

SAP

SAP Solutions

SAP Solutions

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SAP HANA

SAP HANA Deployment Guide

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Version Control

Version	Revision Date	Types Of Changes	Effective Date
1.0			2017/12/10
1.1	2018/07/31	1.Certified IaaS	2018/07/31

		platforms is updated. 2.Part of the content is adjusted and optimized.	
1.2	2018/11/16	1.Certified IaaS platforms is updated.	2018/11/16
1.3	2019/1/10	1.Certified IaaS platforms is updated.	2019/1/10

Overview

SAP HANA is an in-memory, column-oriented, relational database management system developed and marketed by SAP. Its primary function as database server is to store and retrieve data as requested by the applications. In addition, SAP HANA performs high-performance analysis and real-time data processing to address customers' rapidly growing requirements on business analysis.

This deployment guide describes how to plan and deploy the SAP HANA system on Alibaba Cloud ECS, including how to configure the ECS instances, block storage, network, and SUSE Linux Enterprise Server (SLES) operating system. This guide includes the best practices from Alibaba Cloud and SAP.

ECS instance types

This deployment guide describes a memory-optimized instance that runs on the Intel Broadwell architecture and belongs to the ECS enterprise instance type family. The SSD cloud disk and Ultra cloud disk can be used to host data volumes and logs in the SAP HANA database.

The currently supported instance types are listed in the table as follows:

Instance type	vCPU	Memory (GiB)	Microarchitecture
ecs.r5.8xlarge	32	256	Skylake
ecs.se1.14xlarge	56	480	Broadwell
ecs.re4.14xlarge	80	960	Broadwell
ecs.re4.40xlarge	160	1920	Broadwell
ecs.re4e.40xlarge	160	3840	Broadwell

Find all certified and supported SAP HANA ECS families [Alibaba Cloud Certified IaaS Platforms](#)

Alibaba Cloud services

The following table lists services included in the Alibaba Cloud core components used by this deployment guide.

Services	Description
ECS	Elastic Compute Service (ECS) is a type of computing service that features elastic processing capabilities. ECS has a simpler and more efficient management mode than that for the physical server. You can create instances, change the operating system, and add or release any number of ECS instances at any time to fit your business needs.
SSD cloud disk	It is applicable to I/O intensive applications, and provides stable and high random IOPS performance.
Ultra cloud disk	It is applicable to medium I/O load application scenarios and provides the storage performance of up to 3,000 random read/write IOPS for ECS instances.
VPC	The Alibaba Cloud Virtual Private Cloud (VPC) is a private network built on Alibaba Cloud. It is logically isolated from other virtual networks in Alibaba Cloud. VPC enables you to start and use Alibaba Cloud resources in your own defined network.
OSS	Alibaba Cloud Object Storage Service (OSS) is a network-based data access service. OSS enables you to store and retrieve structured and unstructured data, including text files, images, audios, and videos.

Supported SAP HANA versions

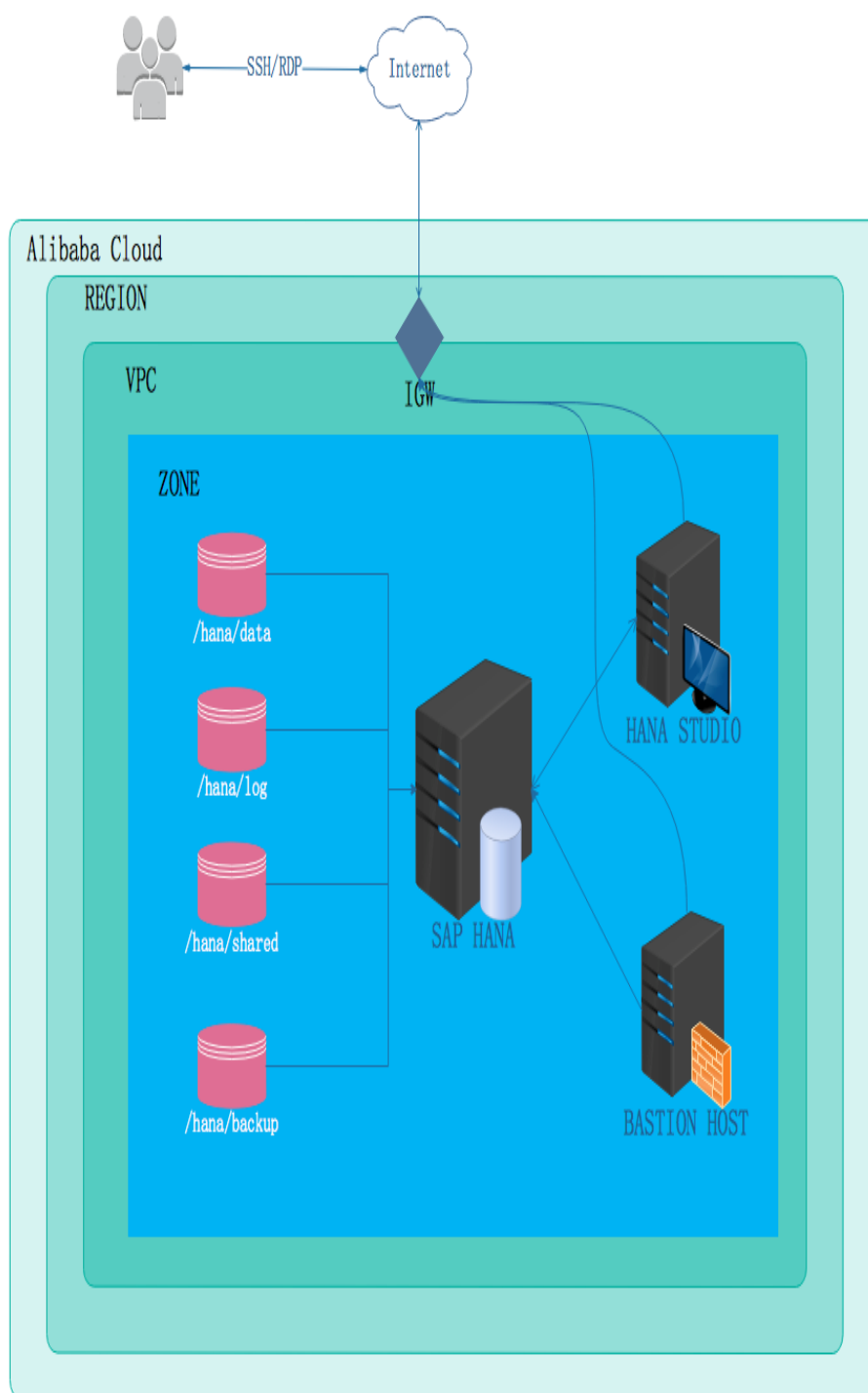
SAP HANA platform V1.0 and V2.0 are supported now.

SAP HANA deployment architecture

SAP HANA supports single-node (scale-up) and multi-node (scale-out) architectures.

Single-node architecture

The following figure shows the single-node architecture of SAP HANA, and its deployment design and disk layout in Alibaba Cloud. You can use OSS to back up your local files in the /hana/backup path. (The size of this attaching point must be equal to or greater than the size of the data volume.)



Note that the ECS instance for SAP HANA does not have a public IP address, which means that it cannot be accessed from an external network. Instead, a bastion host and SAP HANA Studio must be used for accessing SAP HANA during deployment. The SAP HANA Studio instance and bastion host must be deployed in the same VPC as the SAP HANA instance.

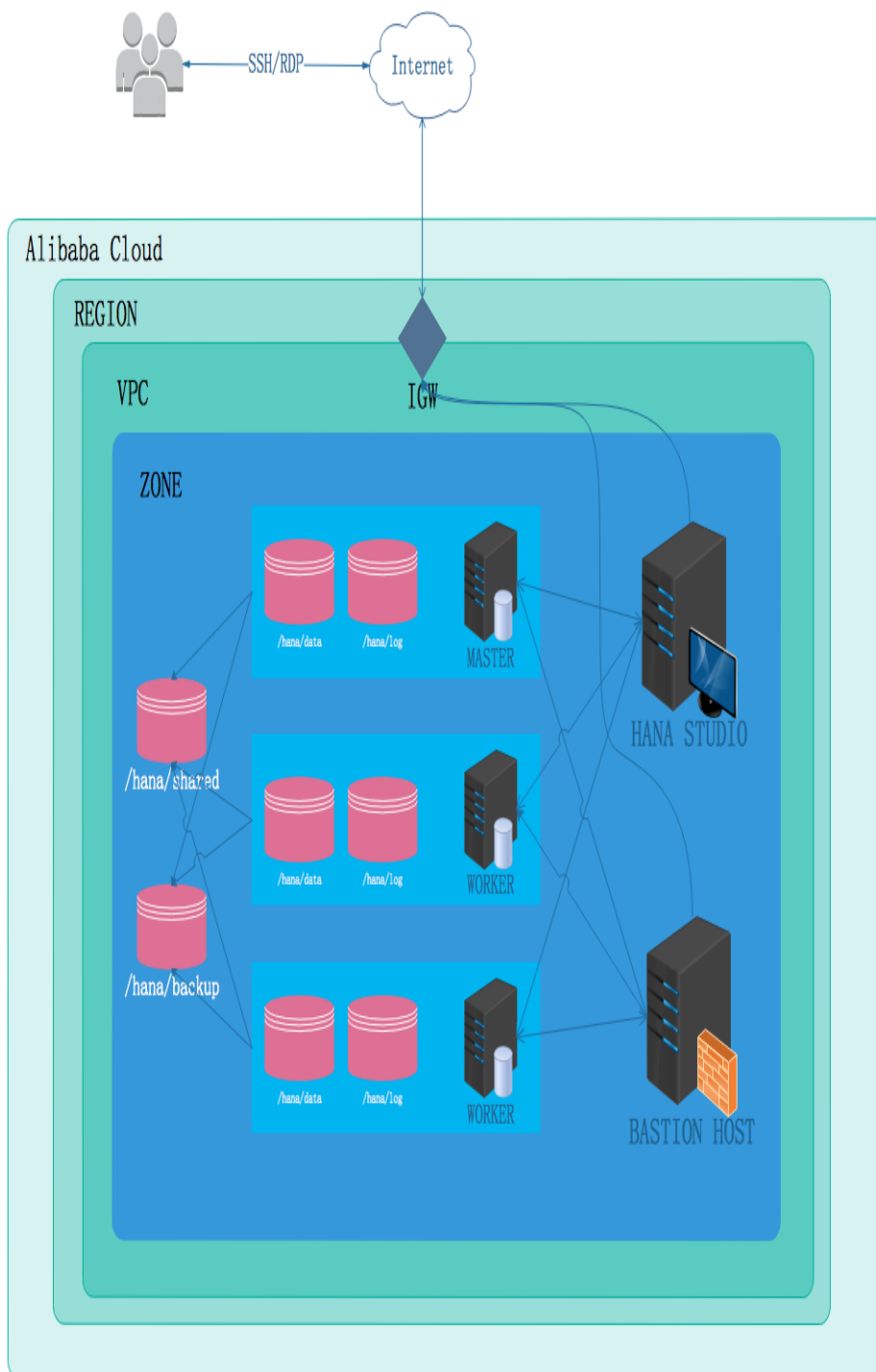
You must provide a Windows host to install SAP HANA Studio, deploy the host instance in the same VPC as the SAP HANA instance, and configure the firewall policies to enable your SAP HANA Studio to connect to the SAP HANA database.

The following components are used when SAP HANA is deployed in a single-node architecture:

- The ECS instance `ecs.se1.14xlarge` for the master node of the SAP HANA database, including: 56 vCPUs, 480 GB memory, an SSD cloud disk whose size is greater than 1.5 TB for the data volume, and two SSD cloud disks whose sizes are greater than 512 GB for the log volume and HANA shared volume. See the storage configuration example in Step 7 of [Create an SAP HANA instance](#).
- A VPC with a custom topology and an IP address range that can be allocated in your selected region. The SAP HANA database and other ECS instances are launched within this VPC. You can use an existing VPC to deploy SAP HANA.
- An Internet gateway configured for the public egress for your SAP HANA and other instances. This guide assumes that you are using this gateway.
- ECS security group, used to restrict access between instances.
- A 2TB ultra cloud disk for backup of the SAP HANA database.
- ECS VM `ecs.sn2.medium` running in Windows to host SAP HANA Studio.
- ECS VM `ecs.n1.medium` as a bastion host.

Multi-node architecture

The following figure shows the SAP HANA multi-node architecture.



Systems where SAP business applications are deployed must be scaled up.

As HANA is an unshared architecture, scale-out systems connect a group of small SAP HANA systems together into one cluster database. With the increased workload demand, the multi-node (scale-out) architecture can balance the load across all nodes.

The scale-out architecture consists of one master node and several worker nodes. They are interconnected through a network with a capacity up to 10 Gbps. Each node has its own `/hana/data` and `/hana/log` volumes on the SSD cloud disk, providing consistent and high IOPS I/O services. The

master node also serves as an NFS master node for the /hana/shared and /hana/backup volumes, which is attached to each worker node.

The following components are used when SAP HANA is deployed in a multi-host scale-out architecture:

- The ECS instance ecs.se1.14xlarge for the **master node** of the SAP HANA database, including: 56 vCPUs, 480 GB memory, an SSD cloud disk whose size is greater than 1.5 TB for the data volume, and two SSD cloud disks whose sizes are greater than 512 GB for the log volume and HANA shared volume. See the storage configuration example in Step 7 of [Create an SAP HANA instance](#).
- The ECS instance ecs.se1.14xlarge for the **worker node** of the SAP HANA database, including: 56 vCPUs, 480 GB memory, an SSD cloud disk whose size is greater than 1.5 TB for the data volume, and two SSD cloud disks whose sizes are greater than 512 GB for the log volume and HANA shared volume.
- A VPC with a custom topology and an IP address range that can be allocated in your selected region. The SAP HANA database and other ECS instances are launched within this VPC. You can use an existing VPC to deploy SAP HANA.
- An Internet gateway configured for the public egress for your SAP HANA and other instances. This guide assumes that you are using this gateway.
- ECS security group, used to restrict access between instances.
- A 2TB ultra cloud disk for backup of the SAP HANA database.
- ECS VM ecs.sn2.medium running in Windows to host SAP HANA studio.
- ECS VM ecs.n1.medium as a bastion host.

Deploy SAP HANA on Alibaba Cloud

This section describes how to deploy a multi-node SAP HANA on Alibaba Cloud.

Preparations

Alibaba Cloud account

If you do not have an Alibaba cloud account yet, you can apply for one according to the following process:

- Perform the registration process. Go to the Alibaba Cloud homepage, and click **Free Account** on the upper-right of the page.
- Follow the guidance described in [Sign up with Alibaba Cloud](#)
- Then, [Add a payment method](#)

SAP HANA installation media

Download SAP HANA installation media.

Please refer to SAP HANA Server Installation and Update

Activate OSS.

- Log on to the Alibaba Cloud website.
- Click **Buy Now** on the OSS product details page
<https://www.alibabacloud.com/product/oss>
- After OSS is activated, click **Console** to go to the OSS console interface.

Create a bucket.

- Go to the OSS console interface.

Click **Create Bucket**. The **Create Bucket** dialog box is displayed.

In the **Bucket Name** text box, enter the bucket name. The bucket name must comply with the naming rules and must be unique among all existing bucket names in Alibaba Cloud OSS. The bucket name cannot be changed after being created. For more information about bucket naming, see **OSS basic concepts**.

In the **Region** drop-down box, select the data center of the bucket. The region cannot be changed after being subscribed. To access the OSS through the ECS intranet, select the same region with your ECS instance. For more information, see **Access domain name**.

In the **Read/Write Permissions** drop-down box, select a permission for the bucket.

- **Public-Read-Write:** Anyone (including anonymous access) can perform read and write operations on the files in the bucket. **Use this permission with caution because the fees incurred by these operations will be borne by the creator of the bucket.**
- **Public Read:** Only the creator of the bucket can perform write operations on the files in the bucket, while anyone (including anonymous access) can perform read operations on the files.
- **Private:** Only the creator of the bucket can perform read/write operations on the files in the bucket. Other users cannot access the files.

Click **Submit**. The bucket is successfully created.

Upload a file.

- Go to the OSS console.

- Click the name of the bucket to which you will upload a file to open the bucket management page.

Click **Object Management** to open the page where all files in the bucket are managed.

Click **Upload File** to open the "Select File" dialog box.

- Select the HANA installation package and click **Open**. After the file is uploaded, click **Refresh** to view the uploaded file.

Zone and region

Zone

- A zone is a physical area with independent power grids and networks in one region. The network latency for ECS instances within the same zone is shorter.
- Intranet communication can take place between zones in the same region, and fault isolation can be performed between zones. Whether to deploy ECS instances in the same zone depends on the requirements for disaster tolerance capabilities and network latency.
- If your applications require high disaster tolerance capabilities, We recommend that you deploy your ECS instances in different zones of the same region.
- If your applications require low network latency between instances, We recommend that you create your ECS instances in the same zone.

Region

Alibaba Cloud data centers are deployed in the following regions now: China East 1 (Hangzhou), China East 2 (Shanghai), China North 1 (Qingdao), China North 2 (Beijing), China North 3 (Zhangjiakou), China South 1 (Shenzhen), Hong Kong, US West 1 (Silicon Valley), US East 1 (Virginia), Singapore, Asia Pacific NE 1 (Japan), Germany 1 (Frankfurt), and Middle East 1 (Dubai).

- The data centers in China East 1 (Hangzhou), China East 2 (Shanghai), China North 1 (Qingdao), China North 2 (Beijing), China North 3 (Zhangjiakou), and China South 1 (Shenzhen) offer multi-line BGP backbone networks covering all provinces and municipalities in China and providing stable and fast access within Chinese mainland.
- The data center in Hong Kong offers access at international bandwidth, covering Hong Kong and Southeast Asia.
- As the partner of the data center in Singapore, SingTel is a dominant operator in Southeast Asia. Highly reliable in terms of business expertise and maturity, the company is well-positioned to serve users across the region.
- The data center in Asia Pacific SE 2 is located in Sydney, Australia.

- The data center in Asia Pacific NE 1 is located in Tokyo, Japan.
- The data center in US West 1 (Silicon Valley) is directly connected to the backbone networks of multiple American operators through BGP lines. In addition to the entire US region, the data center extends its reach to South America and Continental Europe.
- The data center in US East 1 is located in Virginia of the United States.
- The data center in Germany 1 is located in Frankfurt.
- The data center in Middle East 1 is located in Dubai, UAE.

How to select a region

Regions in Chinese mainland

In general cases, we recommend that you select a data center closest to your end users to further speed up user access. Alibaba Cloud's data centers in Chinese mainland are similar to each other in terms of infrastructure, BGP network quality, service quality, and ECS operation and configuration. Domestic BGP networks ensure fast access to regions across China.

International regions

The data centers outside the Chinese mainland provide international bandwidth and target areas outside the Chinese mainland. Access to these regions from the Chinese mainland may cause high latency. Therefore, you are not advised to use them.

- If you have business requirements in Hong Kong or Southeast Asia, you can select Hong Kong or Singapore.
- If you have business requirements in Japan or South Korea, you can select Asia Pacific NE 1 (Japan).
- If you have business requirements in Australia, you can select Asia Pacific SE 2 (Sydney).
- If you have business requirements in America, you can select US West 1 (Silicon Valley) and US East 1 (Virginia).
- If you have business requirements in Continental Europe, you can select Germany 1 (Frankfurt).
- If you have business requirements in Middle East, you can select Middle East 1 (Dubai).

Different Alibaba Cloud products in different regions cannot communicate with each other through an intranet.

- ECS, ApsaraDB for RDS, and OSS instances in different regions cannot communicate with each other through an intranet.
- ECS instances and other cloud resources in different regions, such as ApsaraDB for RDS and OSS instances, cannot communicate with each other through the intranet.
- Server Load Balancer cannot be deployed for ECS instances in different regions,

that is, ECS instances bought in different regions cannot be deployed in the same Server Load Balancer instance.

- A single VPC can only be deployed in one region. VPCs in different regions cannot be communicate with each other by default. You can select VPCs based on the actual running environment.

Account management

SAP HANA account

The SID needs to be specified during SAP HANA installation, and <sid>adm is used as the account for the HANA system (not the account for the HANA database). If this account does not exist, HANA will create one by default. When you create user accounts, do not name them with "adm" as the ending, in case HANA identifies them as the HANA system account and forcibly modifies related information. In addition, in the scale-out scenarios, all nodes must use the same <sid>adm, and uid and gid must be consistent.

System internal account

Alibaba Cloud will not create any account within system. The default user in Linux is only the root user. During system use, you can create or delete user accounts as required by the operating system. For example, you can use useradd and userdel to manage your accounts in Linux.

Create a user: `useradd -u <uid> -g <gid> username`

Delete a user: `userdel username`

Deployment process

Configure a network

Create a VPC and switch

- Log on to the VPC console.
- In the left-side navigation pane, click "VPC" .
- On the VPC list page, select the region where the VPC is located, and click "Create VPC" .
- In the "Create a VPC" dialog box, enter the VPC name and select the network segment for the VPC.

You can select one of the following standard network segments of the VPC: After the VPC is created, its network segment cannot be modified. We recommend that you use a large network segment to prevent subsequent resizing.

```
10.0.0.0/8(10.0.0.0 - 10.255.255.255)
172.16.0.0/12(172.16.0.0 - 172.31.255.255)
192.168.0.0/16(192.168.0.0 - 192.168.255.255)
```

Click **Create VPC**.

After the VPC is created, a VPC ID is generated. A router is created for the VPC at the same time.

Click **Next** to create a switch.

On the **Create a Switch** tab page, provide the following information, and click **Create Switch**.

Name: Specify the switch name.

Zone: Select the zone of the switch.

Network segment: Specify the network segment of the switch.

The network segment of the switch can be the same as that of the VPC to which the switch belongs or the subnet of the VPC network segment. The size of the network segment of the switch must be between a 16-bit netmask and a 29-bit netmask.

NOTE: If the network segment of your switch is the same as that of the VPC to which your switch belongs, you can only create one switch under the VPC.

Click **Finish**.

Return to the instance list page, and click the ID link of the created VPC to enter the VPC details page. Check the VPC and switch on the page.

Configure a security group

About security groups

A security group is a logical group that consists of instances in the same region with the same security requirements and mutual trust. Each instance belongs to at least one security group, which must be specified at the time of creation. Instances in the same security group can communicate through the network, but instances in different security groups cannot

communicate through an intranet by default. Mutual access can be authorized between two security groups.

A security group is a virtual firewall that provides the stateful packet inspection (SPI) function. Security groups are used to set network access control for one or more ECSs. As an important means of security isolation, security groups are used to divide security domains on the cloud.

- **Security group restrictions**

- A single security group cannot contain more than 1,000 instances. If you require intranet mutual access between more than 1,000 instances, you can allocate them to different security groups and permit mutual access through mutual authorization.
- Each instance can join a maximum of five security groups.
- Each user can have a maximum of 100 security groups.
- Adjusting security groups will not affect the continuity of a user's service.
- Security groups are stateful. If an outbound packet is permitted, inbound packets corresponding to this connection will also be permitted.
- Security groups have two network types: classic network and VPC.
 - Instances of the classic network type can join security groups on the classic networks in the same region.
 - Instances of the VPC type can join security groups on the same VPC.

- **Security group rules**

- Security group rules can be set to permit or forbid ECS instances associated with security groups to access a public network or an intranet from the inbound and outbound directions.
- You can authorize or delete security group rules at any time. Security group rules you have changed will automatically apply to ECS instances associated with the security groups. When setting security group rules, make sure security group rules are simple. If you allocate multiple security groups to an instance, up to hundreds of rules may apply to the instance. When you access the instance, the network may be disconnected.
- **Security group rule restrictions**
 - Each security group can have a maximum of 100 security group rules.

Security group configuration methods

- Log on to the ECS console.
- In the left-side navigation pane, click **Security Group**.
- Select the region on which you want to create a security group.
- Click **Create Security Group**. In the displayed dialog box, enter the following information:

Create Security Group

* Security Group Name: hana-default
2 - 128 characters long. Do not start with a special character or a digit. It can contain the following special characters: ".", "_", and "-".

Description: for hana vpc
It must contain 2-256 characters and it cannot begin with http:// or https://

Network Type: VPC

*VPC: vpc-gw8xd6xuhyjagn1fby83d [Create VPC](#)

vpc-gw8xd6xuhyjagn1fby83d / Tony_Zha...

OK Cancel

- Click "OK" and then click "Configuration Rule".
- Complete rule settings by following the corresponding instructions. We recommend that you keep only the ports for remote access.

Add Security Group Rules

?

X

NIC:

Intranet

Rule Direction:

Inbound

Authorization Policy:

Allow

Protocol Type:

Custom TCP

* Port Range:

22/22

i

Priority:

1

i

Authorization Type:

Address Field Access

* Authorization Object:

e.g. 10.0.0.0/32

i

Tutorial

Description:

It must contain 2-256 characters and it cannot begin with http:// or https://

OK

Cancel

Port configuration reference

During SAP HANA deployment, a VPC is used. You only need to set the rules in the outbound and inbound directions, without specifying the public network or VPC. The security group rules are blank by default. When creating an ECS instance, make sure that the selected security group contains port 22 (Linux) or 3389 (Windows). Otherwise, you cannot remotely log on to the ECS instance.

HANA Studio Windows VM

Inbound

Protocol type	Port range	Authorization object	Remarks
TCP	3389	Internet IP address	You must access all IP addresses of HANA Studio.
Outbound			
TCP	1	0.0.0.0/0 (all VMs)	You can access any other VMs from a Windows VM.

Bastion host

Inbound			
Protocol type	Port range	Authorization object	Remarks
TCP	22	Internet IP address	You must access all IP addresses of the bastion host.
Outbound			
TCP	22	0.0.0.0/0 (all VMs)	You can access any other VMs from a bastion host.

For more information about specific ports that SAP needs to access and the related security group rules, see [SAP official documentation](#).

Create an SAP HANA instance

Log on to Alibaba Cloud ECS [ECS product purchase page](#).

Select **Subscription** as the billing method.

Select the region and zone.

Select the region as required. If you have configured a switch, select a zone.

Select "VPC" for the network type.

After selecting the network type, enter the information about the created or existing VPC and switch. In a multi-node architecture, SAP HANA does not provide external services

directly. Therefore, set "Public IP Address" to "Not Allocate" .

Select an instance type.

Select an instance type that passes SAP HANA authentication, that is, "56 vCPU 480GB (ecs.se1.14xlarge)" in the "Memory se1" instance type family of "Series III" .

Select an operating system image.

The operating system is SUSE Linux Enterprise Server 12 SP1 for SAP Applications. The related images can be obtained from the image marketplace.

Configure storage disks.

We recommend that you select storage disks as follows:

System Disk

Ultra Cloud Disk	60	GB	System device: /dev/xvda ?
------------------	----	----	----------------------------

Need help choosing the right disk? [click here>>](#)

Data Disk

/hana/data	SSD Cloud Disk	1536	GB	Create disk with snapshot	Default device ?
/hana/log	SSD Cloud Disk	512	GB	Create disk with snapshot	Default device ?
/hana/shared	SSD Cloud Disk	512	GB	Create disk with snapshot	Default device ?
/hana/backup	Ultra Cloud Disk	2048	GB	Create disk with snapshot	Default device ?

NOTE: After the instance and storage disks are created, open a ticket from the Alibaba Cloud support portal to request a special support for using an SSD cloud disk in SAP HANA deployment. Alibaba Cloud support experts will contact you to introduce more details.

Configure initialization information.

After setting the initial password, click "Create" , and wait several minutes for instance initialization.

Create a bastion host.

Create a bastion host with one vCPU and 2 GB memory and without additional storage in the same VPC of the same zone by following the preceding steps.

Configure the network for the bastion host.

There are multiple ways to configure a public IP address now. The elastic IP address (EIP) configuration is used as an example.

An EIP is a public IP address resource that can be independently bought and held. It can be dynamically bound to or unbound from different ECS instances without stopping the ECS instances.

- Log on to the EIP console.
- Click "Apply for EIP" .
- On the purchase page, select the region, bandwidth peak, and billing method of the EIP, click "Buy Now" , and make the payment.
- NOTE: The region of the EIP must be the same as that of the ECS instance to which the EIP is to be bound.
- Return to the EIP list page, select the region of the EIP, and click "Refresh" to check the created EIP instance.
- Click "Bind" .
- In the "Bind a Public EIP" dialog box, select the created ECS instance, and click "OK" .
- After the binding is complete, click "Refresh" on the EIP list page to check the EIP instance status.
- When the EIP instance status is "Allocated" , the ECS instance to which the EIP is bound can be accessed through a public network.
- Log on to the ECS instance and run the following command to test access through a public network.

```
ping www.aliyun.com
Welcome to Alibaba Cloud Elastic Compute Service !

[root@iZ2ze6gldpwr7p8c9b59kfZ ~]# ping www.aliyun.com
PING sh.wagbridge.aliyun.com.gds.alibabadns.com (140.205.62.8) 56(84) bytes of data.
64 bytes from 140.205.62.8 (140.205.62.8): icmp_seq=1 ttl=47 time=21.7 ms
64 bytes from 140.205.62.8 (140.205.62.8): icmp_seq=2 ttl=47 time=21.8 ms
64 bytes from 140.205.62.8 (140.205.62.8): icmp_seq=3 ttl=47 time=21.7 ms
64 bytes from 140.205.62.8 (140.205.62.8): icmp_seq=4 ttl=47 time=21.7 ms
64 bytes from 140.205.62.8 (140.205.62.8): icmp_seq=5 ttl=47 time=21.7 ms
64 bytes from 140.205.62.8 (140.205.62.8): icmp_seq=6 ttl=47 time=21.7 ms
64 bytes from 140.205.62.8 (140.205.62.8): icmp_seq=7 ttl=47 time=21.7 ms
```

Log on to an instance.

No public network is configured for the HANA ECS instance currently. Therefore, a bastion

host is required for logon to the HANA ECS instance.

Install the SAP HANA database.

- Create the /hana/data, /hana/log, /hana/shared, and /hana/backup directories.
- Format and attach the four data disks based on the specifications and relationships of the disks applied in Step 7.
- Download the SAP HANA installation file in OSS to the local /hana/shared directory.
- Decompress the SAP HANA installation file and install the SAP HANA database. Note the directory during the installation. The following is an example of installation on the master node:

```

master:/hana/shared/122.05 # ./hdblcmm
SAP HANA Lifecycle Management - SAP HANA 1.00.122.05.1481577062
*****
Scanning Software Locations...
Detected components:
SAP HANA Database (1.00.122.05.1481577062) in /hana/shared/122.05/server
Choose installation
Index | System | Database Properties
-----
1 | Install new system |
| |
2 | Extract components |
3 | Exit (do nothing) |
Enter selected system index [3]: 1 --> Newly deployed node
Enter Installation Path [/hana/shared]: --> Select a shared directory
Enter Local Host Name [master]: --> Ensure that the host name can be accessed
Do you want to add additional hosts to the system? (y/n) [n]: n
Enter SAP HANA System ID: AL1 --> Enter the system ID
Enter Instance Number [00]: 00 --> Enter the instance number

Index | Database Mode | Description
-----
1 | single_container | The system contains one database
2 | multiple_containers | The system contains one system database and 1..n tenant databases

Select Database Mode / Enter Index [1]:

Index | System Usage | Description
-----
1 | production | System is used in a production environment
2 | test | System is used for testing, not production
3 | development | System is used for development, not production
4 | custom | System usage is neither production, test nor development

Select System Usage / Enter Index [4]:
Enter Location of Data Volumes [/hana/data/AL1]:
Enter Location of Log Volumes [/hana/log/AL1]:
Restrict maximum memory allocation? [n]:
Enter Certificate Host Name For Host 'master' [master]:

```

```

Enter SAP Host Agent User (sapadm) Password:
Confirm SAP Host Agent User (sapadm) Password:
Enter System Administrator (al1adm) Password: --> Enter the password
Confirm System Administrator (al1adm) Password:
Enter System Administrator Home Directory [/usr/sap/AL1/home]:
Enter System Administrator Login Shell [/bin/sh]:
Enter System Administrator User ID [1000]:
Enter ID of User Group (sapsys) [79]:
Enter Database User (SYSTEM) Password: --> Enter the password of the database
Confirm Database User (SYSTEM) Password:
Restart system after machine reboot? [n]:
Summary before execution:
=====
SAP HANA Components Installation
Installation Parameters
Remote Execution: ssh
Installation Path: /hana/shared
Local Host Name: master
SAP HANA System ID: AL1
Instance Number: 00
Database Mode: single_container
System Usage: custom
Location of Data Volumes: /hana/data/AL1
Location of Log Volumes: /hana/log/AL1
Certificate Host Names: master -> master
System Administrator Home Directory: /usr/sap/AL1/home
System Administrator Login Shell: /bin/sh
System Administrator User ID: 1000
ID of User Group (sapsys): 79
Software Components
SAP HANA Database
Install version 1.00.122.05.1481577062
Location: /hana/shared/122.05/server

Do you want to continue? (y/n): y

Installing components...
Installing SAP HANA Database...

```

The above shows how to set up a single-node HANA environment. To set up a scale-out environment, continue to follow these steps:

- A master HANA node is created in the preceding steps. Configure NFS services on the node and configure /hana/shared and /hana/backup as shared directory.
- Repeat steps 1 to 8 to create a worker node VM in the same VPC. Note that only /hana/data and /hana/log are required for storage of the worker node.
- Attach the /hana/shared and /hana/backup directories on the master node to the worker node.
- Configure the /etc/hostsfile on all nodes to ensure that the relationship between the host name and the IP address of all nodes can be resolved.
- Run hdblcm on the master node to add a worker node.

Create a Windows instance for SAP HANA Studio

1. Create an SAP HANA Studio instance by following the above steps 1 to 8. Pay attention to the following:
 - Extra storage space does not need to be configured.
 - A Windows image is required.
 - No public IP address is allocated.
2. Repeat step 10 in the preceding process to configure a public IP address for the instance.
3. Connect to the instance through the public IP address.
4. Install SAP HANA Studio.

Why are the bastion host and SAP HANA Studio required?

No public IP address is configured for the SAP HANA instance. Therefore, a bastion host and SAP HANA Studio are required to access SAP HANA. The SAP HANA Studio instance and bastion host are deployed in the same VPC as the SAP HANA instance. Therefore, they can access each other directly.

Generally, a bastion host runs in Linux and is used for SSH access, while SAP HANA Studio is deployed in Windows and is used for HANA management. A Linux instance is hard to directly access a Windows instance. Therefore, a public IP address is configured for the Windows VM so that SAP HANA Studio can be accessed through Internet.

Connect to SAP HANA

As no public IP address will be configured for your SAP HANA instance in the preceding deployment, you can only connect to the SAP HANA instances through the bastion host using SSH or through SAP HANA Studio deployed in the Windows VM.

- To connect to SAP HANA through the bastion host, connect the SSH client you select to the bastion host and then to the SAP HANA instance.
- To connect to the SAP HANA database through SAP HANA Studio, use a remote desktop client to the Windows VM instance. When the connection is established, manually install SAP HANA Studio and access your SAP HANA database.

Post-deployment tasks

Before using your SAP HANA instances, We recommend that you perform the following post-deployment steps. (See [SAP HANA Server Installation and Update](#).)

- When using custom SUSE Linux Enterprise Server as the operating system for your SAP HANA instances, make sure that the Linux kernel version is at least 3.12.74-60.64.40, so as to prevent HANA performance degradation in some cases. If the kernel version is earlier than 3.12.74-60.64.40, upgrade the kernel to the minimum required version. For more

information, see SAP Notes 2205917.

- Update your SAP HANA software to the latest version.
- Install other additional components, such as Application Function Libraries (AFL) or Smart Data Access (SDA).
- Configure and back up your new SAP HANA database. For more information, see [Guide for backing up and restoring SAP HANA on Alibaba Cloud](#).

SAP HANA Operation Guide

- Manage your SAP HANA system
 - Start and stop an ECS instance
 - Create a custom image for your SAP HANA
 - Clone an SAP HANA system
- Manage your account
- Network settings
 - Security isolation
 - Public network access
 - VPN connection
 - Security groups
- Technical support for SAProuter access to SAP
- Security configuration
 - RAM
 - Server Guard (server security)
 - Security notification
 - Necessary configuration changes
 - Disable some SAP HANA services
- High availability and disaster recovery
- Backup and restoration
- Appendix: How to create NAT Gateway

This document mainly describes recommended methods for and notes about using SAP HANA deployed on Alibaba Cloud ECS instances. For more information about how to use SAP HANA, refer to the SAP official documentation.

Manage your SAP HANA system

This section describes how to perform administrative tasks typically required to operate an SAP HANA system on Alibaba Cloud ECS, including information about starting, stopping, and cloning the

system.

Start and stop an ECS instance

You can stop one or multiple SAP HANA hosts at any time. As a best practice, you need to first stop SAP HANA running on the Alibaba Cloud ECS instance before you stop the instance. When you resume the instance, it will automatically start with the same IP address, network, and storage configuration as before.

