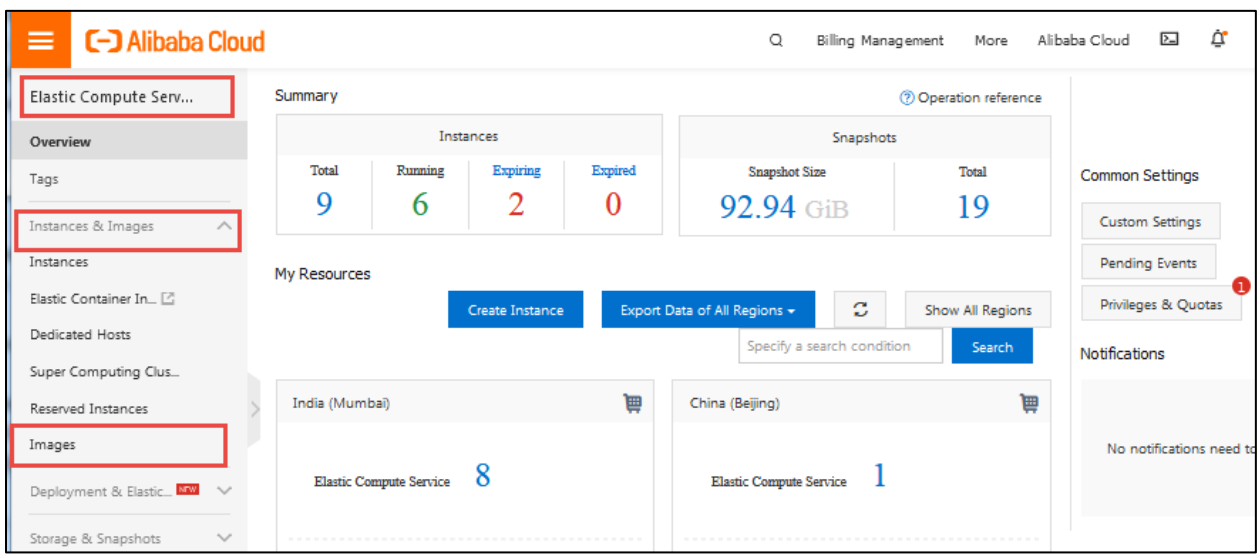
12. Make note of the URL of the image. You need to enter this URL when importing the image.

Figure 9: Image URL



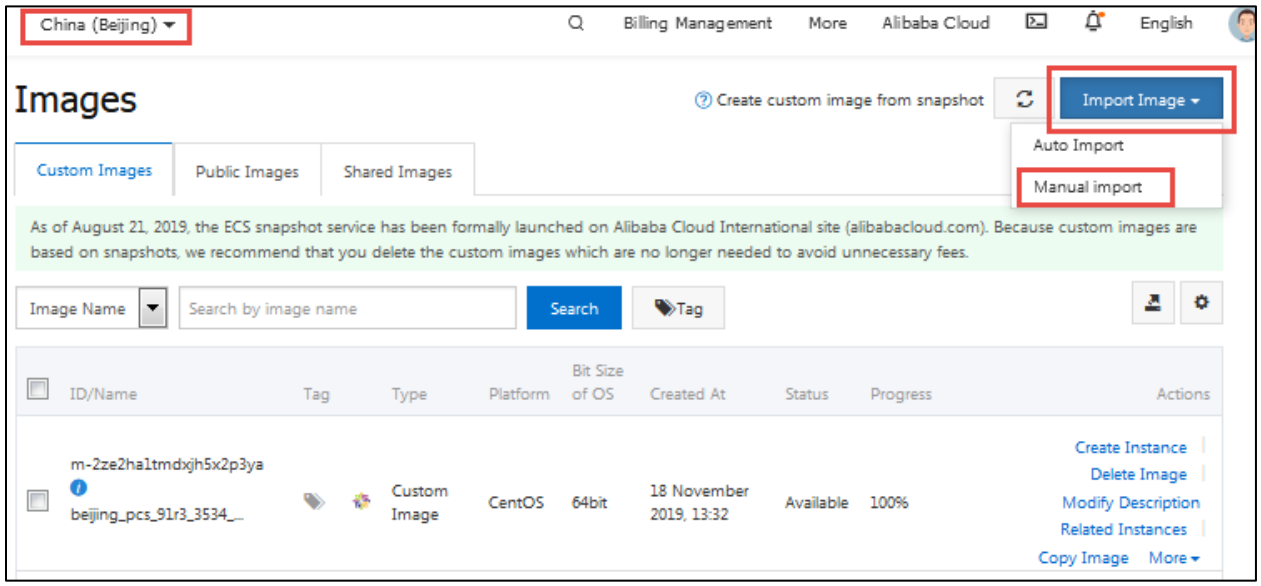
13. In the ECS Console, select **Elastic Compute Service > Instances & Images > Images**.

Figure 10: Images Option



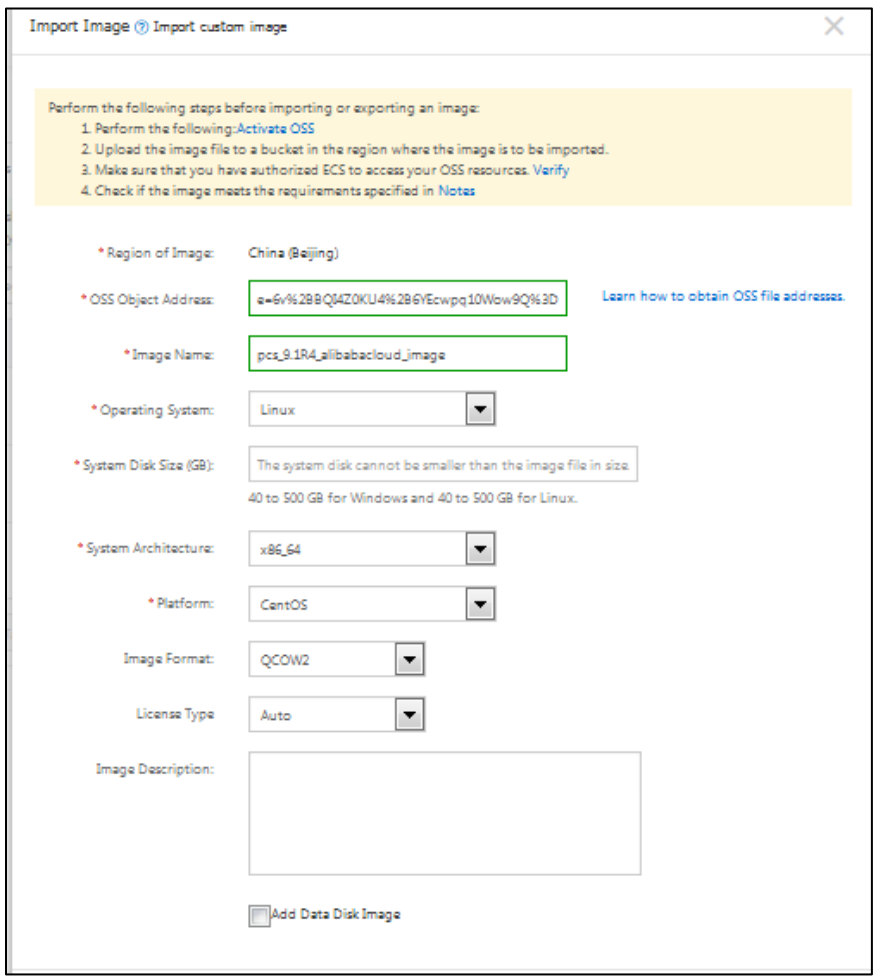
14. In the Images page displayed, select the region from the drop-down list located at the top-left corner of the page.
15. Click the **Import Image** button located at the top-right corner of the page and select **Manual Import**.

Figure 11: Images Page – Manual Import Image



16. In the Import Image page displayed, enter the following details and click **OK**.

Figure 12: Import Image Page

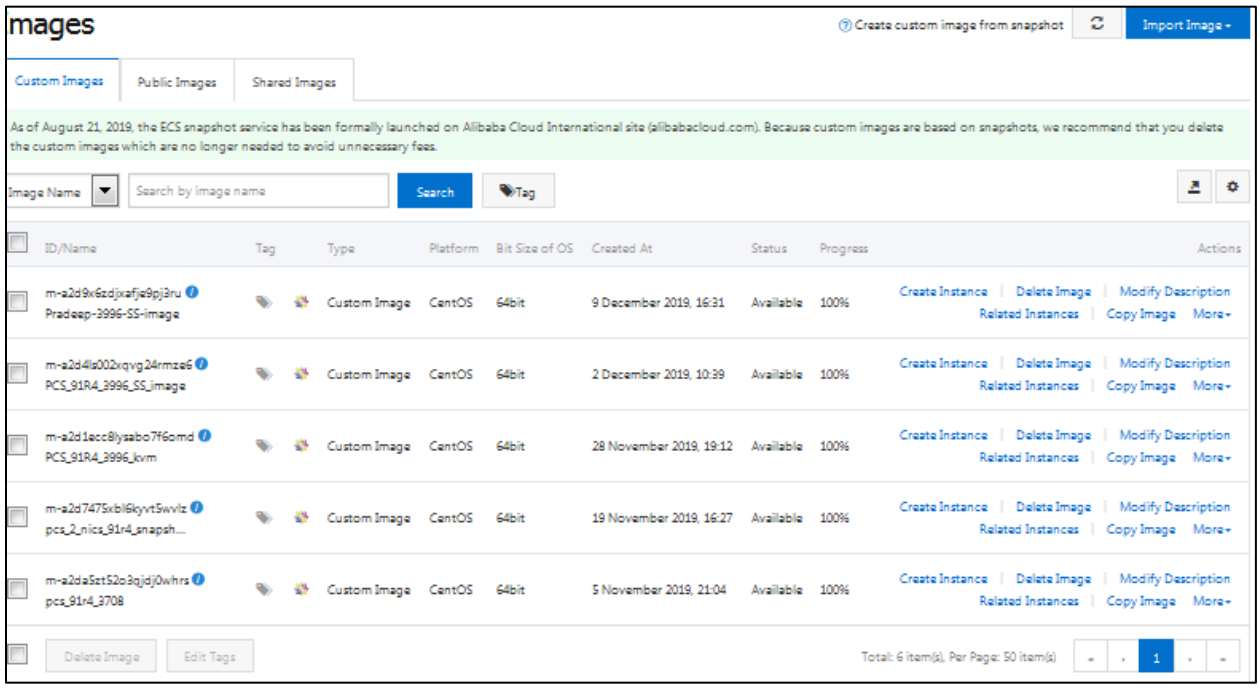


- **OSS Object Address**: Type the URL of the Alibaba Cloud PCS image that was uploaded to OSS bucket.

- **Image Name**: Type a unique name for the image.
- **Operating System**: Linux
- **System Disk Size (GB):** 40
- **System Architecture**: Select an appropriate value from the drop-down list.
- **Platform**: CentOS
- **Image Format**: QCOW2

The imported image is listed in the Images page.

