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Smart Access Gateway vCPE

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Document conventions

Style	Description	Example
Danger	A danger notice indicates a situation that will cause major system changes, faults, physical injuries, and other adverse results.	Danger: Resetting will result in the loss of user configuration data.
Warning	A warning notice indicates a situation that may cause major system changes, faults, physical injuries, and other adverse results.	Warning: Restarting will cause business interruption. About 10 minutes are required to restart an instance.
Notice	A caution notice indicates warning information, supplementary instructions, and other content that the user must understand.	Notice: If the weight is set to 0, the server no longer receives new requests.
Note	A note indicates supplemental instructions, best practices, tips, and other content.	Note: You can use Ctrl + A to select all files.
>	Closing angle brackets are used to indicate a multi-level menu cascade.	Click **Settings**> **Network**> **Set network type**.
Bold	Bold formatting is used for buttons , menus, page names, and other UI elements.	Click **OK**.
`Courier font`	Courier font is used for commands	Run the `cd /d C:/window` command to enter the Windows system folder.
Italic	Italic formatting is used for parameters and variables.	`bae log list --instanceid` *Instance_ID*
[] or [a|b]	This format is used for an optional value, where only one item can be selected.	`ipconfig [-all|-t]`
{} or {a|b}	This format is used for a required value, where only one item can be selected.	`switch {active|stand}`

Table of Contents

1.Introduction to SAG vCPE

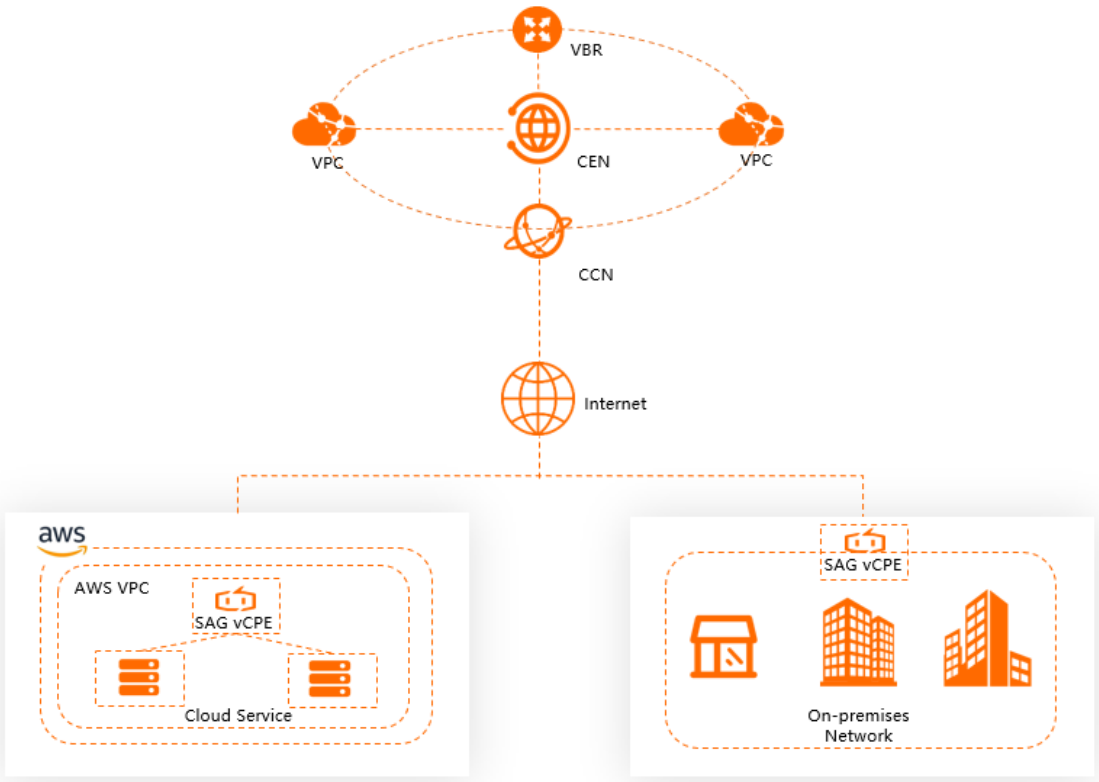
Smart Access Gateway (SAG) vCPE provides an image that can be deployed on your host. After you deploy the SAG vCPE image on your host, the host serves as a virtual customer-premise equipment (CPE) device. SAG vCPE allows you to connect private networks to Alibaba Cloud in a more flexible way.

Scenarios

You can deploy the SAG vCPE image in various types of networks. This allows you to connect private networks to Alibaba Cloud in a more flexible way.

You can deploy the SAG vCPE image in hosts of the following network types:

- You can deploy the SAG vCPE image on an on-premises server. This enables you to connect on-premises networks to Alibaba Cloud.
- You can also deploy the SAG vCPE image on an instance provided by a cloud service provider. This allows you to enable multi-cloud communication. For example, you can deploy the SAG vCPE image on an Alibaba Cloud Elastic Compute Service (ECS) instance, an Amazon Web Services (AWS) Elastic Compute Cloud (EC2) instance, a Microsoft Azure virtual machine (VM), or a Google Cloud VM.



Prerequisites

Before you deploy the SAG vCPE image on a host, make sure that the host meets the following requirements:

- The host runs one of the following operating systems:
  - 64-bit CentOS 7.6 or later (recommended).
  - Ubuntu 18.04 64-bit or later.

- The host uses the 3.10.0-957.21.3.el7.x86_64 kernel or a later kernel version.
- The host has an independent network interface controller (NIC) that allows the instance to connect to the Internet.
- The host supports remote logons.
- No service system is deployed on the host.
- The host allows requests from the following ports over the given protocols.

Protocol	Port
UDP	53, 500, 4500, 789, 801, 12345, 27890, 33336, 43337, 56543, 62345, and 10000 to 10100
TCP	53, 80, 443, 8443, and 10000 to 10100
ICMP	N/A

- If your host has traffic throttling, UDP flood attack check, or ICMP flood attack check configured, we recommend that you disable the preceding features to ensure network connectivity.
- If the host is an ECS instance or an Edge Node Service (ENS) instance, the number of vCPU cores must be one or more and the memory must be 2 GB or more. The following table describes the performance of different specifications.

Instance type	Performance
1 vCPU- 2 GB	The bandwidth of the private network for encrypted connections can reach 200 Mbit/s and higher (the packet length in the performance test is 1,024 bytes).
2 vCPUs - 4 GB (recommended)	The encrypted private bandwidth can reach 350 Mbit/s and higher (the packet length in the performance test is 1,024 bytes).

Use multi-attach

1. Create an SAG vCPE instance.

   After you create an SAG vCPE instance in the SAG console, one SAG vCPE instance can be associated with two SAG vCPE devices by default. The system assigns a serial number and a key to each SAG vCPE device. A serial number and a key are used to associate an SAG vCPE instance with an SAG vCPE device.

2. Deploy the SAG vCPE image.

After you deploy the SAG vCPE image on the host, the host can serve as an SAG vCPE device. You must register the serial number and key of the SAG vCPE device to the host. The serial number and key are used to associate the SAG vCPE device with an SAG vCPE instance. Alibaba Cloud checks the validity of the serial number and key for an SAG vCPE device. If the serial number and key are invalid, the SAG vCPE device cannot be connected to Alibaba Cloud. This ensures network security.