Create a custom image for your SAP HANA

ECS allows to you create custom images based on your current ECS instances. Custom images help you rapidly create multiple ECS instances with the identical operating system and environment to meet auto scaling requirements. You can create a custom image for an existing instance on the ECS console. For details about how to create a custom image, refer to [Create a custom image using an instance](#).

You can use a custom image as follows:

- Create a full offline backup for the SAP HANA system, including the operating system, HANA program /usr/sap, shared program and file /hana/shared, data, logs, and backup files.
- Create a new ECS instance or Change the system disk of an ECS instance.
- Move an SAP HANA system from one region to another: You can create a custom image for an existing ECS instance and use it to create a new ECS instance in another region by following the instructions in [Copy an image](#). Image copying allows you to maintain a consistent environment when you deploy applications across multiple regions.
- Clone an SAP HANA system: You can create an image for an existing SAP HANA system and create an exact clone of the system. Refer to the next section in this document.

NOTE: To create a custom image of the SAP HANA system with a consistent state, you need to first stop the SAP HANA instance before creating the image, or follow the instructions in [SAP Note 1703435](#).

Clone an SAP HANA system

Single-node system – To create a clone of a single-node SAP HANA system, you can create a custom image of the system in the same zone. The image includes an operating system and preinstalled SAP HANA software.

Multi-node system – A multi-node SAP HANA system cannot be cloned by creating an image. Instead, you can perform backup and restoration to create multiple nodes according to the following steps:

- Create a new SAP HANA system with the same configuration as the SAP HANA system you want to clone.
- Back up data of the original system.
- Restore the backup of the original system to the new system.

Manage your account

The following three types of administrator accounts are required to manage an SAP HANA system on Alibaba Cloud:

- **Alibaba Cloud account** – Before using Alibaba Cloud products and services, you need to create an Alibaba Cloud account first. Using this account, you can manage your ECS instances, configure networks, and manage system images or disk snapshots for your SAP HANA system.
- **ECS instance administrator account** – When an ECS instance is created, you need to create an administrator account in the operating system of the instance. The default administrator of a Linux system is the root user. As an administrator, you can create or delete user accounts as required by the operating system.
- **HANA database administrator** – A system ID (SID) needs to be specified during SAP HANA installation. HANA will use [sid]adm as the administrator and create this account in the operating system by default. In scale-out scenarios, all nodes need to use the same [sid]adm and ensure that the UID and GID are consistent.

Network configuration

It is strongly recommended that you use Virtual Private Cloud (VPC) as the default network type to build the SAP HANA system on Alibaba Cloud ECS. VPC is a private network established on Alibaba Cloud. VPCs are logically isolated from each other. VPC enables you to use Alibaba Cloud resources in your own VPC.

You have full control over your own VPC, including choosing your preferred IP address range, network segment, route table, and gateway, to achieve safe and easy access to your resources and applications. For more information, refer to [VPC](#). You can also establish connections through a leased line or VPN between your VPC and traditional data centers to form an on-demand network environment for smooth application migration to the cloud and expansion of data centers.

Security isolation

- ECS instances of different users are deployed in different VPCs.
- Different VPCs are isolated by tunnel IDs. Because of the existence of VSwitches and VRouter, a VPC can be divided into subnets as if in a conventional network environment.

Different ECS instances in each subnet are interconnected through the same VSwitch.

Different subnets are interconnected through VRouters.

- Different VPCs are completely isolated over the intranet, and can only be interconnected through a mapped public IP address (EIP or NAT IP).
- Because the tunneling technology is used to encapsulate the IP packets of ECS instances, the data link layer (Layer 2 MAC address) information of the ECS instances is not transferred to the physical network, thus implementing Layer 2 network isolation between ECS instances and further implementing Layer 2 network isolation between VPCs.
- ECS instances in a VPC use security group firewalls for Layer 3 network access control.

Public network access

If your enterprise security policy requires that all VMs must be in the enterprise' s private network, you can use the following ways to access the public network:

- Set up NAT Gateway on your private network and a NAT proxy to provide a public traffic portal for the private network. In NAT Gateway, configure a corresponding route to enable your VMs to access the public network. For details about how to set up NAT Gateway, refer to [Appendix: How to create NAT Gateway](#).
- As you are not allowed to directly connect VMs in the private network through SSH, you must set up a bastion host. The bastion host has a public IP address and can record data streams of the SSH protocol. The bastion host can serve as a channel that connects the VMs in your private network. For details about how to set up a bastion host, refer to [Guide on implementing SAP HANA on Alibaba Cloud](#).

VPN connection

VPN Gateway is an Internet-based service provided by Alibaba Cloud. It connects enterprise data centers and Alibaba Cloud VPCs safely and reliably through encrypted channels.

Security groups

A security group is a logical group that consists of instances in the same region with the same security requirements and mutual trust. Each instance belongs to at least one security group, which must be specified at the time of creation. Instances in the same security group can communicate through the network, but instances in different security groups cannot communicate through an intranet by default. Mutual access can be authorized between two security groups. A security group is a virtual firewall that provides the stateful packet inspection (SPI) function. Security groups are used to set network access control for one or more ECSs. As an important means of security isolation, security groups are used to divide security domains on the cloud.

For more information, refer to [Introduction to security groups](#).

Technical support for SAProuter access to SAP

SAProuter is a software application that provides a remote connection between the customer's network and the SAP network. In some situations, it may be necessary to allow an SAP technical support engineer to access your SAP HANA system on Alibaba Cloud for fault diagnosis. SAProuter is required to establish the access connection. One of the prerequisites for using SAProuter is a network connection from the customer's network to the SAP network.

SAProuter can be considered as a technical support connection channel between SAP and Alibaba Cloud ECS. To configure SAProuter, perform the following steps:

- Start the ECS instance where SAProuter is to be installed. Because the instance is located in the customer's VPC, you need to buy an EIP and dynamically bind it to the ECS instance without restarting the instance.
- Create and configure a security group, which only allows the inbound and outbound access between the SAProuter instance and the SAP technical support network over TCP port 3299.
- Install SAProuter by following SAP Note 1628296, and create a file named "saprountab".
- Use Secure Network Communication (SNC) to set up the Internet connection required by SAProuter. For more information, refer to [SAP remote support – help](#).

Security configuration

For an HANA system running on Alibaba Cloud, Alibaba Cloud maintains security of the infrastructure that supports the cloud, and the customer is responsible for ensuring the security of the cloud resources, HANA database, and other related applications, which the customer uses.

Besides common security protection methods for your SAP HANA system, Alibaba Cloud provides the following additional security resources:

RAM

Resource Access Management (RAM) is an Alibaba Cloud service designed for user identity management and resource access control. Using RAM, you can create and manage user accounts (for example, employees, systems, and applications) and control the operation permissions these user accounts possess for resources under your account. RAM thereby allows you to securely grant access and management permissions for Alibaba Cloud resources to only your designated enterprise personnel or partners as needed, to reduce the security risks of your enterprise information. For more information, refer to [RAM](#).

Server Guard (server security)

Server Guard is a host security software application, providing vulnerability management, baseline

detection, intrusion alerting, and other functions through interworking between lightweight software installed on ECS and on-cloud security center. Server Guard monitors the server in real time and accurately captures various security events, as well as provides warnings and solutions for intrusions and abnormal behavior. For more information, refer to [Server Guard](#).

Security notification

Alibaba Cloud message center allows you to configure the notification type. After you enable Alibaba Cloud Security notification in the security message, you will receive security notifications about server security and Anti-DDoS. If you have bought services, such as Cloud Anti-DDoS Service and Web Application Firewall, you will receive corresponding notifications.

Necessary configuration changes

You need to configure your SAP HANA system and the operating system with recommended security settings. For example, make sure that only necessary network ports are whitelisted for access, harden the operating system you are running SAP HANA, and so on.

Refer to the following SAP Notes:

- 1944799: Guidelines for SLES SAP HANA installation
- 1730999: Recommended configuration changes
- 1731000: Unrecommended configuration changes

Disable some SAP HANA services

SAP HANA services such as HANA Extended Application Services (HANA XS) are optional and need to be disabled if they are not needed.

For details about how to disable these services, refer to SAP Note 1697613: [Remove XS Engine out of SAP HANA database](#). After a service has been disabled, remove all the TCP ports that were opened for the service from the security groups.

For more information about the security protection, refer to the guide on security of SAP HANA on Alibaba Cloud.

High availability and disaster recovery

For details and best practices about the high-availability and disaster recovery solutions of SAP HANA running on Alibaba Cloud, refer to [Guide on high availability and disaster recovery of SAP HANA on Alibaba Cloud](#).

Backup and restoration

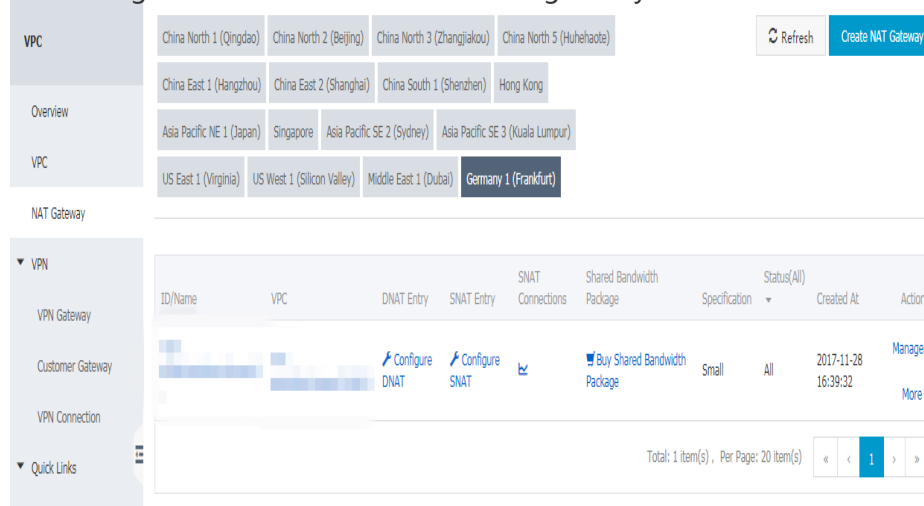
Backups are critical for protecting your system data. Because SAP HANA is an in-memory database, you can create regular data backups at a specific time point when SAP HANA workload is low, depending on your business conditions. In this case, you can recover your data from unexpected system failures.

For details and best practices, refer to [Guide on backup and restoration of SAP HANA on Alibaba Cloud](#).

Appendix: How to create NAT Gateway

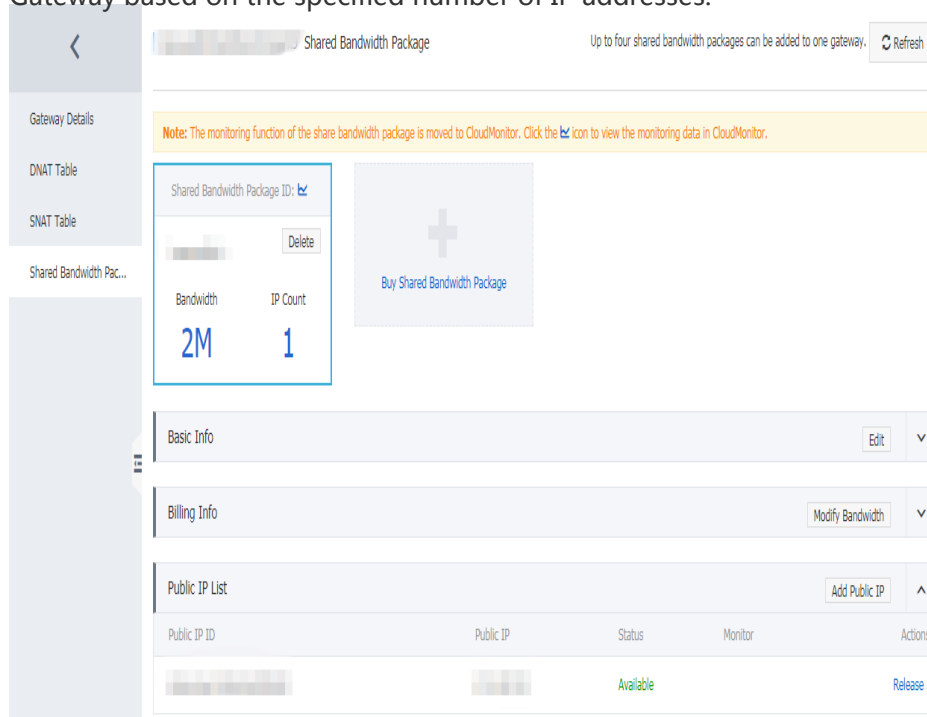
NAT Gateway is an enterprise-level VPC public network gateway that provides NAT proxy services (SNAT and DNAT), 10 Gbps forwarding capacity, and cross-zone disaster tolerance capabilities. NAT Gateway must be used with a shared bandwidth package. Together, they provide a high-performance enterprise-level gateway that can be flexibly configured.

1. Log on to the VPC console.
2. In the left navigation bar, click "NAT Gateway" .
3. Click "Create NAT Gateway" .
4. Select the region, VPC, type, and billing cycle, and click "Buy Now" to complete the creation.
5. After NAT Gateway is successfully created, the system automatically creates a port forwarding table and a SNAT table for this gateway.



6. Click the "Buy Shared Bandwidth Package" link.
NOTE: If a bandwidth package has been configured for NAT gateway, click "Manage" , and select a bandwidth package in the left navigation bar.
7. On the bandwidth package page, click "Buy Shared Bandwidth Package" again.
8. Configure the number of public IP addresses, bandwidth, and billing method for the bandwidth package.

9. Click "Buy Now" to complete the creation.
10. After the bandwidth package is created, the system allocates public IP addresses to NAT Gateway based on the specified number of IP addresses.



11. Return to the NAT Gateway page, click "Port Forwarding Table", set the DNAT, and click "Create Port Forwarding Entry".
12. Configure the port forwarding entry: Select an available public IP address, specify the private IP address of the ECS instance on the VPC to be mapped, and select the mapping mode.

- All ports: IP mapping is used, and an EIP is configured for the selected ECS instance, which can receive requests from any port or any protocol from the public network.

After all ports are selected, you do not need to configure the public network port, private network port, and protocol type.

- Specific port: Port mapping is used. After configuration, NAT Gateway will receive data from [Private IP address:Private network port] with the specified protocol to the specified [Public IP address:Public network port], and send data from [Public IP address:Public network port] with the specified protocol to the specified [Private IP address:Private network port].

After a specific port is selected, you need to configure the public network port, private network port, and protocol type.

13. Click "OK" to complete the configuration.

The new rule is displayed in the port forwarding table and in the "Configuring" state. Click "Refresh". When the status shows "Available", the port forwarding rule is successfully created.

DNAT Table							
Basic Info							
DNAT Table ID: [ID]		NAT Gateway ID: [ID]		Creation Time: 2017-08-08 18:59:30			
DNAT Entry List							
DNAT Entry ID	Public IP	Public Port	Protocol Type	Private IP	Private Port	Status	Action
[ID]	[IP]	80	tcp	[IP]	80	Available	Edit Delete

SAP HANA Backup and Restore

- Use Alibaba Cloud services to backup and restore the SAP HANA database
 - OSS
 - ECS
 - RAM
- Destination of the SAP HANA database backups on Alibaba Cloud
- Permission management for backup files
- Key points about backup and restoration
 - SAP HANA backup and storage snapshot
 - File system backup for the multi-node SAP HANA system
 - Restoration
- Backup and restoration for the SAP HANA database of a non-production system
 - Backup mode
 - Restoration mode
- Backup and restoration for the SAP HANA database of a production system
 - Backup mode
 - Backup example
 - Restoration mode
 - Restoration example

We recommend that you read the following SAP official documents before backing up and restoring the SAP HANA database.

Documentation

SAP Note 1642148 FAQ SAP HANA Database Backup & Recovery

SAP Note 2091951 Best Practice: SAP HANA Backup & Restore

SAP HANA Administration Guide

Use Alibaba Cloud services to backup and restore the SAP HANA database

OSS

Object Storage Service (OSS) is a massive, secure, cost-effective and highly reliable cloud storage service from Alibaba Cloud. OSS allows you to upload and download data at any time and anywhere, and perform simple data management through the Web console. OSS is charged by the actual capacity. OSS plays a critical role in backup and restoration of the SAP HANA database on Alibaba Cloud. For more information about OSS, see the related Alibaba Cloud OSS documentation <https://www.alibabacloud.com/help/product/31815.htm>

ECS

Elastic Compute Service(ECS) is a basic cloud computing service provided by Alibaba Cloud. Using ECS is as convenient and efficient, just like using water, electricity, or gas. Instead of buying hardware in advance, you can create a specific number of ECS instances at any time as required to meet your business needs, and resize disks and increase the bandwidth of ECS as you business continues growing. If you do not need ECS, you can easily release the resources to save the cost.

ECS capabilities:

- **ECS instance**

An ECS instance is a virtual computing environment that includes the CPU, memory, operating system, disk, network, and other basic server components. It is the actual operating entity offered to each user. An instance is equivalent to a virtual machine. You have the administrator permission for the created instances manage the instances at any time. You also can perform basic operations on an instance, such as attaching a disk, creating a snapshot, creating an image, or deploying an environment.

- **Image**

An image is a template of environment you choose to run the ECS instances. It generally includes an operating system and preinstalled software. It may only contain the basic operating system, or have a specific software environment integrated on top of the OS. You can create an ECS instance on the basis of an image, so as to obtain a system environment consistent with the image.

- **Region and zone**

A **region** is a physical data center.

A **zone** is a physical area with independent power grids and networks in one region. The network latency for ECS instances within the same zone is shorter.

Intranet communication can take place between zones in the same region, and fault isolation can be performed between zones. Whether to deploy ECS instances in the same zone depends on the requirements for disaster tolerance capabilities and network latency.

- Block storage — cloud disk

Block storage is a low-latency, persistent, and high-reliability random block-level data storage service Alibaba Cloud provides to ECS. Block storage supports the automatic copying of your data within the zone. It prevents unexpected hardware faults from causing data unavailability and protects your service against the threat of component faults. You can format a block storage attached to an ECS instance and create a file system and persist data on it just like on a hard disk. To meet the needs of different application scenarios, three types of block storage options are available for choosing: SSD cloud disk, ultra cloud disk, and basic cloud disk.

- Cloud disk snapshot

A snapshot is a restore point created for a disk. It contains the disk data at the specified time and can be used to restore disk data or create custom images.

For more information about ECS, see the related Alibaba Cloud ECS documentation <https://www.alibabacloud.com/help/product/25365.htm>.

RAM

Resource Access Management (RAM) is an Alibaba Cloud service designed for controlling resource access. Using RAM, you can create multiple RAM user accounts under your cloud account, and allocate corresponding resource operation permissions to them. In this way, you can collectively manage your user accounts (such as employees, systems, and applications) and control the permissions that these user accounts possess for resources under your account.

When you use OSS to store backup files of the SAP HANA database, you can use RAM to authorize specific users to access the backup files. For more information about RAM, see the related Alibaba Cloud RAM documentation <https://www.alibabacloud.com/help/product/28625.htm>.

Storage of the SAP HANA database backups on Alibaba Cloud

The greatest difference between backing up the SAP HANA database on a traditional physical machine and on Alibaba Cloud is the destination of backups. The traditional physical machine stores the database backups on tapes, while Alibaba Cloud keeps them on OSS. The advantages of storing the SAP HANA database backups on OSS are as follows: OSS automatically stores three copies of data in different locations by default to ensure 99.99999999% data reliability. It is capable of enterprise-grade multilevel security protection, and provides the multi-user resource isolation mechanism, remote disaster tolerance mechanism, multiple authentication and authorization mechanisms, as well as the whitelist, anti-leech, and primary account/subaccount features.

The SAP HANA database backups are first stored in the `/hana/backup` directory of the data cloud disk to which ECS instances are attached. You must copy the backup files in the cloud disk to OSS for long-term storage.

Permission management for backup files

To authorize users to access SAP HANA backup files in the OSS bucket, you must follow these steps to configure the user access rules in the RAM console:

Select a user to access OSS and click "Authorize" .

The screenshot shows the SAP RAM console interface. On the left is a navigation menu with options: RAM, Dashboard, Users, Groups, Policies, Roles, and Settings. The main area is titled 'User Management' and includes a 'New User' button and a 'Refresh' button. Below these is a search bar with a 'Logon Name' dropdown, a 'Search by Logon Name' input field, and a 'Search' button. A table lists users with columns for 'Logon Name/Display Name', 'Remarks', 'Creation Time', and 'Operation'. One user is listed with a creation time of '2017-07-21 10:44:03'. The 'Operation' column for this user contains three links: 'Manage', 'Authorization' (which is circled in red), and 'Delete'. Below the table, it shows 'Total: 1 item(s) , Per Page: 20 item(s)' and a pagination control with the number '1' selected.

Logon Name/Display Name	Remarks	Creation Time	Operation
[User Name]		2017-07-21 10:44:03	Manage Authorization Delete

Select an authorization rule.

Edit Individual Authorization Policy

After adding an authorization policy, this account will have the permissions granted by that policy. The same authorization policy cannot be added more than once.

Available authorization policy names	Type
Search Keywords	
AdministratorAccess	System
Provides full acce...	
AliyunOSSFullAccess	System
Provides full acce...	
AliyunOSSReadOnlyAccess	System
Provides read-only...	
AliyunECSEFullAccess	System
Provides full acce...	

Selected authorization policy name	Type
------------------------------------	------

OKClose

As the owner of the Alibaba Cloud account, you are required to enter the verification code (which will be sent to your registered mobile phone).

If the verification succeeds, you can check and set corresponding access permissions for users on the authorization rule panel.

Authorization Policy Name	Remarks	Number of References	Operation
AdministratorAccess	Provides full access to Alibaba Cloud services and resources...	0	View
AliyunOSSFullAccess	Provides full access to Object Storage Service(OSS) via Mana...	1	View
AliyunOSSReadOnlyAccess	Provides read-only access to Object Storage Service(OSS) via...	0	View
AliyunECSFullAccess	Provides full access to Elastic Compute Service(ECS) via Man...	0	View
AliyunECSReadOnlyAccess	Provides read-only access to Elastic Compute Service(ECS) vi...	0	View

You can also create custom authorization rules on the authorization rule panel. For more information about permission management, see [RAM authorization policy management](#).

Note about backup and restoration

Before preparing the related backup policies for your SAP HANA system on Alibaba Cloud, learn about the following key information about backup (file system backup, to be specific), storage snapshot (cloud disk snapshot), and restoration.

One of the main measures to ensure data security of SAP HANA is to perform a file system backup of files, data, and logs in the SAP HANA database. You can also use the snapshot feature of the cloud disk of Alibaba Cloud ECS to regularly back up the snapshots of the data disk where logs and the data file system of SAP HANA are located.

SAP HANA backup and storage snapshot

- Backup files of the SAP HANA database are stored in the /hana/backup directory by default.
- Alibaba Cloud also supports data backup by storage snapshots.
- Data and logs can be backed up only when the SAP HANA database is online. (All configured services are running.)
- The database can be normally used when a data backup, log backup, or storage snapshot is being created.
- Before initial data backup or snapshot storage is complete, the log mode is "overwrite" .

- When the log mode is overwrite, no log backup file is generated.
- Individual objects in the database cannot be backed up or restored. Backup and restoration always apply to the entire database.
 - Only actual data is backed up, and unused space in the database is not backed up. Data backup includes restoration of all data structures required by the database, and does not include customers' special configurations.
 - A storage snapshot obtains the content of all data zones of SAP HANA in a specific time point.

File system backup for the multi-node SAP HANA system

- The configuration target path for data and log backup must be valid across the system, not just for a specific host.
- If you use a file-based backup mode to back up a multi-node SAP HANA system, it is strongly recommended that you use shared storage that is available for all nodes in the cluster for backup.

Restoration

- The SAP HANA database must be shut down, and cannot be accessed by an end user or application during restoration.
- The SAP HANA database cannot be restored to any version that is earlier than the existing version. The software version used for restoring the SAP HANA database must be the same or later than the version of the SAP HANA database backed up.
- Before a restoration is started, at least one data backup or one storage snapshot needs to be prepared.
- When a restoration is started, all data and log backups must be accessible through the file system or a third-party backup tool. If you restore the database from a storage snapshot, the storage snapshot must be available in the data zone.
- You cannot pause and resume a database restoration.
- You can cancel a running restoration. However, canceling the restoration will lead to database state inconsistency.
- If a restoration fails, you must re-perform the full restoration process.
- During log restoration, the incremental merge operations cannot be performed.
- During the restoration, the number of hosts on your target system is unrestricted, provided that the number of hosts and type of services of the source system are consistent with those of the target system.

Backup and restoration for the SAP HANA database of a non-production system

This section provides several options for backing up the SAP HANA database of a non-production system. Non-production systems include:

- Demonstration system
- Training system
- Sandbox system
- PoC verification system

Typical requirements for backup and restoration for the SAP HANA database of a non-production system:

- Infrequent backups
- Point-in-time not required
- Simple and low cost

Cloud disk snapshots provide a simple and low-cost solution to meet the backup and restoration requirements for the SAP HANA database of non-production systems. The snapshot service provides a flexible policy. Using this service, you can take a cloud disk snapshot at any time and multiple cloud disk snapshots in a day, and configure the related snapshot policies to enable the system to automatically take a cloud disk snapshot in a specific day. You can also configure the time for retaining a cloud disk snapshot, or save a cloud disk snapshot permanently.

For more information about the cloud disk snapshot, see [Alibaba Cloud cloud disk snapshot](#).

Backup mode

You can regularly take snapshots on the SAP HANA system disk (/usr/sap), data disk (/hana/data), and log disk (/hana/log) of ECS instances where SAP HANA is installed to back up the SAP HANA database of non-production systems.

Restoration mode

You can use cloud disk snapshots of the SAP HANA system disk (/usr/sap), data disk (/hana/data), and log disk (/hana/log) of ECS instances where SAP HANA is installed to manually restore the ECS instances of the entire non-production system.

Backup and restoration for the SAP HANA database of a production system

Typical requirements for backup and restoration for the SAP HANA database of a production system:

- Frequent and regular backup and plan
- Point-in-time database restoration

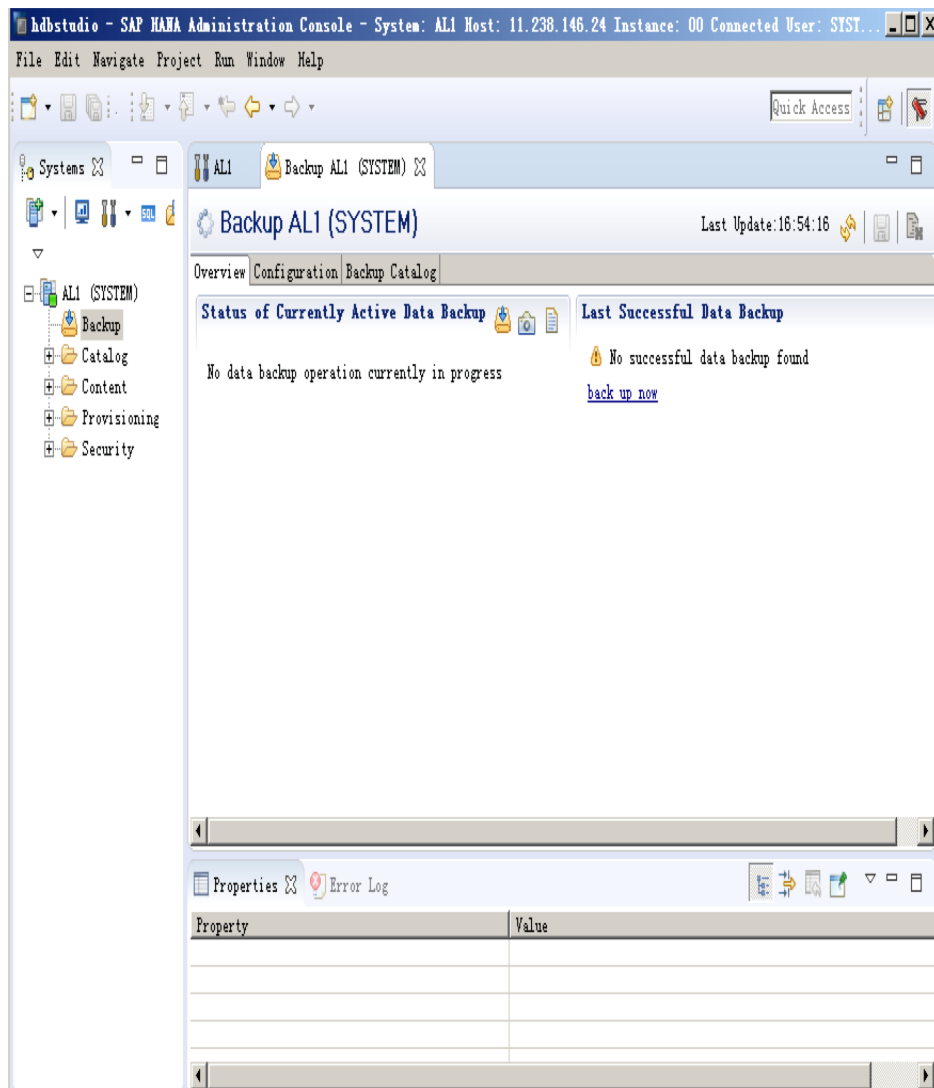
Backup mode

- By default, the initial backup destination for backup files of the SAP HANA database on Alibaba Cloud is a local cloud disk that is attached to an ECS instance.
- You can start and arrange a SAP HANA database backup using SAP HANA Studio, SQL commands, or SAP DBA Cockpit. Unless being manually disabled, log files will be automatically backed up.
- You must regularly save the SAP HANA backup files on the local cloud disk to the OSS bucket for long-term storage.
- If cross-region data redundancy is required, the SAP HANA backup files saved in the OSS bucket can be copied to different regions of Alibaba Cloud based on your settings.

Backup example

A typical backup task may require the following steps:

In the SAP HANA backup editor, open the backup wizard. You can also right-click the system to be backed up and select “Backup” to open the backup wizard.



Select the target file type, and back up the database to the specified file system.

Specify the backup path `/hana/backup/data/[SID]` and backup prefix.

The screenshot shows a Windows-style dialog box titled "Backup of System AL1". The main heading is "Specify Backup Settings". Below the heading, it says "Specify the information required for the data backup" and "Estimated backup size: 15.49 GB.".

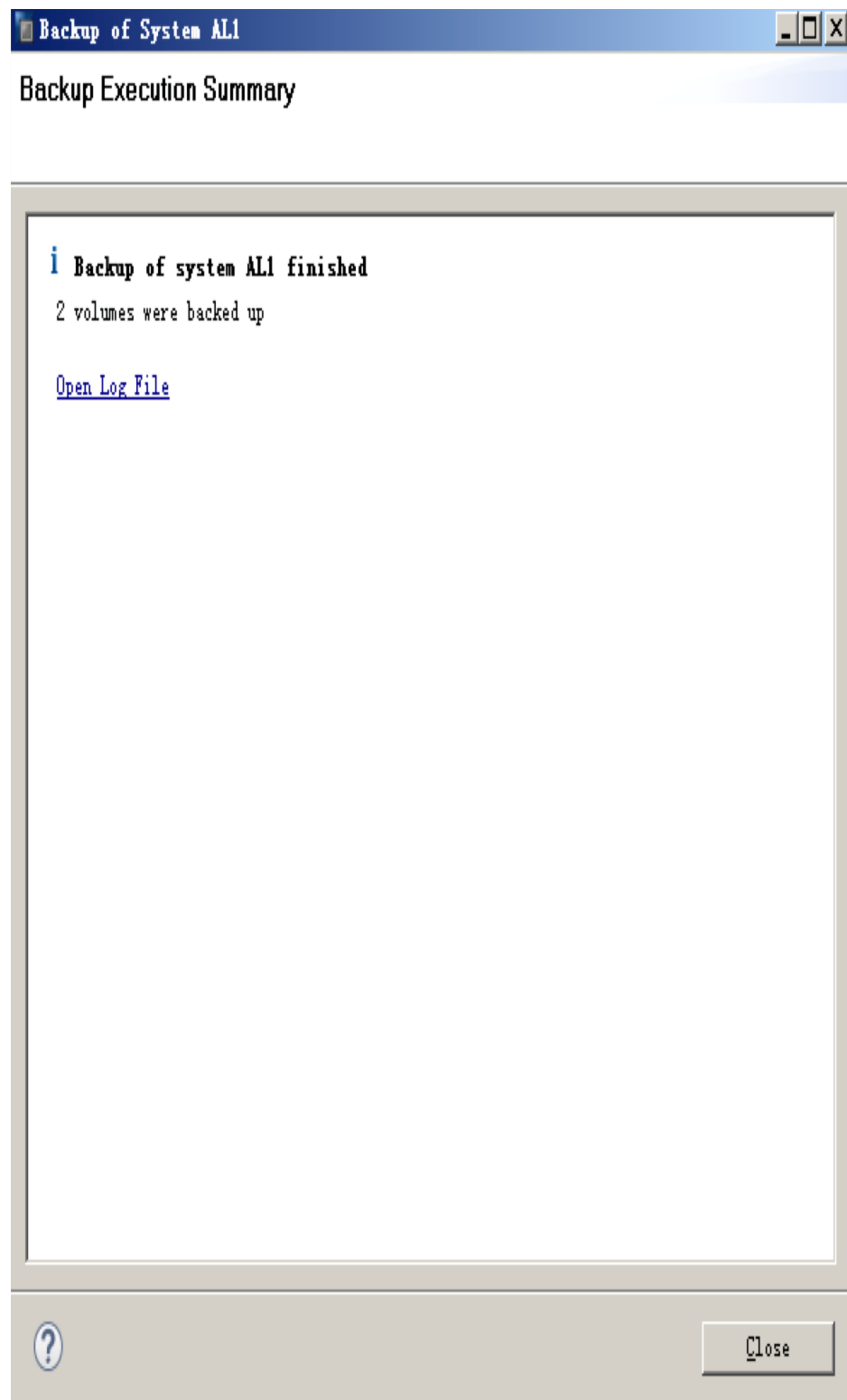
There are two dropdown menus: "Backup Type" set to "Complete Data Backup" and "Destination Type" set to "File".

A section titled "Backup Destination" contains a text box with the path "/hana/backup/data/AL1" and a text box with the prefix "COMPLETE_DATA_BACKUP".

Below the text boxes, there is an information icon (i) followed by the text: "Note that customer-specific changes to the SAP HANA database configuration are not saved as part of the data backup. More Information: SAP HANA Administration Guide".

At the bottom, there is a help icon (?) and four buttons: "< Back", "Next >", "Finish", and "Cancel".

Click "Next" , and then click "Finish" . A message is displayed, instructing you to confirm the backup.



Make sure that the backup file is available on the operating system.

```
[master:/hana/backup/data/AL1 # pwd
/hana/backup/data/AL1
[master:/hana/backup/data/AL1 # ll
total 16335016
-rw-r----- 1 al1adm sapsys    155648 Jul 22 01:08 COMPLETE_DATA_BACKUP_databackup_0_1
-rw-r----- 1 al1adm sapsys    83894272 Jul 22 01:08 COMPLETE_DATA_BACKUP_databackup_1_1
-rw-r----- 1 al1adm sapsys 16643006464 Jul 22 01:09 COMPLETE_DATA_BACKUP_databackup_3_1
master:/hana/backup/data/AL1 #
```

Copy the backup file from the /hana/backup directory to the OSS bucket.

3. Check whether the backup file has been copied to OSS.

Restoration mode

- Copy the SAP HANA backup file stored in the OSS bucket to the backup directory of the cloud disk to which the ECS instance running SAP HANA is attached.
- Run the backup file in the backup directory of the cloud disk to which the ECS instance running SAP HANA is attached to restore the SAP HANA database.

Restoration example

You can follow these steps to restore your SAP HANA database from the backup:

If the backup file is not stored in the /hana/backup directory of the file system but is stored in Alibaba Cloud OSS, copy the backup file to the /hana/backup directory.

Use the restoration wizard to restore the SAP HANA database.

The screenshot shows a Windows-style dialog box titled "Recovery of System ALL". The main heading is "Specify Recovery Type" with the instruction "Select a recovery type." Below this, there are three radio button options for recovery. The first option, "Recover the database to its most recent state", is selected. The second option, "Recover the database to the following point in time", is unselected but has associated input fields: a date field showing "2017-07-21", a time field showing "17:23:11", and a time zone dropdown menu currently set to "(GMT+08:00) 中国标准时间". Below these fields, a status line reads "System Time Used (GMT): 2017-07-21 09:23:11". The third option, "Recover the database to a specific data backup or storage snapshot", is also unselected. An "Advanced >>" button is located on the right side of the dialog. At the bottom, there is a navigation bar with a help icon, and four buttons: "< Back", "Next >" (which is highlighted), "Finish", and "Cancel".

Select the correct time and the path to which the database is to be restored from the backup set.

Recovery of System AL1

Select a Backup

Select a backup to recover the SAP HANA database

Selected Point in Time
Database will be recovered to its most recent state.