Figure 13: Images List

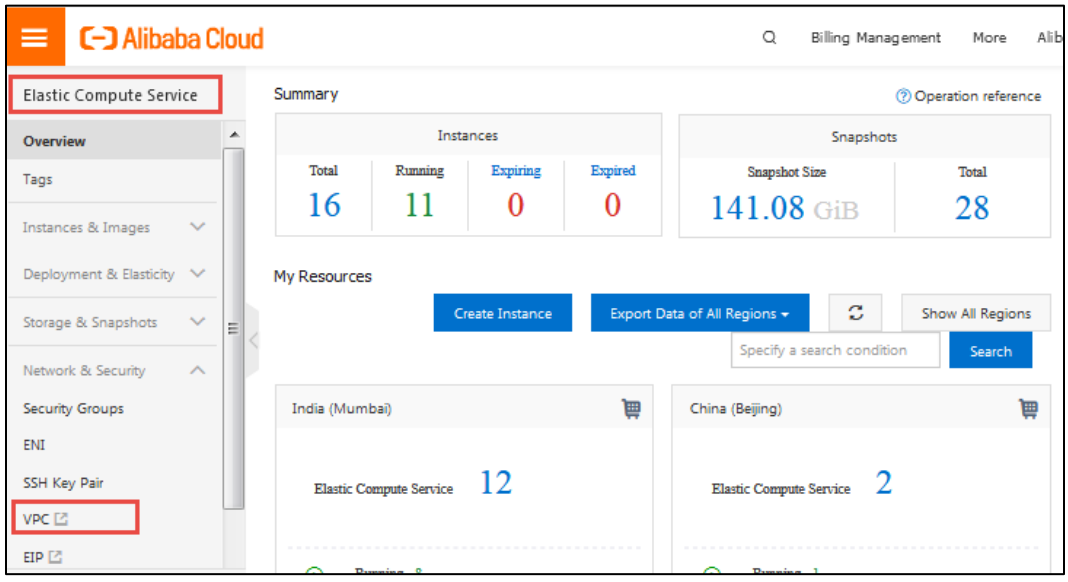


Creating Virtual Private Cloud

To create Virtual Private Cloud (VPC), do the following:

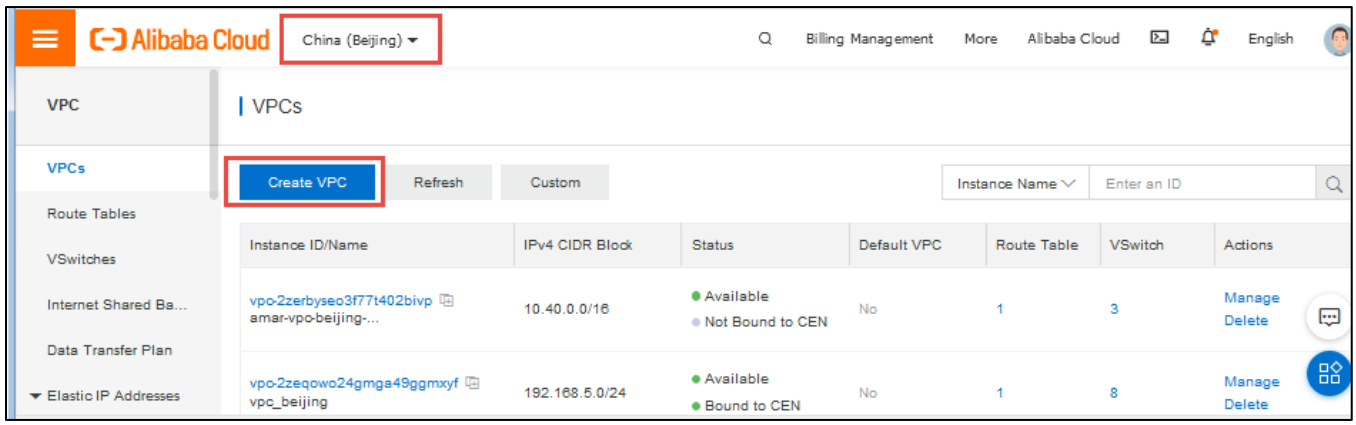
1. Select **Elastic Compute Service > Network & Security > VPC**.

Figure 14: VPC Option



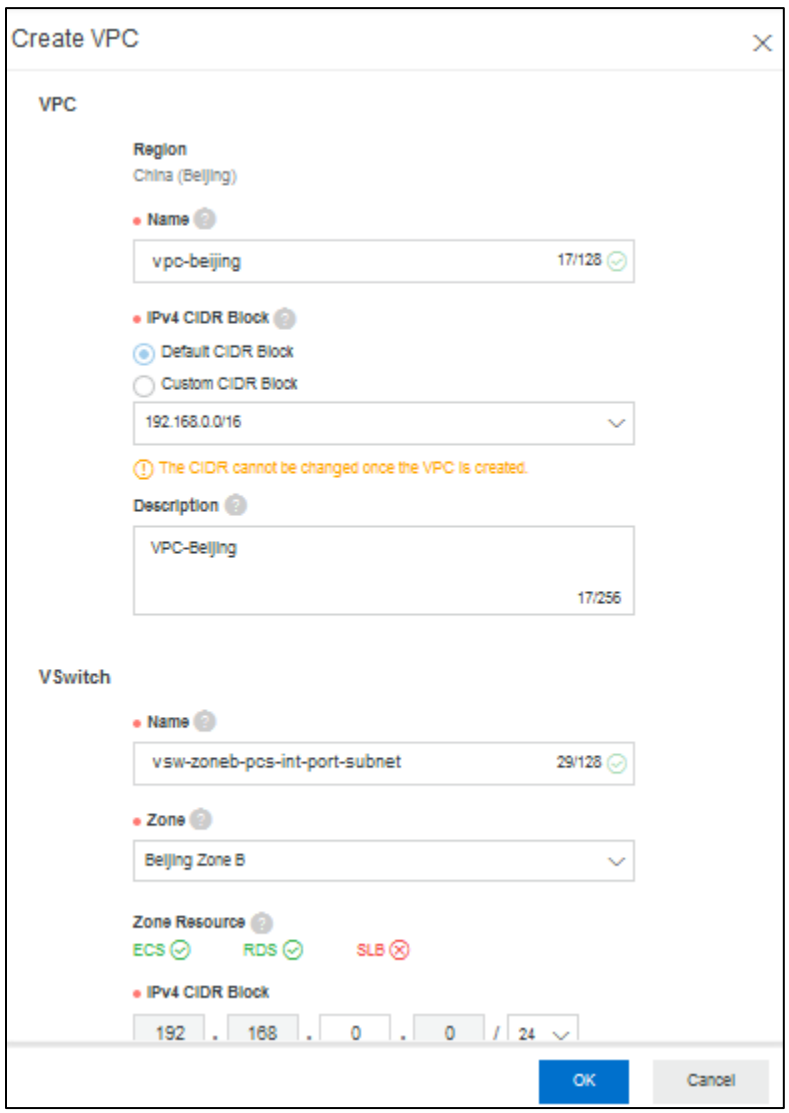
2. In the VPCs page, select the required region from the drop-down list located at the top-left corner of the page and click **Create VPC**.

Figure 15: VPCs Page



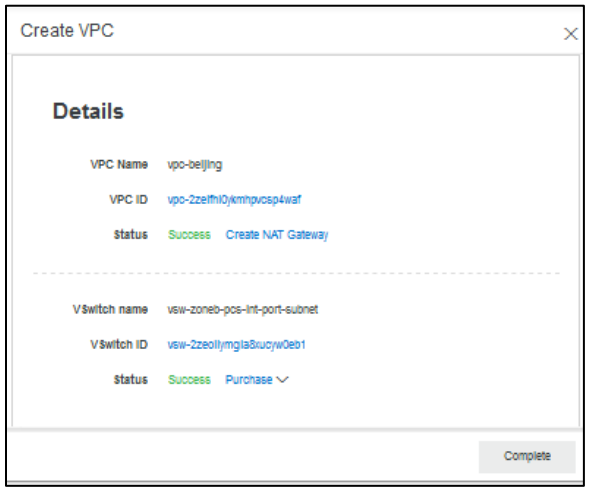
3. In the Create VPC page displayed, enter the VPC and VSwitch (Internal Port) details and click **OK**.

Figure 16: Create VPC Page



4. In the Create VPC - Details page, verify **Status** and click **Complete**. The created VPC is listed in the VPCs page.

Figure 17: Create VPC – Details Page

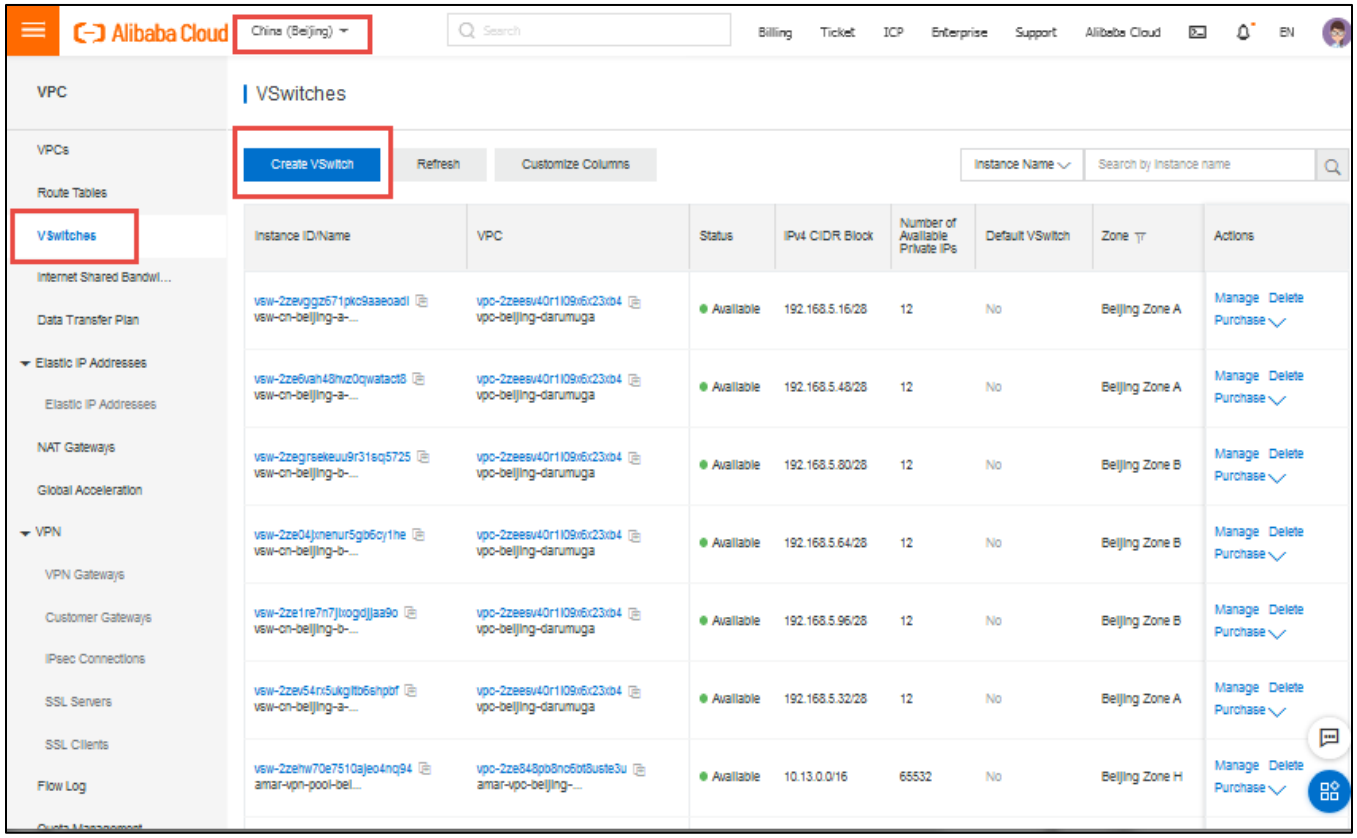


Creating VSwitches

While creating VPC, you created VSwitch for Internal Port. You need to create VSwitches for External and Management ports.
To create VSwitches, do the following:

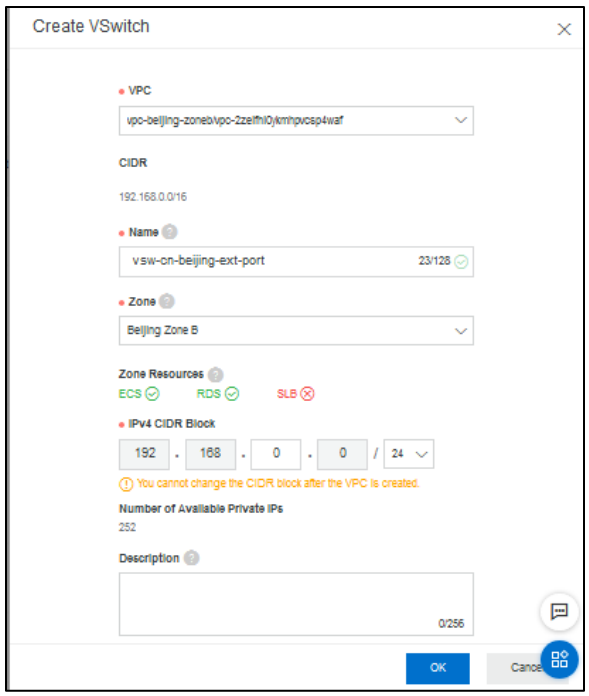
1. Select **Elastic Compute Service > Network & Security > VPC > VSwitches.**
2. In the VSwitches page displayed, select the required region from the drop-down list located at the top-left corner of the page and click **Create VSwitch**.

Figure 18: VSwitches Page



3. In the Create VSwitch window displayed, do the following:
   a. Select **VPC** from the drop-down list.
   b. Enter a unique name for **VSwitch** for External port.
   c. Select **Zone** from the drop-down list.
   d. Click **OK**. The created VSwitch is listed in the VSwitches page.