3. Configure networks on the Alibaba Cloud side.

   After you deploy the SAG vCPE image, you must advertise routes to Alibaba Cloud and associate the SAG vCPE instance with a Cloud Connect Network (CCN) instance. Then, you can connect the SAG vCPE device to Alibaba Cloud.

4. Configure networks on the user side.

   You must configure routes for your on-premises networks to route traffic from on-premises networks to the SAG vCPE device, and then to Alibaba Cloud.

5. Test network connectivity.

References

- Connect AWS resources to Alibaba Cloud resources through SAG vCPE
- Connect Microsoft Azure resources to Alibaba Cloud resources through SAG vCPE
- Use SAG vCPE to connect an ACK cluster with an on-premises Kubernetes cluster

2.Create an SAG vCPE instance

You can create a Smart Access Gateway (SAG) vCPE instance in the SAG console. After you create an SAG vCPE instance, you can manage the host where the SAG vCPE image is deployed. In this topic, the host where the SAG vCPE image is deployed is referred to as an SAG vCPE device.

Procedure

1.
2.
3. On the Smart Access Gateway-vCPE page, set the following parameters, click **Buy Now**, and then complete the payment.

Parameter	Description
Area	Select the region where you want to deploy the SAG vCPE instance.
Instance Name	Enter the name of the SAG vCPE instance. The name must be 2 to 128 characters in length and can contain digits, periods (.), underscores (_), and hyphens (-). It must start with a letter.
Instance Type	Select the type of the SAG vCPE instance. **SAG-vCPE** is selected by default.
Edition	Select the edition of the SAG vCPE device. **Basic Edition** is selected by default.
Deployment Mode	Select the deployment of the SAG vCPE device. By default, **Active-Standby** is selected. In this mode, one SAG vCPE instance can be associated with two SAG vCPE devices by default. You can deploy two SAG vCPE devices in active-standby mode and connect on-premises networks to Alibaba Cloud. This improves network availability.
Peak Bandwidth	Specify the maximum bandwidth for network communication. Unit: Mbit/s.
Quantity	Specify the number of SAG vCPE instances that you want to create.
Duration	Specify the subscription duration. You can select **Auto-renewal** to enable automatic renewal upon expiration.
Resource Group	Select the resource group to which the SAG vCPE instance belongs.

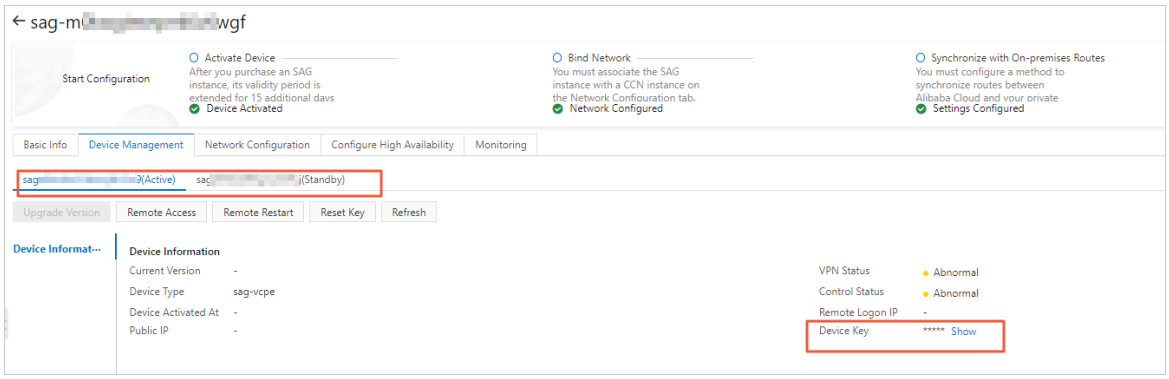
Result

After you create an SAG vCPE instance, you can view the serial number and key that are assigned to the SAG vCPE device. The serial number and key are used to associate the SAG vCPE device with an SAG vCPE instance.

1. Return to the SAG console. In the top navigation bar, select the region where the SAG vCPE

instance is deployed.

2. In the left-side navigation pane, click **Smart Access Gateway**.
3. On the **SAG** page, click the ID of the SAG vCPE instance.
4. On instance details page, click the **Device Management** tab and record the serial number and key of the SAG vCPE device.



What's next

After you create an SAG vCPE instance, you must deploy the SAG vCPE image on the host. After you deploy the SAG vCPE image on the host, the host can serve as an SAG vCPE device. For more information, see Deploy the SAG vCPE image.

3.Deploy the SAG vCPE image

After you create a Smart Access Gateway (SAG) vCPE instance, you can run the script provided by Alibaba Cloud to deploy the SAG vCPE image on a host. This topic describes how to deploy an SAG vCPE image on a host.

Prerequisites

- An SAG vCPE instance is created and the serial number and key of an SAG vCPE device are obtained. For more information, see Create an SAG vCPE instance.
- Before you deploy the SAG vCPE image on a host, make sure that the host meets the requirements. For more information, see Prerequisites.

Descriptions of the script parameters

The script that is used to deploy the SAG vCPE image provides the following parameters.

```
Usage: deploy.sh [command] [options]

SAG-VCPE install tool 2021.06
Options:
    -u          run uninstall process
    -h          print this help message and exit
    -p          update an existing installation
    -c          run service state check
    -w          traffic ingress interface(default eth0)
    -t          platform, available platform:ens/aliyun/aws
    -n          sag-sn, get sn from user console platform
    -k          sag-key, get key from user console platform
    -v          ha-vip, get ha_vip from user console platform

Commands:
    ping        the standard ping command
    traceroute  the standard traceroute command
    mtr         the standard mtr command
    check       display main information
```

Parameter	Description
-n (required)	The serial number of the SAG vCPE device.
-k (required)	The key of the SAG vCPE device.
-t (required)	The service provider of the host on which you want to install the SAG vCPE image. Valid values: • **aliyun** (default): deploys the SAG vCPE image on an Alibaba Cloud Elastic Compute Service (ECS) instance. • **aws**: deploys the SAG vCPE image on an Amazon Elastic Compute Cloud (EC2) instance. • **azure**: deploys the SAG vCPE image on a Microsoft Azure virtual machine (VM). • If you want to deploy the SAG vCPE image on an on-premises server, set the value to a string of letters other than **aliyun**, **ens**, **aws**, or **azure**.

Parameter	Description
-v	The virtual IP address when two SAG vCPE devices have the high availability feature enabled. The high availability feature is available only if the SAG vCPE image is deployed on an Alibaba Cloud ECS instance. **Note** If you want to enable the high availability feature for two SAG vCPE devices, you must use the high-availability virtual IP address (HAVIP) feature provided by Alibaba Cloud. The HAVIP feature is in public preview. For more information, see Overview of HAVIPs.
-w	The name of the NIC for the WAN port. Default value: **eth0**. You can view the NIC name of the host by running the `ifconfig` or `ip -br address` command.
-u	Uninstalls the SAG vCPE image.
-h	Displays the help information about the script.
-p	Upgrades the SAG vCPE image.
-c	Checks the status of the host.
check	Obtains the deployment status of the current host, the system information about the host, and the version of the SAG vCPE image.
ping	Tests the network connectivity.
traceroute	Determines the path that packets pass through when they access the destination.
mtr	Provides the network connectivity diagnostics feature together with the ping and traceroute commands.

Deploy the SAG vCPE image

1. Log on to the host and download the script to the */root* directory.

   Notice
   - For more information about how to log on to the host, consult the service provider of the host.
   - You can also specify a custom path and download the script to the corresponding directory. In this case, make sure that you select the custom path when you run the script.
   - After you download the script, do not modify its content or name.