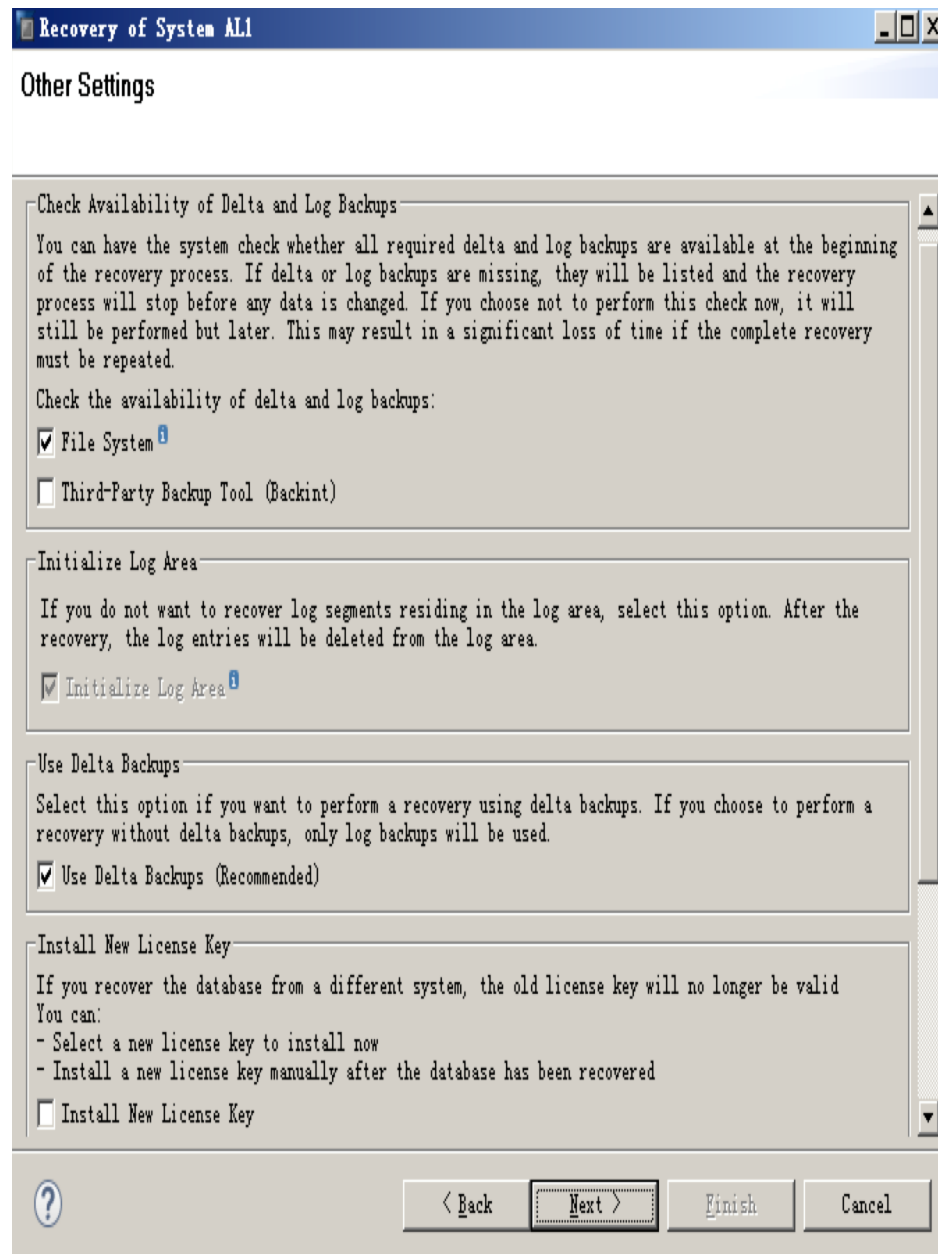
Backups
The overview shows backups that were recorded in the backup catalog as successful. The backup at the top is estimated to have the shortest recovery time.

Start Time	Location	Backup Prefix	A...
2017-07-22 01:08:52	/hana/backup/data/AL1/	COMPLETE_DATA_BACKUP	◆
2017-07-22 00:56:53	/hana/backup/data/	COMPLETE_DATA_BACKUP	◆

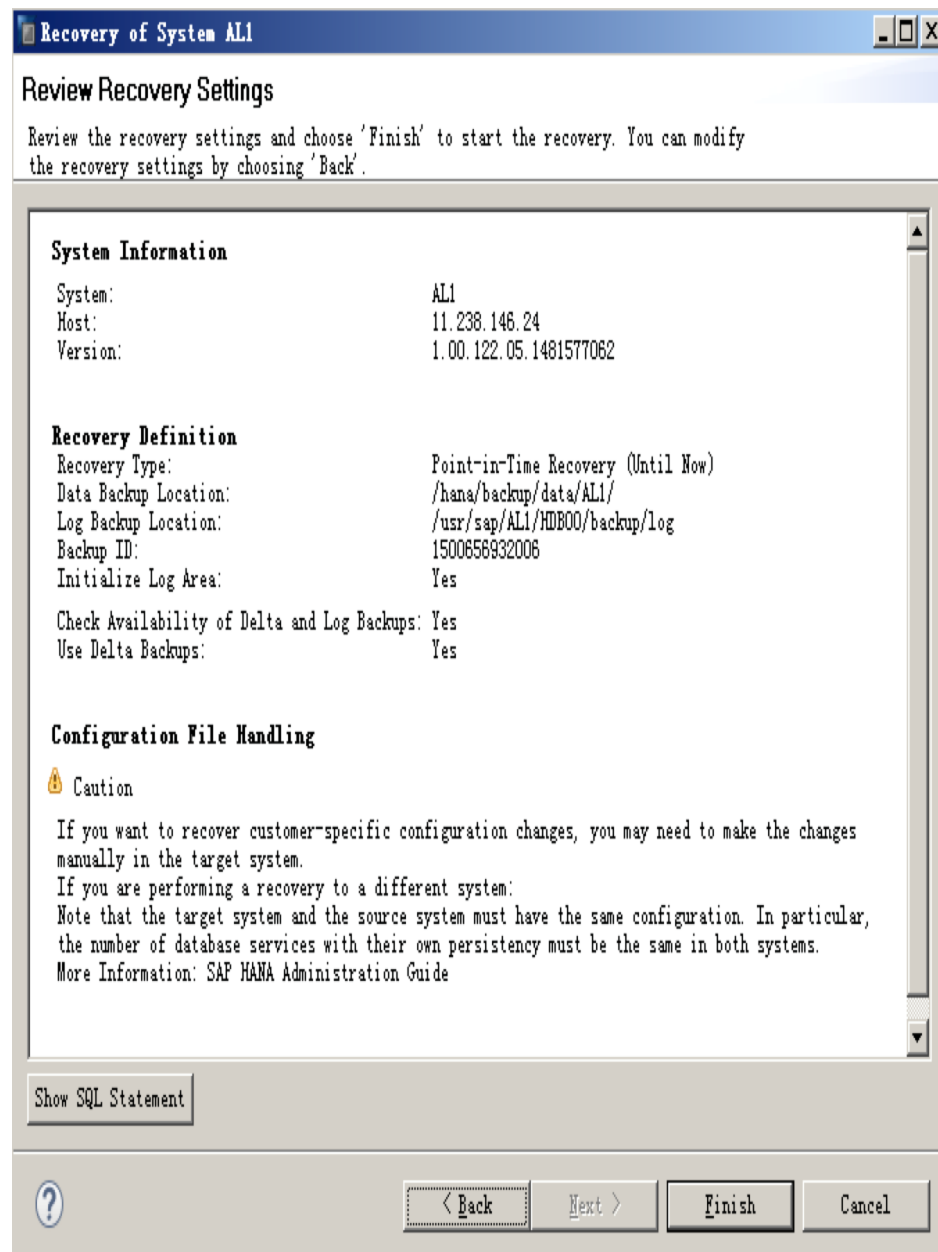
Details of Selected Item

Start Time: 2017-07-22 01:08:52 Destination Type: FILE Source System: AL1
Size: 15.58 GB Backup ID: 1500656932006 External Backup ID: n. a.
Backup Name: /hana/backup/data/AL1/COMPLETE_DATA_BACKUP
Alternative Location:

Carefully check and set the file to the target type.



Check the summary and click "Finish" to restore the SAP HANA database.



After the restoration is complete, you can continue other operations and clear the backup file from the `/hana/backup/[SID]/*` directory.

SAP HANA High Availability and Disaster Recovery

- High Availability of Alibaba Cloud services

- Global infrastructure
- Computing
- Storage
- Automatic Recovery
- SAP HANA High Availability solutions supported by Alibaba Cloud
 - Auto-Restart Service
 - Host Auto-Failover
 - HANA System Replication (HSR)
 - SAP HANA Backup and Restore
 - About Storage Replication
- High Availability and Disaster Recovery solutions for SAP HANA on Alibaba Cloud
 - ECS Automatic Recovery
 - HSR
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 - HSR & secondary node with data preload
 - ECS Automatic Recovery & SAP HANA backup and restore
- Triggering HSR Takeover
- SAP HANA client redirection
- References

High Availability of Alibaba Cloud services

Global infrastructure

Region and zone

Alibaba Cloud infrastructure is distributed in different regions and zones around the world. A **region** is a physical location in the world where Alibaba Cloud infrastructure is deployed. In most cases, a region contains multiple zones. You can deploy your SAP system on Alibaba Cloud infrastructure that is closest to your users to meet the legal or other business requirements. Regions are isolated from each other. Alibaba Cloud does not automatically synchronize your resources across regions.

A **zone** is a data center with independent power grids and networks in the same region. Zones can provide your production systems and databases on Alibaba Cloud with higher availability, fault tolerance performance and better scalability.

Alibaba Cloud services run in 29 zones within 14 regions around the world. For details about Alibaba Cloud regions and zones, refer to [Regions and Zones](#).

High availability through multiple zones

Based on Alibaba Cloud's many years of experience on cloud computing services, customers who care about application availability and performance can deploy their applications in multiple zones

within the same region for better fault tolerance and lower network latency.

Within the same region, zones can intercommunicate with each other through the intranet to implement fault isolation. This architecture enables you to deploy applications in different zones within the same region. In this case, the system implements failover between different zones without human intervention when applications encounter problems.

Continuity improvement through cross-region data synchronization

Block storage (cloud disk) on Alibaba Cloud supports the automatic replication of your data within the zone. It prevents unexpected hardware faults from causing data unavailability and protects your services against component faults. In addition, you can store your services in OSS and synchronize data in different regions to realize data redundancy.

Computing

ECS is one of the core services of Alibaba Cloud. It enables you to deploy an ECS instance within minutes to meet your computing requirements in real time, along with a variety of basic components such as CPUs, memories, operating systems, and IP addresses.

In Alibaba Cloud Management Console, you can deploy your applications on different operating systems and manage network access permissions. From the console, you also can easily use more storage features, such as automatic snapshots. An **automatic snapshot** enables you to rapidly copy and replicate an ECS instance, which is efficient for you to test a new feature or operating system. For details, refer to ECS.

Storage

Block Storage (cloud disk) is a low-latency, persistent, and high-reliability random block-level data storage service provided by Alibaba Cloud to ECS users. You can attach multiple cloud disks to an ECS instance to permanently store data. You can also format the cloud disk that is attached to an ECS instance, create a file system, and store data in the cloud disk. Different service scenarios have different requirements on the I/O performance. Therefore, Alibaba Cloud provides different types of cloud disks that can be used alone or in combination as required. Within the same zone, three copies of data on the cloud disk are automatically stored in different locations to maximize data security. At the same time, you can use the cloud disk snapshot to store and restore your cloud disk. You can also configure the automatic snapshot policies for your cloud disk as required. For details, refer to Disk.

OSS is a simple and low-cost storage service provided by Alibaba Cloud. It can be used to backup and archive data for a long term on Alibaba Cloud. Files stored in OSS can be securely accessed in any place from around the world. OSS guarantees the data reliability of up to 99.99999999%, which is a perfect fit for data storage for global teams and international projects. OSS provides the cross-region data replication feature that allows you to synchronize data in different regions in real time. For the SAP solution, OSS can be used to store database backup and SAP archive files for a long term.

For details, refer to OSS.

Automatic Recovery

The **Automatic Recovery** feature is used to improve the high availability of ECS. If the physical machine where ECS instances are deployed is shut down due to abnormal performance of the underlying physical machine or other causes, protective migration is initiated to migrate the affected ECS instances to another physical machine with normal performance. The instance IDs, private IP addresses, EIPs, and metadata of the ECS instances remain unchanged.

At the same time, Alibaba Cloud sends an Email to users whose services are affected. To effectively use the Automatic Recovery feature of ECS to improve the high reliability of the SAP HANA running environment, it is recommended that you set SAP HANA of the ECS instance to automatically start after system startup. For details about Automatic Recovery of ECS, refer to [Automatic recovery of ECS instance FAQs](#).

NOTE: The Automatic Recovery feature is applicable only to the ECS instances to which cloud disks are attached. For ECS instances using ephemeral disks, after the Email is sent, Alibaba Cloud customer service specialists will contact the instance owner immediately for further actions.

SAP HANA High Availability solutions supported by Alibaba Cloud

Auto-Restart Service

When an SAP HANA service, such as Index Server or Name Server, stops due to program crash or intervention by an administrator, SAP HANA automatically restarts the monitoring program to detect the stopped service and restart it. During the restart, the service loads data into the memory and resumes its functions. Auto-Restart Service takes some time to restore data security.

Auto-Restart Service of SAP HANA works the same way on Alibaba Cloud as it works on any other platform.

Host Auto-Failover

Host Auto-Failover is an N+m node recovery solution provided by SAP. One node or multiple nodes can be configured to work in standby mode and added to a single node or a distributed SAP HANA system. The nodes in standby mode do not store any data and accept any request or query.

When a worker node fails, a standby node in the system automatically takes over its work. As the standby node may take over operations from any of the worker nodes, it needs to access data of all databases. This can be achieved by shared network storage (NFS) or with any storage connector API.

Alibaba Cloud suggests that you fully use the Automatic Recovery feature of Alibaba Cloud ECS. In this case, when a failure occurs on the physical machine where your ECS instance is located, the ECS instance is automatically migrated to another normal physical machine within the same zone. This essentially provides you with a high-availability ECS instance without incurring any additional cost. The ECS instance restored on the new physical machine is identical to the original one, including storage, configurations, IP address, and instance ID. At the same time, you are advised to configure SAP HANA to auto-start during system startup so that the HANA service is automatically restored after your SAP HANA ECS instance is automatically recovered. After restart, it takes some time to load data into the memory. The time required varies with the HANA data volume.

HANA System Replication (HSR)

HANA System Replication (HSR) is a high-availability and disaster recovery solution provided by SAP HANA. After HSR configuration, the secondary node is usually configured as an exact copy of the primary node.

The secondary node can be deployed near the primary node, setting up a rapid failover solution to resolve the planned shutdown or to handle storage corruption or other failures on the primary node. The secondary node can also be installed in a remote site to be used in a disaster recovery solution. With HSR, you can choose many replication options, including synchronous, synchronous in-memory, and asynchronous, depending on your recovery time objective (RTO) and recovery point objective (RPO). For details about HSR, refer to [How to perform system replication for SAP HANA](#).

HSR is fully supported on Alibaba Cloud. You can use it in combination with Alibaba Cloud zones to help protect your data security. Generally, the network speed of the same zone within the same region is faster. It is recommended that synchronous HSR be used within the same zone while asynchronous HSR be used across the zones.

SAP HANA Backup and Restore

Although SAP HANA is an in-memory database, it stores all changes in the persistent storage system to recover data and resume from power outages without any loss of data. To ensure that data can be recovered after a disaster, it backs up data in the persistent storage system and logs in the database to a remote location. For details about backup and restoration of the SAP HANA database, refer to [Backup and recovery - SAP HANA](#).

You can backup and restore the SAP HANA database on Alibaba Cloud, with the same operations as on any other platforms. In addition, you can take advantage of secure, durable, highly scalable, and cost-effective OSS, either by copying your HANA backup files to the OSS bucket or by taking snapshots for the cloud disk that stores HANA backup files to help achieve disaster recovery.

About Storage Replication

SAP HANA hardware partners offer a storage-level system replication solution for SAP HANA, which

replicates data, logs, or file systems in the SAP HANA database to a remote networked storage system to restore the SAP HANA database with low RTO after a disaster.

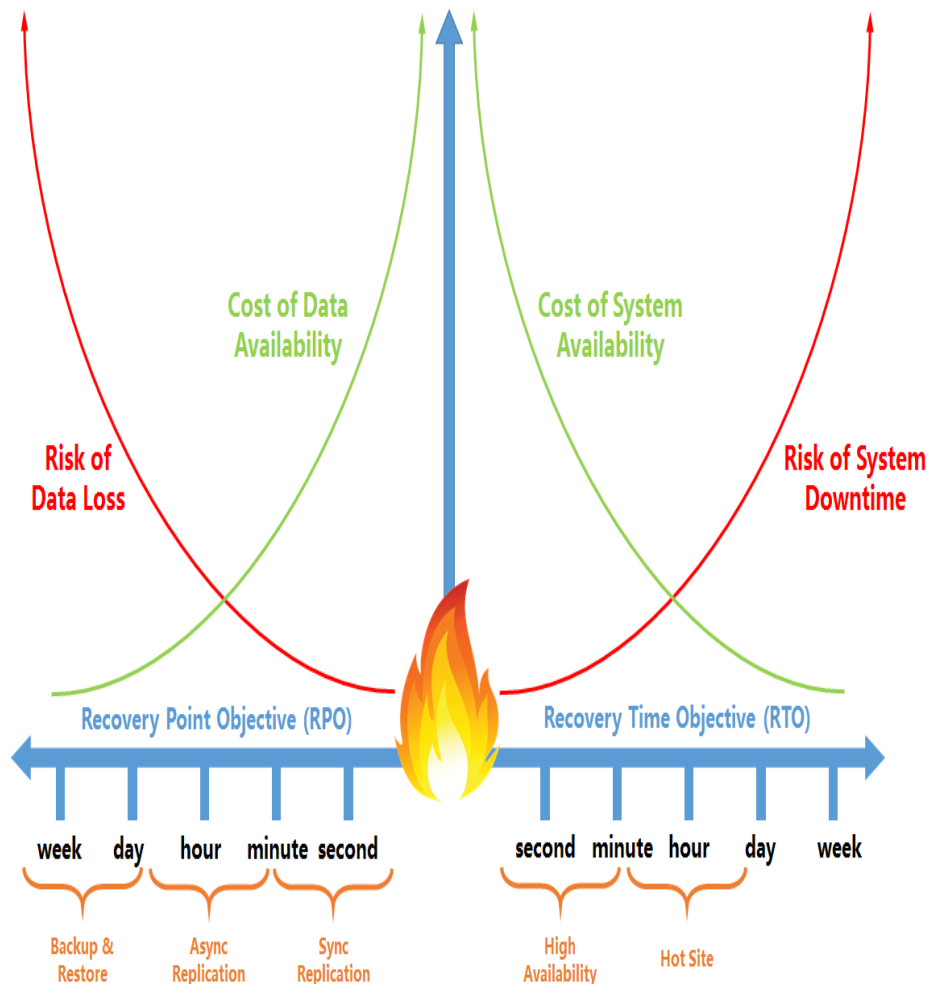
However, Alibaba Cloud does not support Storage Replication.

High Availability and Disaster Recovery solutions for SAP HANA on Alibaba Cloud

You need to select a high-availability and disaster recovery solution for your SAP HANA system on Alibaba Cloud based on your business scenarios and importance. The core determination factors are as follows:

- RPO: Used to determine the data loss volume.
- RTO: Used to determine the service unavailability period.

The following figure shows the related concepts.



The following table describes comparison of the RPO, RTO, and cost between different solutions.

Solution	Cost	RPO	RTO
----------	------	-----	-----

HSR	\$\$	Low	Medium
HSR & secondary node as development and test	\$\$\$	Low	Medium
HSR & secondary node as development and test	\$\$\$	Low	Low
ECS Automatic Recovery + SAP HANA backup and restore	\$	Medium	High

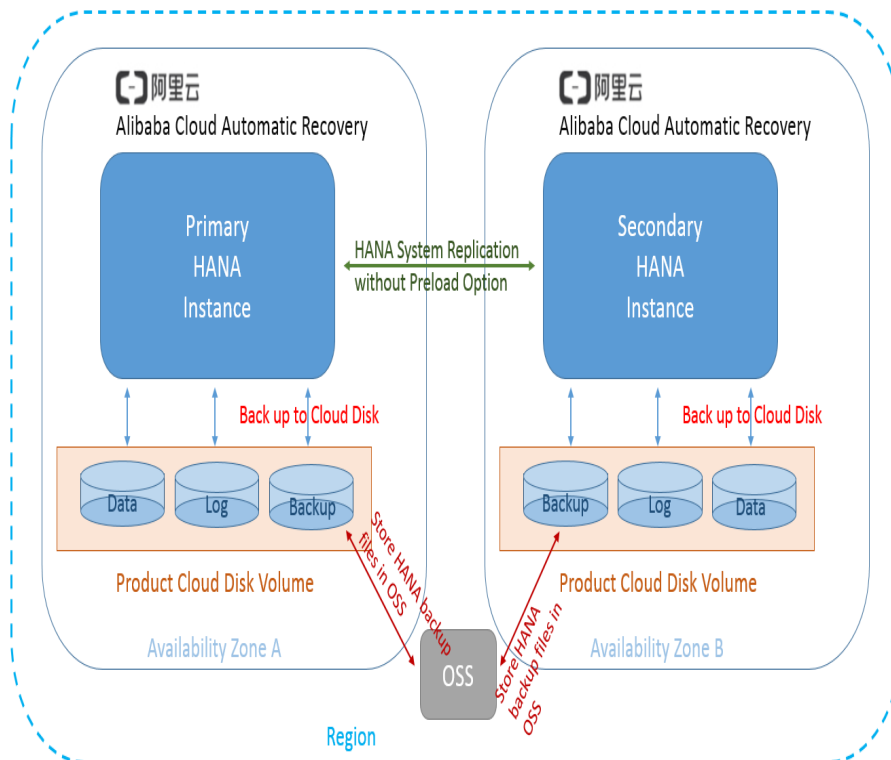
ECS Automatic Recovery

Generally, you can leverage the ECS Automatic Recovery feature to restore the SAP HANA ECS instance on another physical machine **within the same zone** when underlying physical hardware is impaired. When a zone failure occurs, you can refer to the following **cross-zone solutions** to protect data in your SAP HANA database.

HSR

You can deploy a primary node of SAP HANA in zone A, a secondary node in zone B, and HSR between the two nodes. As HSR is used, data changes on the primary node of SAP HANA will be constantly copied to the secondary node. When the primary node in zone A is unavailable, you can immediately restore the entire HANA instance on the secondary node in zone B.

NOTE: In this scenario, you need to configure HSR to work in asynchronous mode. Therefore, performance of the primary node will not be affected due to waiting for the synchronous feedback from the secondary node.



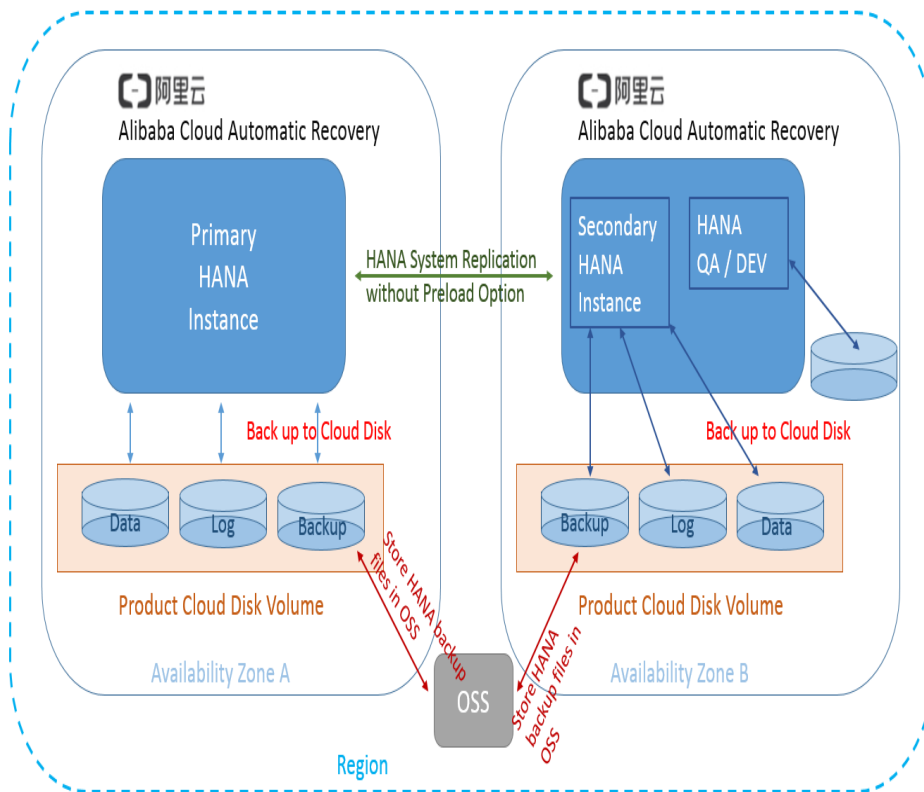
HSR has a configuration option: **Secondary node preload**.

If this option is disabled, data synchronized to the secondary node will not be loaded to the memory in the secondary node. That means you can select an ECS instance with low-end configurations for the secondary node to reduce the total O&M cost. During a failover, you can change the ECS instance type of the secondary node to be the same as that of the primary node. Once the SAP HANA system is fully restored on the secondary node, you can redirect the HANA access from the client to the slave node.

HSR & secondary node as development and test

Based on HSR of SAP HANA, you can fully take advantages of your secondary node to further reduce the total O&M cost. Generally, the ECS instance type of the secondary node can be the same as that of the primary node. Besides taking the secondary node for production environment backup, you also can use it for your HANA development and test environment.

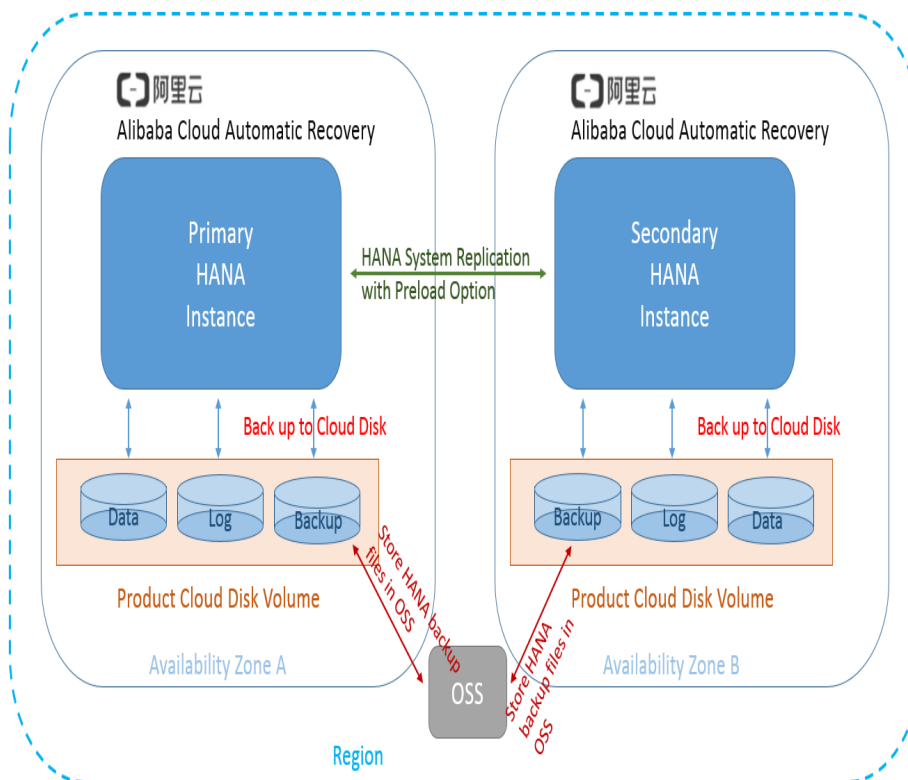
During a failover, the HANA instance of the secondary node provides services for the entire HANA database. At this time, you need to disable the HANA development and test environment on the secondary node, and release the used resources for the HANA production environment. Once the SAP HANA system runs normally on the secondary node, you can redirect the HANA access from the client to the secondary node.



HSR & secondary node with data preload

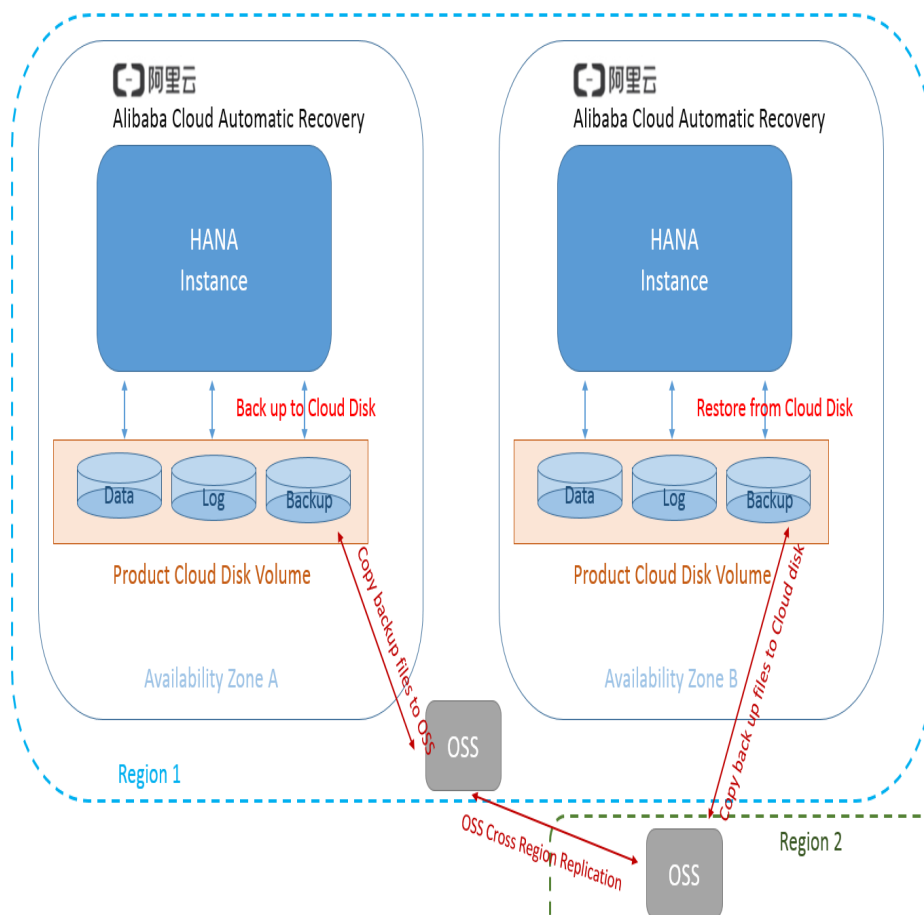
As mentioned above, HSR has a configuration option: **Secondary node preload**.

If this option is enabled, data synchronized to the secondary node will be immediately loaded to the memory in the secondary node. The advantage is that your secondary node needs less time to enable the HANA system to run normally. However, this solution requires that the ECS instance type of the secondary node must be the exactly same as the primary node.



ECS Automatic Recovery & SAP HANA backup and restore

You can use a custom image to rebuild an ECS instance with the same type as the existing one in another zone (for example, zone B in the following figure), and copy the backup files of the SAP HANA database from the OSS bucket stored in another region to the cloud disk which is attached to the new ECS instance. Once the backup files are copied to the cloud disk, you can use the SAP HANA restore feature to restore the SAP HANA database on the new ECS instance. After the SAP HANA database runs normally on the new ECS instance, you can switch the HANA access from the client to the new instance.



The RPO of the SAP HANA database depends on how frequently you back up the SAP HANA database and copy the backup files to OSS.

Triggering HSR Takeover

To start the SAP HANA disaster recovery, you need to trigger the takeover procedure of SAP HANA System Replication on your secondary node. For details, refer to the "Takeover" section in *How to perform system replication for SAP HANA*.

In addition, SAP Note 2063657 provides SAP guidelines to help you decide whether the secondary node takeover is the optimal choice.

SAP HANA client redirection

At the end of an SAP HANA takeover process, you need to ensure that the client applications of SAP HANA (for example, the NetWeaver application server, JDBC links, and ODBC connection) can re-establish their connection with the node of the new SAP HANA server after the failover. You can complete the redirection by updating either the IP address or DNS of the SAP HANA database on the client.

For details about how to redirect a client access after an SAP HANA failover, refer to the “Client connection recovery” section in SAP HANA administration guide.

References

- High Availability for SAP HANA
- How to perform System Replication for SAP HANA
- SAP Notes:
 - 1999880 - FAQ: SAP HANA System Replication
 - 2057595 - FAQ: SAP HANA High Availability
 - 2063657 - HANA System Replication takeover decision guideline
 - 1913302 - HANA: Suspend DB connections for short maintenance tasks

SAP Business Applications

SAP NetWeaver Planning Guide

- Overview of Alibaba Cloud
 - Overview of SAP NetWeaver on Alibaba Cloud
 - Two-tier Architecture
 - Three-tier Architecture (Scale-out of SAP NetWeaver application servers)
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- Database
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 - Database Backup and Restore
- Storage
 - Block Storage (Cloud Disk)

- Object Storage Service (OSS)
- Network and Security
 - Security Group
 - SSH Key Pairs
 - Router configuration
 - Bastion Server
 - NAT Gateway
 - VPN Gateway
 - Security document
- System Copy and Migration
- SAP NetWeaver monitoring and support
- Licensing
 - SAP License
 - Linux License
 - Windows License
- Installation media
- SAP Router and Solution Manager

Version Control

Version	Revision Date	Types Of Changes	Effective Date
1.0			2017/12/8
1.1	2018/4/17	Add windows platform and windows sql server database support	2018/4/17
1.2	2018/6/20	Add Red Hat Enterprise Linux Server support	2018/6/20

Overview of Alibaba Cloud

Overview of SAP NetWeaver on Alibaba Cloud

Alibaba Cloud is built on a global infrastructure providing all kinds of IaaS products and services. Alibaba Cloud services are available to use in different geographical regions across the globe. Before running your SAP NetWeaver on Alibaba Cloud, following basic knowledge must be understood well:

- Alibaba Cloud Elastic Compute Service (ECS)

Alibaba Cloud Elastic Compute Service (ECS) is a web service that provides resizable compute capacity in the cloud. Its simple web service interface allows you to obtain and configure

computing capacity with minimal effort. You are able to quickly scale capacity up and down as your computing requirements change, and you only pay for capacity that you actually need.

- **Alibaba Cloud Block Storage (Cloud Disk)**

Alibaba Cloud Block Storage (Cloud Disk) provides persistent block-level storage volumes for use with Alibaba Cloud ECS instance on the Alibaba Cloud Platform. Cloud Disk volumes provide the consistent and low-latency performance needed to run your workloads. With Cloud Disk, you can scale your usage up or down within minutes – all while paying a low price for only what you provision.

- **Alibaba Cloud Object Storage Service (OSS)**

Alibaba Cloud Object Storage Service (OSS) is an easy-to-use service that enables you to store, backup and archive large amounts of data on the cloud. OSS acts as an encrypted central repository from where files can be securely accessed from around the globe. OSS guarantees up to 99.9999% availability and is a perfect fit for global teams and international project management.

- **Virtual Private Cloud (VPC)**

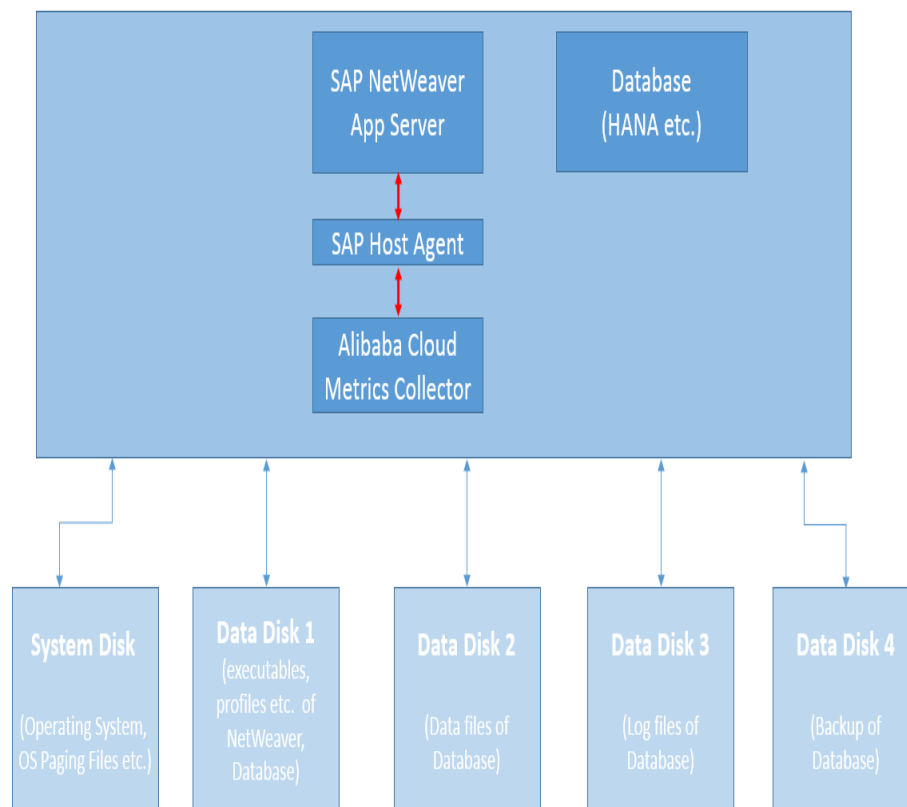
Virtual Private Cloud (VPC) creates an isolated network environment for users on Alibaba Cloud. You can select an IP address range, divide networks, and configure the routing list and gateway.