Figure 19: Create VSwitch Window



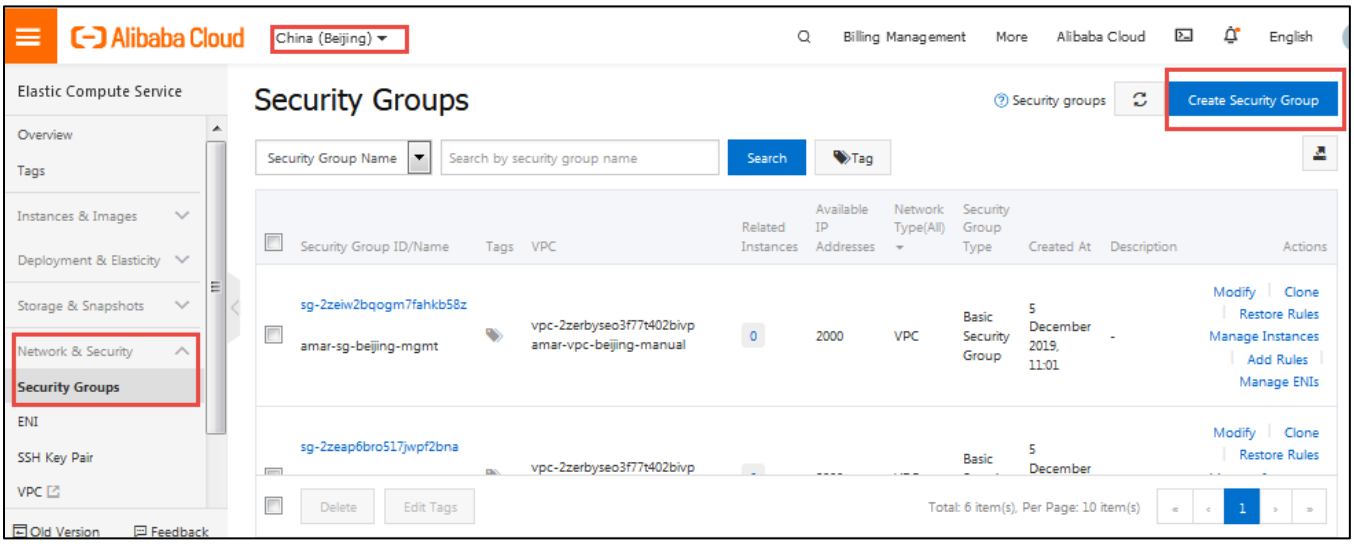
4. Repeat the procedure to create VSwitch for Management Port.

Creating Security Groups

Security groups are groups of VPC instances that are located within the same region and share the same security requirements.
To create a security group, do the following:

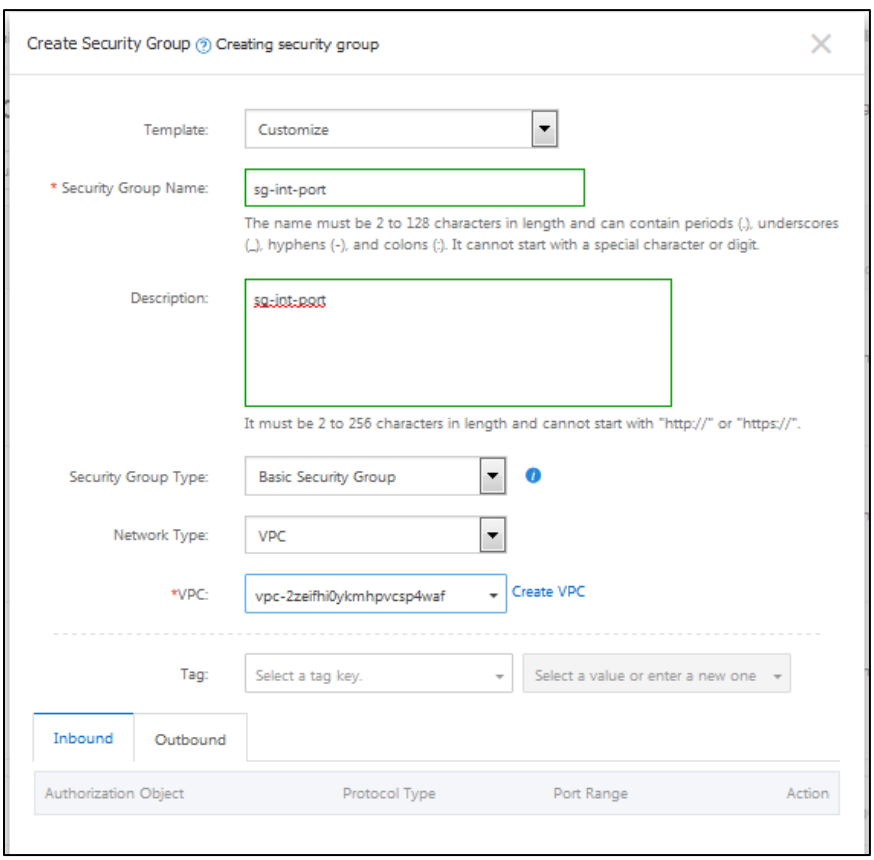
1. Select **Elastic Compute Service > Network & Security > Security Groups**.
2. In the Security Groups page, select the region from the drop-down list located at the top-right corner of the page and click **Create Security Group**.

Figure 20: Security Groups Page

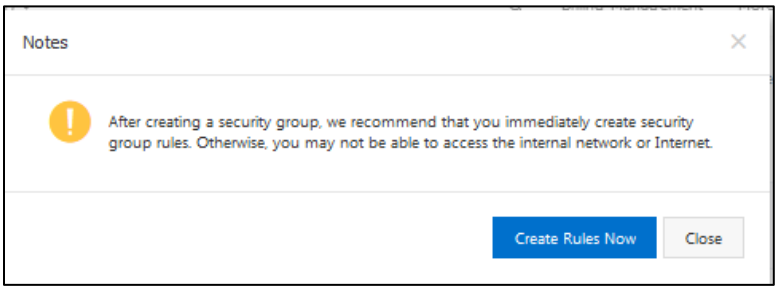


3. In the Create Security Group window, select a template from the drop-down list.
4. Enter a name for the Security Group.
5. Select **Security Group Type** from the drop-down list.
6. Select **Network Type** as **VPC**.
7. Select **VPC** from the drop-down list.
8. Click **OK**.

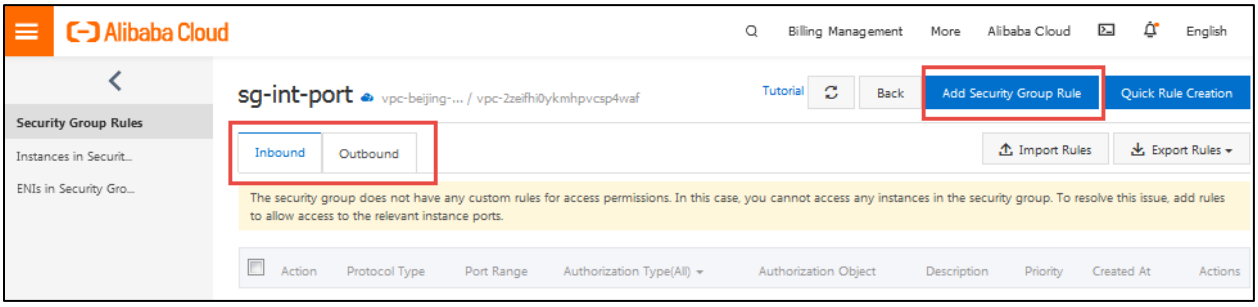
Figure 21: Create Security Group Window



9. In the Notes dialog that is displayed, click **Create Rules Now**.



10. In the page that is displayed, click **Add Security Group Rule** to create the **Inbound** rules.



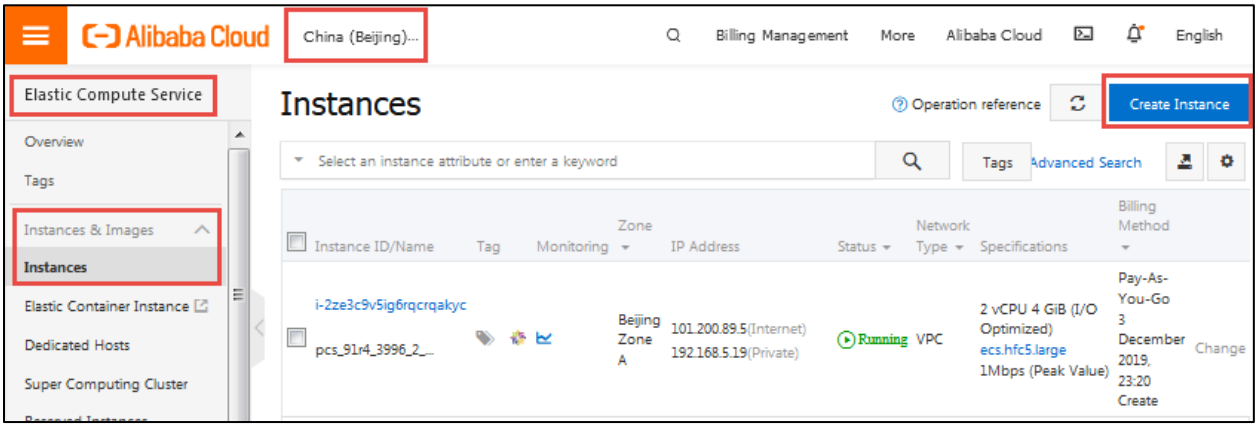
For details about Inbound rules, see Appendix A: Security Group (SG). This completes creation of Security Group.

Creating PCS-VA Instance

To create PCS-VA instance, do the following:

1. Select **Elastic Compute Service > Instances and Images > Instances**.
2. In the Instances page, select the region from the drop-down list located at the top-left corner of the page and click **Create Instance**.

Figure 22: Instances Page – Create Instance Option

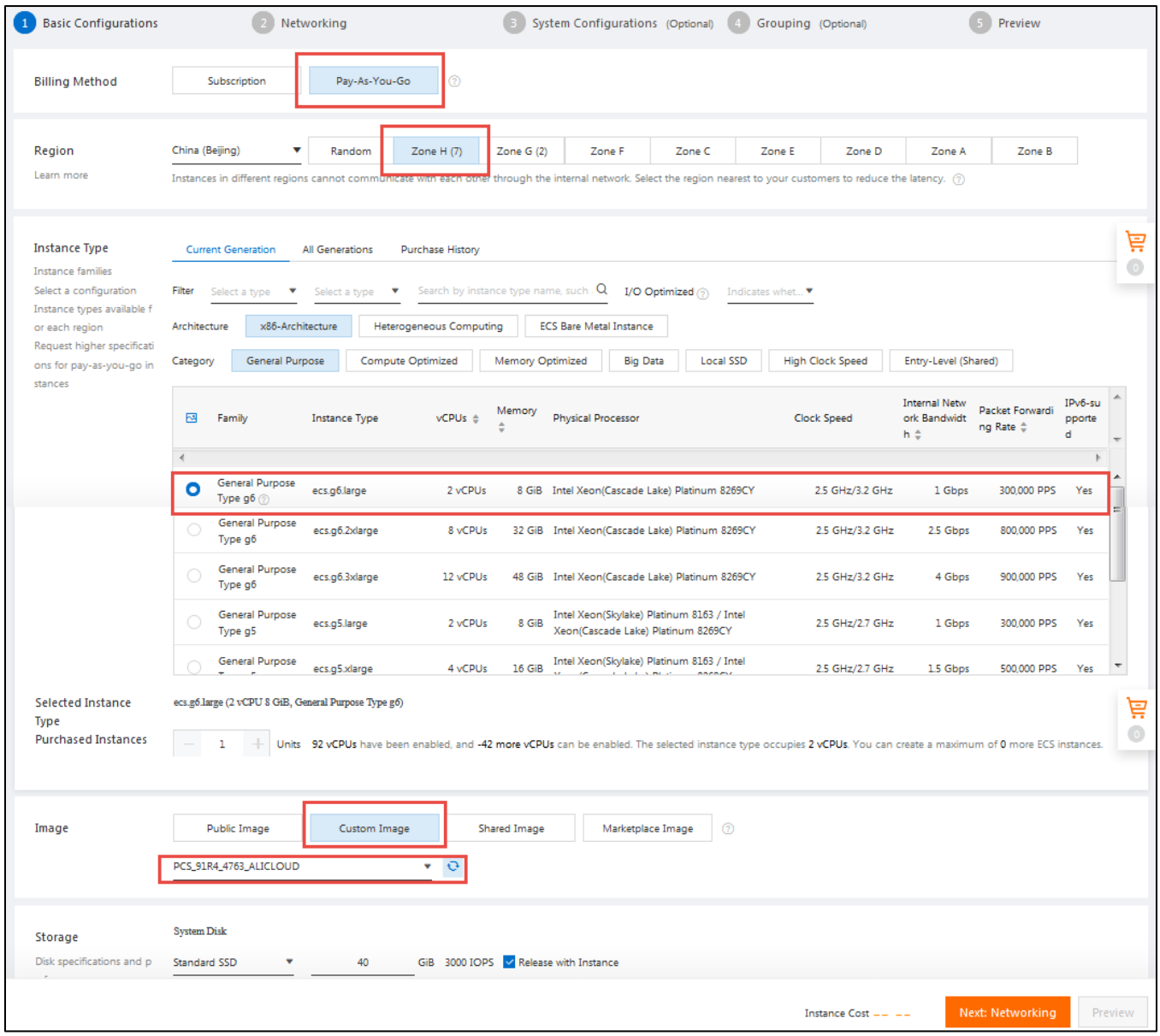


3. In the Basic Configurations page, select the **Custom Launch** tab.
4. Select the Billing Method as **Pay-As-You-Go**.
5. Select the appropriate zone in **Region**.
6. In **Instance Type**, type **ecs.ic5.large**.