   - If your host is deployed in the Chinese mainland, run the following commands to download the script:

```
wget -O /root/sag_vcpe_v2.3.0_deployment.sh https://sdwan-oss-shanghai.oss-cn-shanghai.aliyuncs.com/vcpe_vm/sag_vcpe_v2.3.0_deployment.sh
```

- If your host is deployed outside the Chinese mainland, run the following commands to download the script:

```
wget -O /root/sag_vcpe_v2.3.0_deployment.sh https://sdwan-oss-shanghai.oss-accelerate.aliyuncs.com/vcpe_vm/sag_vcpe_v2.3.0_deployment.sh
```

2. Run the following command to make the script executable:

```
chmod +x /root/sag_vcpe_v2.3.0_deployment.sh
```

3. Run the script.

   You can run the script in the following ways:

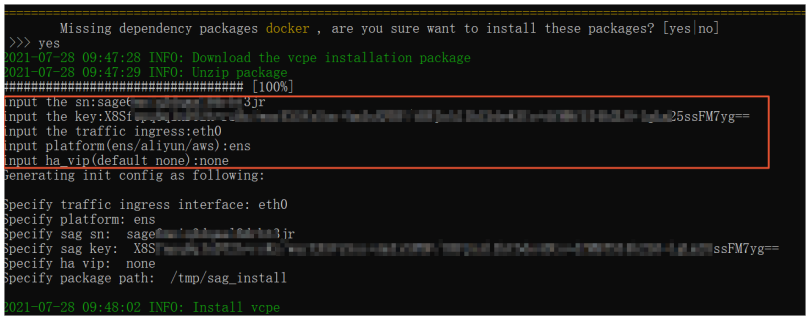
   - Automatic

     If you enter the command in the CLI and specify parameters, the system automatically runs the deployment command. Example:

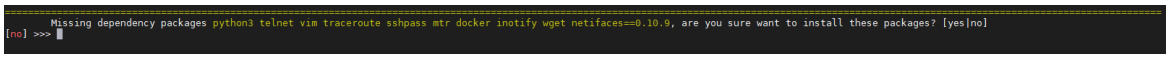
```
/root/sag_vcpe_v2.3.0_deployment.sh -n serial number -k key -t service provider  -w NIC name for WAN port
```

   - Interactive

     If you enter the `/root/sag_vcpe_v2.3.0_deployment.sh` command without specifying parameters, interactive installation is used. In this case, you must manually enter the parameters as prompted by the system.



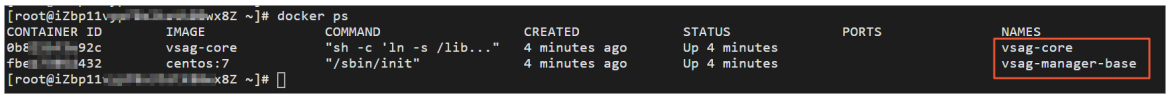
4. When you run the script, the system automatically checks whether the deployment environment meets the requirements. If the deployment environment requires other components, the following prompt appears. In this case, enter *yes* and the system will automatically install the required components.



5. If the deployment environment meets the requirements, the system automatically starts to deploy the SAG vCPE image. After the image is deployed, the following prompt appears.

6. Query the deployment result.

After you deploy the SAG vCPE image, run the `docker ps` command to check whether the system has the following containers installed:



If the system contains the preceding containers, it indicates that the SAG vCPE image is deployed. If not, it indicates that the SAG vCPE image is not deployed. In this case,submit a ticket to request technical support from Alibaba Cloud.

What to do next

After you deploy the SAG vCPE image, you must complete network settings on Alibaba Cloud and for the host network before you can enable network communication. The network settings may vary with the host network. For more information, see the following topics:

- Connect AWS resources to Alibaba Cloud resources through SAG vCPE
- Connect Microsoft Azure resources to Alibaba Cloud resources through SAG vCPE
- Use SAG vCPE to connect an ACK cluster with an on-premises Kubernetes cluster

4.SAG vCPE Tutorials

4.1. Connect AWS resources to Alibaba Cloud resources through SAG vCPE

This topic describes how to connect Amazon Web Services (AWS) resources to Alibaba Cloud resources through Smart Access Gateway (SAG) vCPE.

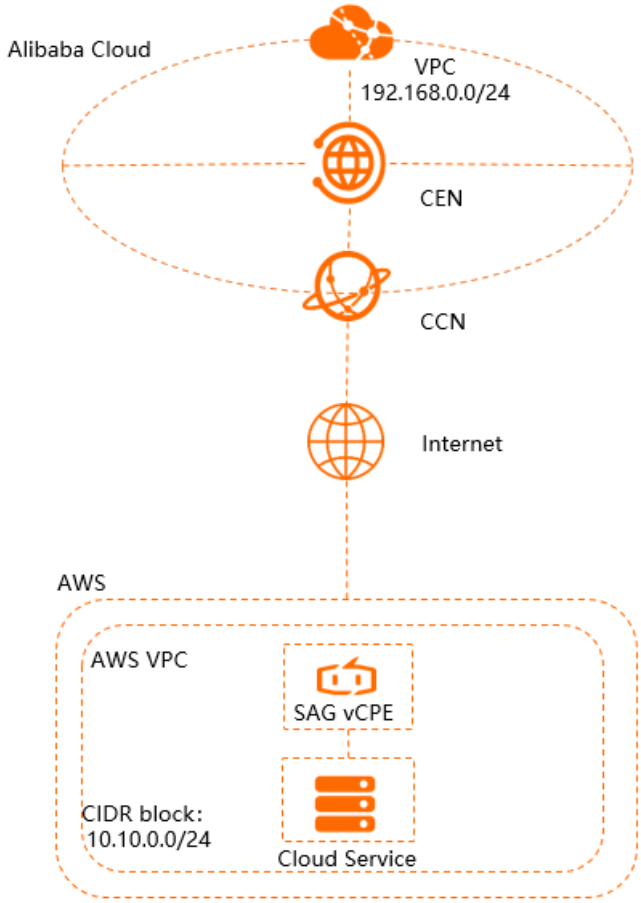
Prerequisites

- Cloud services are deployed on AWS. For more information, see AWS.
- Virtual private clouds (VPCs) are created. For more information, see Create and manage a VPC.
- You understand the security group rules that apply to Alibaba Cloud virtual private clouds (VPCs). Make sure that the security group rules allow AWS resources to access Alibaba Cloud VPC resources. For more information, see Query security group rules and Add security group rules.

Scenarios

The following figure shows how to use SAG vCPE to establish network communication between cloud resources deployed on Alibaba Cloud and AWS. For example, an enterprise has deployed cloud services on Alibaba Cloud in the Singapore (Singapore) region and on AWS. The enterprise wants to establish network communication between cloud resources deployed on Alibaba Cloud and AWS.

You can deploy the SAG vCPE image on an instance in an AWS VPC. This way, the instance can serve as an SAG vCPE device to help you connect AWS resources to Alibaba Cloud. After you connect the SAG vCPE device to Alibaba Cloud, you can enable resources in AWS VPCs and Alibaba Cloud VPCs to access each other by using Cloud Connect Network (CCN) and Cloud Enterprise Network (CEN).



Procedure

Step 1: Create an SAG vCPE instance

You can create an SAG vCPE instance in the SAG console. After you create an SAG vCPE instance, you can manage the SAG vCPE device through the SAG vCPE instance.