SAP NetWeaver and the Alibaba Cloud services work together in particular ways to deliver combined business application and infrastructure capabilities to our customers.

- SAP NetWeaver system and database components use Alibaba Cloud ECS instances storage services as well as Virtual Private Cloud service.
- SAP Host Agent/SAPOSCOL is deployed with standard installation of SAP NetWeaver and is able to make calls to the monitoring agent component provided by Alibaba Cloud.
- Alibaba Cloud ECS Metrics Collector is the monitoring agent that collects required CPU\Memory\Disk\Network monitoring data and makes these metrics available to SAP applications.

Two-tier Architecture

The following diagram shows some details of a 2-tier architecture running on Alibaba Cloud:



In this architecture, all the components run on a single ECS instance. The ECS instance has 3 attached disks, and each disk serves a specific role. These roles include:

- **System Disk:** contains the operating system and paging files for the ECS instance.
- **Data Disk 1:** contains the SAP NetWeaver installation and the profile files as well as database installation and profiles
- **Data Disk 2:** contains the database data files used for maintaining data consistency. Caution: data disk 2, should using SSD cloud disk to guarantee performance of database.
- **Data Disk 3:** contains the database log files used for maintaining data consistency. Caution: disk 3 should also using SSD cloud disk to guarantee performance of the database.
- **Data Disk 4:** contains for backup of database;

See the HANA Deployment Guide for more information about the deployment architecture for SAP HANA on Alibaba Cloud : <https://www.alibabacloud.com/help/doc-detail/57229.htm>.

For 2-tier deployment with SAP HANA, please kindly refer to SAP official note: 1953429 - SAP HANA and SAP NetWeaver AS ABAP on one Server.

For 2-tier deployment with Microsoft SQL Server, please kindly refer to SAP NetWeaver installation guide for NetWeaver on SQL Server on Windows Server.

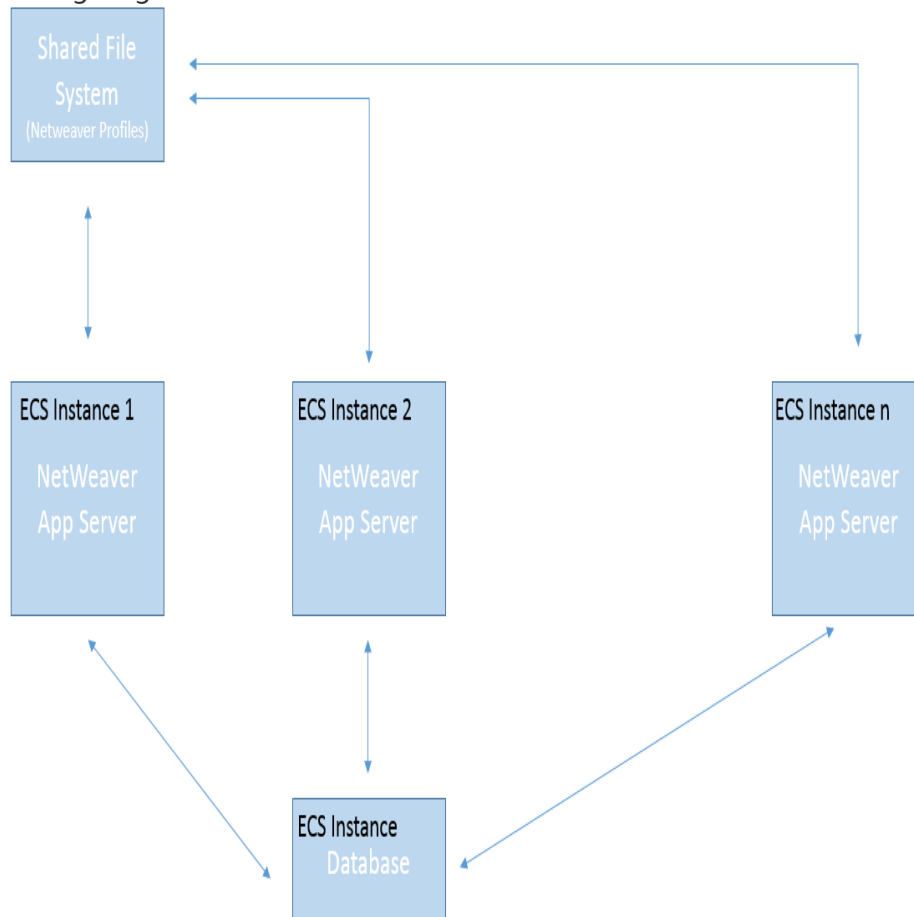
Three-tier Architecture (Scale-out of SAP NetWeaver application servers)

When facing a higher workload, SAP supports a scale-out architecture that uses multiple application

servers as needed.

In scale-out configuration, nodes must access a shared file system. For Linux, use the Network File System (NFS) as your file share on the NetWeaver binaries/profiles disk of the central system (/sapmnt/[SID], where [SID] is the system ID). For more detailed information, please kindly refer SAP standard documents.

The following diagram shows some details of a 3-tier scale-out architecture running on Alibaba



Cloud:

In this architecture, the SAP NetWeaver system distributes work across multiple NetWeaver Application Servers (AS) hosted on multiple ECS instances. All the NetWeaver AS nodes share the same database, which is hosted on a separate ECS instance.

All the NetWeaver AS nodes mount and access a shared file system that hosts the SAP NetWeaver binaries and profiles. For Linux, use the Network File System (NFS) as your filespace for the NetWeaver binaries/profiles disk of the central system (/sapmnt/[SID], where [SID] is the system ID). For more detailed information, please kindly refer SAP standard documents.

In our diagram, this shared file system is contained on a cloud disk that is attached to ECS Instance 1, along with the SAP central services.

High Availability

For guidelines and best practices on planning and setting up high availability for SAP solutions on

Alibaba Cloud, these documents will be provided soon.

Alibaba Cloud ECS

ECS Instance Types

Alibaba Cloud ECS offers a number of instance types (virtual machine sizes) for deploying SAP solutions. Each instance type offers different CPU, memory, and I/O capabilities. You can only run your SAP applications on ECS instances which have been certified by SAP. For a list of SAP-certified instance types approved for SAP NetWeaver usage, see following, and for the most current information please kindly see SAP Note 2552731 - SAP Applications on Alibaba Cloud: Supported Products and IaaS VM types

Instance Type	vCPU	Memory (GiB)
ecs.sn2ne.large	2	8.0
ecs.sn2ne.xlarge	4	16.0
ecs.sn2ne.2xlarge	8	32.0
ecs.sn2ne.4xlarge	16	64.0
ecs.sn2ne.8xlarge	32	128.0
ecs.sn2ne.14xlarge	56	224.0
ecs.r5.large	2	16.0
ecs.r5.xlarge	4	32.0
ecs.r5.2xlarge	8	64.0
ecs.r5.3xlarge	12	96.0
ecs.r5.4xlarge	16	128.0
ecs.r5.6xlarge	24	192.0
ecs.r5.8xlarge	32	256.0

For detailed descriptions of ECS instance types, please kindly check the official website of Alibaba Cloud.

Each SAP-certified ECS instance type has been sized using SAP' s Standard Application Sales and Distribution (SD) benchmark toolkit. For the SAPS rating of each SAP certified instance, please also see SAP Note 2552731 - SAP Applications on Alibaba Cloud: Supported Products and IaaS VM types

Images

When you create an ECS instance, you use an image that contains a pre-installed base operating

system. Alibaba Cloud works with operating system partners to provide you with up-to-date, optimized operating system images. There are several ways you can specify an image for your ECS instance.

Public image

Licenses for the operating system in public images are already included in the price of ECS instance charge. You are not required to provide your own operating system licenses. Following ones are the required operating systems for SAP NetWeaver usage available in Public Image list:

- SLES-11-SP4
- SLES-12-SP1
- SLES-12-SP2
- Windows Server 2016 Data Center Edition 64 bit
- Windows Server 2012 R2 Data Center Edition 64 bit
- Windows Server 2008 R2 Enterprise Edition 64 bit

Marketplace image

Marketplace image: OS vendor certified images which contains preinstalled operation system and configured user environment. Alibaba Cloud currently supports the following images for running SAP NetWeaver systems::

- Red Hat Enterprise Linux Server (RHEL)

For the most current supported operating systems please kindly refer to SAP Note 2552731 - SAP Applications on Alibaba Cloud: Supported Products and IaaS VM types.

Regions and Zones

The Alibaba Cloud infrastructure is built around Regions and Zones. A Region is a physical location in the world, where for most cases, we have multiple Zones. Zones consist of one or more discrete data centers, each with redundant power, networking and connectivity, housed in separate facilities. These Zones offer you the ability to operate production applications and databases which are more highly available, fault tolerant and scalable than it would be possible from a single data center. Alibaba Cloud operates 29 Zones within 14 geographic Regions around the world.

VPC

Virtual Private Cloud (VPC) allows you to provision a private, isolated section of Alibaba Cloud where you can launch IaaS resources in a virtual network that you define. With VPC, you can define a virtual network topology that closely resembles a traditional network that you might operate in your own data center. Additionally, you can create a connection between your corporate data center and your VPC on Alibaba Cloud, and use the Alibaba Cloud as an extension of your corporate data center.

Deploying ECS Instance

You can use the standard Alibaba Cloud methods to deploy your ECS instances on Alibaba Cloud platform, including ECS Console (the Cloud Platform Console web UI) and REST API. You can read the following pages to get more useful information.

- Create an ECS instance
- Start and view an ECS instance

For detailed information and step-by-step instructions about deploying your SAP NetWeaver system on ECS, please refer to [SAP NetWeaver Implementation Guide on Alibaba Cloud](#).

Accessing ECS Instance

On a Linux-based ECS instance, users have SSH capabilities, and can access an ECS instance through SSH based tools such as putty. For example, you can access the ECS instance through putty from a Jumping server.

On a Windows-based ECS instance, users are able to access the ECS through Remote Desktop Protocol (RDP), as long as the ECS instance is accessible from a public IP address.

Database

For SAP NetWeaver on Alibaba Cloud, you can use SAP HANA and Microsoft SQL Server.

SAP HANA

SAP HANA is supported only for SUSE Linux Enterprise Server for the moment. For more information on supported ECS instance types and operating systems, see the [SAP HANA deployment guide](#).

For more information about SAP HANA, see the [SAP HANA Operation guide](#) and the [SAP documentation](#).

To determine the sizing guidelines and recommendations for SAP HANA, please kindly check [SAP official website](#) for sizing.

Microsoft SQL Server

Microsoft SQL Server is supported on Windows Server 2016, 2012 R2 and 2008 R2 on Alibaba Cloud. For more information about deployment with SQL Server, please kindly refer to [NetWeaver on SQL Server on Windows Installation guide](#).

Database Backup and Restore

Since most SAP NetWeaver systems are used for mission critical workloads, customers must have a data backup and restore plan to ensure that their system and database can be restored if the worst case happens.

SAP HANA: For information about backup and recovery for SAP HANA, see the SAP HANA on Alibaba Cloud Operations Guide as follows:

- Operation Guide, <https://www.alibabacloud.com/help/doc-detail/57886.htm>
- Backup and Restore, <https://www.alibabacloud.com/help/doc-detail/57886.htm>

Microsoft SQL Server: Customers are encouraged to back up their SQL Server on a regular basis. There's no difference of backing up on Alibaba Cloud compared to on physical server. However, for long term storage for backup files, it is suggested to use OSS (Object Storage Service) on Alibaba Cloud. For more information, please kindly refer to best practice for running Microsoft SQL Server on Alibaba Cloud.

Storage

By default, each ECS instance has a small System disk (Ultra Cloud Disk or SSD Cloud Disk) that contains the operating system. You can add additional Data disks, and attach them to your ECS instance to act as storage for the different components of your system.

Block Storage (Cloud Disk)

Alibaba Cloud Block Storage (Cloud Disk) provides persistent block-level storage volumes for use with Alibaba Cloud ECS instance. You can choose different Cloud Disk type depending on your requirement:

Disk Category	Basic Cloud Disk	Ultra Cloud Disk	SSD Cloud Disk
Max size of single disk	2 TB	32.768 TB	32.768 TB
Max IOPS per disk	300+ IOPS	3,000 IOPS	20,000 IOPS
Max throughput per disk	20~40 MBps	80 MBps	300 MBps
Access latency	5.0~10.0 ms	1.0~3.0 ms	0.5~2.0 ms
Typical scenarios	Data is not frequently accessed or with low I/O loads.	<ul style="list-style-type: none"> - Small and medium sized databases. - Development and testing. - Cloud Server logging. 	<ul style="list-style-type: none"> - I/O intensive applications. - Medium sized or large relational databases. - NoSQL databases.

For **Data reliability**, with the strength of the Alibaba Cloud distributed storage technology, which uses a triplicate storage system, all these 3 disk types ensure data integrity of 99.9999999%. |

In General, we recommend following disk layout:

Disk Layout	Usage	Cloud Disk Type
System Disk	Operating System	Ultra Cloud Disk
Data Disk 1	Executives, profiles etc. of NetWeaver, Database	SSD Cloud Disk
Data Disk 2	Data files of database	SSD Cloud Disk
Data Disk 3	Log files of database	SSD Cloud Disk

For SAP HANA database, we recommend using SSD Cloud Disk. For more information about how to setup storage system for SAP HANA, please kindly refer to SAP HANA Operation guide on Alibaba Cloud.

For Microsoft SQL Server, it is suggested to use separate SSD Cloud disks for file systems of database transaction log and database data files and backup. For more information, please kindly refer to best practice for SQL Server on Alibaba Cloud.

Object Storage Service (OSS)

Alibaba Cloud Object Storage Service is an object store for files of any type or format; it has virtually unlimited storage and you do not have to worry about provisioning it or adding more capacity.

It's common practice to use OSS to store backup files for long term storage.

Network and Security

Security Group

A security group functions similarly to virtual firewalls, and is used to set network access controls for one or more ECS instances. When creating instances, you must select a security group. You can also add security group rules to control outbound and inbound network access for all ECS instances in the security group.

SSH Key Pairs

Alibaba Cloud offers two authentication methods for remote logon to ECS instances:

- **Password logon:** A standard authentication method using the administrator password. It

applies to both Windows instances and Linux instances.

- **SSH Key Pair logon:** This method only applies to Linux instances. If you are running Linux, it is recommended that you choose this authentication method to protect your ECS instance's security.

An SSH Key Pair is a pair of keys generated by an encryption algorithm: one key is intentionally available, known as the public key; and the other key is kept confidential, known as the private key.

Alibaba Cloud can help you to generate the key pair using 2048-bit RSA key by default. You are also welcome to import the public key of a key pair that has been generated by other key pair generation tool. For more details, please kindly see SSH key pair on Alibaba Cloud as follows:

<https://www.alibabacloud.com/help/doc-detail/51792.htm>.

If you have placed the public key in a Linux instance, you can use the private key to log on to the instance using SSH commands or related tools from local computer or another instance, without the need to enter a password.

Router configuration

When you create a VPC network on Alibaba Cloud, a vRouter and route table are automatically created after the VPC creation. You cannot create or delete them directly. They will be deleted automatically with the deletion of the VPC. You can add route entries to the route table to route network traffic.

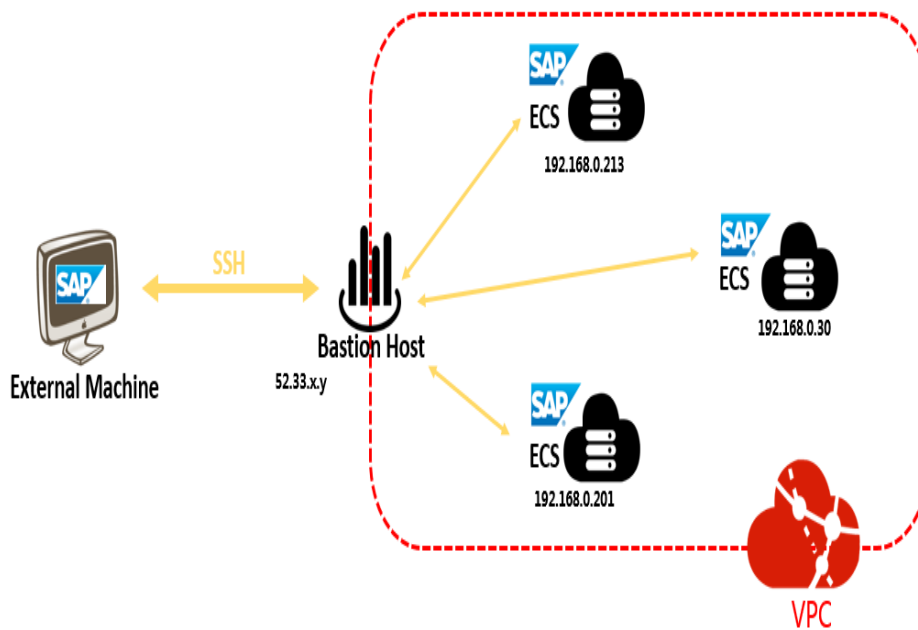
Each entry in the route table is a route entry determining where network traffic is directed. A route entry with the destination CIDR block 100.64.0.0/10 is added by the system by default, when you create a VPC. You are allowed to add customized route entries for your VPC.

If an ECS instance in the VPC, without external IP address, wants to access the internet, a NAT gateway is needed. You can see more details about NAT gateway from following link:

<https://www.alibabacloud.com/product/NAT>.

Bastion Server

Bastion hosts provide an external facing point of entry into a VPC network containing private-network VMs. This host can provide a single point of fortification or audit and can be started and stopped to enable or disable inbound SSH communication from the Internet.



SSH access to VMs that do not have an external IP address can be achieved by first connecting to a bastion host.

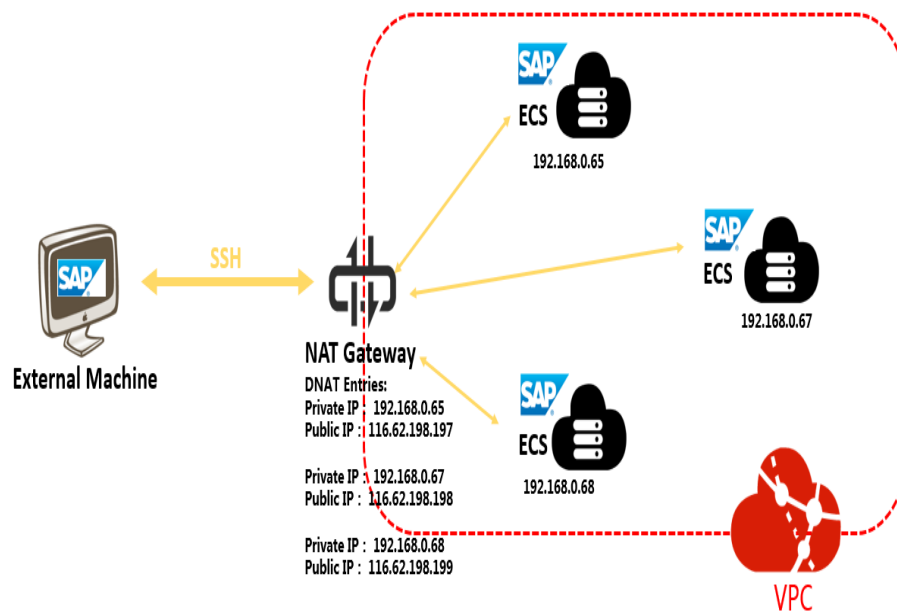
When using a bastion host, you log into the bastion host first, and then into your target private ECS instance through an SSH based tool, like putty.

NAT Gateway

When an ECS instance is created within VPC and without an assigned external IP address, it cannot make direct connections to external services.

To allow these ECS instances to access the Internet, you can set up and configure a NAT gateway. The NAT gateway can route traffic on behalf of any ECS instance in the VPC. You should have one NAT gateway per VPC.

In the case of deploying an SAP solution, an NAT gateway configure with SNAT for the VPC is a must. For more details about this configuration, please kindly refer to Implementation guide.



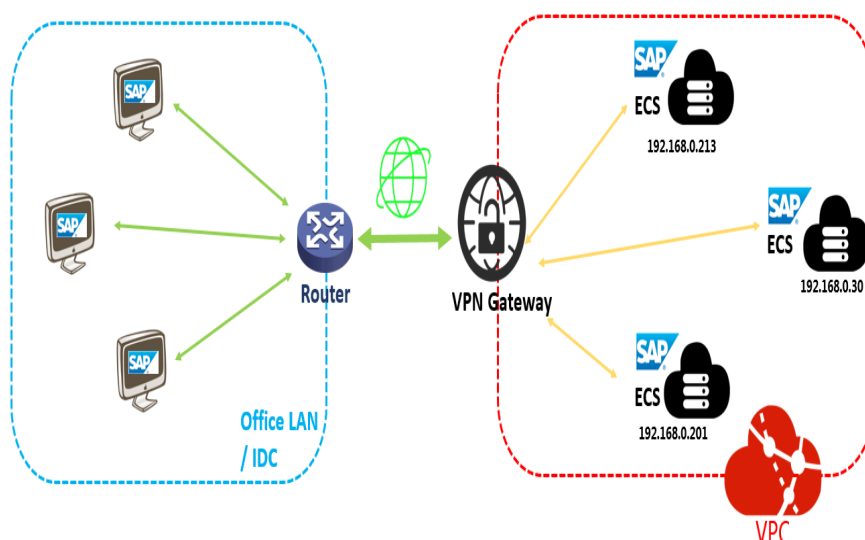
See more details about NAT Gateway, from Alibaba Cloud official site as follows:

<https://www.alibabacloud.com/product/NAT>

If you want to allow the access to your SAP system from Internet, it is suggested that you use a NAT gateway.

VPN Gateway

You can securely connect your existing IDC to your VPC on Alibaba Cloud through a VPN connection using IPsec by using VPN gateway on Alibaba Cloud. Traffic traveling between the two networks is encrypted by one VPN gateway, then decrypted by the other VPN gateway. This protects your data as it travels over the Internet. For more information, please kindly check Alibaba Cloud official site.



See more details of VPN Gateway from Alibaba Cloud official network as follows:
<https://www.alibabacloud.com/product/vpn-gateway>

If you only want to have access your SAP system from local data center or office LAN, it is suggested that you can connect your local data center and office LAN to VPC on Alibaba Cloud through VPN Gateway.

Security document

Following additional resources will help you to further understand your SAP environment on Alibaba Cloud from security and compliance perspective:

- Security & Compliance Center
- Alibaba Cloud Security Whitepaper

System Copy and Migration

Please kindly refer to SAP official document System copy and migration guide from:
<http://support.sap.com/sltoolset> -> System Provisioning -> System Copy Option first.

SAP is offering the system copy and migration services of Software Provisioning Manager 1.0 that enables you to create consistent copies of your SAP systems

- When the source and target systems use the same operating system and database system, you need to use **homogeneous system copy**.
For homogeneous system copy, you probably have this options:
 - Using database independent process (R3load / JLoad);
 - Database restore/recovery; (by using database recover and restore, you can minimize your system downtime. Especially if you combine this approach with some kind of log shipping);
- When the source and target systems use a different operating system or database system, you need to use **heterogeneous system copy**
 - The system copy guides can be found here:
<https://help.sap.com/viewer/nwguidefinder>
 - For a heterogeneous SAP system copy, a consultant with SAP migration certification is necessary.

For more details about best practice of SAP system Copy and migration, please kindly refer this link:
<https://wiki.scn.sap.com/wiki/display/SL/System%2BCopy%2Band%2BMigration>

SAP NetWeaver monitoring and support

The SAP application in a cloud environment runs on a guest operating system (Guest OS) installed

inside the virtual environment. SAP Host Agent collects all information required for SAP monitoring and provides them to the SAP NetWeaver local monitoring and Solution Manager to analyze and display. Customer or SAP Technical Support can access the SAP tool through SAP transaction code ST06, either in the local system monitoring of an ABAP system or via SolutionManager for a managed system running on Alibaba Cloud.

In addition to that, Alibaba Cloud and SAP have worked together to create a monitoring agent – ECS Metrics Collector, for SAP NetWeaver running on Alibaba Cloud. ECS Metrics Collector is responsible for gathering information about configuration and resource (CPU \ Memory \ Disk \ Network) utilization from the underlying Alibaba Cloud infrastructure and virtualization platform, and feeding them to SAP Host Agent.

For details and step-by-step instructions about how to install ECS Metrics Collector, please check the SAP NetWeaver on Alibaba Cloud Implementation Guide, and for details about its lifecycle and operations, see the SAP NetWeaver on Alibaba Cloud Operation Guide.

Licensing

SAP License

Running SAP on Alibaba Cloud requires you to bring your own license (BYOL).

For more information about SAP licensing, please contact SAP.

Linux License

In Alibaba Cloud, there are two ways to license **SUSE** Linux:

- Pay-as-you-go licensing model:

Alibaba Cloud provides SLES 11 SP4 and SLES 12 SP2 as public images, and the SLES license cost is included in ECS instance price

- BYOL model:

Customer can purchase their own SLES license and import SLES operating system as customized images.

Regarding **Red Hat Enterprise Linux**, there are two ways to consume Alibaba Cloud:

- Pay-as-you-go licensing model:

You can choose Red Hat Enterprise Linux 7.4 and 7.5 as marketplace image, while the RHEL license needs to be obtained from Red Hat separately.

- Subscription model:

You can choose Red Hat Enterprise Linux 7.4 and 7.5 as marketplace image, while the RHEL license needs to be obtained from Red Hat separately.

Windows License

In Alibaba Cloud, we provide Pas-as-you-go licensing model for following Windows version:

1. Windows Server 2016 Data Center Edition 64bit
2. Windows Server 2012 R2 Data Center Edition 64bit
3. Windows Server 2008 R2 Enterprise Edition 64bit

Installation media

There are two main options for copying SAP installation media to ECS instance:

- Download from SAP Service Marketplace to ECS instance directly. From your ECS instance, connect to the SAP Service Marketplace and download the required installation media. This option will most likely be the fastest method for getting SAP installation media to Alibaba Cloud, because ECS instances have very fast connections to the Internet. You can create a dedicated ECS instance, for downloading and storing the SAP installation media.
- Copy from your network to the ECS instance. If you already have the required SAP installation media downloaded to a location in your network, you can copy the media from your network directly to an ECS instance.

SAP Router and Solution Manager

The following sections describe options for SAP Solution Manager and SAProuter when running SAP solutions on Alibaba Cloud.

Hybrid Architecture – Part of the SAP solution on Cloud, part of the SAP solution on local IDC

When using Alibaba Cloud as an extension to your IT infrastructure, you can use your existing SAP Solution Manager system and SAProuter that are running in your local data center to manage SAP systems running on Alibaba Cloud within a VPC.

All-on-Alibaba Cloud Architecture

When setting up an SAP environment on Alibaba Cloud, you will need to set up an SAP Solution Manager system and a SAProuter with a connection to the SAP support network, as you would with any infrastructure.

When setting up the SAProuter and SAP support network connection, follow these guidelines:

- The instance that the SAProuter software will be installed on should be launched into a

- public subnet of an Alibaba Cloud VPC and assigned an Elastic IP address (EIP).
- A specific security group should be created for the SAProuter instance with the necessary rules to allow the required inbound and outbound access to the SAP support network.
- You should use the Secure Network Communication (SNC) type of Internet connection. For more information, see <https://support.sap.com/en/tools/connectivity-tools/remote-support.html>

SAP NetWeaver Implementation Guide

- Deploying SAP system
 - Prerequisites
 - Account setup
 - Creating a VPC and VSwitch
 - Creating a security group
 - Creating an SSH key pair
 - Connecting ECS instance from Internet
 - RAM service role setup
 - Create and configure an instance
 - Open ECS Purchase page
 - Choose Pricing Model
 - Choose the Datacenter Region and Zone
 - Choose the instance type
 - Choose Network Type
 - Choose the base operating system
 - Provision and configure storage
 - Security Setting
 - Purchase Plan
 - Launch instances
 - Instance post-configuration
 - Add a DNAT entry
 - Add an SNAT entry
 - Connecting to SAP ECS instances
 - Harden OS security
 - Changing hostname
 - RAM Role configuration
 - Prepare SAP installation media
 - ECS Metrics Collector Installation and Verification
 - Checking the operating system
 - Creating operating system image

- Install the SAP solution
- Start SWPM
- Upgrade SAP kernel
- Check Host Agent version
- Upgrade Host Agent
- Installation of a scale-out system
- Installation of a single-node system
- Post-installation
 - Creating SAP instance image
- SAP System Migration
 - VM Import/Export Tools
 - SAP Homogeneous and Heterogeneous System Copy
 - Third-Party Tools

Version Control

Version	Revision Date	Types Of Changes	Effective Date
1.0			2017/12/8
1.1	2018/4/17	1.Add windows platform support 2.Update RAM role for ECS data collector	2018/4/17
1.2	2018/4/23	1.Add operation for "Changing hostname" and "Check host agent version" based on the Windows platform 2.Add a link to MaxDB and SQLServer specific guidance	2018/4/23
1.3	2018/6/20	Add Red Hat Enterprise Linux Server support	2018/6/20

This guide provides instructions for deploying your own SAP NetWeaver based system and migrating an existing SAP system to Alibaba Cloud.

Deploying SAP system

Prerequisites

For SAP administrators who have experience in deploying and running SAP systems on traditional an infrastructure, the following prerequisite knowledge will help to understand some public cloud specific tasks before starting to create an ECS instance for SAP and the SAP system deployment.

Account setup

- Signing up for Alibaba Cloud
- Adding a payment method
- Real-name registration, it is required only if you have to create an ECS instance in a region inside mainland China

Creating a VPC and VSwitch

Log on to the VPC console.

In the left-side navigation pane, click **VPC**.

Choose the region where the VPC is created.

Click **Create VPC** in the upper-right corner.

In the pop-up dialog, enter a VPC name and select the IP address range for the VPC in the form of a Classless Inter-Domain Routing block.

Use the one of the following standard CIDR blocks as the IP address range. The CIDR block cannot be modified after you create the VPC. For more details, refer to [Create a VPC](#).

- 10.0.0.0/8 (10.0.0.0 - 10.255.255.255)
- 172.16.0.0/12 (172.16.0.0 - 172.31.255.255)
- 192.168.0.0/16 (192.168.0.0 - 192.168.255.255)

Create VPC

Create VPC

Create VSwitch

*VPC Name :

VPC1

The name must be 2-128 characters long and start with English letters or Chinese characters. Only numbers, special characters, "_" and "-" are allowed.

Description :

This field is not required. A description must contain 2-256 characters, and cannot begin with "http://" or "https://".

*CIDR :

192.168.0.0/16

① The CIDR cannot be changed once the VPC is created.

Create VPC

Click **Create VPC**.

A VPC ID is generated after the VPC is created, and a VRouter is created by the system for the VPC.

Create VPC

Create VPC

Create VSwitch

✓

Create VPC Successful

Generate:

VPC ID:

vpc-bp

VRouter ID:

vrt-bp

Now you can continue to: [Manage VSwitch](#)

Next Step

Click **Next Step** to create a VSwitch.

In the **Create VSwitch** tab, provide the following information and click **Create VSwitch**.

- Name: Enter a name for the VSwitch.
- Zone: Select a zone for the VSwitch.
- CIDR block: Specify the IP address range of the VSwitch in the form of a Classless Inter-Domain Routing block.

The allowed block size for a VSwitch is between a /16 netmask and /29 netmask, and the CIDR block of the VSwitch can be the same as that of the VPC that it belongs to, or the subset of the VPC CIDR block.

Note: If the CIDR block of the VSwitch is the same as that of the VPC, you can only create one VSwitch.

Create VPC

Create VSwitch

*VPC :

- / vpc-bp1kjfpne61vi8qezvt0h

VPC CIDR Block :

192 · 168 · 0 · 0 / 16

Display Binary

*Name :

VS1

The name must be 2-128 characters long and start with English letters or Chinese characters. Only numbers, special characters, "_" and "-" are allowed.

*Zone :

China East 1 Zone E

① It cannot be modified after creation.

*CIDR :

192 · 168 · 1 · 0 / 24

Display Binary

① It cannot be modified after creation.

The specified CIDR must be the same as, or belong to, that of the VPC. The allowed block size is between a /29 netmask and /16 netmask.
For example:192.168.247.0/24
[How to Configure VSwitch CIDR Block](#)

Number of Available Private IPs :

252 IPs

Description :

This field is not required. A description must contain 2-256 characters, and cannot begin with "http://" or "https://".

Create VSwitch

Click **Done**.

Creating a security group

You can add security group rules to enable or disable access to and from the Internet, intranet, or private networks for ECS instances in the security group. For your VPC network: You only need to set outbound and inbound rules, and do not need different rules for private networks and Internet.

To create a security group, perform the following:

Log on to the ECS console.

In the left-side navigation pane, click Security Groups.

Select a region.

Click Create Security Group. In the displayed dialog box, enter the following:

Security Group Name

The length must be 2–128 characters. It can contain uppercase letters, lowercase letters, and Chinese characters. It cannot contain numbers, underscores (_), or hyphens (-).

Description

The length must be 2–256 characters. Do not start with http:// or https://.

Network Type

You should select VPC as a network type; you must select a specific VPC. If no VPCs have been created in the current region, you must create one first.

Create Security Group



* Security Group

Name:

SAP_NetWeaver

2 - 128 characters long. Do not start with a special character or a digit. It can contain the following special characters: ".", "_", and "-".

Description:

Security Group for SAP NetWeaver testing

It must contain 2-256 characters and it cannot begin with http:// or https://

Network Type:

VPC

*VPC:

vpc-bp1amqrofljqw4v8ufbk2f

[Create VPC](#)

OK

Cancel

Click OK.

Adding a security group rule

To add a security group rule, follow these steps:

Log on to the ECS console.

In the left-side navigation pane, select Networks & Security > Security Groups.

Select a region.

Find the security group to add authorization rules, and in the Action column click Configure Rules.

On the Security Group Rules page, click Add Security Group Rules.

(Optional) If you do not need to enable or disable all ports for all protocols, ICMP, or GRE, you can select Quickly Create Rules.

In the dialog box, set the following parameters:

NIC:

- If the security group is for VPC, you do not need to select the NIC.
- If your instances can access the Internet, the rules work for both the Internet and intranet.

Rule Direction:

- **Outbound:** ECS instances access other ECS instances over intranet, private networks, or through Internet resources.
- **Inbound:** Other ECS instances in the intranet or private networks and Internet resources access the ECS instance.

Authorization Policy: Select Allow or Drop.

Note: **Drop** policy discards the data packet without returning a response. If two security groups overlap except the authorization policy, the **Drop** rule takes priority over the **Allow** rule.

Protocol Type and Port Range

The port range setting is affected by the selected protocol type. SAP requires access to certain ports, so add firewall rules to allow access to the ports outlined by SAP. The following table shows the relationship between all major ones.

Protocol type	Port range	Scenarios
All	Shown as -1/-1, indicating all ports.	Used in scenarios: - No limit to outbound calls; - Both applications are fully mutually trusted.
RDP	Shown as 3389/3389, the default RDP port 3389.	Shown as 3389/3389, the default RDP port 3389.
SSH	Shown as 22/22, the default SSH port 22.	Used for remotely connecting to Linux

		instances.
TELNET	Shown as 23/23.	Used to remotely log on to instances by using Telnet.
HTTP	Shown as 80/80.	The instance is used as a server for a website or a web application.
HTTPS	Shown as 443/443.	The instance is used as a server for a website or a web application that supports the HTTPS protocol.
MS SQL	Shown as 1433/1433.	The instance is used as a MS SQL server.
Oracle	Shown as 1521/1521.	The instance is used as an Oracle SQL server.
MaxDB	Shown as 7210/7210.	The instance is used as an MaxDB.
SAP HANA	Shown as 30015-39915.	The instance is used as an SAP HANA.
SAP Dispatcher	Range 3200-3299	Used by SAP GUI for Windows and Java.
SAP Gateway	Range 3300-3399	Used for CPIC and RFC communication.
SAP Message server	Range 3600-3699	Used for SAP message server communication.

For more details, see [TCP/IP Ports of All SAP Products](#)

Priority

1–100. The smaller the number is, the higher the priority is. For more information on priority, see [Security group rule priority](#).

Authorization Type and Authorization Object

The authorization object affects setting of authorization type. The following table shows the relationship between them.