   The Selected Instance Type displays the details of the instance type.
7. In the Image section, select the **Custom Image** tab.

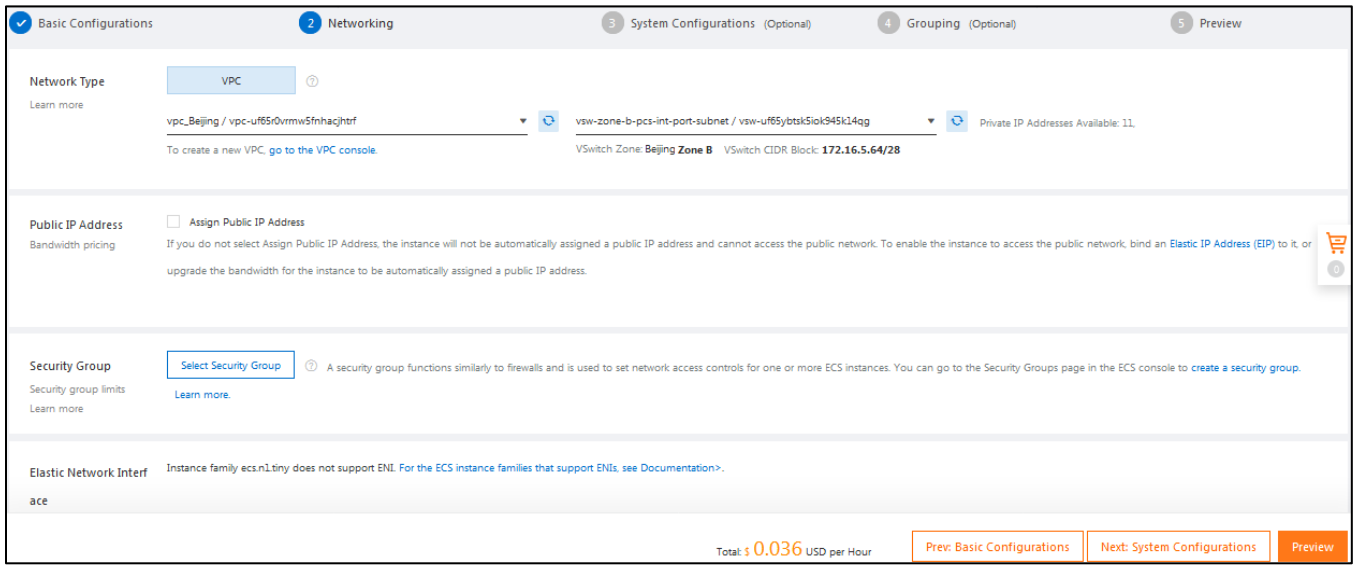
8. From the drop-down list, select the required Alibaba Cloud PCS image that you want to deploy. For details about Alibaba Cloud PCS image, see “Creating Alibaba Cloud PCS Image”.

Figure 23: Basic Configurations Page



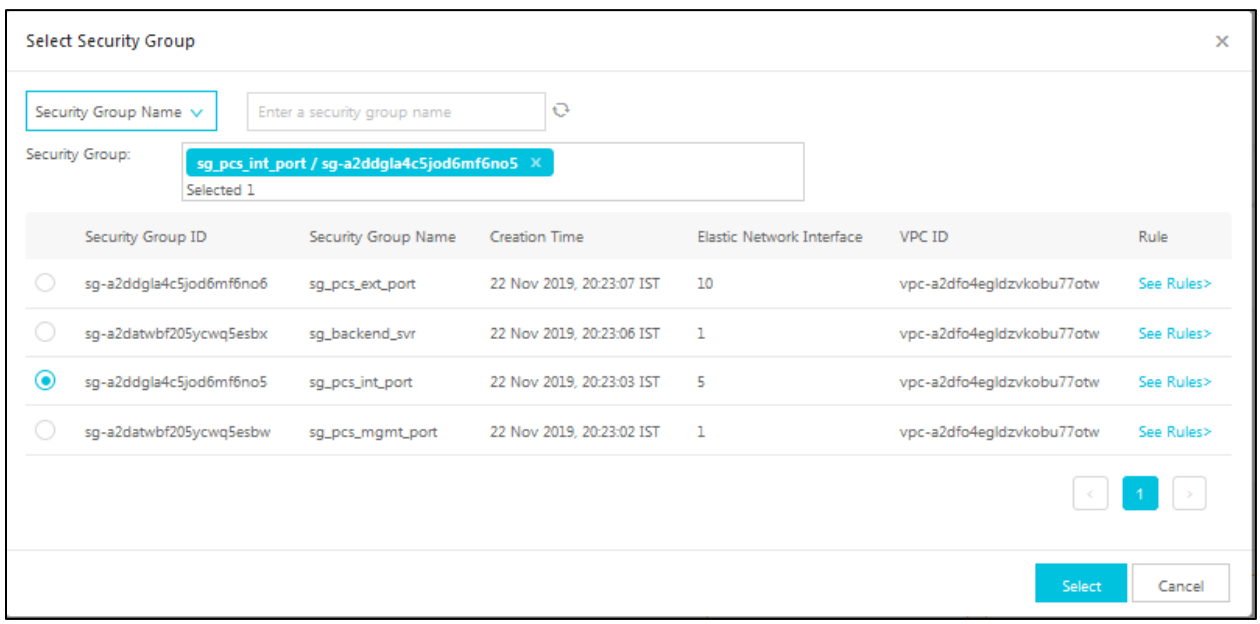
9. Click **Next Networking** to proceed to networking configuration.
10. In the Networking page, go to the Network Type section and select the required **VPC** and **VSwitch** from the drop-down lists. For details about creating VPC and VSwitch, see “Creating Virtual Private Cloud”.
11. In the Public IP Address section, select the **Assign Public IP Address** check box to select an IP address for the Internal Port.

Figure 24: Networking Page



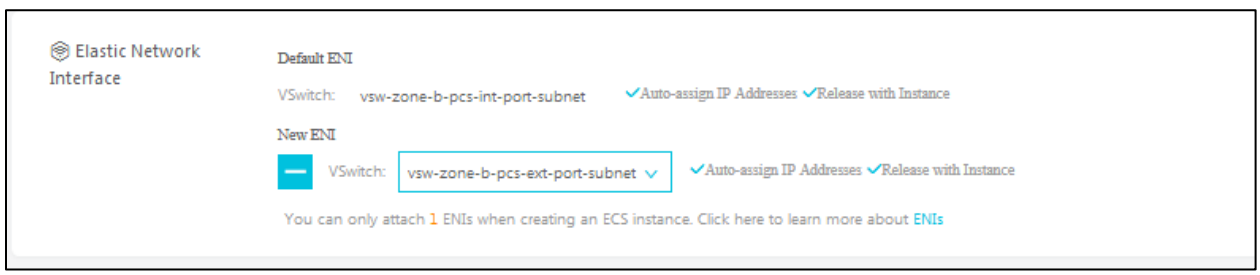
12. In the Security Group section, click **Select Security Group.** In the Select Secure Group window displayed, select the security group assigned to the Internal Port and click **Save**. For details about creating Security Group, see "Creating Security Groups".

Figure 25: Select Security Group Window



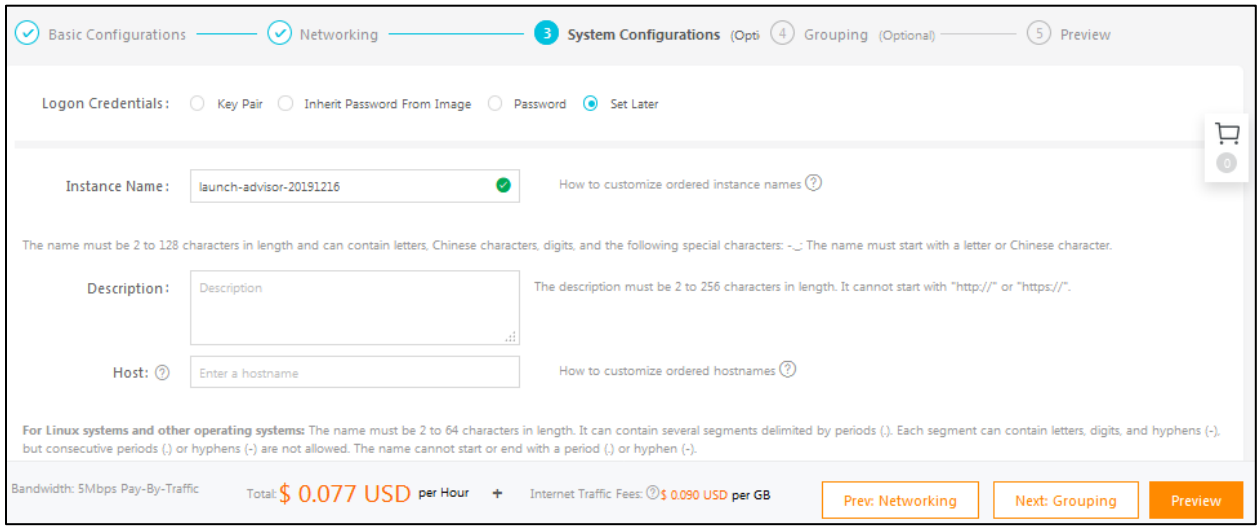
13. In the Elastic Network Interface section, click **Add ENI** and select the External Port.

Figure 26: Elastic Network Interface Section



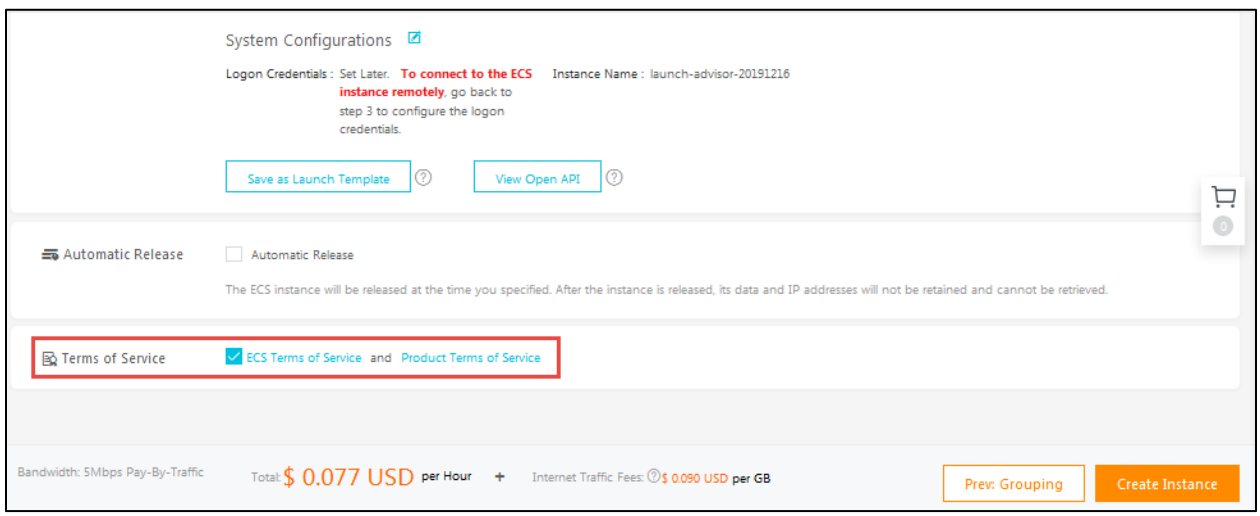
14. Click **Next System Configuration** to proceed to system configuration.
15. In the System Configurations page, for Logon Credentials, select **Set Later**.
16. For **Instance Name**, enter the name of the virtual appliance.
17. In the User Data section, provide Provisioning Parameters in the XML format.