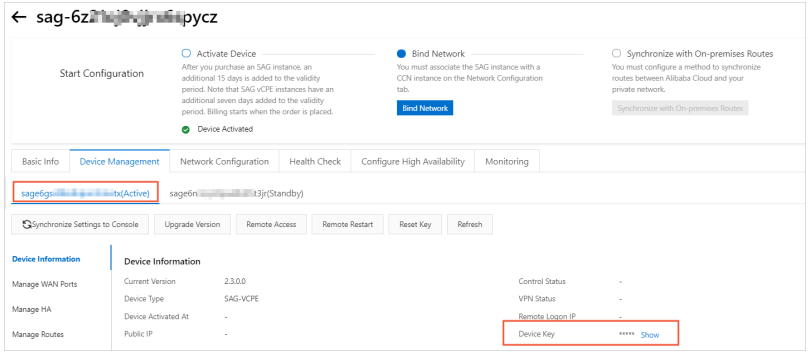
1.
2.
3. Set the following parameters to configure the SAG vCPE instance, click **Buy Now**, and then complete the payment.
   - **Area**: Select the region where you want to deploy the SAG vCPE instance. In this example, **Singapore** is selected.
   - **Instance Name**: Enter a name for the SAG vCPE instance.

     The name must be 2 to 128 characters in length and can contain digits, periods (.), underscores (_), and hyphens (-). It must start with a letter.

- **Device Type**: **SAG-vCPE** is selected by default.
- **Edition**: **Basic Edition** is selected by default.
- **Deployment Mode**: Select a deployment mode for the SAG vCPE device. By default,**Active-Standby** is selected.

  In **Active-Standby** mode, one SAG vCPE instance can be associated with two SAG vCPE devices by default. You can deploy two SAG vCPE devices in active-standby mode and connect on-premises networks to Alibaba Cloud. This improves network availability. In this example, only the active device is used.
- **Peak Bandwidth**: Select the maximum bandwidth for network connections. Unit: Mbit/s.
- **Quantity**: Enter the number of SAG vCPE instances that you want to create. In this example, 1 is used.
- **Duration**: Specify the subscription duration.
- **Resource Group**: Select the resource group to which the SAG vCPE instance belongs.

4. Return to the SAG console. In the top navigation bar, select the region where the SAG vCPE instance is deployed.
5. In the left-side navigation pane, click **Smart Access Gateway**.
6. On the **SAG** page, click the ID of the SAG vCPE instance.
7. On the instance details page, click the **Device Management** tab, view and record the serial number and key of the active SAG vCPE device. The serial number and key are used to associate the SAG vCPE instance with an SAG vCPE device.



Step 2: Deploy the SAG vCPE image

To establish network communication between cloud resources deployed on Alibaba Cloud and AWS, you must create an instance in the AWS VPC. Then, you can deploy the SAG vCPE image on the newly created instance. After you deploy the SAG vCPE image, the AWS instance can serve as an SAG vCPE device and allows you to connect AWS resources to Alibaba Cloud resources.

1. Create an instance in the AWS VPC.

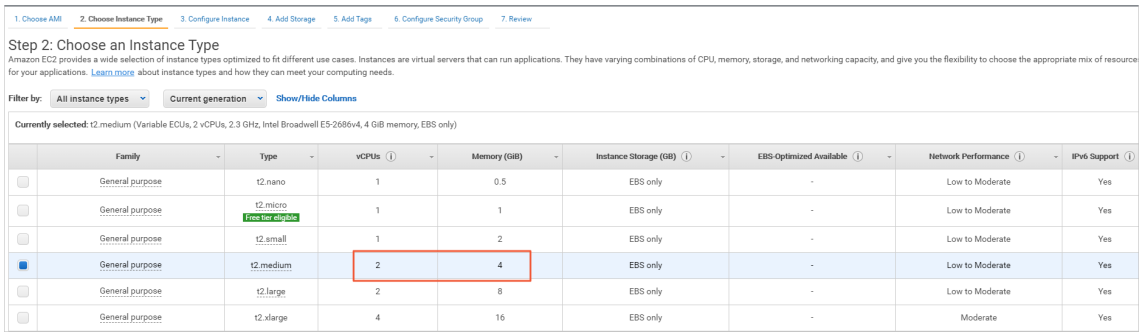
   For more information about how to create an instance in the AWS VPC, see relevant AWS documentation. Make sure that the AWS instance meets the following requirements:

   - You can install operating systems of the following types on the instance:
     - 64-bit CentOS 7.6 or later.
     - 64-bit Ubuntu 18.04 or later.

     We recommend that you install the 64-bit CentOS 7.6 operating system.

- The instance supports the kernel version 3.10.0-957.21.3.el7.x86_64 or later.
- The instance has an independent network interface controller (NIC) that allows the instance to connect to the Internet.
- You can remotely log on to the instance.
- No service system is running on the instance.
- If the host is a cloud instance or an Edge Node Service (ENS) instance, the number of vCPU cores must be one or more and the memory must be 2 GB or more.

  We recommend that you select a 2-core vCPU and 4 GB memory for the instance. In this case, the bandwidth of private networks for encrypted connections can reach 350 Mbit/s and higher (the packet length in the performance test is 1024 bytes).



2. Log on to the AWS instance and download the script to the */root* directory of the instance. For more information, see relevant AWS documentation.

   > **Notice**
   > - You can also download the script to a custom directory. In this case, make sure that you select the corresponding path when you run the script.
   > - After you download the script, do not modify its content or name.

   - If your host is deployed in mainland China, run the following commands to download the script:

     ```
     wget -O /root/sag_vcpe_v2.3.0_deployment.sh https://sdwan-oss-shanghai.oss-cn-shanghai.aliyuncs.com/vcpe_vm/sag_vcpe_v2.3.0_deployment.sh
     ```

   - If your host is deployed outside mainland China, run the following commands to download the script:

     ```
     wget -O /root/sag_vcpe_v2.3.0_deployment.sh https://sdwan-oss-shanghai.oss-accelerate.aliyuncs.com/vcpe_vm/sag_vcpe_v2.3.0_deployment.sh
     ```

3. Run the following command to grant the script executable permissions:

   ```
   chmod +x /root/sag_vcpe_v2.3.0_deployment.sh
   ```

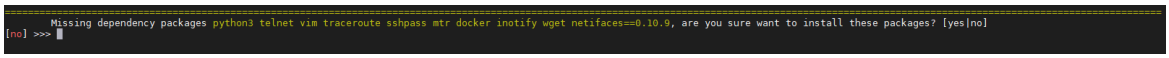
4. Run the script.

   ```
   /root/sag_vcpe_v2.3.0_deployment.sh -n sage6nniq3**** -k X8==**** -t aws  -w eth0
   ```

   The following table describes the parameters of the script. For more information about more parameters of the script, see Descriptions of the script parameters.

Parameter	Description
-n	The serial number of the SAG vCPE device.
-k	The key of the SAG vCPE device.
-t	The service provider of the host where you want to install the SAG vCPE image. Valid values: ○ **aliyun** (default): deploys the SAG vCPE image on an Alibaba Cloud Elastic Compute Service (ECS) instance. ○ **aws**: deploys the SAG vCPE image on an Amazon Elastic Compute Cloud (EC2) instance. ○ If you want to deploy the SAG vCPE image on an on-premises server, set the value to a string of letters except **aliyun** or **aws**.
-w	The name of the NIC for the WAN port. You can view the NIC name of the host by running the `ifconfig` command.