Authorization type	Authorization object
Address Field Access	Use the IP or CIDR block format such as 10.0.0.0 or 192.168.0.0/24. Only IPv4 addresses are supported. 0.0.0.0/0 indicates all IP addresses.
Security Group Access	Authorize the instances in a security group under your account or another account to

access the instances in this security group.

- **Authorize This Account:** Select a security group under your account.

- **Authorize Other Account:** Enter the target security group ID and the Account ID. You can view the account ID in **Account Management > Security Settings**.

For VPC network instances, **Security Group Access** works for private IP addresses only. If you want to authorize Internet IP address access, use **Address Field Access**.

- Click OK to add the security group rule to the specified security group.

Add Security Group Rules?×

NIC:

Intranet

Rule Direction:

Inbound

Authorization Policy:

Allow

Protocol Type:

Custom TCP

* Port Range:

3200/3201

Priority:

1

Authorization Type:

Address Field Access

* Authorization Object:

192.168.1.0/32

It must contain 2-256 characters and it cannot begin with http:// or https://

OK

Cancel

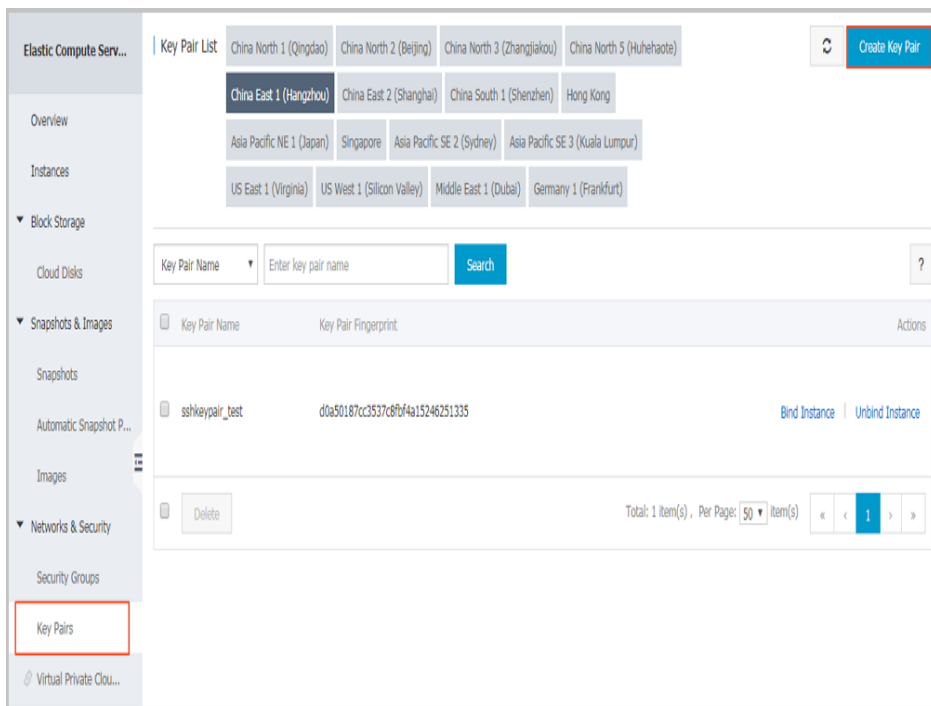
Creating an SSH key pair(Linux only)

To create an SSH key pair, follow these steps:

Log on to the ECS console.

In the left-side navigation pane, choose Networks & Security > Key Pairs.

On the Key Pairs page, select a region, and click Create Key Pair.



On the Create Key Pair page, enter a name for the key pair, and select Automatically Create a Key Pair for the Creation Type.

Note: The specified key pair name must be unique. It must not match with the existing key pair or a key pair that was deleted when it was still bound to an instance. Otherwise, an error message “The key pair already exists” appears.

Click OK to create a key pair.

Note: After a key pair is created, you must download and save the private key for further use. If you do not have the private key, you cannot log on to your ECS instance that is bound to this key pair.

After creating the key pair, you can view the information, including Key Pair Name and Key Pair Fingerprint, in the key pair list.

Connecting ECS instance from Internet

VPC is a private network established in Alibaba Cloud. VPCs are logically isolated from other virtual networks in Alibaba Cloud. You can use NAT Gateway or EIP (Elastic IP) to connect ECS instances from Internet.

NAT Gateway is an enterprise-class public network gateway that provides NAT proxy services (SNAT and DNAT), up to 10 Gbps forwarding capacity, and cross-zone disaster recovery. As a public network gateway, NAT Gateway requires configured public IPs and bandwidth. Public IPs for NAT Gateway are grouped into abstract groups called shared bandwidth packages.

An EIP address is a type of NAT IP address. It is located in a public network gateway of Alibaba Cloud, and is mapped to the private network interface card (NIC) of the bound ECS instance in the way of NAT. Therefore, the ECS instance bound with the EIP address can communicate with the Internet without disclosing the EIP address on the NIC.

For each ECS instance that runs SAP applications, ECS Metrics Collector needs to be installed. So, your SAP ECS instances also require access to the Internet for SAP system monitoring. There are two ways to enable this access, you should bind an EIP to the ECS instance directly; or you can use a NAT Gateway, configure SNAT for your ECS instances.

Creating a NAT gateway

Create a NAT gateway

Log on to the VPC console.

In the left-side navigation pane, click NAT Gateway.

In the upper-right corner of the NAT Gateway page, click Create NAT Gateway.

Configure the NAT gateway with the following information.

Configuration	Description
Region	Select the region of the NAT gateway. Make sure the regions of the NAT gateway and VPC are the same.
VPC	Choose the VPC for the NAT gateway. Once the gateway is created, you cannot change the VPC. If you cannot find the required VPC in the VPC list, troubleshoot the following: Check

	<p>whether the VPC already has a NAT gateway configured. A VPC can be configured with only one NAT gateway.</p> <p>Check whether a custom route entry, where the destination CIDR block is 0.0.0.0/0, already exists in the VPC. If so, delete this custom route entry.</p>
Specification	<p>Select a specification for the NAT gateway. The specification affects the maximum number of connections and the number of new connections allowed per second for the SNAT proxy service, but does not affect data throughput.</p> <p>Note: The specification has no impact on the DNAT function. For more details, see Gateway specification.</p>
Billing Cycle	Display the billing cycle.

NAT Gateway (Pay-As-You-Go)

Basic Configuration

Region

China North 1 (Qingdao)	China North 2 (Beijing)	China North 3 (Zhangjiakou)	China North 5 (Huhehaote)	China East 1 (Hangzhou)	China East 2 (Shanghai)
China South 1 (Shenzhen)	Hong Kong	Asia Pacific NE 1 (Japan)	Singapore	Asia Pacific SE 2 (Sydney)	Asia Pacific SE 3 (Kuala Lumpur)
	US West 1 (Silicon Valley)		EU Central 1		
US East 1 (Virginia)		Middle East 1 (Dubai)	(Frankfurt)		

VPC ID

vpc-bp f

A VPC can have only one NAT Gateway. You cannot change the VPC once the NAT Gateway is created.

Specification

Small

Medium

Large

Super Large-1

For details on the specifications, refer to [NAT Gateway specifications >>](#)

You can change the specification at any time.

After creating a NAT Gateway, you have to buy a shared bandwidth package that contains the public IPs for use.

Purchase Plan

Billing Cycle

By Day

NAT Gateway has different specifications. Different specifications correspond to different performance metrics (maximum connections and the number of new connections per second). The specifications only affect the SNAT performance and have no impact on the DNAT performance.

The following table lists the available specifications. Generally, for or your SAP solution, small size is OK.

Specification	Max Connection	New Connections Per Second (CPS)
Small	10,000	1,000
Medium	50,000	5,000
Large	200,000	10,000

Click Buy Now and complete the creation.

Note: The creation of a NAT gateway generally takes 1-5 minutes.

After the NAT gateway is created, the system automatically creates a DNAT table and an SNAT table. A custom route entry with the destination CIDR block 0.0.0.0/0 pointing to the NAT gateway is automatically added to the VPC route table.

China North 1 (Qingdao)

China North 2 (Beijing)

China North 3 (Zhangjiakou)

China North 5 (Huhehaote)

Refresh

Create NAT Gateway

China East 1 (Hangzhou)

China East 2 (Shanghai)

China South 1 (Shenzhen)

Hong Kong

Asia Pacific NE 1 (Japan)

Singapore

Asia Pacific SE 2 (Sydney)

Asia Pacific SE 3 (Kuala Lumpur)

US East 1 (Virginia)

US West 1 (Silicon Valley)

Middle East 1 (Dubai)

Germany 1 (Frankfurt)

Maintain a name for NAT gateway

In the right side of NAT gateway, choose More and click Edit to change the name of NAT gateway.

Edit

* Name:

NetWeaver-testing

The name must be 1-64 characters long and can contain English letters, digits and "-".

Description:

E2E testing

The description can contain up to 128 characters.

OK

Cancel

Enter a name for your NET gateway, click OK to finish configuration.

Create a shared bandwidth package

Find the target NAT gateway, and click the Buy Shared Bandwidth Package link.

Note: If the NAT gateway already has a shared bandwidth package, click **Manage** and then click **Shared Bandwidth Package**.

On the Shared Bandwidth Package page, click Buy Shared Bandwidth Package again.

Configure the shared bandwidth package according to the following information.

Configuration	Description
Public IP count	Select the number of public IPs that you want to purchase. You can adjust the number of public IPs at any time once a shared bandwidth package is created. You need at least 1 public IP for SNAT to

	deploy ECS Metrics Collector.
Peak Bandwidth	Set a peak bandwidth. You can adjust the peak bandwidth at any time.
ISP Type	BGP multi-pathing is used to connect the Internet.
Billing method	The shared bandwidth package is billed based on traffic usage. For more details, see Billing overview .
Billing cycle	Display the billing cycle.

| Shared Bandwidth Package (Pay-As-You-Go)

Basic Configuration

Public IP Count

2

The number of public IPs. You can adjust the IP count at any time.

Peak Bandwidth

50Mbps

100Mbps

200Mbps

2 Mbps

All the public IPs share this bandwidth, and you can change the bandwidth at any time.

ISP Type

BGP (Multipathing)

Billing Method

Pay By Traffic

Billing Cycle

By Hour

Purchase Plan

Quantity

1

Click Buy Now.

Note: The creation of a shared bandwidth package generally takes 1-5 minutes.

Creating an Elastic IP (EIP)

Elastic IP (EIP) is a public IP address resource that you can purchase and possess independently. It can

be dynamically bound to a VPC ECS instance without restarting the ECS instance.

Log on to the EIP console and click Create EIP.

On the purchase page, select the region, bandwidth, and purchase quantity for the EIP address, and click Buy Now.

Elastic IP

Basic Configuration	Region	China North 2	China East 1	China North 1	Hong Kong	China South 1	China East 2
		Singapore	US West 1	US East 1	Japan	Middle East 1	Asia Pacific SE 2
					China North 5		
		EU Central 1	China North 3	Asia Pacific SE 3	(Huhehaote)		
	Network traffic	By traffic					
	Max bandwidth	<div> <div></div> <div>50Mbps</div> <div>100Mbps</div> <div>200Mbps</div> <div>1 Mbps</div> </div>					
Fee	Billing cycle	Hour					
Purchase Plan	Quantity	<div>1</div>					
		You currently have 2 instances. You can create 18 more instances					

Complete the payment.

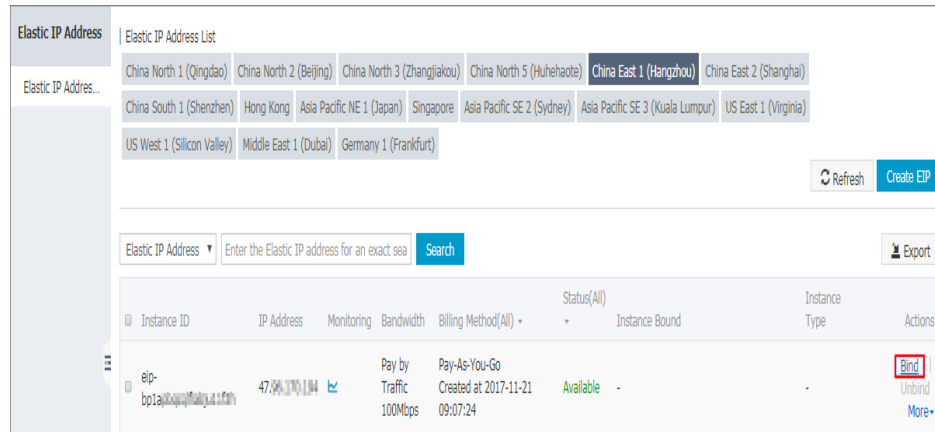
You can bind an EIP address to an ECS instance in any VPC as needed to make the instance accessible to the Internet, and release it whenever the Internet communication is not needed. Before binding an EIP address to an ECS instance, ensure that the following conditions are met:

- The regions of the EIP address and ECS instance to be bound are the same.
- The ECS instance to be bound is not allocated any public IP address. Procedure

Log on to the EIP console.

Choose a region. All Elastic IP addresses under the selected region are displayed.

Click Bind in the Actions column of the target EIP address.



In the **Bind** dialog box, perform the following operations:

- Instance type: Select **ECS Instance**.
- ECS instance: Select the ECS instance to be bound.
- Click **OK**.

After the EIP address is bound to the ECS instance, the ECS instance can communicate with the Internet. Make sure the configured security group rules do not block the Internet access.

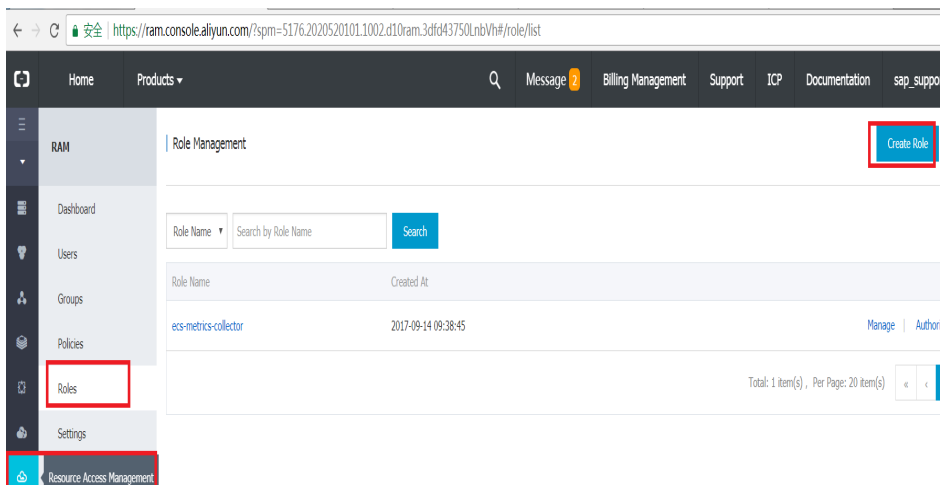
RAM service role setup

The monitoring agent **ECS Metrics Collector**, which is designed for SAP systems running on Alibaba Cloud infrastructure, needs a specific RAM service role setup. Please be noticed that this is just a one-time effort, because it's effective at your account level. For more information about RAM (Resource Access Management) Role setup, please refer to [How to use the instance RAM role on the console](#).

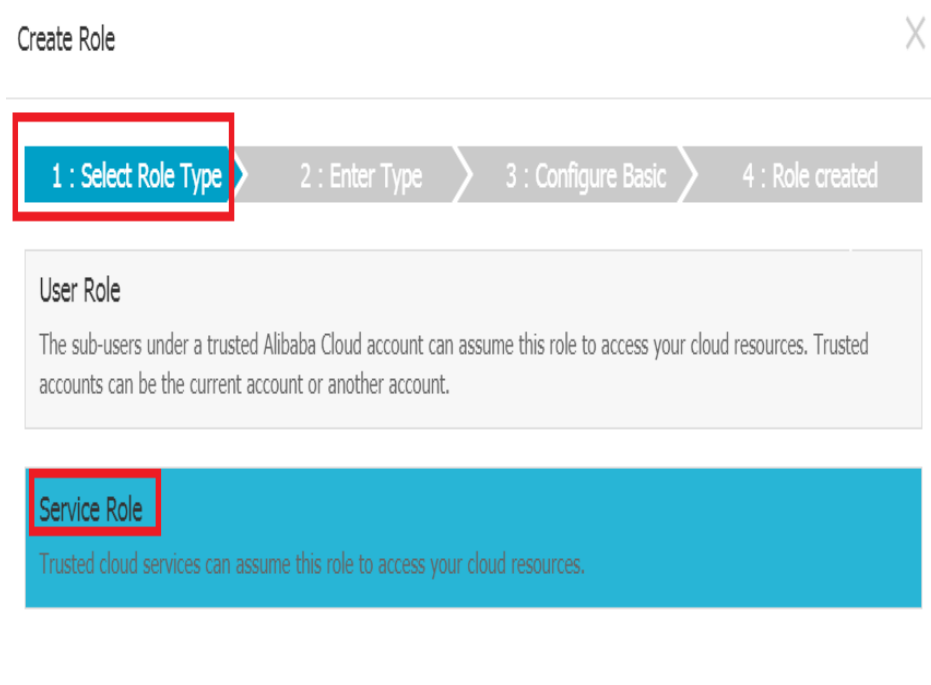
Log on to the ECS console.

On the left-side navigation pane, click Resource Access Management.

Open Resource Access Management Console, selects the tab **Roles**, then click **Create Role**



Select **Service Role** in step **Select Role Type**



In step **Enter Type**, find the service **ECS Elastic Compute Service**

Create Role ✕

1 : Select Role Type

2 : Enter Type

3 : Configure Basic

4 : Role created

Select the trusted services that can use this role to access your cloud resources.

LOG Log Service

When the Log Service imports collected logs to OSS, you must create a Log Service trusted service role. The Log Service can then assume this role to write data to your OSS.

ApiGateway Service

When configure the FunctionCompute as API Gateway backend service , you must create an API Gateway trusted service role. The API Gateway will play the role to call your FunctionCompute.

ECS Elastic Compute Service

Elastic Compute Service will play the role to access your other resources.

In step **Configure Basic**, you need to define a role name. For example, you can add **ecs-metrics-collector** as the role name. Then click **Create**

Create Role ✕

1 : Select Role Type

2 : Enter Type

3 : Configure Basic

4 : Role created

* Role Name :

ecs-metrics-collector

Names must be 1-64 characters long. They may only contain letters, numbers, and hyphens.

Description :

Previous

Create

The service role is created. Click **Authorize** for next steps

Create Role ✕

1 : Select Role Type

2 : Enter Type

3 : Configure Basic

4 : Role created

✓

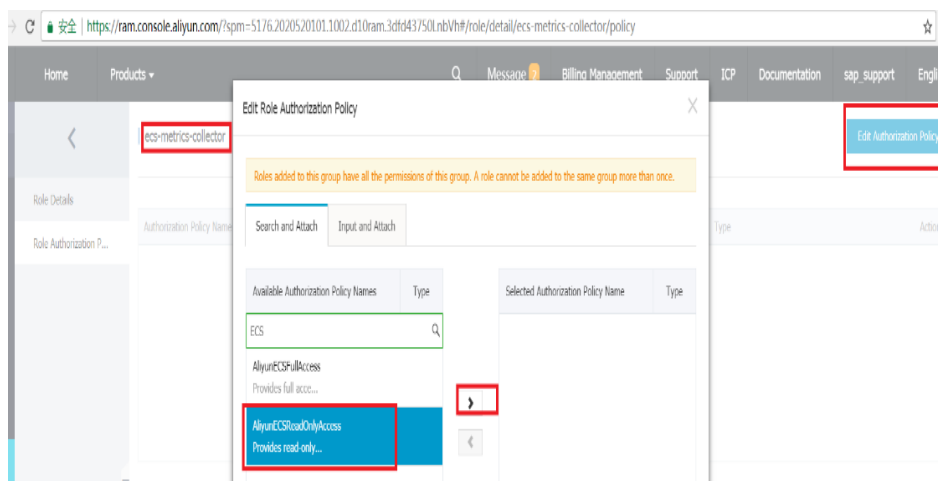
Role created successfully.

You have created a role that currently has no permissions. Please grant permissions to this role.

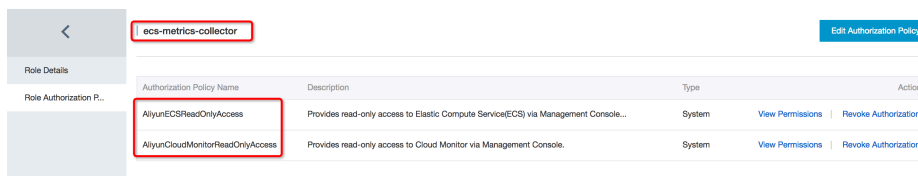
Close

Authorize

Click **Edit Authorization Policy**. By typing the Policy Name **AliyunECSReadOnlyAccess** and **AliyunCloudMonitorReadOnlyAccess** in the search bar, it will be easy for you to pick up the required policy. Select Policy Name **AliyunECSReadOnlyAccess** and **AliyunCloudMonitorReadOnlyAccess** and assign it to your RAM service role



Click **OK**, the policy assignment is completed.



Create and configure an instance

To create an ECS instance for deploying SAP NetWeaver on Alibaba Cloud, follow these steps:

Open ECS Purchase page

- Log on to the ECS console.
- On the left-side navigation pane, click **Instances**.
- On the **Instance List** page, click **Create Instance**.
- Open ECS Purchase page, and switch to the tab "Advanced Purchase" .

Choose Pricing Model

You can choose either **Subscription** or **Pay-As-You-Go** as the billing method of your instance.

Currently, ECS instances support two billing methods:

- **Subscription:** A type of prepayment whereby instances can be used only after payment is made. Instance usage is billed on a monthly basis, and the billing unit is US\$/month. Subscription is applicable to fixed 24/7 services, such as Web service.
- **Pay-As-You-Go:** A type of post payment whereby payment is made after instance usage. Instance usage is billed on a minute basis, and the billing unit is US\$/hour. The minimum charge for the lifecycle of an ECS instance (from creation to release) is 0.01 US\$. Pay-As-You-

Go is applicable to scenarios with sudden traffic spikes, such as temporary scaling, interim testing, and scientific computing.

See [Purchase ECS instances in the ECS Purchase Guide](#) for the differences between these two billing methods.

Choose the Datacenter Region and Zone

Usually, All SAP applications (SAP ERP, CRM, SRM, and so on) and systems (SAP DB, SAP Application servers) should be deployed in the same Zone. The region and zone cannot be changed after the instance is created. When choosing a region and zone, consider the following:

- Generally, if the region where your instance is located is close proximity to your customers, they will experience shorter network latency and faster download speed when using your service.
- Some features, such as the number of zones, instance types, storage types, and network service pricing, vary by region. Select an appropriate region to meet your business needs.
- ECS instances in regions outside Mainland China do not support interchange between Linux systems.
- If you are creating multiple instances for your SAP system,
 - If it requires shorter network latency, we recommend that you create the instances in the same zone.
 - If it has higher requirements for disaster recovery, we recommend that you create the instances in different zones of one region.
- Instances in different regions cannot communicate with each other over intranet.

Choose the instance type

The availability of instance types varies by region. See [Instance generations and type families in Product Instruction](#) for scenarios of each instance type.

Note : If you chose pricing model as 'Pay-As-You-Go' , you cannot purchase all ECS instances from instance types. If the instance you need is not in the list, you can submit a ticket for purchasing to Alibaba Cloud support.

Alibaba Cloud ECS instance offers a number of instance types (virtual machine sizes) for deploying SAP solutions. You can only run your SAP applications on ECS instances that had been certified by SAP. For a list of SAP-certified instance types approved for production use, see following,

Instance Type	Family Type	vCPU	Memory (GiB)
ecs.sn2ne.large	sn2ne	2	8
ecs.sn2ne.xlarge	sn2ne	4	16
ecs.sn2ne.2xlarge	sn2ne	8	32

ecs.sn2ne.4xlarge	sn2ne	16	64
ecs.sn2ne.8xlarge	sn2ne	32	128
ecs.sn2ne.14large	sn2ne	56	224
ecs.r5.large	r5	2	16.0
ecs.r5.xlarge	r5	4	32.0
ecs.r5.2xlarge	r5	8	64.0
ecs.r5.3xlarge	r5	12	96.0
ecs.r5.4xlarge	r5	16	128.0
ecs.r5.6xlarge	r5	24	192.0
ecs.r5.8xlarge	r5	32	256.0

And for more information please kindly see [SAP Note 2552731 - SAP Applications on Alibaba Cloud: Supported Products and IaaS VM types](#).

Choose Network Type

- **Network Type:** For your SAP system ECS instance, please choose Virtual Private Cloud (VPC) as the network type. You can select your own VPC and VSwitch. If you do not have one, use the default VPC and VSwitch.
- **Security Group:** A security group functions similarly to virtual firewalls, and is used to set network access controls for one or more ECS instances. When creating instances, you must select a security group. Please add security group rules to control outbound and inbound network access for all SAP system ECS instances in the security group.
- **Network Billing Type:** Billing by **Data Transfer**. With this billing method, charges are determined by the amount of the data transferred to an instance every hour (usually calculated by GB). The traffic price varies by region. Check the Internet traffic fee on the bottom of the page.
- **Network Bandwidth Peak:** To help prevent high charges from sudden traffic spikes, you can specify a peak bandwidth for the Instance.

Network type	Internet access?	Network bandwidth peak
VPC	Yes	If no Elastic IP (EIP) address is used, set the peak bandwidth to a non-zero value and an Internet IP address will be bound to your instance. The address cannot be changed or unbound.
VPC	No	Set the peak bandwidth to 0 Mbps.

Choose the base operating system

Public Image: it contains the image of an operating system officially provided by Alibaba Cloud. On top of this, you will need to install the related software and configure the application environment based on your specific requirements. Alibaba Cloud currently supports the following operating systems for running SAP NetWeaver systems:

- SUSE Linux Enterprise Server (SLES)
- Microsoft Windows Server (2016 Data Center Edition, 2012 R2 Data Center Edition)

Marketplace image: it contains certified images. Preinstalled with OS, configured user environments, and applications, to be deployed immediately. Alibaba Cloud currently supports the following operating systems for running SAP NetWeaver systems:

- Red Hat Enterprise Linux Server (RHEL)

Provision and configure storage

You have to select cloud disks for the system disk and data disks. Alibaba Cloud provides you with flexible, cost-effective, and easy-to-use data storage options for your ECS instances.

- **System Disk** is required. It is for installing the operating system.
 - Local, temporary, instance based storages.
 - Data stored on instance storage volumes will be persistent until ECS instance is released.
 - For system disk, we recommend using Ultra Cloud Disks; you can choose SSD Cloud Disk to get better performance.
- **Data Disk** that you add here will be released with the instance and cannot be detached from the instance. You can create a cloud disk independently.
 - Persistent block-level storage volumes for use with ECS instances.
 - For data disk, we recommend using Ultra Cloud Disks in your SAP non-production environments, using SSD Cloud Disks in production environments.
- Each user account can own up to 250 cloud disks simultaneously, with a maximum capacity of 32768 GB per data disk.
- You can add up to 16 data disks, blank or from a snapshot, based on business needs.

Cloud disk types vary by region. See [Disk parameters and performance test](#) for differences of cloud disk features. Three different volume types, each option has a unique combination of performance and durability.

- SSD cloud disks
Ideal for I/O intensive applications, and provide stable and high random IOPS performance.
- Ultra cloud disks
Ideal for application scenarios with medium I/O load and provide a storage performance of up to 3000 random IOPS for ECS instances.

- Basic cloud disks

Ideal for application scenarios with low I/O load and provide an I/O performance of several hundred IOPS for ECS instances.

For your SAP production environments, recommended storage options as below,

Directory	Disk type
SAP software	SSD cloud disks
DB data files	SSD cloud disks
DB log files	SSD cloud disks
Intermediate backup storage	Ultra cloud disks
SAP archiving storage	Ultra cloud disks

For SAP HANA, we recommend using SSD Cloud Disks in all environments. For more information about HANA storage configuration, please refer to [SAP HANA Deployment Guide on Alibaba Cloud](#).

Directory	Disk type
HANA shared	SSD cloud disks
HANA data files	SSD cloud disks
HANA log files	SSD cloud disks
Intermediate backup storage	Ultra cloud disks

For Microsoft SQL Server, we recommend using SSD Cloud Disks in all environments. For more information about SQL Server storage configuration, please refer to [Microsoft SQL Server on Alibaba Cloud](#)

Directory	Disk type
data files	SSD cloud disks
log files	SSD cloud disks
backup files	Ultra cloud disks

For SAP MaxDB Server, we recommend using SSD Cloud Disks in all environments. For more information about MaxDB Server storage configuration, please refer to [SAP MaxDB Deployment Guide on Alibaba Cloud](#)

Directory	Disk type
data files	SSD cloud disks
log files	SSD cloud disks
backup storage	Ultra cloud disks

Security Setting

You can set the authentication method based on the operating system.

Operating system	Authentication method
Linux	SSH key pairs or password

- You have two choices: Set authentication method now or later.
- If you want to set the authentication method later, after the instance is created, reset the password or bind an SSH key pair in the ECS console.

Purchase Plan

- **Subscription Type:** If you are creating an ECS instance of the Subscription billing method, you have to set **Subscription Type** to either **1 Month** or **1 Year**. If you do not want to manually renew your instance after it expires, select Auto-renew to activate automatic renewal. For more information, see **Auto-renewal** in Purchase Guide.
- **Instance Name:** We recommend that you specify a name for the instance for efficient management.
- **Number of Instances:** You can create up to 10 instance of the Pay-As-You-Go billing method at the same time, but no quota for instances of the Subscription billing method.

Launch instances

- **Overview and cost.** Check the overview and cost information to make sure that the selected configuration details are correct.
- Click either **Add to Cart** (if you decide to continue shopping) or **Buy Now** (if you want to confirm the purchase).
- On the **Confirm Order** page, confirm the order information, and then,
- For an instance of the Subscription billing method, click **Place Order**, make payment, and then activate the instance.
- For an instance of the Pay-As-You-Go billing method, click **Activate**, and then activate the instance.

When the instance is activated, you can go to the ECS console to check the instance details, such as the instance name, Internet IP address, and private IP address for VPC network.

Instance post-configuration

Add a DNAT entry

You can use the DNAT function to map a public IP to a private IP. Then, the ECS instance with the

specified public IP can provide public services or access over the Internet.

Find the target NAT gateway and click the Configure DNAT link.

If you have already configured a DNAT entry, click the NAT gateway ID, and then click **DNAT Table** in the left-side navigation pane.

Click Create DNAT Entry.

Configure the DNAT entry according to the following information.

Configuration	Description
Public IP	<p>Select a public IP to forward the Internet traffic.</p> <p>Note: You cannot use the IP that is already being used in an SNAT entry.</p>
Private IP	<p>The private IP that you want to map. You can specify the private IP in the following ways:</p> <p>Manually Input: Enter the private IP that you want to map. It must be within the private IP range of the VPC.</p> <p>Auto Fill: Select an ECS instance in the VPC from the list. The private IP of the selected ECS instance is automatically entered in the field.</p> <p>For this tutorial, select Auto Fill.</p>
Port Settings	<p>DNAT supports IP mapping and port mapping. Select a mapping method:</p> <p>All Ports: Select this option to configure IP mapping. Using this method, the ECS instance with the specified private IP can receive any Internet requests using any protocol on any port. This is the same as binding an EIP to it.</p> <p>You do not need to configure the public port, private port, and IP protocol when configuring IP mapping.</p> <p>Specific Port: Select this option to configure port mapping. Using this method, the NAT gateway will forward the received data from [ExternalIp:ExternalPort] using the specified protocol to [InternalIp:InternalPort], and send the response in the same.</p> <p>You must specify the public port, private port,</p>

and IP protocol when configuring port mapping.

For this tutorial, select Specific Port, set the public port and private port to 80, and use the TCP protocol.

Click Confirm.

The status of the added DNAT entry is **Configuring**. Click **Refresh** to refresh the status. When the status is **Available**, the DNAT entry has been successfully added.

DNAT Entry ID	Public IP	Public Port	Protocol Type	Private IP	Private Port	Status	Action
fbb-bp1wmc...	118.111.111.201	80	tcp	192.168.1.1	80	Available	Edit Delete

Add an SNAT entry

When an ECS instance in the specified VSwitch initiates an Internet access request, the NAT gateway will provide it with the Internet proxy service and then the ECS instance can use the specified public IP to access the Internet.

If the ECS instance has no access to the internet by an EIP which is directly assigned to the instance you have to add an SNAT entry to ensure that the SAP Metrics Collector can access the internet by this way.

The SNAT function provides the Internet proxy service for VPC ECS instances that do not have a public IP.

Find the target NAT gateway and click the Configure SNAT link.

If you have already configured an SNAT entry, click the NAT gateway ID, and then click SNAT Table in the left-side navigation pane.

Click Create SNAT entry.

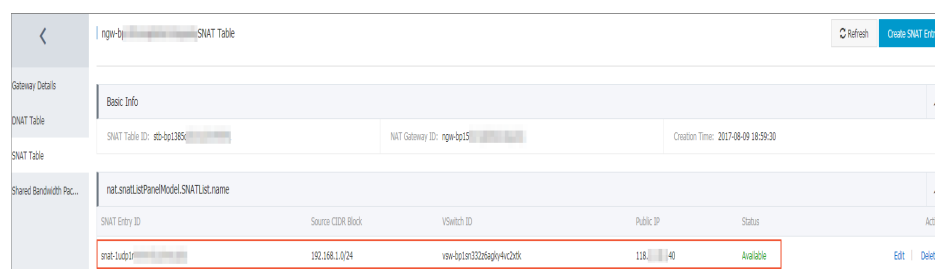
Configure the SNAT entry according to the following information.

Configuration	Description
VSwitch	The VSwitch of the ECS instances that require the Internet access.

	<p>By default, all ECS instances in the specified VSwitch can use the specified public IP to access the Internet.</p> <p>Note: If an ECS instance has already configured a public IP (such as an EIP), the previously configured public IP for the ECS instance is used to access the Internet, rather than using the SNAT proxy service.</p>
VSwitch CIDR Block	Display the CIDR block of the selected VSwitch.
Public IP	<p>The public IP that is used to access the Internet.</p> <p>Note: You cannot use a public IP that has already been added to a DNAT entry.</p>

Click Confirm.

The status of the added SNAT entry is **Configuring**. Click **Refresh** to refresh the status. When the status is **Available**, the SNAT entry has been successfully added.



Connecting to SAP ECS instances

Generally, if you don't use an external IP for SAP ECS instances, you can only connect to the SAP system instances through the bastion instance using SSH.

To connect to SAP systems through the bastion instance, connect to the bastion host and then to the SAP system ECS instance(s) by using an SSH client of your choice.

To install or maintain SAP system via SWPM from your bastion host, you should install bastion host with Windows Operating System. It easy to run SWPM with GUI or browser.

To connect to the SAP HANA database through SAP HANA Studio, use a remote desktop client to connect to the Windows Server instance. After connection, manually install SAP HANA Studio and start accessing your SAP HANA database.

Harden OS security

After you create an instance, for security of your instance, we recommend that you perform security compliance inspection and configuration on:

- Linux instances: See [Harden operating system security for Linux in Security Advisories](#).
- Windows instance: See [Harden operating system security for Windows in Security Advisories](#).

Changing hostname

The default naming of ECS instance is Instance ID, the naming of hosts running SAP software has to be done according to general standards and some SAP specific restrictions, for example, the maximum length of the hostname is up to 13 characters for SAP rel. 4.6 or higher. Please refer to [SAP note 611361 - Hostnames of SAP servers](#) for more details.

For your SAP system on SUSE Linux Server:

```
#vi /etc/HOSTNAME
```

or

```
# echo newhostname > /etc/HOSTNAME
```

For your SAP system on RHEL Linux Server:

```
#vi /etc/hostname
```

or

```
# echo newhostname > /etc/hostname
```

For your SAP system on Windows Server:

- Navigate to the "This PC" screen and click "System properties" .
- Click "Change settings" next to the current computer name.
- Click the "Change" button.
- Enter a new computer name and confirm by clicking "OK" .

This will change hostname permanently.