Figure 27: System Configurations Page

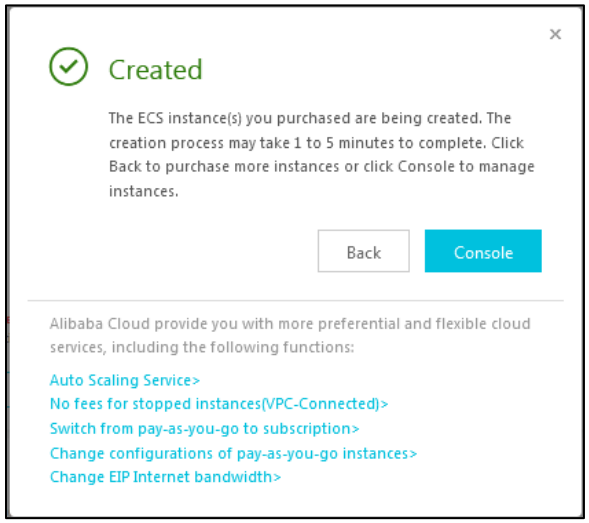


18. Click **Preview**. In the Summary page, accept **Terms of Service** and click **Create Instance**.

Figure 28: Terms of Service



The instance will be created.



Deploying Alibaba Cloud PCS using Terraform Template

This section describes how to install terraform template, deploy PCS with 2 NICs and 3 NICs.

Installing Terraform Template

1. Go to the Terraform website and install Terraform on a Linux VM of your choice.
2. Download the following directories and files in it:

Directory	Files
base_setup	• base_setup.tf • variables.tf
pcs_2_nics	• pcs_2_nics.tf • user_data.txt • variables.tf
pcs_3_nics	• pcs_3_nics.tf • user_data.txt • variables.tf

Configuring Base Setup

1. Customize and set the variables in **variables.tf** file.
2. Copy **user_data.txt** and **variables.tf** file to each of the directories (base_setup, pcs_2_nics, pcs_3_nics). Alternatively, create a softlink to these files.
3. Change directory to base_setup directory, and run the following commands:

   linux# terraform init
   linux# terraform apply

Deploying PCS with 2 NICs

1. Change directory to **pcs_2_nics**.
2. Customize the **user_data.txt** file. This file contains the PCS initial configuration data.
3. Run the following commands:

   linux# terraform init
   linux# terraform apply

Deploying PCS with 3 NICs

1. Change directory to **pcs_3_nics**.
2. Customize the **user_data.txt** file. This file contains the PCS initial configuration data.
3. Run the following commands:

   linux# terraform init
   linux# terraform apply

Pulse Connect Secure Provisioning Parameters

Provisioning parameters are those parameters which are required during the deployment of a virtual appliance. Pulse Connect Secure accepts the following parameters as provisioning parameters in the XML format.

```
<pulse-config>
   <wins-server><value></wins-server>
   <dns-domain><value></dns-domain>
   <admin-username><value></admin-username>
   <admin-password><value></admin-password>
   <cert-common-name><value></cert-common-name>
   <cert-random-text><value></cert-random-text>
   <cert-organisation><value></cert-organisation>
   <config-download-url><value></config-download-url>
   <config-data><value></config-data>
   <auth-code-license><value></auth-code-license>
   <enable-license-server><value></enable-license-server>
   <accept-license-agreement><value></accept-license-agreement >
   <enable-rest><value></enable-rest>
</pulse-config>
```

The below table depicts the details of the xml file.

#	Parameter Name	Type	Description
1	wins-server	IP address	Wins server for Pulse Connect Secure
2	dns-domain	string	DNS domain of Pulse Connect Secure
3	admin-username	string	admin UI username
4	admin-password	string	admin UI password.
5	cert-common-name	string	Common name for the self-signed certificate generation. This certificate is used as the device certificate of Pulse Connect Secure
6	cert-random-text	string	Random text for the self-certificate generation
7	cert-organization	string	Organization name for the self-signed certificate generation
8	config-download-url	String URL	Http based URL where XML based Pulse Connect Secure configuration can be found. During provisioning, Pulse Connect Secure fetches this file and comes up with preloaded configuration. XML based configuration can be present in another VM in Alibaba Cloud or at corporate network which is accessible for Pulse Connect Secure through site to site VPN between Alibaba Cloud and corporate data center.
9	config-data	string	base64 encoded XML based Pulse Connect Secure configuration
10	auth-code-license	string	Authentication code that needs to be obtained from Pulse Secure
11	enable-license-server	string	If set to 'y', PCS will be deployed as a License server. If set to 'n', PCS will be deployed as a normal server.
12	accept-license-agreement	string	This value is passed to the instance for configuration at the boot time. By default, this value is set to "n". This value must be set to "y".
13	enable-rest	string	If set to 'y', REST API access for the administrator user is enabled.

Note:

- In the above list of parameters, dns domain, admin username, admin password, cert-random name, cert-random text, cert-organization and accept-license-agreement are mandatory parameters. The other parameters are optional parameters.
- From 9.1R3 release, Pulse Connect Secure supports zero touch provisioning. This feature can detect and assign DHCP networking settings automatically at the Pulse Connect Secure boot up. The Pulse Connect Secure parameters should be set to null in order to fetch the networking configuration automatically from the DHCP server.

Limitations

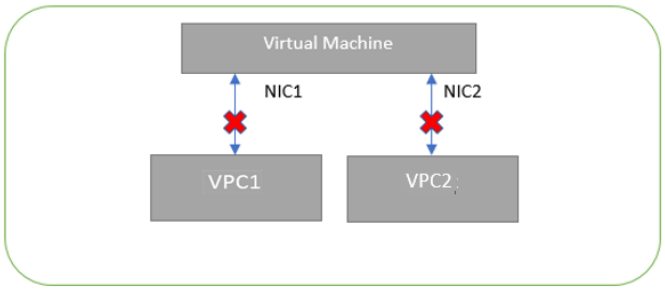
The following list of Pulse Connect Secure features are not supported in this release:

- Default VLAN on Internal, External and Management Ports
- VLAN functionality
- AP Cluster
- Layer 3 Tunnel IP pool assignment via DHCP
- Virtual Ports

Appendix A: Security Group (SG)

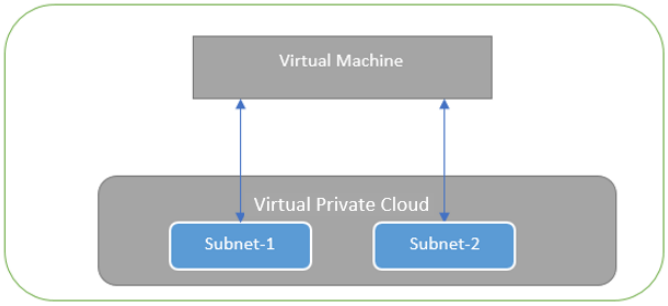
Alibaba Cloud has a limitation where virtual machine with multiple network interfaces cannot connect to different Virtual Private Cloud (VPCs). For example, a VM with two NICs, NIC1 and NIC2, will not be able to connect to VPC1 and VPC2 respectively.

Figure 29: Virtual Machine with two NICs Connecting to VPC1 and VPC2



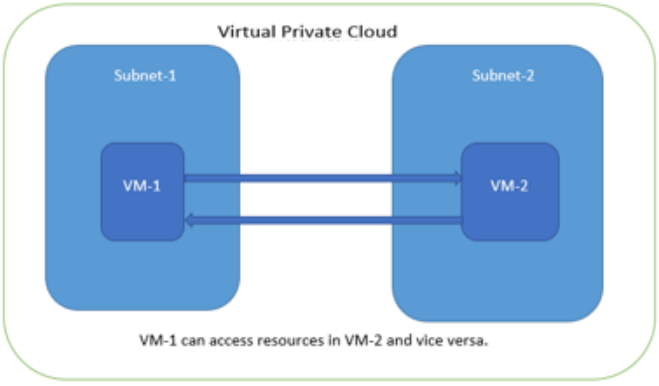
Alibaba Cloud supports a virtual machine with multiple NICs to connect to different Subnets under a same Virtual Private Cloud. For example, a VM with two NICs, NIC1 and NIC2, can connect to 'Subnet1' and 'Subnet2' where these subnets exist under a same Virtual Private Cloud respectively.

Figure 30: Virtual Machine with two NICs Connecting to Subnet1 and Subnet2



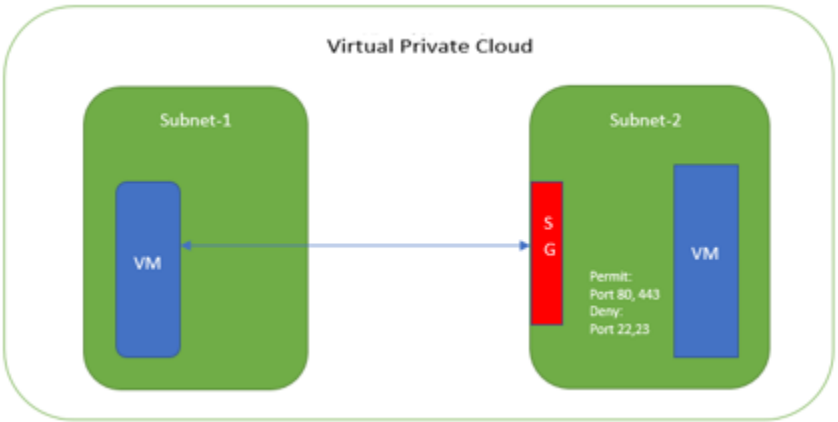
Alibaba Cloud provides isolation between different VPCs. But it does not provide the same kind of isolation when it comes to subnets in the same VPC. For example, consider a VPC has two subnets, Subnet1 and Subnet2. And consider two VMs, VM-1 and VM-2, which are connected to Subnet1 and Subnet2 respectively. In this scenario VM-1 can access the resources from VM-2 and vice versa.

Figure 31: Virtual Machine VM-1 can Access Resources in VM-2 and Vice Versa



Application isolation is an important concern in enterprise environments, as enterprise customers seek to protect various environments from unauthorized or unwanted access. To achieve the traffic isolation between subnets, go for an option of filtering traffic using "Security Group" provided by Alibaba Cloud.