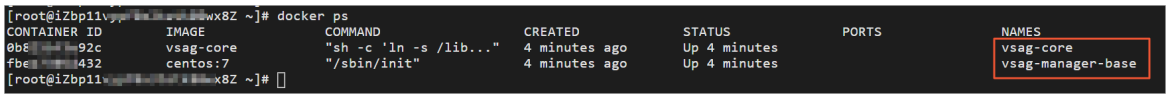
5. When you run the script, the system automatically checks whether the deployment environment meets the requirements. If the deployment environment requires other components, the following prompt appears. In this case, enter yes and the system will automatically install required components.



6. If the deployment environment meets the requirements, the system automatically starts to deploy the SAG vCPE image. After the image is deployed, the following prompt appears.

7. View the deployment result.

   After you deploy the SAG vCPE image, run the `docker ps` command to check whether the system has the following containers installed:



   If the system has both the **vsag-core** and **vsag-manager-base** containers installed, it indicates that the SAG vCPE image is deployed. If not, it indicates that the SAG vCPE image is not deployed. In this case, you can submit a ticket to request technical support from Alibaba Cloud.

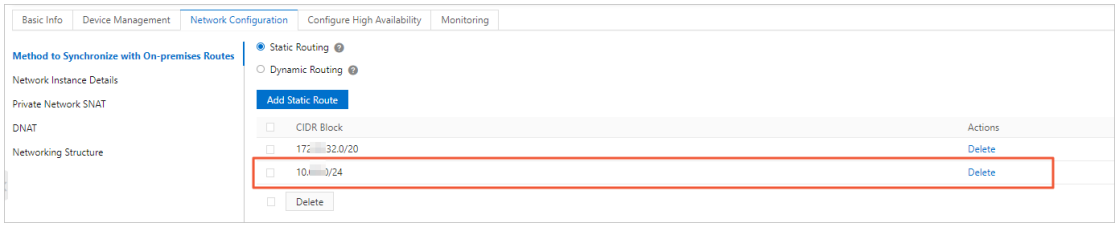
Step 3: Configure networks on the Alibaba Cloud side

After the SAG vCPE image is deployed, you must configure networks for the SAG vCPE device in the SAG console. This allows the SAG vCPE device to connect to Alibaba Cloud.

1. Select a method to advertise routes to Alibaba Cloud.
   i. Log on to the SAG console.
   ii. In the top navigation bar, select the region where the SAG vCPE device is deployed.
   iii. On the **Smart Access Gateway** page, find the SAG vCPE instance and click **Network Configuration** in the **Actions** column.

iv. Choose **Network Configuration > Method to Synchronize with On-premises Routes** and click **Add Static Route**.

v. In the **Add Static Route** dialog box, enter the private CIDR block of the AWS service and click **OK**.



2. Associate the SAG vCPE instance with a CCN instance.

   CCN is an important component of SAG. SAG connects your private networks to Alibaba Cloud through CCN.

   i. Create a CCN instance. For more information, see Create a CCN instance.

      The SAG vCPE instance and CCN instance must belong to the same region.

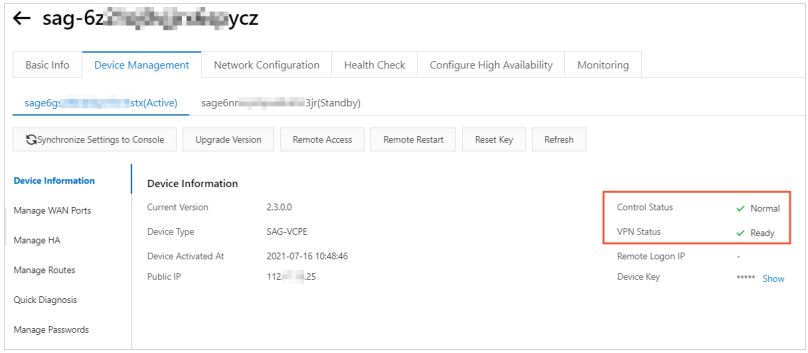
   ii. In the left-side navigation pane, click **Smart Access Gateway**.

   iii. On the **Smart Access Gateway** page, find the SAG vCPE instance and click **Network Configuration** in the **Actions** column.

   iv. On the instance details page, choose **Network Configuration > Network Instance Details**.

   v. In the **Associated Instances Under Current Account** section, click **Attach Network**, select a CCN instance, and then click **OK**.

   vi. After you associate the CCN instance, click the **Device Management** tab. If the **VPN Status** and **Controller Status** of the SAG vCPE device is **Normal**, it indicates that the SAG vCPE device is connected to Alibaba Cloud.



3. Configure a CEN instance.

   You must perform the following operations to connect the SAG vCPE instance to CEN and attach the Alibaba Cloud VPC to a CEN instance. Then, the SAG vCPE instance and the Alibaba Cloud VPC can learn routes from each other. The SAG vCPE device can communicate with the resources in the Alibaba Cloud VPC.

   i. In the left-side navigation pane, click **CCN**.

   ii. On the **CCN** page, find the CCN instance and click **Bind CEN Instance** in the **Actions** column.

iii. In the **CEN Instance** panel, select a CEN instance and click **OK**.

You can use one of the following methods to select a CEN instance. **Create CEN** is selected in this example.

- **Existing CEN**: If you have already created a CEN instance, you can select an existing CEN instance from the drop-down list.
- **Create CEN**: If you have not created a CEN instance, enter an instance name. The system then creates a CEN instance and automatically attaches the CCN instance to the CEN instance.

  The instance name must be 2 to 100 characters in length, and can contain digits, underscores (_), and hyphens (-). It must start with a letter.

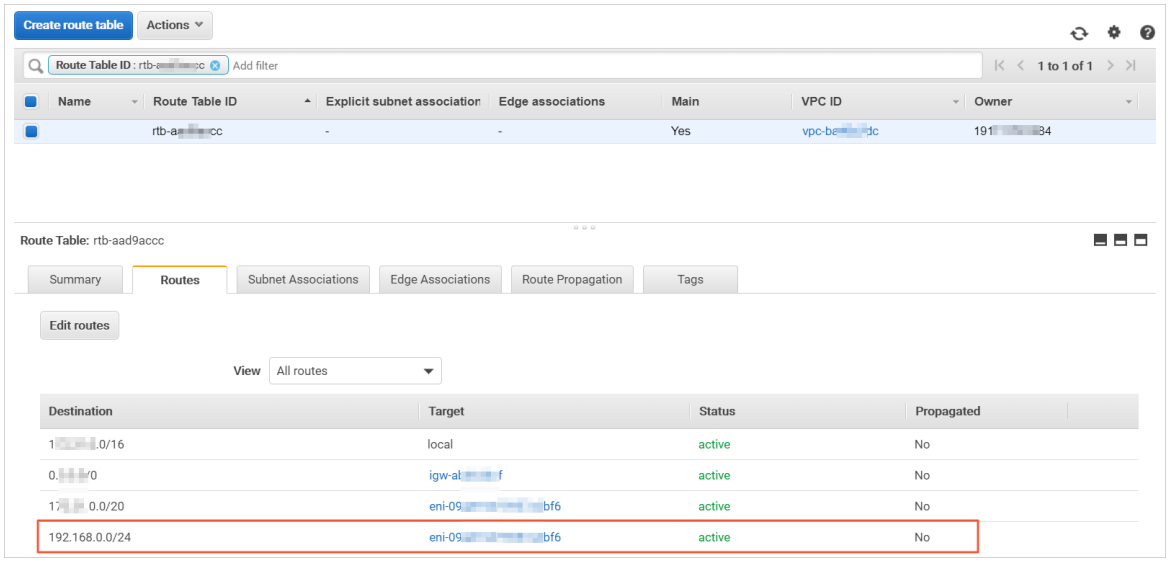
iv. Attach the Alibaba Cloud VPC to the CEN instance. For more information, see Attach a network instance.