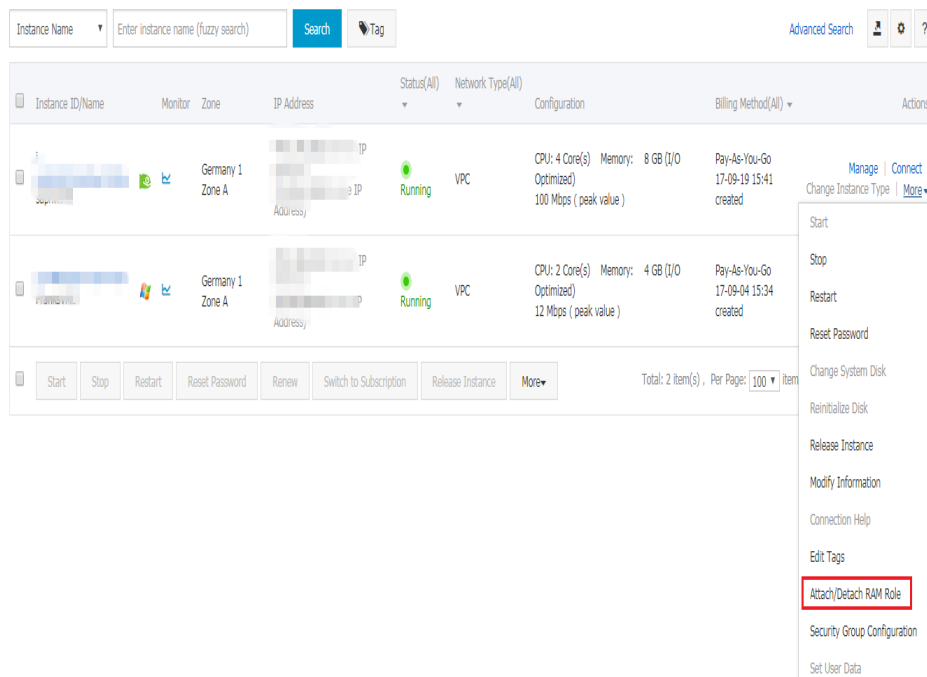
Reboot the server and verify before your SAP installation.

RAM Role configuration

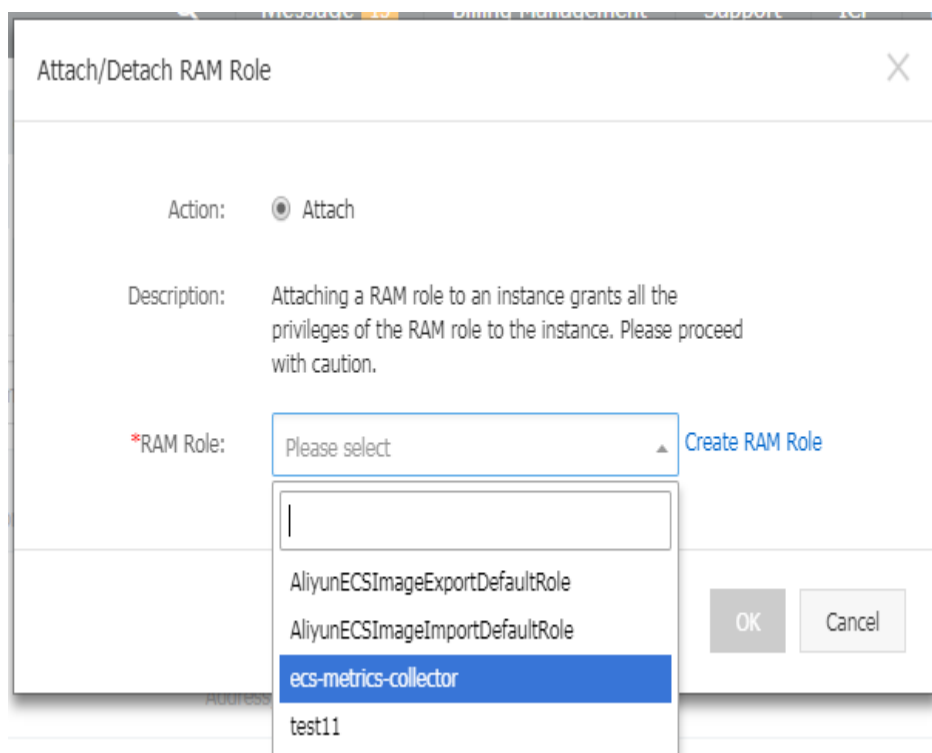
Attach the RAM Service Role you created to your SAP ECS instances.

Open ECS Console, go to tab **Instances** and find your ECS instance

Select **Attach/Detach RAM Role** in the drop down list of **More** actions



Select the RAM service role you created at the beginning.



Click **OK** to attach the role.

For more information about attaching/detaching a RAM Role, please refer to [How to use the instance RAM role on the console](#).

Prepare SAP installation media

You normally obtain the installation media as part of the installation package from SAP. However, you can also download installation media from the SAP Software Distribution Center at <http://support.sap.com/swdc>. There are two main options for copying SAP installation media to ECS instance on Alibaba Cloud:

Download from SAP Service Marketplace to ECS instance on Alibaba Cloud

From your Alibaba Cloud ECS instance, connect to the SAP Service Marketplace and download the required installation media. This option will most likely be the fastest method for getting SAP installation media to Alibaba Cloud, because Alibaba Cloud instances have very fast connections to the Internet. You can create a dedicated Alibaba Cloud OSS volume to store installation media, and then attach the volume to different instances as needed. You can also create a snapshot of the Alibaba Cloud volume and create multiple volumes that you can attach to multiple instances in parallel.

Copy from your network to ECS instance on Alibaba Cloud

If you already have the required SAP installation media downloaded to a location on your network, you can copy the media from your network directly to an Alibaba Cloud ECS instance.

ECS Metrics Collector Installation and Verification

ECS Metrics Collector is the monitoring agent which enables SAP monitoring tools to gather system information from the SAP ECS instances and underlying host environment. For each ECS instance which runs SAP applications, this monitoring agent needs to be installed.



On Linux

Install ECS Metrics Collector

Step 1: Login your SAP ECS instance through a user account with root privileges.

In order to use root privileges, you need to use **sudo**, and your user has to belong to the sudo group.

Step 2: Install ECS Metrics Collector via Cloud Tool (aka Aliyun Assistant) as following:

In case you are using RHEL from marketplace, you need to follow Cloud Assistant Client to install aliyun assistant manually.

```
aliyun_installer --list  
aliyun_installer -i ecs-metrics-collector
```

```
114.55.126.11 - PuTTY
izbp16g18mpr8vgi51v20rZ:/tmp # aliyun_installer --list
package_id  name      version arch  publisher
6           ecs-metrics-collector  0.2   x64   aliyun-inc
7           node        6.11.2 x86    Node.js Foundation
8           ecs-metrics-collector  0.3   x64   aliyun-inc
izbp16g18mpr8vgi51v20rZ:/tmp # aliyun_installer -i ecs-metrics-collector
package_id  name      version arch  publisher
6           ecs-metrics-collector  0.2   x64   aliyun-inc
8           ecs-metrics-collector  0.3   x64   aliyun-inc
Please input the package_id you want to install.
6
The package_id you input is 6.
The package you want to install is ecs-metrics-collector.
Downloading...
Check MD5
Unzip
Installing...
see details in installation log file: /var/log/ecs_metrics_collector/install.log

[DEBUG] prepare_env
[DEBUG] account_check
[DEBUG] distro_check
[DEBUG] init_system_check
[DEBUG] system_restraint_check
[DEBUG] package_check
[DEBUG] python_env_check
[DEBUG] install_collector
[DEBUG] install_watchmen
[DEBUG] install_service

Installation success !
```

Verification the installation of ECS Metrics Collector

Step 3: Verify if the ECS Metrics Collector is installed successfully, by running:

```
systemctl status ecs_metrics_collector
```

Check if the status is "active (running)"

```
ps -aux | grep ecs
```

Check if the corresponding process is running

```

114.55.126.11 - PuTTY
iZbp16gl8mpr8vgi51v20rZ:~ # systemctl status ecs_metrics_collector
● ecs_metrics_collector.service - ECS Metrics Collector for SAP
   Loaded: loaded (/etc/systemd/system/ecs_metrics_collector.service; enabled; vendor preset: disabled)
   Active: active (running) since Fri 2017-09-29 23:30:02 CST; 16min ago
     Process: 8103 ExecStop=/usr/local/sbin/ecs_metrics_collector_watchmen --unset (code=exited, status=0/SUCCESS)
     Process: 8119 ExecStartPost=/usr/local/sbin/ecs_metrics_collector_watchmen --set (code=exited, status=0/SUCCESS)
     Process: 8110 ExecStart=/usr/local/sbin/ecs_metrics_collector -d (code=exited, status=0/SUCCESS)
    Main PID: 8117 (python)
      Tasks: 2 (limit: 512)
    CGroup: /system.slice/ecs_metrics_collector.service
           └─8117 python /usr/local/sbin/ecs_metrics_collector -d

Sep 29 23:30:02 iZbp16gl8mpr8vgi51v20rZ systemd[1]: Starting ECS Metrics Collector for SAP...
Sep 29 23:30:02 iZbp16gl8mpr8vgi51v20rZ systemd[1]: Started ECS Metrics Collector for SAP.
iZbp16gl8mpr8vgi51v20rZ:~ # ps -aux | grep ecs
ecs-sap  8117  0.0  0.3 192440 28128 ?        Sl   23:30   0:00 python /usr/local/sbin/ecs_metrics_collector -d
root     8525  0.0  0.0  9288  1644 pts/1    S+   23:47   0:00 grep --color=auto ecs
iZbp16gl8mpr8vgi51v20rZ:~ #

```

Step 4: Verify safeguarding task and automatic update tasks configured in crontab as following, using command

```
cat /etc/cron.d/ecs_metrics_collector
```

```

iZbp16gl8mpr8vgi51v20rZ:~ # cat /etc/cron.d/ecs_metrics_collector
*/1 * * * * root /usr/local/sbin/ecs_metrics_collector_watchmen --watching >& /dev/null
*/5 * * * * root /usr/local/sbin/ecs_metrics_collector_watchmen --update >& /dev/null
iZbp16gl8mpr8vgi51v20rZ:~ #

```

```
cat /var/log/ecs_metrics_collector/watchmen.log
```

```

iZbp16gl8mpr8vgi51v20rZ:~ # cat /var/log/ecs_metrics_collector/watchmen.log
[Fri Sep 29 23:28:35 CST 2017] [watchmen] [INFO] register watchmen
[Fri Sep 29 23:29:01 CST 2017] [watchmen] [INFO] detect collector running, pid 7890
[Fri Sep 29 23:30:01 CST 2017] [watchmen] [INFO] check_update
[Fri Sep 29 23:30:02 CST 2017] [watchmen] [INFO] unregister watchmen
[Fri Sep 29 23:30:02 CST 2017] [watchmen] [INFO] register watchmen
[Fri Sep 29 23:30:02 CST 2017] [watchmen] [INFO] update ecs-metrics-collector to 0.3
[Fri Sep 29 23:30:03 CST 2017] [watchmen] [INFO] detect collector running, pid 8117
[Fri Sep 29 23:31:01 CST 2017] [watchmen] [INFO] detect collector running, pid 8117

```

These two tasks are automatically added to crontab, during the installation of the ECS Metrics Collector. Automatic Update task automatically checks the latest version of ECS Metrics Collector from Cloud Tool (Aliyun Assistant) server every 5 minutes, and will launch auto-upgrade once there is new version available.

Check the metrics data collected

Step 5: Verify the collected data:

```
curl localhost:8888 | vim -
```

```

118.31.49.76 - PuTTY
Sep 25 17:11:10 iZbp1grz5pkz2z1lqqwntvZ systemd[1]: ecs_metrics_collector.service:
Sep 25 17:11:10 iZbp1grz5pkz2z1lqqwntvZ systemd[1]: Started ECS Metrics Collector
iZbp1grz5pkz2z1lqqwntvZ:~ # curl localhost:8888 | vim -
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left   Speed
100 5541  100 5541    0     0 2701k      0 --:--:-- --:--:-- --:--:-- 5411k
Vim: Reading from stdin...
<?xml version="1.0" encoding="UTF-8"?>
<metrics>
  <metric context="vm" category="config" type="string" unit="none">
    <name>Data Provider Version</name>
    <value>0.1</value>
  </metric>
  <metric context="host" category="config" type="string" unit="none">
    <name>Cloud Provider</name>
    <value>Alibaba Cloud</value>
  </metric>
  <metric context="vm" category="config" type="string" unit="none">
    <name>Instance Type</name>
    <value>None</value>
  </metric>
  <metric context="host" category="config" type="string" unit="none">
    <name>Virtualization Solution</name>
    <value>ECS-Virt</value>
  </metric>
  <metric context="host" category="config" type="string" unit="none">
    <name>Virtualization Solution Version</name>
    <value>2.0</value>
  </metric>

```

Additional operational commands

Following are some operational commands for your reference. In general, these commands are not necessary to be used, unless due to specific maintenance needs. Please refer to SAP NetWeaver Operation Guide on Alibaba Cloud for more details.

- Start ECS Metrics Collector

```
systemctl start ecs_metrics_collector
```

```

iZbp16g18mpr8vgi51v20rZ:~ # systemctl start ecs_metrics_collector
iZbp16g18mpr8vgi51v20rZ:~ # ps -ef |grep ecs
ecs-sap 24632    1  0 15:59 ?        00:00:00 python /usr/local/sbin/ecs_metrics_collector -d
root    24642 24556  0 15:59 pts/0    00:00:00 grep --color=auto ecs
iZbp16g18mpr8vgi51v20rZ:~ #

```


- Stop ECS Metrics Collector

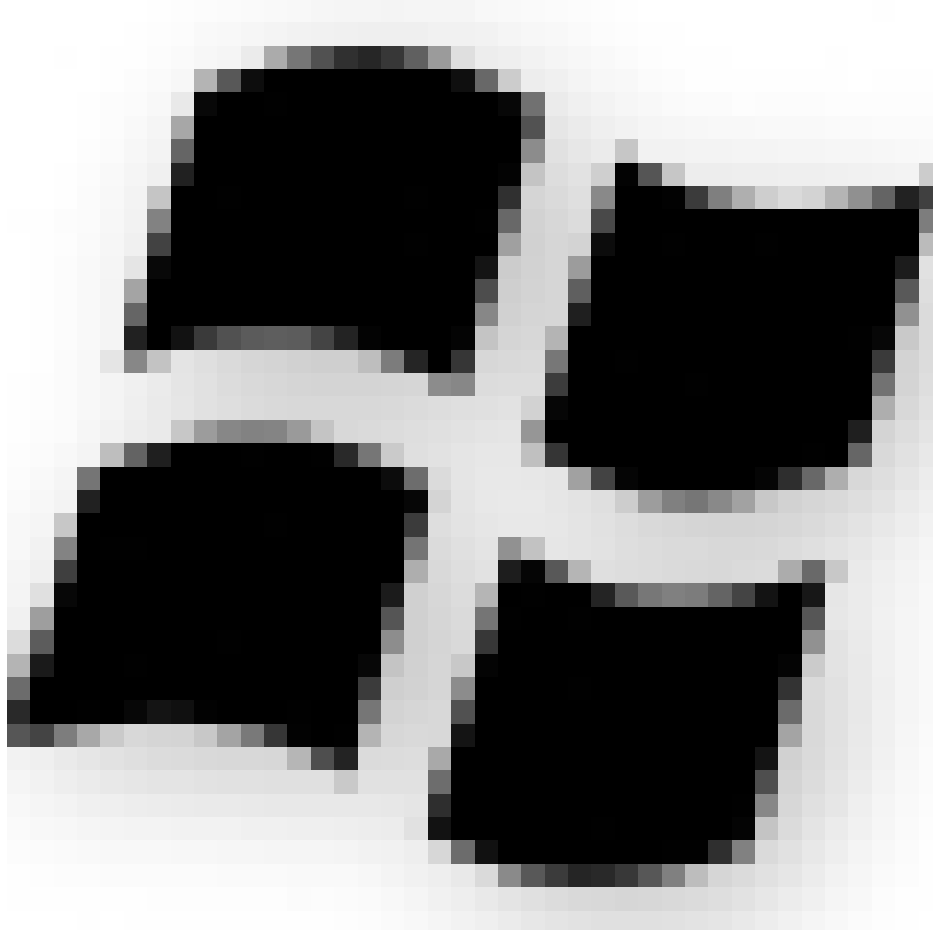
```
systemctl stop ecs_metrics_collector
```

```
izbp16g18mpr8vgi51v20rZ:~ # systemctl stop ecs_metrics_collector  
izbp16g18mpr8vgi51v20rZ:~ # ps -ef |grep ecs  
root      24622 24556  0 15:59 pts/0    00:00:00 grep --color=auto ecs
```

- Uninstall ECS Metrics Collector

```
Aliyun_installer -u ecs-metrics-collector
```

```
izbp13p8rqlgg6uy49h237Z:~ # aliyun_installer -u ecs-metrics-collector  
Uninstalling...  
/etc/cron.d/ecs_metrics_collector not exist  
/etc/init.d/ecs_metrics_collector not exist  
/etc/systemd/system/ecs_metrics_collector not exist  
  
Uninstallation success !
```



On Windows

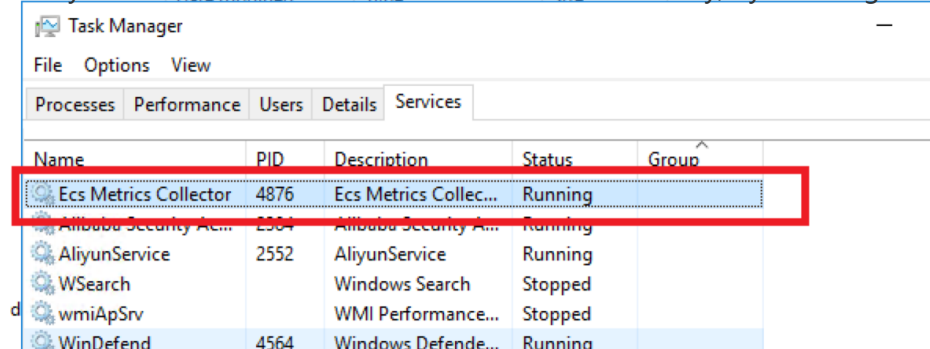
Install ECS Metrics Collector

Run Powershell as Administrator and execute the following:

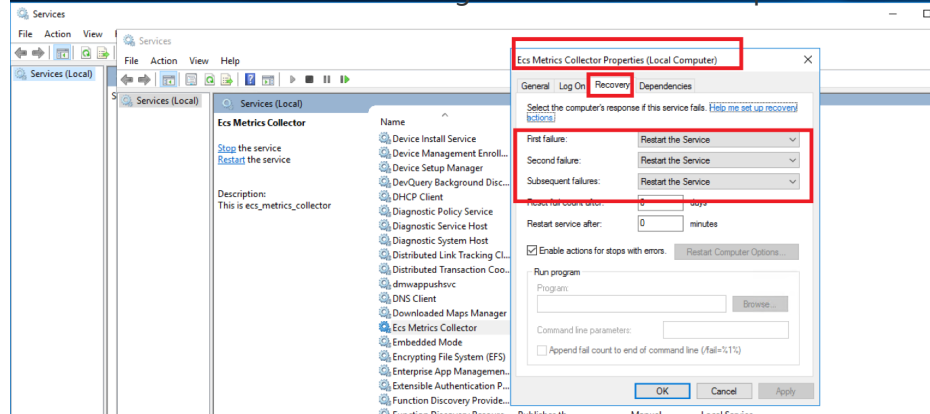
```
$assistPath = Get-ChildItem -Name -Path C:\ProgramData\aliyun\assist -Directory | Sort-Object CreationTime -
Descending | select -First 1
$assistPath = "C:\ProgramData\aliyun\assist\" + $assistPath
Set-Location -Path $assistPath
.\aliyun_installer.exe -i ecs_metrics_collector
```

Verification the installation of ECS Metrics Collector

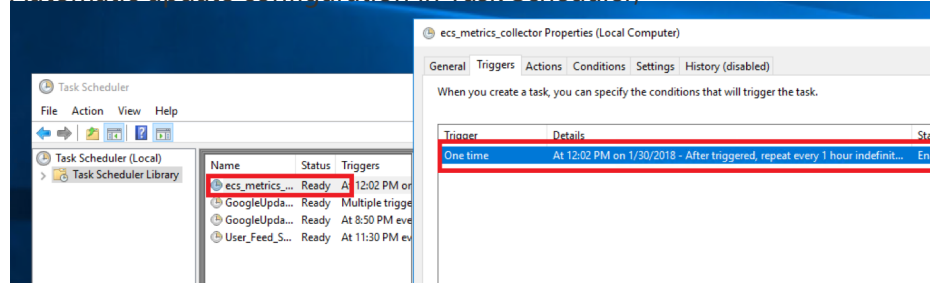
Verify if the ECS Metrics Collector is installed successfully, by checking from task manager as follows:



Verify safeguarding task and automatic update tasks configured in Task Scheduler as following, using commandAutomatic Restart is configured in the Service Properties as follows:



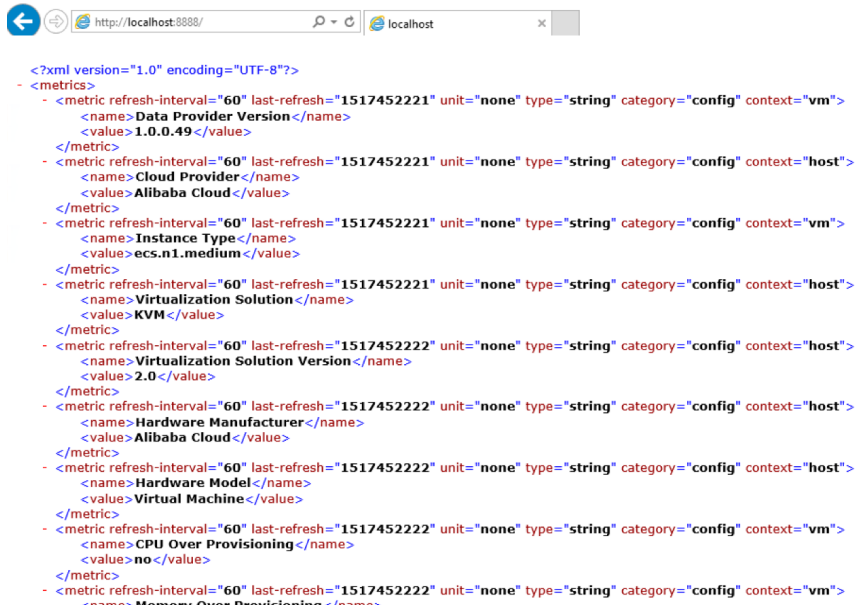
Automatic update configuration in Task Scheduler:



Check the metrics data collected

Verify the collected data:

http://localhost:8888



```
<?xml version="1.0" encoding="UTF-8"?>
<metrics>
  <metric refresh-interval="60" last-refresh="1517452221" unit="none" type="string" category="config" context="vm">
    <name>Data Provider Version</name>
    <value>1.0.0.49</value>
  </metric>
  <metric refresh-interval="60" last-refresh="1517452221" unit="none" type="string" category="config" context="host">
    <name>Cloud Provider</name>
    <value>Alibaba Cloud</value>
  </metric>
  <metric refresh-interval="60" last-refresh="1517452221" unit="none" type="string" category="config" context="vm">
    <name>Instance Type</name>
    <value>ecs.n1.medium</value>
  </metric>
  <metric refresh-interval="60" last-refresh="1517452221" unit="none" type="string" category="config" context="host">
    <name>Virtualization Solution</name>
    <value>KVM</value>
  </metric>
  <metric refresh-interval="60" last-refresh="1517452222" unit="none" type="string" category="config" context="host">
    <name>Virtualization Solution Version</name>
    <value>2.0</value>
  </metric>
  <metric refresh-interval="60" last-refresh="1517452222" unit="none" type="string" category="config" context="host">
    <name>Hardware Manufacturer</name>
    <value>Alibaba Cloud</value>
  </metric>
  <metric refresh-interval="60" last-refresh="1517452222" unit="none" type="string" category="config" context="host">
    <name>Hardware Model</name>
    <value>Virtual Machine</value>
  </metric>
  <metric refresh-interval="60" last-refresh="1517452222" unit="none" type="string" category="config" context="vm">
    <name>CPU Over Provisioning</name>
    <value>no</value>
  </metric>
  <metric refresh-interval="60" last-refresh="1517452222" unit="none" type="string" category="config" context="vm">
    <name>Memory Over Provisioning</name>
    <value>no</value>
  </metric>
</metrics>
```

Additional operational commands

Following are some operational commands for your reference. In general, these commands are not necessary to be used, unless due to specific maintenance needs. Please refer to SAP NetWeaver Operation Guide on Alibaba Cloud for more details.

Manually Start ECS Metrics Collector

Run Powershell as Administrator and add following in the console and execute:

```
net stop "Ecs Metrics Collector"
```

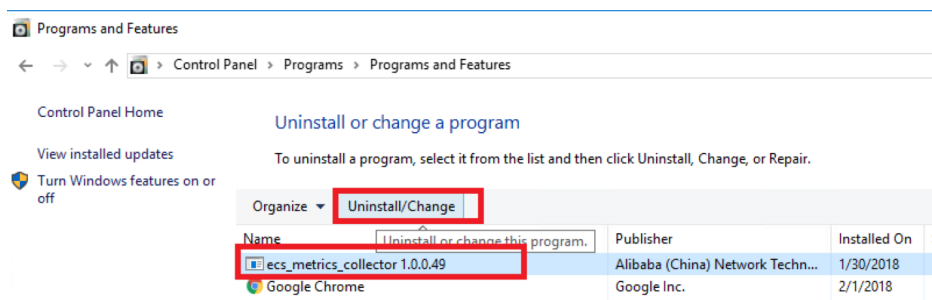
Manually Stop ECS Metrics Collector

Run Powershell as Administrator and add following in the console and execute:

```
net start "Ecs Metrics Collector"
```

Uninstall ECS Metrics Collector

Control Panel -> Programs -> Program and Features -> Uninstall or change a program



Checking the operating system

After launching ECS, consult the relevant SAP notes on installation and ensure that your system includes the software components specified:

- 1310037 - SUSE LINUX Enterprise Server 11: Installation notes
- 1984787 - SUSE LINUX Enterprise Server 12: Installation notes
- 1496410 - Red Hat Enterprise Linux 6.x: Installation and Upgrade
- 2002167 - Red Hat Enterprise Linux 7.x: Installation and Upgrade
- 2325651 - Required Windows Patches for SAP Operations
- 1732161 - SAP Systems on Windows Server 2012 (R2)
- 1054740 - SAP System Installation on Windows Server 2008

Creating operating system image

When you launched your SAP ECS instance and got SAP installation media, you should create a custom image from a snapshot, perform the following:

Log on to the ECS console.

Click **Snapshots** > **Snapshots** in the left navigation bar.

Select your desired region.

Select a snapshot with the disk attribute of **System Disk** and click **Create Custom Image**.

Note: Data disks cannot be used to create custom images.

<div>Elastic Computing Se...</div> <div>Overview</div> <div>Instances</div> <div>Disks</div> <div>Snapshots</div> <div>Snapshots</div> <div>Automatic Snapshot P...</div> <div>Images</div> <div>Security Groups</div> <div>Manage Tags</div> <div>Operation Logs</div>	Create Custom Image									
	<input type="checkbox"/>	tes12	20G	Data Disk	2016-12-27 16:29:48	100%	Success	Disk Rollback Create Custom Image		
	<input type="checkbox"/>	s0r5oi	40G	System Disk	2016-12-21 11:12:08	100%	Success	Disk Rollback Create Custom Image		
	<input type="checkbox"/>	az680	40G	System Disk	2016-12-13 11:07:47	100%	Success	Disk Rollback Create Custom Image		
	<input type="checkbox"/>	9gi3	40G	System Disk	2016-11-25 08:57:49	100%	Success	Disk Rollback Create Custom Image		
	<input type="checkbox"/>		37G	Data Disk	2016-08-05 13:38:07	100%	Success	Disk Rollback Create Custom Image		
	<input type="checkbox"/>		40G	System Disk	2016-03-14 16:00:02	100%	Success	Disk Rollback Create Custom Image		


In the displayed dialog box, you can view the snapshot ID. Enter a name and description for the custom image.

(Optional) Click **Add Data Disk Snapshot** to select multiple snapshots of data disks for the image.

Note: If the snapshot disk capacity is left blank, an empty disk will be created with the default capacity of 5 GB. If you select available snapshots, the disk size is the same as the size of these snapshots.

Create Custom Image

When creating a custom image with Linux system, please do not load data disk information in the `/etc/fstab` file. Otherwise, you cannot launch the instance created through the image.

System Snapshot ID: 

* Image Name:


It must contain 2-128 characters and begin with English letters or Chinese characters. It can include numbers and the characters ".", "_", and "-".

* Image Description:

It must contain 2-256 characters and it cannot begin with `http://` or `https://`

☒ Add Data Disk Snapshot

Snapshot Details:

Snapshot ID	Device Name:	Disk Capacity:	Action
	/dev/xvda	<div></div> GB	Delete
<div>Add</div>			

1. Leaving the snapshot ID blank will create an empty disk. Default capacity: 5 GB, with up to 2,000 GB supported.
 2. If a snapshot ID is selected, the default disk capacity will be the snapshot capacity.
 3. If the device name is blank, it will be randomly allocated.

Create

Cancel

Click **Create**. The custom image is successfully created.

(Optional) To view images you have created, select **Images** in the left navigation bar.

Install the SAP solution

Once you have provisioned and configured the required ECS instance on Alibaba Cloud, you are ready to begin the installation of the SAP solution. Before that, please refer to the following SAP official guides.

System Provisioning Guide

- Check the section of Installation Guides - Application Server Systems > and find **Installing SAP Systems Based on SAP NetWeaver 7.1 and Higher - Using Software Provisioning Manager 1.0** which is appropriate to your database, SAP product release, operating system and technical stack.

More specific installation guides for all supported combinations of technologies (ABAP, Java, or ABAP and Java), databases and operating systems, available at:

<http://support.sap.com/sltoolset>

Start SWPM

The Software Provisioning Manager (SWPM) chooses the disk drive with the most free space as an installation suggestion for each component. Be sure to assign the disks to their proper roles in the SWPM dialog boxes.

You can download the latest SWPM as per the **SAP note 1680045**. You need to verify that you have installed JAVA JDK software on your SAP ECS instance.

Note: When you run SWPM to perform an installation, if you want to connect to the SWPM with the browser, it is required using root user. So the password has to be set for root even if the customer selected to connect with a certificate.

After installation, to secure the system, if required, the customer can disable password login within the ssh configuration.

Upgrade SAP kernel

After you have installed SAP NetWeaver, make sure that you apply the latest kernel as described in the Installation Guide, or update the SAP kernel to the minimum supported patch level.

In addition to that, please also make sure it contains the minimum SAP kernel patch level, as described in the **SAP note 2533233 - Linux on Alibaba Cloud (IaaS): Adaption of your SAP License**.

Check Host Agent version

SAP Host Agent is an agent that can accomplish several life-cycle management tasks, such as operating system monitoring, database monitoring, system instance control and provisioning. Usually SAP Host Agent is automatically started when the operating system is booted. You can also manually control it using the saphostexec program.

You are running SAP in a Linux ECS instance on Alibaba cloud and want to configure Enhanced Monitoring as required by SAP in cloud environments. In addition you should reference **SAP Note**

2564176

The steps to check SAP Host Agent version, please follow below steps to check version:



On Linux

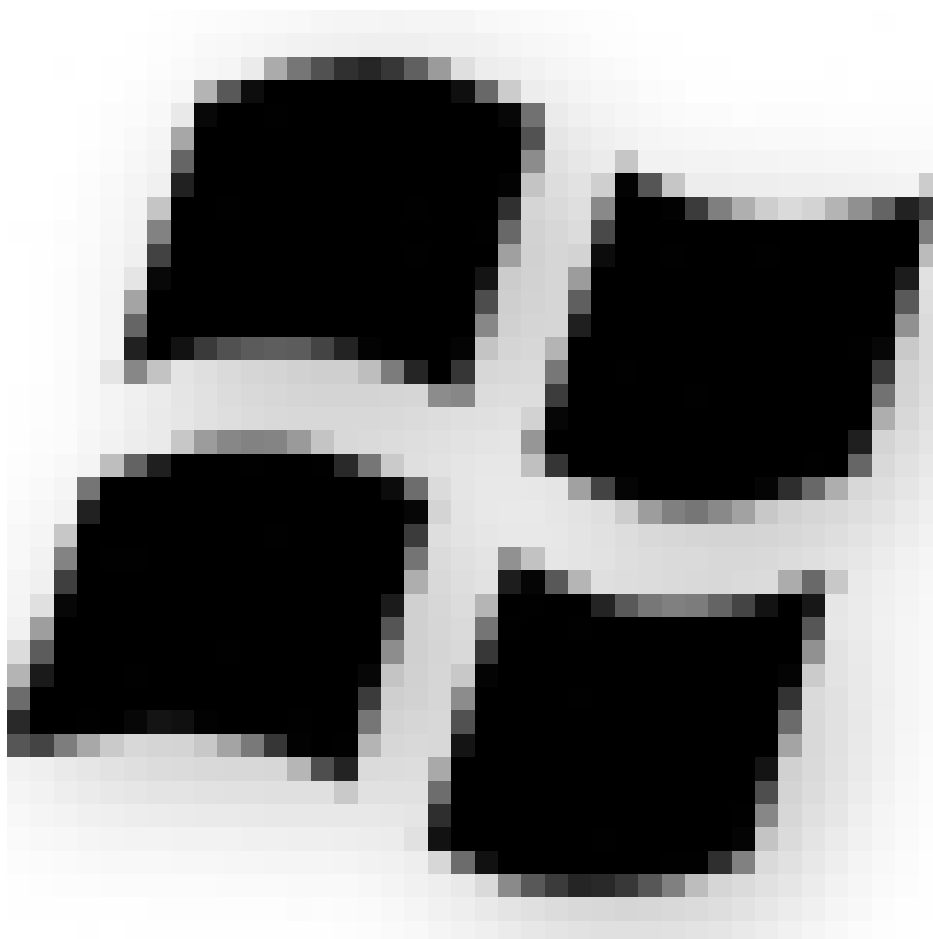
Login as root, since sidadm user doesn' t have permission for executing SAP HOST AGENT commands

navigate to directory where SAP Host Agent is installed

```
cd /usr/sap/hostctrl/exe
```

execute command

```
./saphostexec -version
```

On Windows

- You are logged on as a member of the local Administrator group.
- Open a command-line window.
- Change to the directory where the saphostexec executable of SAP Host Agent is located:

```
cd %ProgramFiles%\SAP\hostctrl\exe
```

- Execute the following command:

```
saphostexec.exe -version
```

The minimum SAP Host Agent version for Enhanced Monitoring is release 7.21 patch level 32. To include Alibaba cloud performance counters in the SAP enhanced monitoring, SAP has enhanced the SAP Host Agent and its monitoring transaction ST06.

For the required SAP NetWeaver support package levels please check SAP Note 1102124.

Upgrade Host Agent

Please ensure that you run at least the minimum SAP Host Agent version required for the Alibaba

Cloud environment. We recommend upgrading SAP Host Agent independently from the SAP instance, either by doing this manually or by configuring automated upgrade.

To update your SAP Host Agent by default on a regular basis, see [SAP Note 1473974 - Using the SAP Host Agent Auto Upgrade Feature](#).

Installation of a scale-out system

In a 3-tier scale-out SAP system, you should deploy several ECS instances as different SAP instances.

ASCS: ABAP Central Services Instance, you can install ASCS on independent ECS instance, containing the enqueue server and the message server. There can only be one such instance in the SAP system, and it can be made into a high availability instance.

SCS: SAP Central Services, for Java systems the Central Services are referred to as SCS.

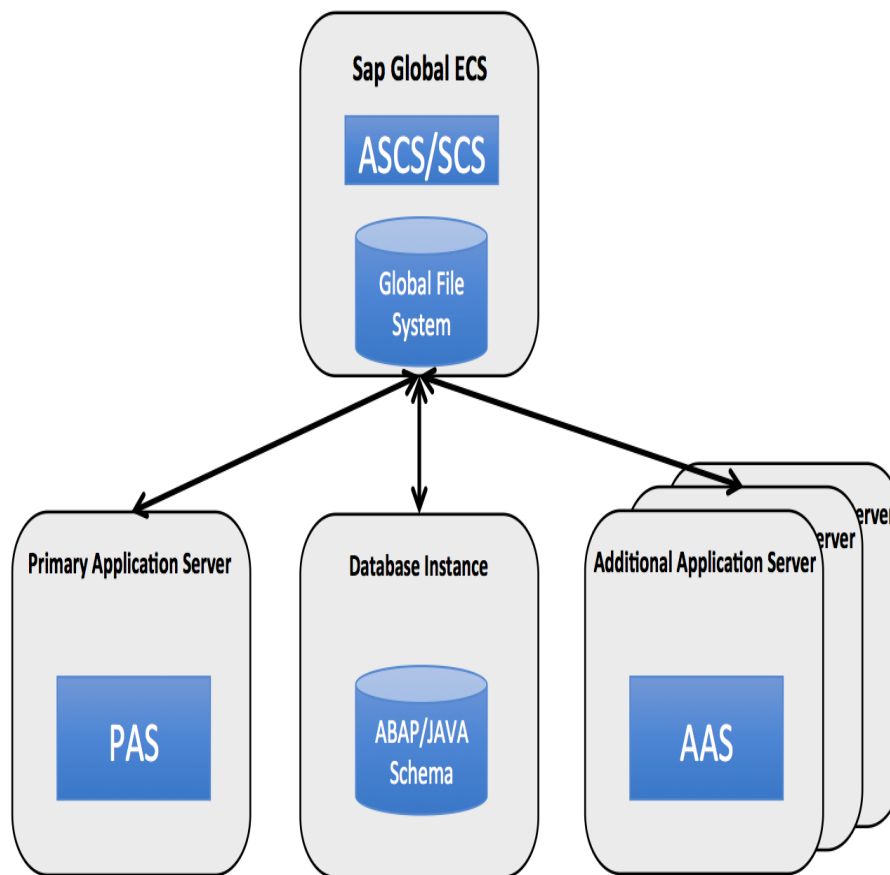
PAS: Primary Application Server Instance, a primary ECS instance that runs the SAP NetWeaver application server (AS), this ECS instance also hosts a shared file-system that contains the shared profile and must be accessible from each ECS instances which run parts of the same SAP SID. If it's also used for the transport share it has to be shared with all SAP SIDs using the same transport directories.