Figure 32: Traffic Filtering by Alibaba Cloud Support Group



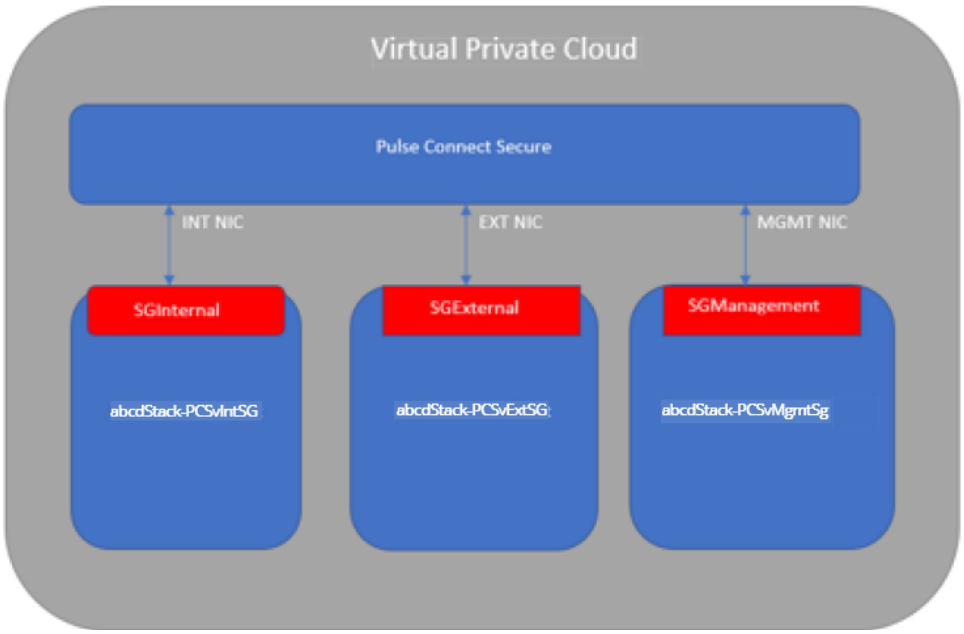
Pulse Connect Secure, when provisioned through the Terraform template provided by Pulse Secure, creates three subnets under a virtual private cloud named "PCSVirtualNetwork". The three Subnets are:

1. vsw-zone-a-pcs-int-port-subnet
2. vsw-zone-a-pcs-ext-port-subnet
3. vsw-zone-a-pcs-mgmt-port-subnet

Along with above mentioned subnets, create the following three Security Groups (SG) policies:

1. sg_pcs_int_port
2. sg_pcs_ext_port
3. sg_pcs_mgmt_port

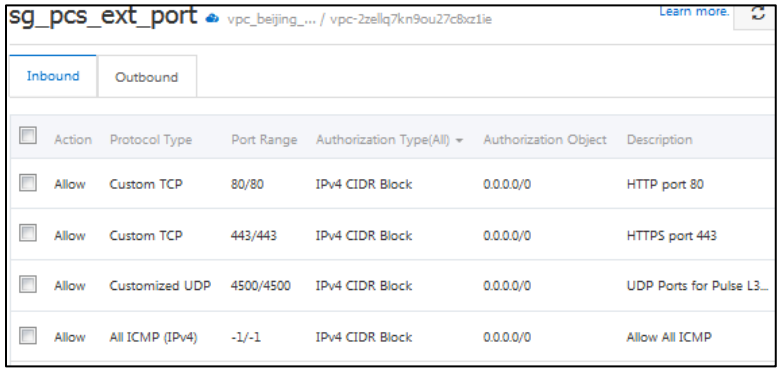
Figure 33: SG External, Internal and Management Subnets



In Security Group (SG) we need to create policies for Inbound traffic.

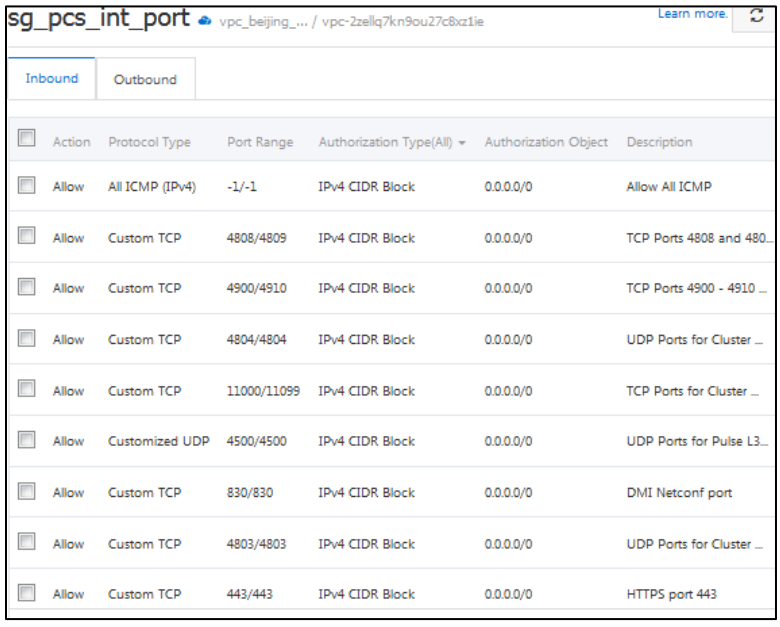
1. Select **Elastic Compute Service > Network & Security > Security Groups.**
2. The list of SG Inbound rules created "**sg_pcs_ext_port**" are:

Figure 34: sg_pcs_ext_port - Inbound Rules



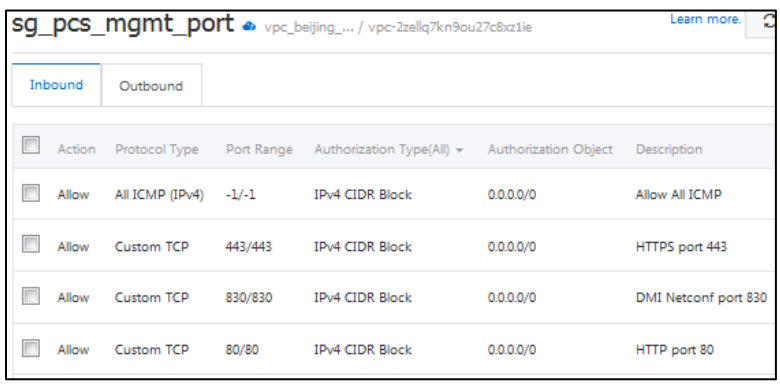
3. The list of SG Inbound rules created "**sg_pcs_int_port**" are:

Figure 35: sg_pcs_int_port - Inbound Rules



4. The list of SG Inbound rules created "**sg_pcs_mgmt_port**" are:

Figure 36: sg_pcs_mgmt_port - Inbound Rules



Appendix B: Pulse Connect Secure Terraform Template

Terraform is an open source tool to easily define, preview, and deploy cloud infrastructure on Alibaba Cloud. Pulse Secure provides sample Terraform template files for 2 NICs and 3 NICs to deploy the Pulse Connect Secure Virtual Appliance on Alibaba Cloud. Users can modify this to make it suitable for their need. Visit https://www.pulsesecure.net and download the template file.