Step 4: Configure networks on the AWS side

To enable communication between AWS resources and Alibaba Cloud resources, you must configure networks for the AWS VPC. For more information about specific commands, consult AWS.

1. Configure routes for the AWS service.

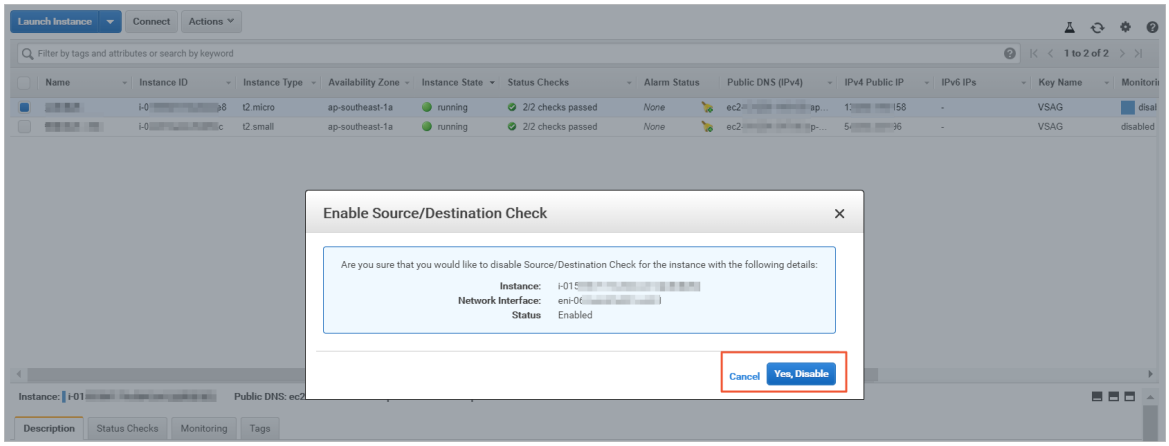
   Add the following route entry to the AWS VPC: The destination CIDR block of the route entry is the CIDR block of the Alibaba Cloud VPC and the next hop points to the AWS instance. The AWS instance is used to enable communication between AWS resources and Alibaba Cloud resources.



2. Configure the security group of the AWS service.

   Allow the private CIDR blocks of Alibaba Cloud and AWS services to communicate with each other.

3. Disable source checks and destination checks for the AWS instance.



Step 5: Test the connectivity

1. Log on to an Elastic Compute Service (ECS) instance in the Alibaba Cloud VPC. For more information, see Overview.
2. Test the connectivity between the Alibaba Cloud VPC and AWS VPC by running the **ping** command to ping an instance in the AWS VPC.

   The test result shows that the resources in the Alibaba Cloud VPC and AWS VPC can communicate with each other.

```
[root@iZbp1c xmmsZ ~]# ping 10.10.0.252
PING 10.10.0.252 (10.10.0.252) 56(84) bytes of data.
64 bytes from 10.10.0.252: icmp_seq=1 ttl=252 time=99.0 ms
64 bytes from 10.10.0.252: icmp_seq=2 ttl=252 time=99.0 ms
64 bytes from 10.10.0.252: icmp_seq=3 ttl=252 time=99.0 ms
64 bytes from 10.10.0.252: icmp_seq=4 ttl=252 time=99.0 ms
^Z
[2]+  Stopped                 ping 10.10.0.252
```

References

- What is CEN?
- Introduction to CCN

4.2. Connect Microsoft Azure resources to Alibaba Cloud resources through SAG vCPE

This topic describes how to connect Microsoft Azure resources to Alibaba Cloud resources through Smart Access Gateway (SAG) vCPE.

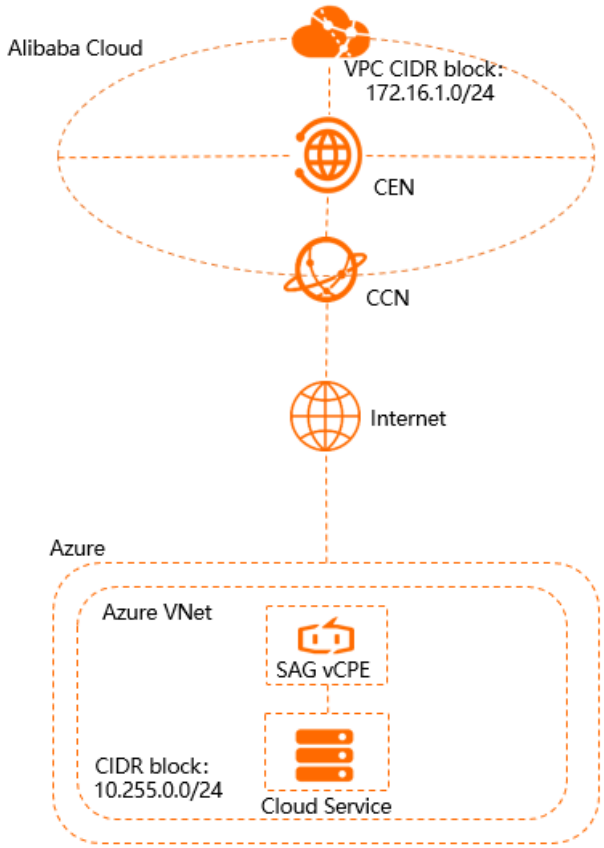
Prerequisites

- Cloud resources are deployed on Microsoft Azure. For more information, see Microsoft Azure.
-
- You have learned and understand the security group rules that apply to Alibaba Cloud virtual private clouds (VPCs). Make sure that the security group rules allow Azure resources to access Alibaba Cloud VPC resources. For more information, see Query security group rules and Add security group rules.

Scenarios

The following figure describes how to establish network communication between cloud resources deployed on Alibaba Cloud and Azure. An enterprise has deployed cloud resources on Azure in the Azure West Europe region and on Alibaba Cloud in the Germany (Frankfurt) region. The enterprise wants to establish network communication between cloud resources deployed on Alibaba Cloud and Azure.

You can deploy the SAG vCPE image on an Azure virtual machine (VM) in an Azure virtual network (VNet). Then, the VM can serve as an SAG vCPE device and can be connected to Alibaba Cloud. After the SAG vCPE device is connected to Alibaba Cloud, resources in Alibaba Cloud VPCs and Azure VNets can communicate with each other through Cloud Connect Network (CCN) and Cloud Enterprise Network (CEN).



Procedure

Step 1: Create an SAG vCPE instance

You must create an SAG vCPE instance in the SAG console. Then, you can use the SAG vCPE instance to manage the SAG vCPE device.