You also can install ASCS or SCS on this primary ECS instance.

AAS: Additional Application Server Instances, some number of additional VMs that run the AS, for scaling purposes.

DB Instance: An ECS instance that is dedicated to the central database.

Everything needs to run in the same zone.



The primary steps are as follows:

- DB instance: Create the ECS instance that hosts the database and then install the database instance.
- PAS :
 - Run SWPM on the ECS instance that you want to run SAP NetWeaver.
 - Install central services, ASCS or SCS.
 - Install the AS ABAP or AS JAVA.
 - Connect to the existing database instance.
- AAS:
 - Run SWPM on each additional ECS instances that you want to run SAP NetWeaver.
 - Install the AAS.
 - Connect to the existing database instance.
 - Point to the network share that contains the profiles and is managed by the primary instance.

Installation of a single-node system

The steps to deploy SAP NetWeaver in a 2-tier configuration on Linux are very similar to the steps for

setting up a 3-tier configuration. In a 2-tier configuration:

- Both SAP NetWeaver and the database instance are installed on a single ECS instance.
- Install the database instance before you install SAP NetWeaver.
- For SAP HANA-based systems, use a different SAP system ID (SID) for the SAP NetWeaver ABAP system than for the SAP HANA system. See [SAP Note 1953429 - SAP HANA and SAP NetWeaver AS ABAP on One Server](#). An installation guide is attached to the note.

Post-installation

Creating SAP instance image

Once you have completed the SAP installation steps, you are suggested to create an image of the ECS instance to save all the installation works you did. Please refer to the following steps to create a custom SAP instance image.

1. Log on to the ECS console.
2. Click **Instances** on the left navigation pane.
3. Select region.
4. Select your SAP ECS instance, and then choose **More > Create Custom Image**.
5. Enter the name and description.
6. Click **Create**.

Create Custom Image

You can create a complete image template for the current ECS instance, including all its disks. A new snapshot will be taken for each instance disk and can be viewed in the snapshot list. You must wait for the snapshots for each disk to be created before the image can be used. Please be patient.

* Image Name:

2 - 128 characters long. Do not start with a special character or a digit. It can contain the following special characters: ", ", and ".

* Image Description:

It must contain 2-256 characters and it cannot begin with http:// or https://

Create Cancel

SAP System Migration

There are three options for migrating an SAP system to an ECS instance on Alibaba Cloud. You can

use P2V tools, perform an SAP homogeneous or heterogeneous system copy or use Third-Party Tools.

VM Import/Export Tools

For the migration of small SAP systems, we recommend using P2V or V2V tools, which enable you to easily import machine images from your existing environment to ECS instances on Alibaba Cloud. The system status and data of your existing environment will mirror to a virtual disk file, and are uploaded to Alibaba Cloud platform. Make it as a custom mirror, to ensure that ECS instance runs the same application and data as the original physical server.

For additional information, see [P2V migration tools](#) on the Alibaba Cloud website.

Because of hardware key of your SAP system will be changed during migration, so you should implement new SAP license in target system on Alibaba Cloud.

You also need to install the metrics collector manually. For more information, you should refer to section about ECS Metrics Collector installation in this Guide.

SAP Homogeneous and Heterogeneous System Copy

The recommended method for migrating an SAP system to ECS instance on Alibaba Cloud is the standard SAP homogeneous and heterogeneous system copy procedure.

These are the three major steps to migrate an existing SAP system to Alibaba Cloud:

Export

In the source system, stop all SAP application instances before your export your source system. Create the export dump files of the source system by using SWPM.

Transmission

Copy the export dump files or DB backup data to Alibaba Cloud.

Network copy

For SAP systems with export dump files and DB backup data, you can copy the data over the network directly to the target ECS instance on Alibaba Cloud. The transfer time depends on the amount of data, the speed and bandwidth of the network connection. You can load data in parallel to reduce transfer time.

Import

On Alibaba Cloud, install the new SAP system on ECS instance. During the installation of the DB instance, import the files you exported from the source system by using SWPM.

Then, install SAP application instances and do post-installation of SAP System Copy.

Finally, start SAP system and provide SAP services on Alibaba Cloud.

Third-Party Tools

If using an unapproved Third-Party tool or migration method, contact the vendor of the procedure for support. SAP supported system copy methods are described in the [system copy guides](#) and [SAP Notes](#).

After system migration, you should implement new SAP license and install metrics collector manually.

SAP NetWeaver Operation Guide

- ECS Instance Life Cycle Management
 - ECS Instance availability
 - Stopping ECS Instance
 - Starting ECS Instance
- Backup and Restore
 - OSS Backup
 - Disk snapshot
 - SAP NetWeaver System Cloning
 - Customized System Image
 - Moving SAP NetWeaver system across Region and Zone
 - Backup and recovery in non-production environment
 - Backup and recovery in production environment
- Database Operation
 - HANA
 - Windows SQL Server
- Resource Access Management
 - RAM Role of an ECS Instance
- Access Security
 - SSH keys
- ECS Metrics Collector for SAP NetWeaver monitoring and support
 - Linux Platform
 - Lifecycle Management of ECS Metrics Collector

- Status of ECS Metrics Collector
- Restarting ECS Metrics Collector
- Troubleshooting
- Windows Platform
 - Lifecycle Management of ECS Metrics Collector
 - Status of ECS Metrics Collector
 - Restarting ECS Metrics Collector
 - Troubleshooting

Version Control

Version	Revision Date	Types Of Changes	Effective Date
1.0			2017/12/8
1.1	2018/4/17	1.Add windows platform support 2.Update RAM role for ECS data collector	2018/4/17
1.2	2018/6/20	Add Red Hat Enterprise Linux Server support	2018/6/20

ECS Instance Life Cycle Management

This part provides information about how to manage the running state of your ECS instance.

ECS Instance availability

ECS Instance Automatic Recovery is a feature of Alibaba Cloud. It is designed to increase instance availability. If an ECS instance becomes impaired or terminated due to its underlying hardware problem or failure, an identical instance with the same instance ID, private IP address, Elastic IP address and all instance metadata, will be recovered on a different piece of hardware. Users will receive an email during the recovery procedure. Please check more details from [here](#).

Stopping ECS Instance

You can stop one or multiple SAP NetWeaver hosts at any time. Stopping an ECS instance means shutting down the instance, you can do this via ECS Console. See [here](#) for more details. Make sure that you should first stop SAP NetWeaver, before you stop the instance.

Note: The private IP assigned to the ECS instance is not released after you stop the instance, so when

you start the instance again, it will start with the same private IP address, network, and storage configuration as before.

Starting ECS Instance

You can start or restart an ECS instance via ECS Console. Please check **Start an instance** and **Restart an instance** for more details. Please kindly make sure that, you stop the SAP instance before you shut down ECS instance.

Backup and Restore

This part introduces the features of Alibaba Cloud which can help you handle the scenarios that require saving the state of your system.

OSS Backup

Alibaba Cloud Object Storage Service (OSS) is an easy-to-use service that enables you to store, backup and archive large amounts of data in the cloud. OSS acts as an encrypted central repository from where files can be securely accessed from around the globe.

OSS buckets can be used to store your disk snapshot, custom image and system copy.

Disk snapshot

You can create snapshots of a cloud disk attached to the ECS instance at any time to generate a point-in-time copy of the disk state. Snapshots are useful for the following use cases:

1. Changing your Cloud Disk TypeE.g. you want to change the current Cloud Disk type from Ultra Cloud Disk to SSD Cloud Disk;

Moving SAP NetWeaver System from one Region (or Zone) to anotherYou can achieve this by:

- i. Creating a Custom Image including all snapshots of the disks attached to the ECS instance;
- ii. Creating a new ECS instance in another Region or Zone with the Custom Image, in this way, you need to update the SAP license after you moved the NetWeaver.

Back up non-production system with high efficiency and low cost;You can achieve this by creating snapshots of all cloud disks attached to this ECS instance hosing the non-production system.

To obtain a consistent snapshot, you must either stop SAP NetWeaver or stop the database from writing to the file system.

To create a snapshot, you can follow the official guide [Creating Snapshots from Alibaba Cloud website](#).

SAP NetWeaver System Cloning

To clone your SAP NetWeaver system on Alibaba Cloud, please kindly follow the standard SAP export-import procedure:

1. Use the Software Provisioning Manager (SWPM) to export the source system.
2. Copy the data from the system and database export to your Alibaba Cloud OSS Bucket;
3. Copy the exported data from OSS Bucket to your target ECS instance;
4. Use SWPM to create a new, target system and to import the data that you exported from the source system.

Customized System Image

To capture the state of the system disk attached to your ECS instance, you can create a custom image. An image is different from a backup. Image can be used to create new ECS instances, but backup cannot. Unless you use the backup of system disk to create a custom image, then use this custom image to create ECS instances.

You should have created one or more images at the end of the deployment steps. However, you might want to create new images after you make important changes to the system, such as installing an update of SAP NetWeaver binaries or upgrading the SAP NetWeaver version.

Please check the following documents to learn more about images

- [Create a custom image by using an instance](#)
- [Create a custom image by using a snapshot](#)
- [Delete a custom image](#)

Moving SAP NetWeaver system across Region and Zone

In some cases, you may want to move your SAP NetWeaver system from one Region (or Zone) to another. You can achieve this by taking a custom image (including snapshot) of the whole ECS instance hosting the SAP NetWeaver system in the source Region (or Zone) and create a new ECS instance through the custom image.

You can create Custom Image from ECS Console as follows:

The screenshot shows the Alibaba Cloud ECS console interface. The left sidebar contains navigation options like Overview, Instances, Block Storage, Cloud Disks, Snapshots & Images, and Networks & Security. The main area displays a table of ECS instances. The first instance, 'i-gw8e0r4vt4uc8u3lmmnd', is highlighted with a red box. A 'More' button next to it is also highlighted with a red box. The 'More' dropdown menu is open, showing various actions like Start, Stop, Restart, Reset Password, Buy the Same Configuration, Change System Disk, Reinitialize Disk, Release Instance, Modify Information, Connection Help, Edit Tags, Scheduled migrations to VPC, Attach/Detach RAM Role, Change bandwidth, Security Group Configuration, Bind Elastic IP address, Set User Data, and Create Custom Image. The 'Create Custom Image' option at the bottom of the menu is highlighted with a red box.

Instance ID/Name	Monitor	Zone	IP Address	Status(All)	Network Type(All)	Configuration	Billing Method(All)	Actions
i-gw8e0r4vt4uc8u3lmmnd bar.2.disk		EU Central 1 Zone A	192.168.0.25 (Private IP Address)	Running	VPC	CPU: 4 Core(s) Memory: 16 GB (I/O Optimized)	Pay-As-You-Go 17-11-16 12:06 created	Manage Change Instance Type Start Stop Restart Reset Password Buy the Same Configuration Change System Disk Reinitialize Disk Release Instance Modify Information Connection Help Edit Tags Scheduled migrations to VPC Attach/Detach RAM Role Change bandwidth Security Group Configuration Bind Elastic IP address Set User Data Create Custom Image
i-gw8g2h2gaas3f7u7zdu src.2.disk		EU Central 1 Zone A	192.168.0.24 (Private IP Address)	Running	VPC	CPU: 2 Core(s) Memory: 4 GB (I/O Optimized)	Pay-As-You-Go 17-11-16 11:34 created	
i-gw8e0r4vt4uc8u3lmmnd test.source		EU Central 1 Zone A	192.168.0.23 (Private IP Address)	Running	VPC	CPU: 2 Core(s) Memory: 4 GB (I/O Optimized)	Pay-As-You-Go 17-11-16 11:06 created	
i-gw8g2h2gaas4aakmcw4 metrics.collector		EU Central 1 Zone A	192.168.0.22 (Private IP Address)	Running	VPC	CPU: 4 Core(s) Memory: 8 GB (I/O Optimized)	Pay-As-You-Go 17-11-16 10:07 created	
i-gw8e0r4vt4uc8u3lmmnd External		EU Central 1 Zone A	47.91.93.113 (Elastic IP Address) 192.168.0.19 (Private IP Address)	Running	VPC	CPU: 2 Core(s) Memory: 4 GB (I/O Optimized) 5 Mbps (peak value)	Pay-As-You-Go 17-11-15 19:40 created	Manage

Fill in all the information, and take note of the highlight part (a snapshot of disk will be created as well) as follows:

Create Custom Image



When you create an image, a snapshot will be created as well. Because the snapshot service is now a paid service, your images will incur snapshot fees.

When creating a custom image with Linux system, please do not load data disk information in the `/etc/fstab` file. Otherwise, you cannot launch the instance created through the image.

You can create a complete image template for the current ECS instance, including all its disks. A new snapshot will be taken for each instance disk and can be viewed in the snapshot list. You must wait for the snapshots for each disk to be created before the image can be used. Please be patient.

* Image Name:

tst.for.sys.copy

2 - 128 characters long. Do not start with a special character or a digit. It can contain the following special characters: " ", "_", and ".".

* Image Description:

tst.for.sys.copy

It must contain 2-256 characters and it cannot begin with `http://` or `https://`

Create

Cancel

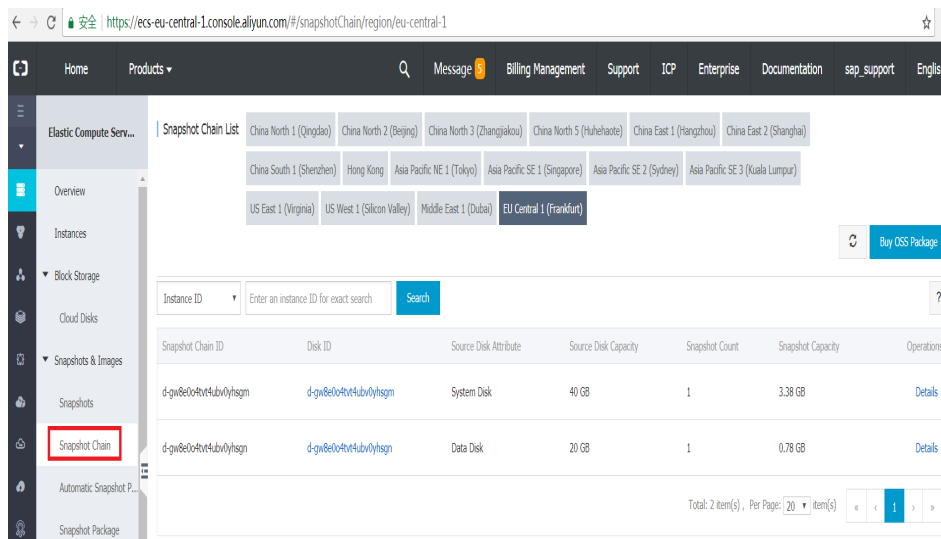
When the Custom Image is created, you can find following on the ECS console:

Custom Image:

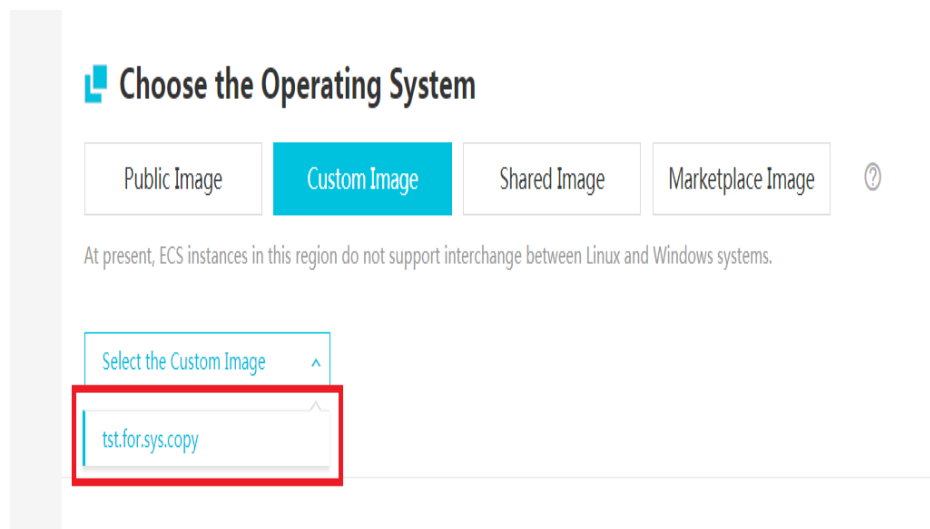
The screenshot shows the ECS console interface. The left sidebar has a menu with 'Images' highlighted. The main content area shows the 'Image List' for the 'EU Central 1 (Frankfurt)' region. A table lists the custom images, with one image 'tst.for.sys.copy' (Image ID: m-gw8elo7v4kuz2t1s2) shown as a 'Custom Image' with status 'Available' and 100% progress. The 'Images' tab is selected in the top navigation bar.

Image ID/Name	Image Type	Platform	System Bit	Creation Time	Status	Progress	Actions
m-gw8elo7v4kuz2t1s2 tst.for.sys.copy	Custom Image	SUSE	64bit	2017-11-16 11:53:37	Available	100%	Modify Image Description Related Instances Share Image Export Image

Snapshot of all related disks:



After creating a Custom Image, you can easily create a copy of an SAP NetWeaver System from one ECS instance on another by launching a new ECS instance through the Custom Image as follows:



Please check the section “Create and configure an instance” in SAP NetWeaver Implementation Guide on Alibaba Cloud for more detailed steps

You can keep the same hostname in the new Region (or Zone), if it isn't in use yet. However, please be kindly noticed that, after you moving the ECS instance from one zone to another, the ECS instance ID will be changed. This means the SAP hardware key is changed, and you have to import a new SAP license accordingly.

Backup and recovery in non-production environment

Cloud Disk Snapshot offers simple and low cost backup service, which can be leveraged to reach requirements of non-production system. It has a very flexible snapshot policy, for example, a user can take snapshots on the hour and for several times in a day, a user can choose any day as the recurring

day for taking weekly snapshots, and a user can specify the snapshot retention period or choose to retain it permanently. Please be noticed that when the maximum number of automatic snapshots has been reached, the oldest automatic snapshot will be deleted. For more information about Cloud Disk Snapshot, please refer Alibaba Cloud website.

Snapshots can be used to manually restore a whole HANA or Microsoft SQL Server ECS instance of non-production system.

Backup and recovery in production environment

For production system, you should leverage the database backup and recovery functions.

Database Operation

This part provides general information for managing SAP HANA on Alibaba Cloud.

HANA

For complete information about running SAP HANA on Alibaba Cloud, please kindly check the SAP HANA on Alibaba Cloud Operations Guide. That guide provides you with detailed information covering administration, backup and recovery, security, networking, and other topics.

Windows SQL Server

For more information about running Microsoft SQL Server on Alibaba Cloud, please kindly refer to best practice for running Microsoft SQL Server on Alibaba Cloud.

Resource Access Management

Controlling access to computing resources on Alibaba Cloud is a critical part of securing and operating your SAP system deployment. Although SAP provides its own user-management system, Alibaba Cloud Resource Access Management (RAM) service provides unified access control over computing resources on Alibaba Cloud.

From time to time, you may need to add or remove team members or change their access permission level at different phases of an SAP project. You can manage access control by defining who has which access to resources. For example, you can control who can perform Alibaba Cloud Console operations on your SAP instances such as creating and modifying ECS instances, VPC settings etc.

For more details about RAM, please see [here](#).

RAM Role of an ECS Instance

The RAM (Resource Access Management) role of an ECS instance, hereinafter referred to as instance RAM role, grants permissions to the ECS instance by assuming an authorized role.

By associating a RAM role to the ECS instance, you can access other cloud services by the temporary STS (Security Token Service) credential from the applications within your ECS instance. This feature guarantees the security of your AccessKey and supports delicacy permission control and management in virtue of the RAM. For more details, please kindly check [here](#).

Access Security

SSH keys

Alibaba Cloud offers SSH key pair login, which only applies to Linux instances. If you are running Linux, it is recommended that you choose this authentication method to protect your ECS instance's security.

An SSH key pair is a pair of keys generated through an encryption algorithm: one key is intentionally available, known as the public key, and the other key is kept confidential, known as the private key.

If you have placed the public key in a Linux instance, you can use the private key to log on to the instance using SSH commands or related tools from a local computer or another instance, without the need to enter a password. For more details about SSH Keys, please kindly check [here](#).

ECS Metrics Collector for SAP NetWeaver monitoring and support

The SAP application in a cloud environment runs on a guest operating system (Guest OS) installed inside the virtual environment. SAP Host Agent collects all information required for SAP monitoring and provides it to the SAP NetWeaver local monitoring and Solution Manager to analyze and display. Customer or SAP Technical Support can access the SAP tool through SAP transaction code ST06.

In addition to that, Alibaba Cloud and SAP have worked together to create a monitoring agent – ECS Metrics Collector, for SAP NetWeaver running on Alibaba Cloud. ECS Metrics Collector is responsible for gathering information about configuration and resource (CPU \ Memory \ Disk \ Network) utilization from the underlying Alibaba Cloud infrastructure and virtualization platform, and feeding them to SAP Host Agent.

Note: You must deploy ECS Metrics Collector on your SAP ECS instance so that you can get support from SAP and enable SAP to meet its service-level agreements (SLAs).

- Linux Platform

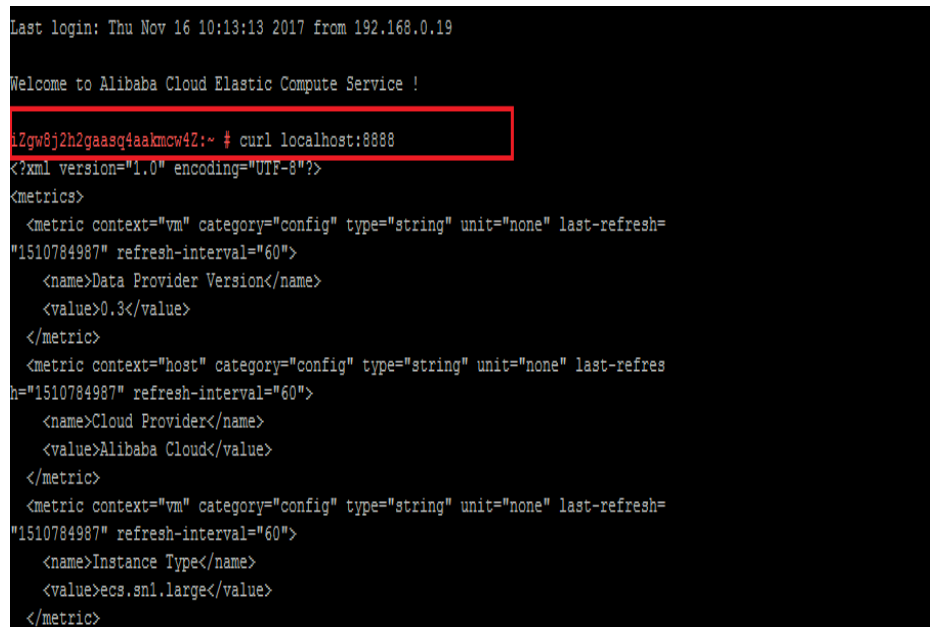
Lifecycle Management of ECS Metrics Collector

Metrics Collector is a local agent that collects metrics, events, and metadata of the hosting ECS instance in Alibaba Cloud, and this monitoring agent runs as a Linux process. Each ECS instance in your SAP NetWeaver deployment must have an ECS Metrics Collector agent.

The collected data mainly comes from the metadata server and open API of ECS. SAP Host Agent polls this monitoring agent for its cached data over HTTP service. It aggregates the metrics, reports them, and stores them in the SAP NetWeaver database. And finally, SAP's transaction ST06 or the SAPOSCOL command line interface displays the aggregated metrics.

You can directly view the data from OS level by running some specific commands as follows:

`curl localhost:8888`



```
Last login: Thu Nov 16 10:13:13 2017 from 192.168.0.19

Welcome to Alibaba Cloud Elastic Compute Service !

i2gw8j2h2gaasq4aakmcw4Z:~ # curl localhost:8888
<?xml version="1.0" encoding="UTF-8"?>
<metrics>
  <metric context="vm" category="config" type="string" unit="none" last-refresh="1510784987" refresh-interval="60">
    <name>Data Provider Version</name>
    <value>0.3</value>
  </metric>
  <metric context="host" category="config" type="string" unit="none" last-refresh="1510784987" refresh-interval="60">
    <name>Cloud Provider</name>
    <value>Alibaba Cloud</value>
  </metric>
  <metric context="vm" category="config" type="string" unit="none" last-refresh="1510784987" refresh-interval="60">
    <name>Instance Type</name>
    <value>ecs.sn1.large</value>
  </metric>
```

When you install the monitoring agent, the start-up script completes the following tasks:

- Install ECS Metrics Collector
- Add monitoring task (monitoring ecs-metrics-collector) to cron.d task list
- Start ecs-metrics-collector process

```

[10:14:00] [The Nov 16 10:14:00 CST 2017] execute command 'cat install.log'
[DEB00] [The Nov 16 10:14:00 CST 2017] execute command 'groupadd ecs-sap'
[DEB00] [The Nov 16 10:14:00 CST 2017] execute command 'useradd -r -s /bin/bash -g ecs-sap -s /bin/hologain'
[DEB00] [The Nov 16 10:14:00 CST 2017] execute command 'systemctl start ecs-sap'
[DEB00] [The Nov 16 10:14:00 CST 2017] execute command 'chown ecs-sap:ecs-sap /var/log/ecs_metrics_collector'
[DEB00] [The Nov 16 10:14:00 CST 2017] detect system distro is 'sles'
[DEB00] [The Nov 16 10:14:00 CST 2017] detect init system is 'systemd'
[DEB00] [The Nov 16 10:14:00 CST 2017] detect system default python version: 2
[DEB00] [The Nov 16 10:14:00 CST 2017] execute command 'pip2 install -r /home/.local/share/data/Aliyun/assist/ecs-metrics-collector-0.2-release/requirements-py2.txt'
Collecting aliyun-python-sdk-core==2.3.5 (from -r /home/.local/share/data/Aliyun/assist/ecs-metrics-collector-0.2-release/requirements-py2.txt (line 1))
  Downloading http://mirrors.aliyun.com/pypi/packages/d/5a/54e4a8d71a92b2cd371a1235b646753721d5ae6377b2f4b20c6f73/aliyun-python-sdk-core-2.3.5.tar.gz
Collecting aliyun-python-sdk-ecs==4.0.0 (from -r /home/.local/share/data/Aliyun/assist/ecs-metrics-collector-0.2-release/requirements-py2.txt (line 2))
  Downloading http://mirrors.aliyun.com/pypi/packages/c/e/e/1aee8785146705f0f2c632a813b0467846d6f9410c4f3ba7f0d487/aliyun-python-sdk-ecs-4.0.0.tar.gz
Requirement already satisfied: requests in /usr/lib/python2.7/site-packages (from -r /home/.local/share/data/Aliyun/assist/ecs-metrics-collector-0.2-release/requirements-py2.txt (line 3))
Requirement already satisfied: six in /usr/lib/python2.7/site-packages (from -r /home/.local/share/data/Aliyun/assist/ecs-metrics-collector-0.2-release/requirements-py2.txt (line 4))
Collecting pytz (from -r /home/.local/share/data/Aliyun/assist/ecs-metrics-collector-0.2-release/requirements-py2.txt (line 5))
  Downloading http://mirrors.aliyun.com/pypi/packages/a/3/76/6f1adcb03b291364f4b182af3c3653717193a26c1de09ad1ef29/pytz-2017.3-py2.py3-none-any.whl (511kB)
Requirement already satisfied: idna<2.7,>=2.5 in /usr/lib/python2.7/site-packages (from requests->-r /home/.local/share/data/Aliyun/assist/ecs-metrics-collector-0.2-release/requirements-py2.txt (line 3))
Requirement already satisfied: urllib3<3.9,>=1.21.1 in /usr/lib/python2.7/site-packages (from requests->-r /home/.local/share/data/Aliyun/assist/ecs-metrics-collector-0.2-release/requirements-py2.txt (line 3))
Requirement already satisfied: certifi>2017.4.7 in /usr/lib/python2.7/site-packages (from requests->-r /home/.local/share/data/Aliyun/assist/ecs-metrics-collector-0.2-release/requirements-py2.txt (line 3))
Requirement already satisfied: chardet<3.1.0,>=3.0.2 in /usr/lib/python2.7/site-packages (from requests->-r /home/.local/share/data/Aliyun/assist/ecs-metrics-collector-0.2-release/requirements-py2.txt (line 3))
Building wheels for collected packages: aliyun-python-sdk-core, aliyun-python-sdk-ecs
Running setup.py bdist_wheel for aliyun-python-sdk-core: started
Running setup.py bdist_wheel for aliyun-python-sdk-core: finished with status 'done'
Stored in directory: /root/.cache/pip/wheels/bb/02/8f/d0ba0dc784911d6e3384949281f0b03cf7359444f55a2
Running setup.py bdist_wheel for aliyun-python-sdk-ecs: started
Running setup.py bdist_wheel for aliyun-python-sdk-ecs: finished with status 'done'
Stored in directory: /root/.cache/pip/wheels/44/79/30/e59c14cf2f2b310e914b4f0b1087bf0f1655deaf632437
Successfully built aliyun-python-sdk-core aliyun-python-sdk-ecs
Installing collected packages: aliyun-python-sdk-core, aliyun-python-sdk-ecs, pytz
Successfully installed aliyun-python-sdk-core-4.0.0 aliyun-python-sdk-ecs-4.0.0 pytz-2017.3
[DEB00] [The Nov 16 10:14:00 CST 2017] execute command 'cp /home/.local/share/data/Aliyun/assist/ecs-metrics-collector-0.2-release/src/ecs_metrics_collector.py /usr/local/sbin/ecs_metrics_collector'
[DEB00] [The Nov 16 10:14:00 CST 2017] execute command 'chmod +x /usr/local/sbin/ecs_metrics_collector'
[DEB00] [The Nov 16 10:14:00 CST 2017] execute command 'cp /home/.local/share/data/Aliyun/assist/ecs-metrics-collector-0.2-release/crontab/ecs_metrics_collector_watchmen /usr/local/sbin/ecs_metrics_collector_watchmen'
[DEB00] [The Nov 16 10:14:00 CST 2017] execute command 'chmod +x /usr/local/sbin/ecs_metrics_collector_watchmen'
[DEB00] [The Nov 16 10:14:00 CST 2017] execute command 'cp /home/.local/share/data/Aliyun/assist/ecs-metrics-collector-0.2-release/service/ecs_metrics_collector.service /etc/systemd/system/ecs_metrics_collector.service'
[DEB00] [The Nov 16 10:14:00 CST 2017] you first install ecs_metrics_collector.service
[DEB00] [The Nov 16 10:14:00 CST 2017] execute command 'systemctl enable ecs_metrics_collector.service'
[DEB00] [The Nov 16 10:14:00 CST 2017] execute command 'systemctl start ecs_metrics_collector.service'
[DEB00] [The Nov 16 10:14:00 CST 2017] execute command 'systemctl status ecs_metrics_collector.service'
[DEB00] [The Nov 16 10:14:00 CST 2017] execute command 'systemctl status ecs_metrics_collector.service'
* ecs_metrics_collector.service - ECS Metrics Collector for SAP
   loaded: loaded (/etc/systemd/system/ecs_metrics_collector.service; enabled; vendor preset: disabled)
   Active: active (running) since Thu 2017-11-16 10:14:00 CST; 5ms ago
   Process: 7853 ExecStartPost=/usr/local/sbin/ecs_metrics_collector_watchmen --set (code=exited, status=0/SUCCESS)
   Process: 7843 ExecStart=/usr/local/sbin/ecs_metrics_collector -d (code=exited, status=0/SUCCESS)
   Main PID: 7851 (python)
   Tasks: 0 (limit: 32)
   CGroup: /system.slice/ecs_metrics_collector.service
           └─7851 python /usr/local/sbin/ecs_metrics_collector -d

Nov 16 10:14:00 i1gw6i2hpaasq4aakmow1 systemd[1]: Starting ECS Metrics Collector for SAP...
Nov 16 10:14:00 i1gw6i2hpaasq4aakmow1 systemd[1]: Started ECS Metrics Collector for SAP.
[DEB00] [The Nov 16 10:14:00 CST 2017] installation success
[DEB00] [The Nov 16 10:15:01 CST 2017] execute command 'chown ecs-sap:ecs-sap /var/log/ecs_metrics_collector'
[DEB00] [The Nov 16 10:15:01 CST 2017] detect system distro is 'sles'
[DEB00] [The Nov 16 10:15:01 CST 2017] detect init system is 'systemd'

```

ECS Metrics Collector must be installed manually by users though Cloud Tool (Aliyun Assistant) of Alibaba Cloud during SAP NetWeaver deployment. For detailed steps, please refer to [SAP NetWeaver Implementation Guide on Alibaba Cloud](#)

ECS Metrics Collector will be automatically started right after the installation. The setting of automatic upgrade will be configured by the installation job. With this setting, ECS Metrics Collector will automatically upgrade to the latest version as long as there is one.

Meanwhile, there are crontab tasks defined for monitoring the status of ECS Metrics Collector. It will be restarted right away in case it crashed.

Status of ECS Metrics Collector

On Linux, you can check the status of the ECS Metrics Collector on operating system level.

You can use the following commands:

```
systemctl status ecs_metrics_collector
```



```

114.55.126.11 - PuTTY
iZbp16g18mpr8vgi51v20rZ:~ # systemctl status ecs_metrics_collector
● ecs_metrics_collector.service - ECS Metrics Collector for SAP
   Loaded: loaded (/etc/systemd/system/ecs_metrics_collector.service; enabled; vendor preset: disabled)
   Active: active (running) since Fri 2017-09-29 23:30:02 CST; 16min ago
     Process: 8103 ExecStop=/usr/local/sbin/ecs_metrics_collector_watchmen --unset (code=exited, status=0/SUCCESS)
     Process: 8119 ExecStartPost=/usr/local/sbin/ecs_metrics_collector_watchmen --set (code=exited, status=0/SUCCESS)
     Process: 8110 ExecStart=/usr/local/sbin/ecs_metrics_collector -d (code=exited, status=0/SUCCESS)
   Main PID: 8117 (python)
     Tasks: 2 (limit: 512)
   CGroup: /system.slice/ecs_metrics_collector.service
           └─8117 python /usr/local/sbin/ecs_metrics_collector -d

Sep 29 23:30:02 iZbp16g18mpr8vgi51v20rZ systemd[1]: Starting ECS Metrics Collector for SAP...
Sep 29 23:30:02 iZbp16g18mpr8vgi51v20rZ systemd[1]: Started ECS Metrics Collector for SAP.
iZbp16g18mpr8vgi51v20rZ:~ # ps -aux | grep ecs
ecs-sap  8117  0.0  0.3 192440 28128 ?        Sl   23:30   0:00 python /usr/local/sbin/ecs_metrics_collector -d
root     8525  0.0  0.0   9288  1644 pts/1    S+   23:47   0:00 grep --color=auto ecs
iZbp16g18mpr8vgi51v20rZ:~ #

```

Restarting ECS Metrics Collector

In some special case, you may need to manually restart ECS Metrics Collector.

You can use the following commands:

Stop:

```
systemctl stop ecs_metrics_collector
```

```

iZbp16g18mpr8vgi51v20rZ:~ # systemctl stop ecs_metrics_collector
iZbp16g18mpr8vgi51v20rZ:~ # ps -ef |grep ecs
root      24622 24556  0 15:59 pts/0      00:00:00 grep --color=auto ecs

```

Start:

```
systemctl start ecs_metrics_collector
```

```

iZbp16g18mpr8vgi51v20rZ:~ # systemctl start ecs_metrics_collector
iZbp16g18mpr8vgi51v20rZ:~ # ps -ef |grep ecs
ecs-sap  24632  1  0 15:59 ?          00:00:00 python /usr/local/sbin/ecs_metrics_collector -d
root     24642 24556  0 15:59 pts/0      00:00:00 grep --color=auto ecs
iZbp16g18mpr8vgi51v20rZ:~ #

```

Troubleshooting

There could be situations where the ECS Metrics Collector doesn't work properly as expected. Following aspects should be checked during troubleshooting:

Check if RAM Service Role is created and assigned with correct Policy

RAM Service Role (or RAM Role for an ECS instance) is created;

ecs-metrics-collector

Role Details

Role Authorization P...