Base Setup

```
#Terraform version
    terraform {
      required_version = ">= 0.12.18"
    }
#Access Keys
    provider "alicloud" {
      access_key = var.access_key
      secret_key = var.secret_key
      #region is important
      region     = var.region
    }
#Bucket Creation
    terraform {
      backend "oss" {
        bucket      = "bucket-beijing-darumuga"
        prefix      = "terraform_state/base_setup_beijing"
        key         = "terraform.tfstate"
        region      = "cn-beijing"
        tablestore_endpoint = "https://oss-cn-beijing.aliyuncs.com"
      }
    }
#VPCs , VSwitches, Security Groups and Alibaba Cloud PCS VA Images
    #VPCs
    data "alicloud_vpcs" "vpcs_ds" {
            #No args required
    }
    #vSwitches
    data "alicloud_vswitches" "vswitches_ds" {
      vpc_id       = "${local.vpc_id}"
    }
    #available security groups
    data "alicloud_security_groups" "sec_groups_ds" {
      vpc_id       = "${local.vpc_id}"
    }
    #available images loaded by the user
    data "alicloud_images" "self_images_ds" {
      owners      = "self" #system|marketplace|others|self
```

```
}
#Local variables
locals {
  vpcs_list          = "${data.alicloud_vpcs.vpcs_ds.vpcs}"
  vpc_id             = join ( "", [ for vpc in local.vpcs_list : vpc.id if vpc.vpc_name == "${var.vpc}" ] )
  vsws_list_in_vpc   = "${data.alicloud_vswitches.vswitches_ds.vswitches}"
  sec_groups_list    = "${data.alicloud_security_groups.sec_groups_ds.groups}"
  images_list        = {
    "self"       = "${data.alicloud_images.self_images_ds.images}" ,
  }
  instance_type    = var.instance_type
      region          = var.region
      zone            = var.zone
      vswitch_names_map   = {
    "${var.zone_a}" = {
      "pcs_int_port"  = "vsw-zone-a-pcs-int-port-subnet",
      "pcs_ext_port"  = "vsw-zone-a-pcs-ext-port-subnet",
      "pcs_mgmt_port" = "vsw-zone-a-pcs-mgmt-port-subnet",
    },
    "${var.zone_b}" = {
      "pcs_int_port"  = "vsw-zone-b-pcs-int-port-subnet",
      "pcs_ext_port"  = "vsw-zone-b-pcs-ext-port-subnet",
      "pcs_mgmt_port" = "vsw-zone-b-pcs-mgmt-port-subnet",
    },
  }
  security_group_names_map = {
      "pcs_int_port"     = "sg_pcs_int_port",
      "pcs_ext_port"     = "sg_pcs_ext_port",
      "pcs_mgmt_port"    = "sg_pcs_mgmt_port",
  }
}
#Create a VPC
resource "alicloud_vpc" "vpc" {
  name       = "vpc_beijing_darumuga"
  cidr_block = "172.16.5.0/24"
}
#Create vSwitch for zone-a
#for pcs internal port
resource "alicloud_vswitch" "vsw-zone-a-pcs-int-port-subnet" {
  vpc_id          = alicloud_vpc.vpc.id
  name            = local.vswitch_names_map[var.zone_a]["pcs_int_port"]
  cidr_block      = "172.16.5.16/28"
  availability_zone = var.zone_a
}
#for pcs external port
resource "alicloud_vswitch" "vsw-zone-a-pcs-ext-port-subnet" {
  vpc_id          = alicloud_vpc.vpc.id
  name            = local.vswitch_names_map[var.zone_a]["pcs_ext_port"]
  cidr_block      = "172.16.5.32/28"
  availability_zone = var.zone_a
}
#for pcs management port
resource "alicloud_vswitch" "vsw-zone-a-pcs-mgmt-port-subnet" {
  vpc_id          = alicloud_vpc.vpc.id
  name            = local.vswitch_names_map[var.zone_a]["pcs_mgmt_port"]
```

```
    cidr_block        = "172.16.5.48/28"
    availability_zone = var.zone_a
  }
#Create vSwitch for zone-b
  #for pcs internal port
  resource "alicloud_vswitch" "vsw-zone-b-pcs-int-port-subnet" {
   vpc_id            = alicloud_vpc.vpc.id
   name              = local.vswitch_names_map[var.zone_b]["pcs_int_port"]
   cidr_block        = "172.16.5.64/28"
   availability_zone = var.zone_b
  }
  #for pcs external port
  resource "alicloud_vswitch" "vsw-zone-b-pcs-ext-port-subnet" {
   vpc_id            = alicloud_vpc.vpc.id
   name              = local.vswitch_names_map[var.zone_b]["pcs_ext_port"]
   cidr_block        = "172.16.5.80/28"
   availability_zone = var.zone_b
  }
  #for pcs management port
  resource "alicloud_vswitch" "vsw-zone-b-pcs-mgmt-port-subnet" {
   vpc_id            = alicloud_vpc.vpc.id
   name              = local.vswitch_names_map[var.zone_b]["pcs_mgmt_port"]
   cidr_block        = "172.16.5.96/28"
   availability_zone = var.zone_b
  }
#Create Security Groups
  #create security group for pcs internal port
  resource "alicloud_security_group" "sg_pcs_int_port" {
    name        = local.security_group_names_map["pcs_int_port"]
    description = "Security Group for PCS internal port"
    vpc_id      = alicloud_vpc.vpc.id
  }
  #create security group for pcs external port
  resource "alicloud_security_group" "sg_pcs_ext_port" {
    name        = local.security_group_names_map["pcs_ext_port"]
    description = "Security Group for PCS external port"
    vpc_id      = alicloud_vpc.vpc.id
  }
  #create security group for pcs management port
  resource "alicloud_security_group" "sg_pcs_mgmt_port" {
    name        = local.security_group_names_map["pcs_mgmt_port"]
    description = "Security Group for PCS management port"
    vpc_id      = alicloud_vpc.vpc.id
  }
  #create security group for backend servers
  resource "alicloud_security_group" "sg_backend_svr" {
    name        = "sg_backend_svr"
    description = "Security Group for backend servers in protected network"
    vpc_id      = alicloud_vpc.vpc.id
  }
#Create Security Group Rules for PCS Internal Port and Assign to Security Group
  #HTTP port 80
  resource "alicloud_security_group_rule" "int_port_allow_tcp_80" {
    description      = "HTTP port 80"
    type             = "ingress"
```

```
    ip_protocol       = "tcp"
    nic_type          = "intranet"
    policy            = "accept"
    port_range        = "80/80"
    priority          = 1
    security_group_id = alicloud_security_group.sg_pcs_int_port.id
    cidr_ip           = "0.0.0.0/0"
}
#HTTPS port 443
resource "alicloud_security_group_rule" "int_port_allow_tcp_443" {
    description       = "HTTPS port 443"
    type              = "ingress"
    ip_protocol       = "tcp"
    nic_type          = "intranet"
    policy            = "accept"
    port_range        = "443/443"
    priority          = 1
    security_group_id = alicloud_security_group.sg_pcs_int_port.id
    cidr_ip           = "0.0.0.0/0"
}
#DMI Netconf port
resource "alicloud_security_group_rule" "int_port_allow_tcp_dmi_830" {
    description       = "DMI Netconf port"
    type              = "ingress"
    ip_protocol       = "tcp"
    nic_type          = "intranet"
    policy            = "accept"
    port_range        = "830/830"
    priority          = 1
    security_group_id = alicloud_security_group.sg_pcs_int_port.id
    cidr_ip           = "0.0.0.0/0"
}
#Allow All ICMP
resource "alicloud_security_group_rule" "int_port_allow_all_icmp" {
    description       = "Allow All ICMP"
    type              = "ingress"
    ip_protocol       = "icmp"
    nic_type          = "intranet"
    policy            = "accept"
    port_range        = "-1/-1"
    priority          = 1
    security_group_id = alicloud_security_group.sg_pcs_int_port.id
    cidr_ip           = "0.0.0.0/0"
}
#TCP Ports for Cluster Communication
resource "alicloud_security_group_rule" "int_port_allow_tcp_cluster_comms" {
    description       = "TCP Ports for Cluster Communication"
    type              = "ingress"
    ip_protocol       = "tcp"
    nic_type          = "intranet"
    policy            = "accept"
    port_range        = "11000/11099"
    priority          = 1
    security_group_id = alicloud_security_group.sg_pcs_int_port.id
    cidr_ip           = "0.0.0.0/0"
}
#TCP Ports 4808 and 4809 for Cluster Communication
```

```
resource "alicloud_security_group_rule" "int_port_allow_tcp_cluster_comms_4808_4809" {
    description       = "TCP Ports 4808 and 4809 for Cluster Communication"
    type              = "ingress"
    ip_protocol       = "tcp"
    nic_type          = "intranet"
    policy            = "accept"
    port_range        = "4808/4809"
    priority          = 1
    security_group_id = alicloud_security_group.sg_pcs_int_port.id
    cidr_ip           = "0.0.0.0/0"
}
#TCP Ports 4900 - 4910 for Cluster Key Exchange and State Sync
resource "alicloud_security_group_rule" "int_port_allow_tcp_cluster_key_exchange_and_sync" {
    description       = "TCP Ports 4900 - 4910 for Cluster Key Exchange and State Sync"
    type              = "ingress"
    ip_protocol       = "tcp"
    nic_type          = "intranet"
    policy            = "accept"
    port_range        = "4900/4910"
    priority          = 1
    security_group_id = alicloud_security_group.sg_pcs_int_port.id
    cidr_ip           = "0.0.0.0/0"
}
#UDP Ports for Cluster Communication
resource "alicloud_security_group_rule" "int_port_allow_udp_cluster_comms" {
    description       = "UDP Ports for Cluster Communication"
    type              = "ingress"
    ip_protocol       = "tcp"
    nic_type          = "intranet"
    policy            = "accept"
    port_range        = "4803/4803"
    priority          = 1
    security_group_id = alicloud_security_group.sg_pcs_int_port.id
    cidr_ip           = "0.0.0.0/0"
}
#UDP Ports for Cluster HeartBeat
resource "alicloud_security_group_rule" "int_port_allow_udp_cluster_hearbeat" {
    description       = "UDP Ports for Cluster HeartBeat"
    type              = "ingress"
    ip_protocol       = "tcp"
    nic_type          = "intranet"
    policy            = "accept"
    port_range        = "4804/4804"
    priority          = 1
    security_group_id = alicloud_security_group.sg_pcs_int_port.id
    cidr_ip           = "0.0.0.0/0"
}
#UDP Ports for Pulse L3 Connection
resource "alicloud_security_group_rule" "int_port_allow_udp_pulse_client" {
    description       = "UDP Ports for Pulse L3 Connection"
    type              = "ingress"
    ip_protocol       = "udp"
    nic_type          = "intranet"
    policy            = "accept"
    port_range        = "4500/4500"
    priority          = 1
    security_group_id = alicloud_security_group.sg_pcs_int_port.id
```

```
    cidr_ip         = "0.0.0.0/0"
  }
#Create Security Group Rules for PCS External Port and Assign to Security Group
  #HTTP port 80
  resource "alicloud_security_group_rule" "ext_port_allow_tcp_80" {
        description                 = "HTTP port 80"
        type            = "ingress"
        ip_protocol     = "tcp"
        nic_type        = "intranet"
        policy          = "accept"
        port_range      = "80/80"
        priority        = 1
        security_group_id = alicloud_security_group.sg_pcs_ext_port.id
        cidr_ip         = "0.0.0.0/0"
  }
  #HTTPS port 443
  resource "alicloud_security_group_rule" "ext_port_allow_tcp_443" {
        description                 = "HTTPS port 443"
        type            = "ingress"
        ip_protocol     = "tcp"
        nic_type        = "intranet"
        policy          = "accept"
        port_range      = "443/443"
        priority        = 1
        security_group_id = alicloud_security_group.sg_pcs_ext_port.id
        cidr_ip         = "0.0.0.0/0"
  }
  #Allow All ICMP
  resource "alicloud_security_group_rule" "ext_port_allow_all_icmp" {
        description                 = "Allow All ICMP"
        type            = "ingress"
        ip_protocol     = "icmp"
        nic_type        = "intranet"
        policy          = "accept"
        port_range      = "-1/-1"
        priority        = 1
        security_group_id = alicloud_security_group.sg_pcs_ext_port.id
        cidr_ip         = "0.0.0.0/0"
  }
  #UDP Ports for Pulse L3 Connection
  resource "alicloud_security_group_rule" "ext_port_allow_udp_pulse_client" {
        description                 = "UDP Ports for Pulse L3 Connection"
        type            = "ingress"
        ip_protocol     = "udp"
        nic_type        = "intranet"
        policy          = "accept"
        port_range      = "4500/4500"
        priority        = 1
        security_group_id = alicloud_security_group.sg_pcs_ext_port.id
        cidr_ip         = "0.0.0.0/0"
  }
#Create Security Group Rules for PCS Management Port and Assign to Security Group
  #HTTP port 80
  resource "alicloud_security_group_rule" "mgmt_port_allow_tcp_80" {
        description                 = "HTTP port 80"
        type            = "ingress"
```

```
    ip_protocol      = "tcp"
    nic_type         = "intranet"
    policy           = "accept"
    port_range       = "80/80"
    priority         = 1
    security_group_id = alicloud_security_group.sg_pcs_mgmt_port.id
    cidr_ip          = "0.0.0.0/0"
}
#HTTPS port 443
resource "alicloud_security_group_rule" "mgmt_port_allow_tcp_443" {
    description                = "HTTPS port 443"
    type             = "ingress"
    ip_protocol      = "tcp"
    nic_type         = "intranet"
    policy           = "accept"
    port_range       = "443/443"
    priority         = 1
    security_group_id = alicloud_security_group.sg_pcs_mgmt_port.id
    cidr_ip          = "0.0.0.0/0"
}
#DMI Netconf port 830
resource "alicloud_security_group_rule" "mgmt_port_allow_tcp_dmi_830" {
    description                = "DMI Netconf port 830"
    type             = "ingress"
    ip_protocol      = "tcp"
    nic_type         = "intranet"
    policy           = "accept"
    port_range       = "830/830"
    priority         = 1
    security_group_id = alicloud_security_group.sg_pcs_mgmt_port.id
    cidr_ip          = "0.0.0.0/0"
}
#Allow All ICMP
resource "alicloud_security_group_rule" "mgmt_port_allow_all_icmp" {
    description                = "Allow All ICMP"
    type             = "ingress"
    ip_protocol      = "icmp"
    nic_type         = "intranet"
    policy           = "accept"
    port_range       = "-1/-1"
    priority         = 1
    security_group_id = alicloud_security_group.sg_pcs_mgmt_port.id
    cidr_ip          = "0.0.0.0/0"
}
#Create Security Group Rules for Backend Servers and Assign to Security Group
#HTTP port 80
resource "alicloud_security_group_rule" "backend_svr_allow_tcp_80" {
    description                = "HTTP port 80"
    type             = "ingress"
    ip_protocol      = "tcp"
    nic_type         = "intranet"
    policy           = "accept"
    port_range       = "80/80"
    priority         = 1
    security_group_id = alicloud_security_group.sg_backend_svr.id
    cidr_ip          = "0.0.0.0/0"
```

```
}
#HTTPS port 443
resource "alicloud_security_group_rule" "backend_svr_allow_tcp_443" {
        description                 = "HTTPS port 443"
        type            = "ingress"
        ip_protocol     = "tcp"
        nic_type        = "intranet"
        policy          = "accept"
        port_range      = "443/443"
        priority        = 1
        security_group_id = alicloud_security_group.sg_backend_svr.id
        cidr_ip         = "0.0.0.0/0"
}
#SSH port 22
resource "alicloud_security_group_rule" "backend_svr_allow_tcp_ssh_22" {
        description                 = "SSH port 22"
        type            = "ingress"
        ip_protocol     = "tcp"
        nic_type        = "intranet"
        policy          = "accept"
        port_range      = "22/22"
        priority        = 1
        security_group_id = alicloud_security_group.sg_backend_svr.id
        cidr_ip         = "0.0.0.0/0"
}
#Allow All ICMP
resource "alicloud_security_group_rule" "backend_svr_allow_all_icmp" {
        description                 = "Allow All ICMP"
        type            = "ingress"
        ip_protocol     = "icmp"
        nic_type        = "intranet"
        policy          = "accept"
        port_range      = "-1/-1"
        priority        = 1
        security_group_id = alicloud_security_group.sg_backend_svr.id
        cidr_ip         = "0.0.0.0/0"
}
```

PCS with 2 NICs

```
#Terraform version
    terraform {
      required_version = ">= 0.12.18"
    }
#Access Keys
    provider "alicloud" {
      access_key = var.access_key
      secret_key = var.secret_key
      #region is important
      region     = var.region
    }
#VPCs , VSwitches, Security Groups and Alibaba Cloud PCS VA Images
    #VPCs
```

```
data "alicloud_vpcs" "vpcs_ds" {
        #No args required
}
#vSwitches
data "alicloud_vswitches" "vswitches_ds" {
  vpc_id       = "${local.vpc_id}"
}
#available security groups
data "alicloud_security_groups" "sec_groups_ds" {
  vpc_id       = "${local.vpc_id}"
}
#available images loaded by the user
data "alicloud_images" "self_images_ds" {
  owners      = "self" #system|marketplace|others|self
}
```

#Local variables

```
locals {
   vpcs_list          = "${data.alicloud_vpcs.vpcs_ds.vpcs}"
   vpc_id             = join ( "", [ for vpc in local.vpcs_list : vpc.id if vpc.vpc_name == "${var.vpc}" ] )
   vsws_list_in_vpc    = "${data.alicloud_vswitches.vswitches_ds.vswitches}"
   sec_groups_list     = "${data.alicloud_security_groups.sec_groups_ds.groups}"
   images_list        = {
      "self"       = "${data.alicloud_images.self_images_ds.images}" ,
   }
   instance_type     = var.instance_type
        region           = var.region
        zone             = var.zone
        security_group_id_map    = {
                "pcs_int_port"      = join ("", [ for sec_group in local.sec_groups_list : sec_group.id if
sec_group.name == "sg_pcs_int_port" ]),
                "pcs_ext_port"      = join ("", [ for sec_group in local.sec_groups_list : sec_group.id if
sec_group.name == "sg_pcs_ext_port" ]),
                "pcs_mgmt_port"     = join ("", [ for sec_group in local.sec_groups_list : sec_group.id if
sec_group.name == "sg_pcs_mgmt_port" ]),
        }
        vswitch_id_map = {
                "${var.zone_a}"    = {
                        "pcs_int_port"      = join ("", [ for vswitch in local.vsws_list_in_vpc : vswitch.id if
vswitch.name == "vsw-zone-a-pcs-int-port-subnet" ]),
                        "pcs_ext_port"      = join ("", [ for vswitch in local.vsws_list_in_vpc : vswitch.id if
vswitch.name == "vsw-zone-a-pcs-ext-port-subnet" ]),
                        "pcs_mgmt_port"     = join ("", [ for vswitch in local.vsws_list_in_vpc : vswitch.id if
vswitch.name == "vsw-zone-a-pcs-mgmt-port-subnet" ])
                },
                "${var.zone_b}"    = {
                        "pcs_int_port"      = join ("", [ for vswitch in local.vsws_list_in_vpc : vswitch.id if
vswitch.name == "vsw-zone-b-pcs-int-port-subnet" ]),
                        "pcs_ext_port"      = join ("", [ for vswitch in local.vsws_list_in_vpc : vswitch.id if
vswitch.name == "vsw-zone-b-pcs-ext-port-subnet" ]),
                        "pcs_mgmt_port"     = join ("", [ for vswitch in local.vsws_list_in_vpc : vswitch.id if
vswitch.name == "vsw-zone-b-pcs-mgmt-port-subnet" ])
                }
        }
}
```