1.
2.
3. Set the following parameters to configure an SAG vCPE instance, click **Buy Now**, and then

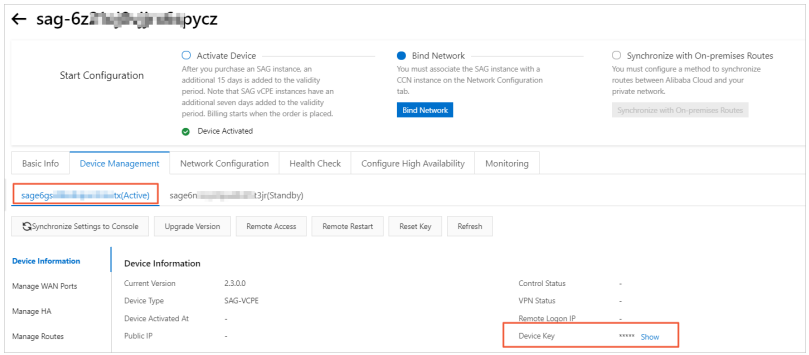
complete the payment.

- **Area**: Select the region or area where you want to create the SAG vCPE instance. In this example, **Germany (Frankfurt)** is selected.
- **Instance Name**: Enter a name for the SAG vCPE instance.

  The name must be 2 to 128 characters in length and can contain digits, periods (.), underscores (_), and hyphens (-). It must start with a letter.
- **Device Type**: **SAG-vCPE** is selected by default.
- **Edition**: **Basic Edition** is selected by default.
- **Deployment Mode**: Select a deployment mode for the SAG vCPE device. By default,**Active-Standby** is selected.

  In **Active-Standby** mode, one SAG vCPE instance can be associated with two SAG vCPE devices by default. You can deploy two SAG vCPE devices in active-standby mode and connect on-premises networks to Alibaba Cloud. This improves network availability. In this example, only the active device is used.
- **Peak Bandwidth**: Select the maximum bandwidth for network connections. Unit: Mbit/s.
- **Quantity**: Enter the number of SAG vCPE instances that you want to create. In this example, 1 is used.
- **Duration**: Specify the subscription duration.
- **Resource Group**: Select the resource group to which the SAG vCPE instance belongs.

4. Return to the SAG console. In the top navigation bar, select the region where the SAG vCPE instance is deployed.
5. In the left-side navigation pane, click **Smart Access Gateway**.
6. On the **SAG** page, click the ID of the SAG vCPE instance.
7. On the instance details page, click the **Device Management** tab, view and record the serial number and key of the active SAG vCPE device. The serial number and key are used to associate the SAG vCPE instance with an SAG vCPE device.



Step 2: Deploy the SAG vCPE image

To connect Azure resources to Alibaba Cloud resources, you must first create an Azure VM in an Azure VNet and deploy the SAG vCPE image on the Azure VM. After you deploy the SAG vCPE image, the Azure VM can serve as an SAG vCPE device to connect Azure resources to Alibaba Cloud resources.

1. Create an Azure VM in an Azure VNet.

   For more information about how to create an Azure VM, see relevant documentation provided by Azure. Make sure that the Azure VM meets the following requirements:

- One of the following operating systems is installed on the Azure VM:
  - 64-bit CentOS 7.6 or later (recommended).
  - 64-bit Ubuntu 18.04 or later.
- The kernel version of the Azure VM is 3.10.0-957.21.3.el7.x86_64 or later.
- The Azure VM has an independent network interface controller (NIC) that allows the Azure VM to connect to the Internet.
- You can remotely log on to the Azure VM.
- No business system is running on the Azure VM.
- The number of vCPU cores for the Azure VM must be one or more and the memory of the Azure VM must be 2 GB or more.

  We recommend that you select a 2-core vCPU and 4 GB memory for the Azure VM. In this case, the bandwidth of private networks for encrypted connections can reach 350 Mbit/s and higher (the packet length in the performance test is 1,024 bytes).

2. Log on to the Azure VM and download the following script to the */root* directory. For more information, see relevant documentation provided by Azure.

   > **Notice**
   > - You can also specify a custom path and download the script to the corresponding directory. In this case, make sure that you select the custom path when you run the script.
   > - After you download the script, do not modify its content or name.

   - If the Azure VM is deployed in mainland China, run the following commands to download the script:

     ```
     wget -O /root/sag_vcpe_v2.3.0_deployment.sh https://sdwan-oss-shanghai.oss-cn-shanghai.aliyuncs.com/vcpe_vm/sag_vcpe_v2.3.0_deployment.sh
     ```

   - If the Azure VM is deployed outside mainland China, run the following commands to download the script:

     ```
     wget -O /root/sag_vcpe_v2.3.0_deployment.sh https://sdwan-oss-shanghai.oss-accelerate.aliyuncs.com/vcpe_vm/sag_vcpe_v2.3.0_deployment.sh
     ```

3. Run the following command to grant the script executable permissions:

   ```
   chmod +x /root/sag_vcpe_v2.3.0_deployment.sh
   ```

4. Run the script.

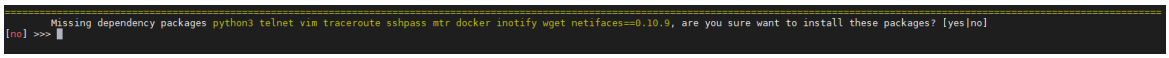
   ```
   /root/sag_vcpe_v2.3.0_deployment.sh -n sage6nniq3**** -k X8==**** -t azure  -w eth0
   ```

   The following table describes the parameters of the script. For more information about more parameters of the script, see Descriptions of the script parameters.

Parameter	Description
-n	The serial number of the SAG vCPE device.

Parameter	Description
-k	The key of the SAG vCPE device.
-t	The service provider of the host where you want to install the SAG vCPE image. Valid values: ○ **aliyun** (default): deploys the SAG vCPE image on an Alibaba Cloud Elastic Compute Service (ECS) instance. ○ **aws**: deploys the SAG vCPE image on an Amazon Elastic Compute Cloud (EC2) instance. ○ **azure**: deploys the SAG vCPE image on a Microsoft Azure virtual machine (VM). ○ If you want to deploy the SAG vCPE image on an on-premises server, set the value to a string of letters other than **aliyun**, **ens**, **aws**, or **azure**.
-w	The name of the NIC for the WAN port. You can run the `ifconfig` or `ip -br address` command to view the NIC name of the host.

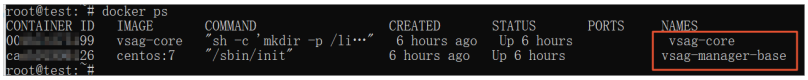
5. When you run the script, the system automatically checks whether the deployment environment meets the requirements. If the deployment environment requires other components, the following prompt appears. In this case, enter yes and the system will automatically install required components.



6. If the deployment environment meets the requirements, the system automatically starts to deploy the SAG vCPE image. After the image is deployed, the following prompt appears.

7. View the deployment result.

   After you deploy the SAG vCPE image, run the `docker ps` command to check whether the system has the following containers installed:



   If the system has both the **vsag-core** and **vsag-manager-base** containers installed, it indicates that the SAG vCPE image is deployed. If not, it indicates that the SAG vCPE image is not deployed. In this case, you can submit a ticket to request technical support from Alibaba Cloud.

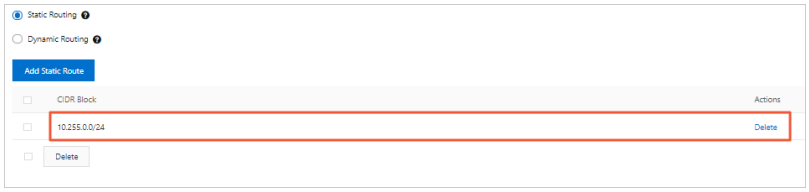
Step 3: Configure networks on the Alibaba Cloud side

After the SAG vCPE image is deployed, you must configure networks for the SAG vCPE device in the SAG console. This allows the SAG vCPE device to connect to Alibaba Cloud.