#PCS instance on Alibaba Cloud

```
resource "alicloud_instance" "pcs_instance" {
```

```
    instance_name          = var.instance_name
    image_id               = join ("", [ for pcs_image in local.images_list[var.image_from] : pcs_image.image_id if
  pcs_image.name == var.image_name ])
    availability_zone      = var.zone
    #instance_type          = var.instance_type #ecs.hfc5.large
    instance_type          = "ecs.n1.large" #customise according to your needs
    instance_charge_type   = var.instance_charge_type #PayByBandwidth
    system_disk_category   = "cloud_efficiency"
    vswitch_id             = local.vswitch_id_map[local.zone]["pcs_int_port"]
    security_groups        = [ local.security_group_id_map["pcs_int_port"] ]

    #internet_max_bandwidth_out  = 1 #in mbps, when this value is set, a public IP(not elastic IP) is assigned
    #internet_charge_type   = "PayByBandwidth"

    #user-data
    user_data = file("user_data.txt")
  }
#Create External Port
  resource "alicloud_network_interface" "pcs_ext_port" {
    name               = "pcs_ext_port"
    vswitch_id         = local.vswitch_id_map[local.zone]["pcs_ext_port"]
    security_groups    = [ local.security_group_id_map["pcs_ext_port"] ]
  }
  resource "alicloud_network_interface_attachment" "pcs_ext_port_attachment" {
   instance_id          = alicloud_instance.pcs_instance.id
   network_interface_id  = alicloud_network_interface.pcs_ext_port.id
  }
#Create a new EIP
  # Create a new EIP for Internal Port.
  resource "alicloud_eip" "pcs_int_port_eip" {
   bandwidth              = "5"
   internet_charge_type = "PayByTraffic"
  }
  resource "alicloud_eip_association" "pcs_int_port_eip_asso" {
   allocation_id   = alicloud_eip.pcs_int_port_eip.id
   instance_id     = alicloud_instance.pcs_instance.id
  }
  # Create a new EIP for External Port.
  resource "alicloud_eip" "pcs_ext_port_eip" {
   bandwidth              = "5"
   internet_charge_type = "PayByTraffic"
  }
  resource "alicloud_eip_association" "pcs_ext_port_eip_asso" {
   allocation_id          = alicloud_eip.pcs_ext_port_eip.id
   instance_id            = alicloud_network_interface.pcs_ext_port.id #if instance_type is NetworkInterface,
  instance_id should point to the ENI ID(not VM instance ID)
   instance_type          = "NetworkInterface" #for assigning EIP to ext port(which is secondary ENI)
   private_ip_address  = alicloud_network_interface.pcs_ext_port.private_ip
  }
#Output
  output "pcs_int_port" {
    value = "${alicloud_instance.pcs_instance.private_ip}"
  }
  output "pcs_ext_port" {
    value = "${alicloud_network_interface.pcs_ext_port.private_ip}"
```

```
}
```

PCS with 3 NICs

```
#Terraform version
  terraform {
    required_version = ">= 0.12.18"
  }
#Access Keys
  provider "alicloud" {
    access_key = var.access_key
    secret_key = var.secret_key
    #region is important
    region     = var.region
  }
#VPCs , VSwitches, Security Groups and Alibaba Cloud PCS VA Images
  #VPCs
  data "alicloud_vpcs" "vpcs_ds" {
          #No args required
  }
  #vSwitches
  data "alicloud_vswitches" "vswitches_ds" {
   vpc_id       = "${local.vpc_id}"
  }
  #available security groups
  data "alicloud_security_groups" "sec_groups_ds" {
   vpc_id       = "${local.vpc_id}"
  }
  #available images loaded by the user
  data "alicloud_images" "self_images_ds" {
   owners      = "self" #system|marketplace|others|self
  }
#Local variables
  locals {
    vpcs_list      = "${data.alicloud_vpcs.vpcs_ds.vpcs}"
    vpc_id         = join ( "", [ for vpc in local.vpcs_list : vpc.id if vpc.vpc_name == "${var.vpc}" ] )
    vsws_list_in_vpc    = "${data.alicloud_vswitches.vswitches_ds.vswitches}"
    sec_groups_list     = "${data.alicloud_security_groups.sec_groups_ds.groups}"
    images_list         = {
      "self"       = "${data.alicloud_images.self_images_ds.images}" ,
    }
    instance_type     = var.instance_type
        region         = var.region
```

```
        zone            = var.zone
        security_group_id_map    = {
                "pcs_int_port"      = join ("", [ for sec_group in local.sec_groups_list : sec_group.id if
  sec_group.name == "sg_pcs_int_port" ]),
                "pcs_ext_port"      = join ("", [ for sec_group in local.sec_groups_list : sec_group.id if
  sec_group.name == "sg_pcs_ext_port" ]),
                "pcs_mgmt_port"     = join ("", [ for sec_group in local.sec_groups_list : sec_group.id if
  sec_group.name == "sg_pcs_mgmt_port" ]),
        }
        vswitch_id_map = {
                "${var.zone_a}"    = {
                        "pcs_int_port"      = join ("", [ for vswitch in local.vsws_list_in_vpc : vswitch.id if
  vswitch.name == "vsw-zone-a-pcs-int-port-subnet" ]),
                        "pcs_ext_port"      = join ("", [ for vswitch in local.vsws_list_in_vpc : vswitch.id if
  vswitch.name == "vsw-zone-a-pcs-ext-port-subnet" ]),
                        "pcs_mgmt_port"     = join ("", [ for vswitch in local.vsws_list_in_vpc : vswitch.id if
  vswitch.name == "vsw-zone-a-pcs-mgmt-port-subnet" ])
                },
                "${var.zone_b}"    = {
                        "pcs_int_port"      = join ("", [ for vswitch in local.vsws_list_in_vpc : vswitch.id if
  vswitch.name == "vsw-zone-b-pcs-int-port-subnet" ]),
                        "pcs_ext_port"      = join ("", [ for vswitch in local.vsws_list_in_vpc : vswitch.id if
  vswitch.name == "vsw-zone-b-pcs-ext-port-subnet" ]),
                        "pcs_mgmt_port"     = join ("", [ for vswitch in local.vsws_list_in_vpc : vswitch.id if
  vswitch.name == "vsw-zone-b-pcs-mgmt-port-subnet" ])
                }
        }
}
```

#PCS Instance on Alibaba Cloud

```
resource "alicloud_instance" "pcs_instance" {
   instance_name     = var.instance_name
   image_id          = join ("", [ for pcs_image in local.images_list[var.image_from] : pcs_image.image_id if
pcs_image.name == var.image_name ])
   availability_zone      = var.zone
   #instance_type       = var.instance_type #ecs.hfc5.large
   instance_type         = "ecs.n1.xlarge" #customise according to your needs
   instance_charge_type    = var.instance_charge_type #PayByBandwidth
   system_disk_category    = "cloud_efficiency"
   vswitch_id                = local.vswitch_id_map[local.zone]["pcs_int_port"]
   security_groups           = [ local.security_group_id_map["pcs_int_port"] ]

   #internet_max_bandwidth_out  = 1 #in mbps, when this value is set, a public IP(not elastic IP) is assigned
   #internet_charge_type            = "PayByBandwidth"

   #user-data
   user_data = file("user_data.txt")
}
```

#Create External Port and Management Port

```
#create external port and attach to PCS instance
resource "alicloud_network_interface" "pcs_ext_port" {
   name              = "pcs_ext_port"
   vswitch_id        = local.vswitch_id_map[local.zone]["pcs_ext_port"]
   security_groups = [ local.security_group_id_map["pcs_ext_port"] ]
}
resource "alicloud_network_interface_attachment" "pcs_ext_port_attachment" {
  instance_id             = alicloud_instance.pcs_instance.id
```

```
  network_interface_id  = alicloud_network_interface.pcs_ext_port.id
}
#create management port and attach to PCS instance
resource "alicloud_network_interface" "pcs_mgmt_port" {
   name              = "pcs_ext_port"
   vswitch_id        = local.vswitch_id_map[local.zone]["pcs_mgmt_port"]
   security_groups  = [ local.security_group_id_map["pcs_mgmt_port"] ]
}
resource "alicloud_network_interface_attachment" "pcs_mgmt_port_attachment" {
  instance_id         = alicloud_instance.pcs_instance.id
  network_interface_id  = alicloud_network_interface.pcs_mgmt_port.id
}
```

#Create a new EIP

```
# Create a new EIP for External Port.
resource "alicloud_eip" "pcs_ext_port_eip" {
  bandwidth          = "5"
  internet_charge_type = "PayByTraffic"
}
resource "alicloud_eip_association" "pcs_ext_port_eip_asso" {
  allocation_id           = alicloud_eip.pcs_ext_port_eip.id
  instance_id                                    = alicloud_network_interface.pcs_ext_port.id #if instance_type is
NetworkInterface, instance_id should point to the ENI ID(not VM instance ID)
  instance_type                                  = "NetworkInterface" #for assigning EIP to ext port(which is secondary
ENI)
  private_ip_address       = alicloud_network_interface.pcs_ext_port.private_ip
}
# Create a new EIP for Management Port.
resource "alicloud_eip" "pcs_mgmt_port_eip" {
  bandwidth          = "5"
  internet_charge_type = "PayByTraffic"
}
resource "alicloud_eip_association" "pcs_mgmt_port_eip_asso" {
        allocation_id         = alicloud_eip.pcs_mgmt_port_eip.id
        instance_id                                    = alicloud_network_interface.pcs_mgmt_port.id
        instance_type                                  = "NetworkInterface"
        private_ip_address     = alicloud_network_interface.pcs_mgmt_port.private_ip
}
```

#Output

```
output "pcs_int_port" {
   value = "${alicloud_instance.pcs_instance.private_ip}"
}
output "pcs_ext_port" {
    value = "${alicloud_network_interface.pcs_ext_port.private_ip}"
}
output "pcs_mgmt_port" {
   value = "${alicloud_network_interface.pcs_mgmt_port.private_ip}"
}
```

Variables

```
variable access_key {
   default = "alicloud-access-key" #replace with the actual alicloud-access key
}
variable secret_key {
   default = "alicloud-secret-key" #replace with the actual alicloud-secret-key
}
variable region {
   default = "cn-beijing"
}
variable zone {
   default = "cn-beijing-a"
}
variable zone_a {
   default = "cn-beijing-a"
}
variable zone_b {
   default = "cn-beijing-b"
}
variable vpc {
   default = "vpc_beijing"
}
variable image_name {
   default = "pcs_91r4_alicloud_image"
}
variable image_from {
   default = "self"
   #default = "marketplace"
}
variable instance_type {
        default = "ecs.n1.large"
}
variable instance_name {
   default = "pcs_91r4_on_alicloud"
}
variable cpu_core_count {
   default = "4"
}
variable memory_size {
   default = "8"
}
variable eni_amount {
   default = "2"
}
variable oss_bucket {
        default = "bucket-beijing-darumuga"
}
variable instance_charge_type {
   default = "PostPaid"
}
```

User Data

<pulse-config><primary-dns>8.8.8.8</primary-dns><secondary-dns>8.8.8.9</secondary-dns><wins-server>1.1.1.1</wins-server><dns-domain>pcsqa.psecure.net</dns-domain><admin-username>admindb</admin-username><admin-password>Psecure123$</admin-password><cert-common-name>alicloud-pcs.psecure.net</cert-common-name><cert-random-text>fdsfpisonvsfnms</cert-random-text><cert-organisation>Psecure Org</cert-organisation><config-download-url>http://149.129.181.113/pcs_config/pcs_config.xml</config-download-url><config-data></config-data><auth-code-license></auth-code-license><enable-license-server>n</enable-license-server><accept-license-agreement>y</accept-license-agreement></pulse-config>

References

Alibaba Cloud documentation: https://www.alibabacloud.com/help/

Requesting Technical Support

Technical product support is available through the Pulse Secure Global Support Center (PSGSC). If you have a support contract, then file a ticket with PSGSC.

- Product warranties—for product warranty information, visit https://www.pulsesecure.net.