1. Select a method to advertise routes to Alibaba Cloud.
   i. Log on to the SAG console.
   ii. In the top navigation bar, select the region where the SAG vCPE instance is deployed.
   iii. On the **Smart Access Gateway** page, find the SAG vCPE instance and click **Network Configuration** in the **Actions** column.

iv. Choose **Network Configuration > Method to Synchronize with On-premises Routes** and click **Add Static Route**.

v. In the **Add Static Route** dialog box, enter the private CIDR block of the Azure service and click **OK**.



2. Associate the SAG vCPE instance with a CCN instance.

CCN is an important component of SAG. SAG connects your private networks to Alibaba Cloud through CCN.

i. Create a CCN instance. For more information, see Create a CCN instance.

The SAG vCPE instance and CCN instance must belong to the same region.

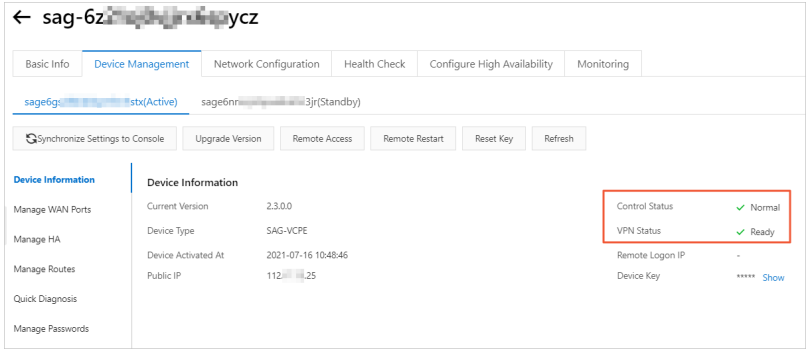
ii. In the left-side navigation pane, click **Smart Access Gateway**.

iii. On the **Smart Access Gateway** page, find the SAG vCPE instance and click **Network Configuration** in the **Actions** column.

iv. On the instance details page, choose **Network Configuration > Network Instance Details**.

v. In the **Associated Instances Under Current Account** section, click **Attach Network**, select a CCN instance, and then click **OK**.

vi. After you associate the CCN instance, click the **Device Management** tab. If the **VPN Status** and **Controller Status** of the SAG vCPE device is **Normal**, it indicates that the SAG vCPE device is connected to Alibaba Cloud.



3. Configure a CEN instance.

You must perform the following operations to connect the SAG vCPE instance to CEN and attach the Alibaba Cloud VPC to a CEN instance. Then, the SAG vCPE instance and the Alibaba Cloud VPC can learn routes from each other.

i. In the left-side navigation pane, click **CCN**.

ii. On the **CCN** page, find the CCN instance and click **Bind CEN Instance** in the **Actions** column.

iii. In the **CEN Instance** panel, select a CEN instance and click **OK**.

You can use one of the following methods to select a CEN instance. **Create CEN** is selected in this example.

- **Existing CEN**: If you have already created a CEN instance, you can select an existing CEN instance from the drop-down list.
- **Create CEN**: If you have not created a CEN instance, enter an instance name. The system then creates a CEN instance and automatically attaches the CCN instance to the CEN instance.

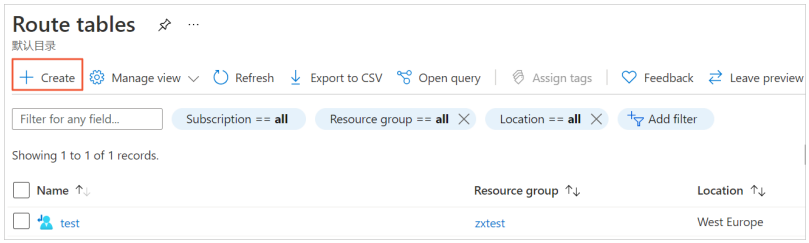
  The instance name must be 2 to 100 characters in length, and can contain digits, underscores (_), and hyphens (-). It must start with a letter.

iv. Attach the Alibaba Cloud VPC to the CEN instance. For more information, see Attach a network instance.

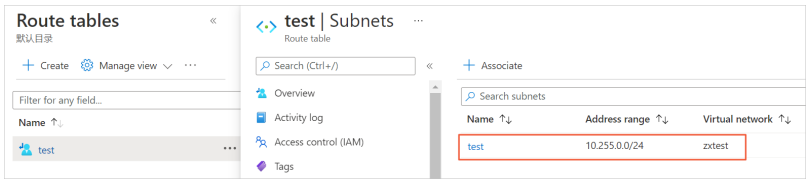
Step 4: Configure networks on the Azure side

To enable communication between Azure resources and Alibaba Cloud resources, you must configure networks on the Azure side. For more information about specific commands or operations, consult Azure.

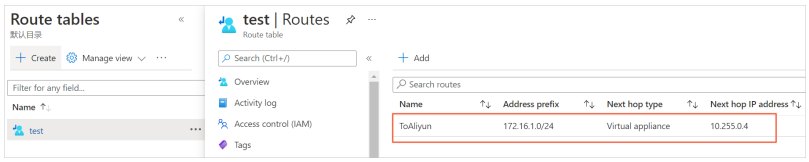
1. Create a route table in Azure.



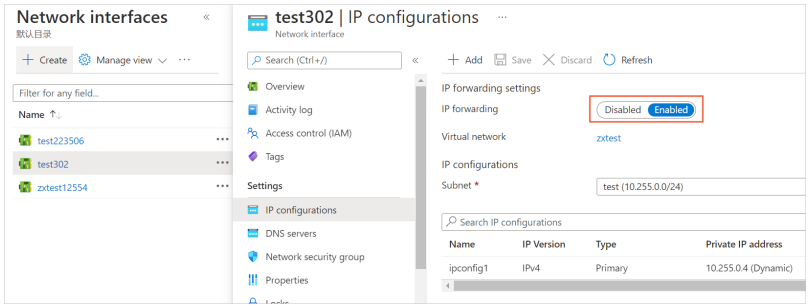
2. Associate the route table with the subnet where the Azure service is deployed.



3. Add a route that points to Alibaba Cloud to the Azure route table.
   - **Address prefix**: Enter the private CIDR block where the Alibaba Cloud service is deployed.
   - **Next hop type**: Select **Virtual appliance**.
   - **Next hop address**: Enter the private IP address of the Azure VM where the SAG vCPE image is deployed.



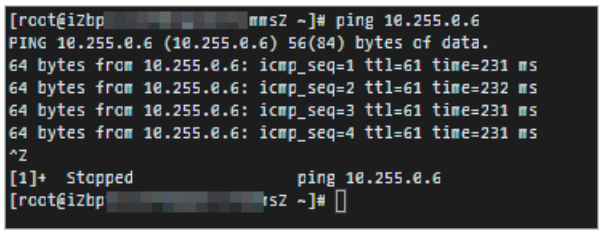
4. Find the private network interface of the Azure VM where the SAG vCPE image is deployed, and enable the **IP forwarding** feature of the network interface.



Step 5: Test the connectivity

1. Log on to an Elastic Compute Service (ECS) instance in the Alibaba Cloud VPC. For more information, see Overview.
2. You can run the **ping** command to ping an Azure VM in the Azure VNet to test whether the Alibaba Cloud VPC is connected to the Azure VNet.

   The following figure shows that the resources in the Alibaba Cloud VPC and Azure VNet can communicate with each other.



References

- What is CEN?
- Introduction to CCN