Resource Access Management

Basic information

Role Name	ecs-metrics-collector	Description	-
Created At	2017-09-25 10:16:23	Arn	acs:ram::1544...

```

{
  "Statement": [
    {
      "Action": "sts:AssumeRole",
      "Effect": "Allow",
      "Principal": {
        "Service": [
          "ecs.aliyuncs.com"
        ]
      }
    }
  ],
  "Version": "1"
}

```

RAM Role is assigned with correct policy: **AliyunECSReadOnlyAccess** and **AliyunCloudMonitorReadOnlyAccess**

ecs-metrics-collector

Role Authorization Policies

Role Authorization P...

Authorization Policy Name	Description
AliyunECSReadOnlyAccess	Provides read-only access to Elastic Compute Service(ECS) via Management Console...

Check if RAM Service Role (RAM Role for an ECS instance) is attached to the ECS instance:

When the ECS instance is already created, you can verify if the RAM service role is attached correct with following command:

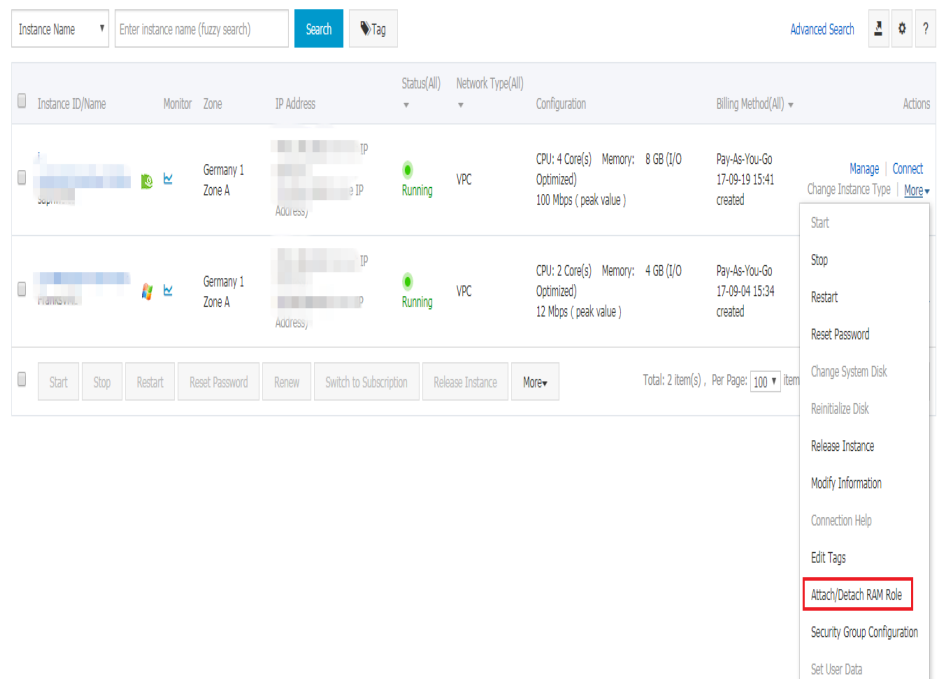
```
curl 100.100.100.200/latest/meta-data/ram/security-credentials/
```

```
iZgw8j2h2gaasq4aakmcw4Z:/var/log/ecs_metrics_collector #  
iZgw8j2h2gaasq4aakmcw4Z:/var/log/ecs_metrics_collector # curl 100.100.100.200/latest/meta-data/ram/security-credentials/  
ecs-metrics-collector iZgw8j2h2gaasq4aakmcw4Z:/var/log/ecs_metrics_collector #
```

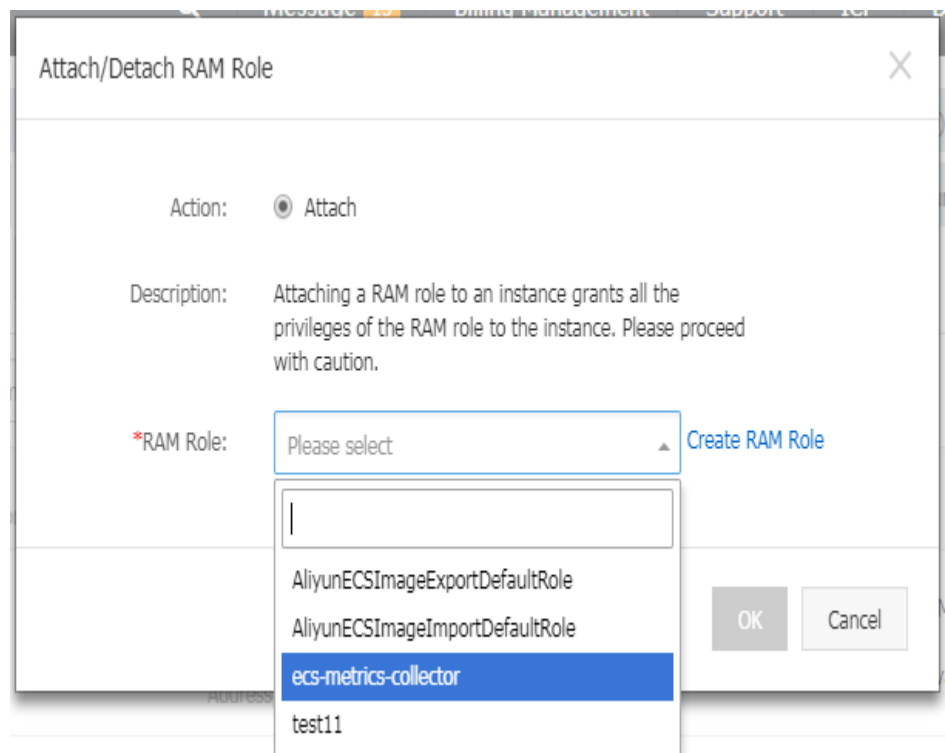
If the RAM service role is not attached, please execute to the following steps:

Open the ECS Console, go to the tab “Instances” and find your ECS instance

Select “Attach/Detach RAM Role” in the drop-down list of “More” actions



Select the RAM service role you created at the beginning.



Click "OK" to attach the role.

Check if the instance has access to public network. There are two options recommended to allow ECS instance to access public network

- i. NAT Gateway
 - i. create a NAT Gateway
 - ii. create a SNAT item for network range where the ECS instance locates.
- ii. Elastic Public IP
 - i. bind an Elastic IP to the ECS instance

Check logs of Metrics collector; you can access the metrics collector logs from following location:

`/var/log/ecs_metrics_collector/`

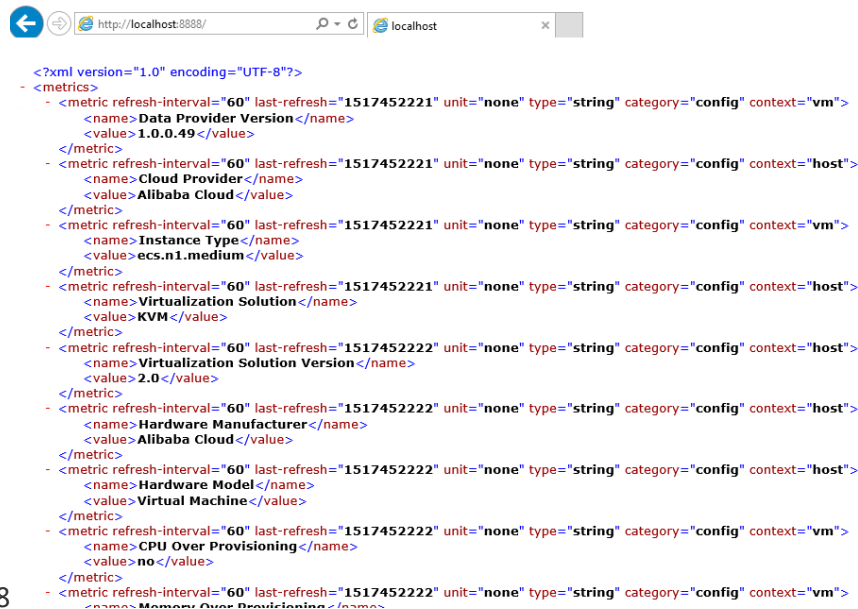
- **Windows Platform**

Lifecycle Management of ECS Metrics Collector

Metrics Collector is a local agent that collects metrics, events, and metadata of the hosting ECS instance in Alibaba Cloud, and this monitoring agent runs as a Windows Service. Each ECS instance in your SAP NetWeaver deployment must have an ECS Metrics Collector agent.

The collected data mainly comes from the metadata server and open API of ECS. SAP Host Agent polls this monitoring agent for its cached data over HTTP service. It aggregates the metrics, reports them, and stores them in the SAP NetWeaver database. And finally, SAP's transaction ST06 or the SAPOSCOL command line interface displays the aggregated metrics.

You can directly view the data from Internet Explorer with following link:



```
<?xml version="1.0" encoding="UTF-8"?>
<metrics>
  <metric refresh-interval="60" last-refresh="1517452221" unit="none" type="string" category="config" context="vm">
    <name>Data Provider Version</name>
    <value>1.0.0.49</value>
  </metric>
  <metric refresh-interval="60" last-refresh="1517452221" unit="none" type="string" category="config" context="host">
    <name>Cloud Provider</name>
    <value>Alibaba Cloud</value>
  </metric>
  <metric refresh-interval="60" last-refresh="1517452221" unit="none" type="string" category="config" context="vm">
    <name>Instance Type</name>
    <value>ecs.n1.medium</value>
  </metric>
  <metric refresh-interval="60" last-refresh="1517452221" unit="none" type="string" category="config" context="host">
    <name>Virtualization Solution</name>
    <value>KVM</value>
  </metric>
  <metric refresh-interval="60" last-refresh="1517452221" unit="none" type="string" category="config" context="host">
    <name>Virtualization Solution Version</name>
    <value>2.0</value>
  </metric>
  <metric refresh-interval="60" last-refresh="1517452221" unit="none" type="string" category="config" context="host">
    <name>Hardware Manufacturer</name>
    <value>Alibaba Cloud</value>
  </metric>
  <metric refresh-interval="60" last-refresh="1517452221" unit="none" type="string" category="config" context="host">
    <name>Hardware Model</name>
    <value>Virtual Machine</value>
  </metric>
  <metric refresh-interval="60" last-refresh="1517452221" unit="none" type="string" category="config" context="vm">
    <name>CPU Over Provisioning</name>
    <value>no</value>
  </metric>
  <metric refresh-interval="60" last-refresh="1517452221" unit="none" type="string" category="config" context="vm">
    <name>Memory Over Provisioning</name>
    <value>no</value>
  </metric>

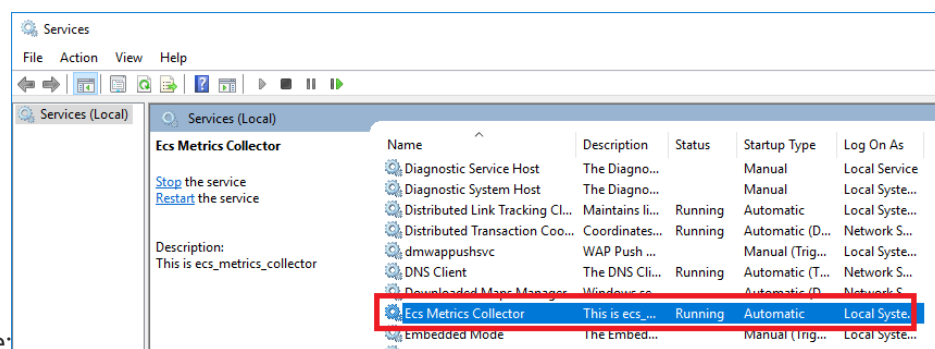
```

<https://localhost:8888>

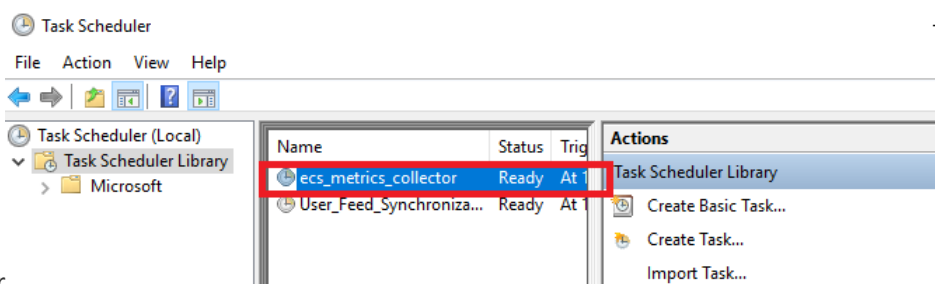
When you install the monitoring agent, the installation program completes the following tasks:

- Install ECS Metrics Collector
- Add monitoring task (monitoring ecs-metrics-collector) to Service List and Windows Task Scheduler
- Start ecs-metrics-collector service

Windows Service:



Windows – Task Scheduler



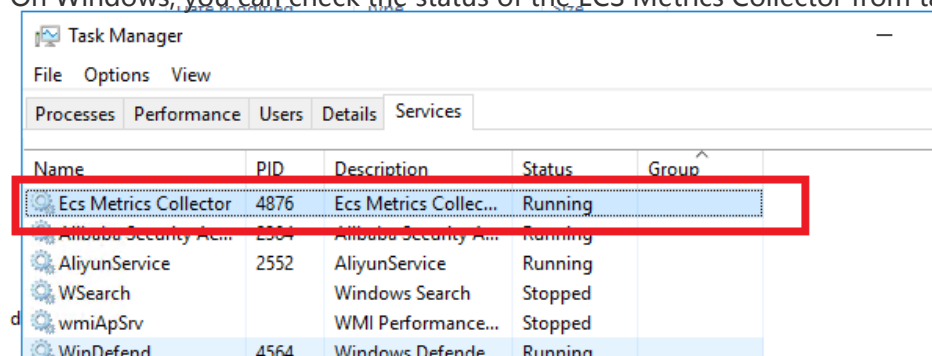
ECS Metrics Collector must be installed manually by users through Cloud Tool (Aliyun Assistant) of Alibaba Cloud during SAP NetWeaver deployment. For detailed steps, please refer to SAP NetWeaver Implementation Guide for Alibaba Cloud.

ECS Metrics Collector will be automatically started right after the installation. The setting of automatic upgrade will be configured by the installation job. With this setting, ECS Metrics Collector will automatically upgrade to the latest version as long as there is one.

Meanwhile, the ECS Metrics Collector service is configured as restart after failure. It will be restarted right away in case it crashed.

Status of ECS Metrics Collector

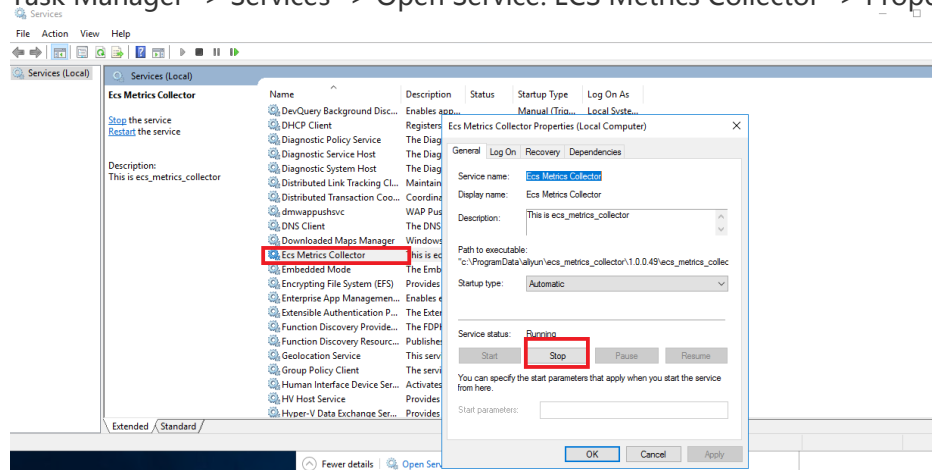
On Windows, you can check the status of the ECS Metrics Collector from task manager:



Restarting ECS Metrics Collector

In some special case, you may need to manually restart ECS Metrics Collector. Stop:

Task Manager -> Services -> Open Service: ECS Metrics Collector -> Properties -> Stop

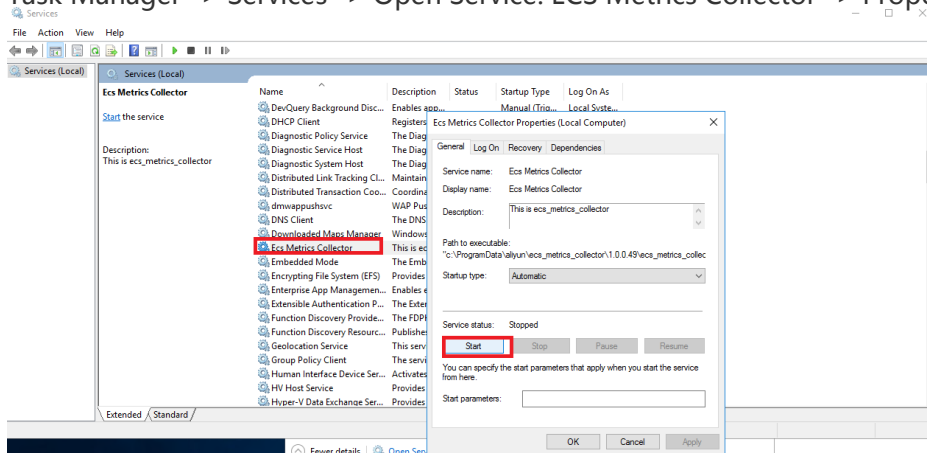


Or you can simply use following command on the command prompt as follows: net stop "Ecs Metrics

```
C:\ProgramData\aliyun\assist\1.0.0.94>net stop "Ecs Metrics Collector"
The Ecs Metrics Collector service is stopping.
The Ecs Metrics Collector service was stopped successfully.
```

Start:

Task Manager -> Services -> Open Service: ECS Metrics Collector -> Properties -> Start:



Or you can simply use following command on the command prompt as follows:

net start "Ecs Metrics Collector"

```
C:\ProgramData\aliyun\assist\1.0.0.94>net start "Ecs Metrics Collector"
The Ecs Metrics Collector service is starting.
The Ecs Metrics Collector service was started successfully.
```

Troubleshooting

There could be situations where the ECS Metrics Collector doesn't work properly as expected. Following aspects should be checked during troubleshooting:

1 Check logs of Metrics collector;

You can access the metrics collector logs from following location:

C:\ProgramData\Aliyun\ecs_metrics_collector\MetricsCollector.Version

```
C:\ProgramData\aliyun\ecs_metrics_collector\1.0.0.47>dir *.log
Volume in drive C has no label.
Volume Serial Number is 06B7-1B9E

Directory of C:\ProgramData\aliyun\ecs_metrics_collector\1.0.0.47

01/26/2018  07:02 PM                161,129  ecs_metrics_collector.log
               1 File(s)                161,129 bytes
               0 Dir(s) 30,070,427,648 bytes free
```

Following is an example:

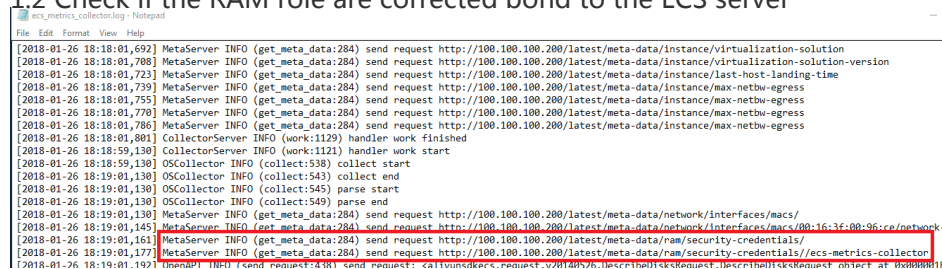
Some important hints in logs as follows:

1.1 Metrics Collector start indicator

MetricsServer INFO (run: xxxx) start

```
ecs_metrics_collector.log - Notepad
File Edit Format View Help
[2018-01-26 18:02:58,880] MetricServer INFO ( init :1226) MetricServer init, is_daem
[2018-01-26 18:02:58,880] MetricServer INFO (run:1273) start run
[2018-01-26 18:02:58,880] CollectorServer INFO (run:1140) start run
[2018-01-26 18:02:58,880] CollectorServer INFO (work:1121) handler work start
[2018-01-26 18:02:58,880] OCollectorServer INFO (collect:538) collect start
```

1.2 Check if the RAM role are corrected bond to the ECS server

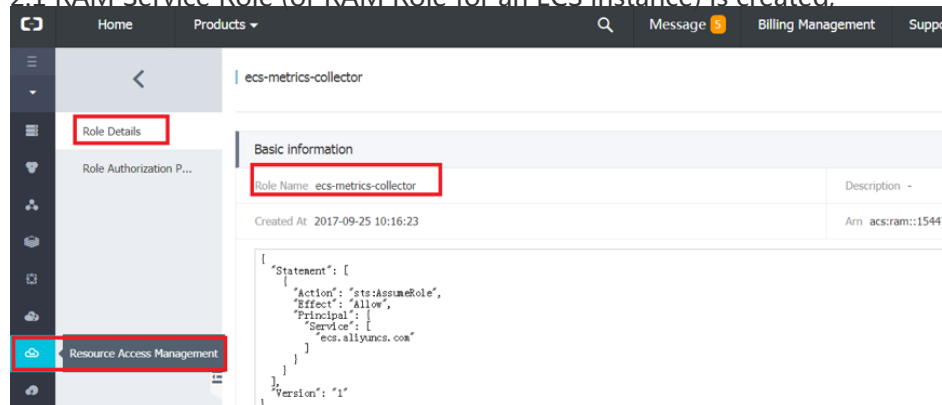


```

[2018-01-26 18:18:01,692] MetaServer INFO (get_meta_data:284) send request http://100.100.100.200/latest/meta-data/instance/virtualization-solution
[2018-01-26 18:18:01,708] MetaServer INFO (get_meta_data:284) send request http://100.100.100.200/latest/meta-data/instance/virtualization-solution-version
[2018-01-26 18:18:01,723] MetaServer INFO (get_meta_data:284) send request http://100.100.100.200/latest/meta-data/instance/last-host-landing-time
[2018-01-26 18:18:01,739] MetaServer INFO (get_meta_data:284) send request http://100.100.100.200/latest/meta-data/instance/max-netbw-egress
[2018-01-26 18:18:01,755] MetaServer INFO (get_meta_data:284) send request http://100.100.100.200/latest/meta-data/instance/max-netbw-egress
[2018-01-26 18:18:01,770] MetaServer INFO (get_meta_data:284) send request http://100.100.100.200/latest/meta-data/instance/max-netbw-egress
[2018-01-26 18:18:01,786] MetaServer INFO (get_meta_data:284) send request http://100.100.100.200/latest/meta-data/instance/max-netbw-egress
[2018-01-26 18:18:01,801] CollectorServer INFO (work:1129) handler work finished
[2018-01-26 18:18:59,130] CollectorServer INFO (work:1121) handler work start
[2018-01-26 18:18:59,130] OScollector INFO (collect:538) collect start
[2018-01-26 18:19:01,130] OScollector INFO (collect:543) collect end
[2018-01-26 18:19:01,130] OScollector INFO (collect:545) parse start
[2018-01-26 18:19:01,130] OScollector INFO (collect:549) parse end
[2018-01-26 18:19:01,130] MetaServer INFO (get_meta_data:284) send request http://100.100.100.200/latest/meta-data/network/interfaces/macs/
[2018-01-26 18:19:01,145] MetaServer INFO (get_meta_data:284) send request http://100.100.100.200/latest/meta-data/network/interfaces/macs/08:16:3f:00:96:ce/network-
[2018-01-26 18:19:01,161] MetaServer INFO (get_meta_data:284) send request http://100.100.100.200/latest/meta-data/ram/security-credentials/
[2018-01-26 18:19:01,177] MetaServer INFO (get_meta_data:284) send request http://100.100.100.200/latest/meta-data/ram/security-credentials/ecs-metrics-collector
[2018-01-26 18:19:01,192] MetaServer INFO (get_meta_data:284) send request http://100.100.100.200/latest/meta-data/ram/security-credentials/ecs-metrics-collector
  
```

2 Check if RAM Service Role is created and assigned with correct Policy

2.1 RAM Service Role (or RAM Role for an ECS instance) is created:



Role Details

Role Name: ecs-metrics-collector

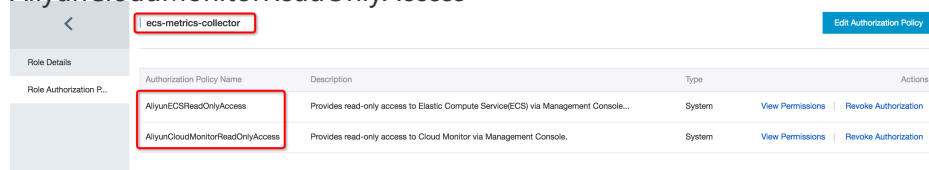
Created At: 2017-09-25 10:16:23

ARN: acs:ram::1544:

```

{
  "Statement": [
    {
      "Action": "sts:AssumeRole",
      "Effect": "Allow",
      "Principal": {
        "Service": "ecs.aliyuncs.com"
      }
    }
  ],
  "Version": "1"
}
  
```

2.2 RAM Role is assigned with correct policy: AliyunECSReadOnlyAccess and AliyunCloudMonitorReadOnlyAccess

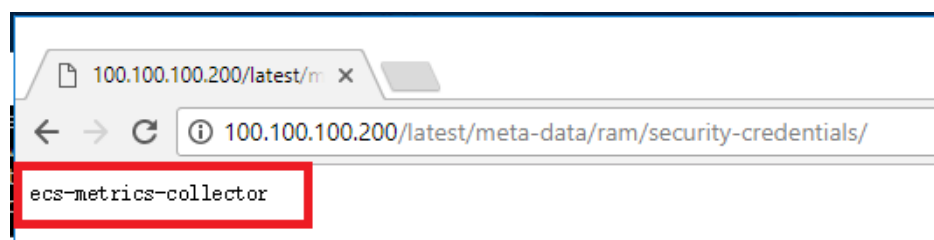


Authorization Policy Name	Description	Type	Actions
AliyunECSReadOnlyAccess	Provides read-only access to Elastic Compute Service(ECS) via Management Console...	System	View Permissions Revoke Authorization
AliyunCloudMonitorReadOnlyAccess	Provides read-only access to Cloud Monitor via Management Console.	System	View Permissions Revoke Authorization

3 Check if RAM Service Role (RAM Role for an ECS instance) is attached to the ECS instance

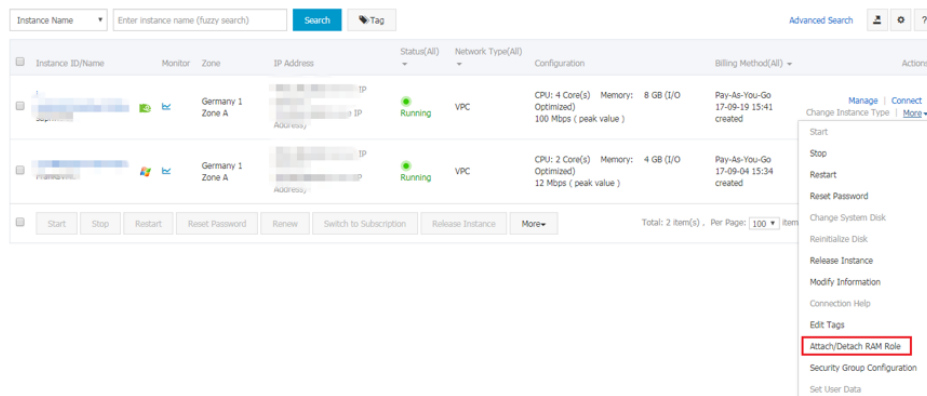
3.1 When the ECS instance is already created, you can verify if the RAM service role is attached correct with following link:

<http://100.100.100.200/latest/meta-data/ram/security-credentials/>

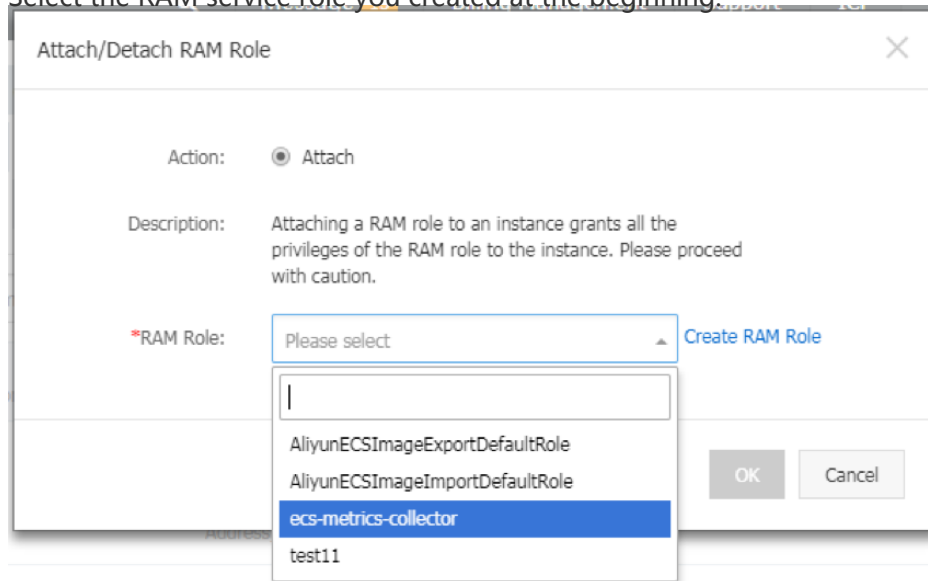


3.2 If the RAM service role is not attached, please execute to the following steps:

- Open the ECS Console, go to the tab "Instances" and find your ECS instance
- Select "Attach/Detach RAM Role" in the drop-down list of "More" actions



Select the RAM service role you created at the beginning.



- Click "OK" to attach the role.

4 Check if the instance has access to public network. There are two options recommended to allow ECS instance to access public network

4.1 NAT Gateway

- create a NAT Gateway
- create a SNAT item for network range where the ECS instance locates.

4.2 Elastic Public IP

- bind an Elastic IP to the ECS instance

SAP B1

SAP B1 Planning Guide

- SAP Business One Planning Guide
- Overview of SAP Business One on Alibaba Cloud
 - Alibaba Cloud Services
 - Supported SAP HANA versions
- Alibaba Cloud ECS
 - ECS Instance Types
 - Regions and Zones
 - VPC
 - Operating System Images
 - Public images
 - Customized images
 - Deploying ECS Instance
 - Accessing ECS Instance
- Database
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 - Block Storage (Cloud Disk)
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 - SSH Key Pairs
 - Router configuration
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Version Control

Version	Revision Date	Types Of Changes	Effective Date
1.0			2018/05/09
1.1	2018/07/31	1.Certified IaaS	2018/07/31

		platforms is updated.	
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SAP Business One Planning Guide

This guide provides an overview of how SAP Business One works on the Alibaba cloud platform, and provides details that you can use when planning the implementation of a new SAP Business One system.

Alibaba Cloud and SAP have worked together to test and certify the SAP Business One solution on the Alibaba cloud. SAP Business One, version for SAP HANA has been certified on the Alibaba cloud platform. For more information about how to deploy SAP Business One on Alibaba Cloud, see the SAP Business One deployment guide.

Overview of SAP Business One on Alibaba Cloud

SAP Business One is business management software designed for small and medium-sized enterprises. It was designed with the idea that smaller companies need ERP software to help manage their business, but not the kind of ERP that large and complex organizations need. It has functional modules for finance, customer relationship management (CRM), warehousing and production management, purchasing and procurement, and reporting and analytics.

SAP HANA is an in-memory, column-oriented, relational database management system developed and marketed by SAP. Its primary function as database server is to store and retrieve data as requested by the applications. In addition, it performs high-performance analytics and real-time data processing to address customer's rapid growing business analysis needs.

Alibaba Cloud is built on a global infrastructure providing all kinds of IaaS products and services. Alibaba Cloud services are available to use in different geographical regions across the globe. For SAP Business One on Alibaba Cloud, you can only choose SAP Business One, version for SAP HANA. When running SAP Business One with SAP HANA on Alibaba Cloud, customers can leverage ease of provisioning, high scalability, and redundant Alibaba Cloud infrastructure capabilities to run their business-critical workloads cost-effectively.

With SAP Business One, version for SAP HANA, the application data is powered in-memory, with a single platform for analytics and transactions. This aids in speeding up processing times, and permits you to maintain a streamlined IT landscape. This elevates the user experience as well as allowing real-time decisions to be made with the various embedded SAP HANA apps, analytics and reporting.

Alibaba Cloud Services

For SAP Business One on Alibaba Cloud, the core Alibaba Cloud components used by this planning

guide include the services as follows,

Elastic Compute Service : Elastic Compute Service (ECS) is a type of computing service that features elastic processing capabilities. ECS has a simpler and more efficient management mode than physical servers. You can create instances, change the operating system, and add or release any number of ECS instances at any time to fit your business needs.

SSD Cloud Disk : Ideal for I/O-intensive applications, and provide stable and high random IOPS performance.

Ultra Cloud Disk : Ideal for medium I/O load application scenarios and provide a storage performance of up to 3,000 random IOPS for ECS instances.

Virtual Private Cloud : The Alibaba Cloud Virtual Private Cloud (VPC) is a private network established in Alibaba Cloud. It is logically isolated from other virtual networks in Alibaba Cloud. VPC enables you to launch and use the Alibaba Cloud resources in your own VPC.

Object Storage Service : Alibaba Cloud Object Storage Service (OSS) is a network-based data access service. OSS enables you to store and retrieve structured and unstructured data including text files, images, audios, and videos.

Supported SAP HANA versions

This guide currently supports SAP HANA Platform Edition 1.0 and 2.0.

Alibaba Cloud ECS

ECS Instance Types

Alibaba Cloud ECS offers a number of instance types (virtual machine sizes) for deploying SAP solutions. Each instance type offers different CPU, memory, and I/O capabilities. You must use one of the SAP-certified ECS instance types for SAP Business One systems. For a list of SAP-certified instance types approved for SAP Business One usage, see following,

Instance Type	vCPU	Memory (GiB)
ecs.se1.14xlarge	56	480
ecs.re4.20xlarge	80	960
ecs.re4.40xlarge	160	1920

For detailed descriptions of ECS instance types, please kindly check official website of Alibaba Cloud.

Regions and Zones

The Alibaba Cloud infrastructure is built around Regions and Zones. A Region is a physical location in the world, where for most cases, we have multiple Zones. Zones consist of one or more discrete data centers, each with redundant power, networking and connectivity, housed in separate facilities. These Zones offer you the ability to operate production applications and databases, which are more highly available, fault tolerant and scalable than it would be possible from a single data center.

VPC

Virtual Private Cloud (VPC) allows you to provision a private, isolated section of Alibaba Cloud where you can launch IaaS resources in a virtual network that you define. With VPC, you can define a virtual network topology that closely resembles a traditional network that you might operate in your own data center. Additionally, you can create a connection between your corporate data center and your VPC on Alibaba Cloud, and use the Alibaba Cloud as an extension of your corporate data center.

Operating System Images

When you create an ECS instance, you use an image that contains a pre-installed base operating system. Alibaba Cloud works with operating system partners to provide you with up-to-date, optimized operating system images. There are several ways you can specify an image for your ECS instance.

Public Images

Licenses of operating system in public image list are already included in the price of ECS instance charge. You are not required to provide your own operating system licenses. Following ones are the recommended operating systems available in Public Image list:

- SLES-11-SP4
- SLES-12-SP2

Customized Images

It is possible for customers to use a BYOL (Bring-Your-Own-License) approach for their operating system. Customers can create their own customized Operating System images, and create an ECS instance through their own customized image.

Deploying ECS Instance

You can use the standard Alibaba Cloud methods to deploy your ECS instances on Alibaba Cloud platform, including ECS Console (the Cloud Platform Console web UI) and REST API. You can read the following pages to get more useful information.

- Create an ECS instance
- Start and view an ECS instance

For more information and step-by-step instructions about deploying your SAP Business One system on ECS instances, please see the SAP Business One on Alibaba Cloud Deployment Guide.

Accessing ECS Instance

On a Linux-based ECS instance, users have SSH capabilities, and can access an ECS instance through SSH based tools such as putty. For example, you can access the ECS instance through putty from a Jumping server.

On a Windows-based ECS instance, users can access the ECS through Remote Desktop Protocol (RDP), as long as the ECS instance is accessible from a public IP address.

Database

For SAP Business One on Alibaba Cloud, you can use SAP HANA on Linux platform.

SAP HANA

SAP HANA is supported only for SLES for the moment. For more information on supported ECS instance types and operating systems, see the [SAP HANA Deployment Guide](#).

For more information about SAP HANA, see the [SAP HANA Operation guide](#) and the [SAP documentation](#).

To determine the sizing guidelines and recommendations for SAP HANA, please kindly check [SAP official website](#) for sizing.

Storage

By default, each ECS instance has a small System disk (Ultra Cloud Disk or SSD Cloud Disk) that contains the operating system. You can add additional Data disks, and attach them to your ECS instance to act as storage for the different components of your system.

Block Storage (Cloud Disk)

Alibaba Cloud Block Storage (Cloud Disk) provides persistent block-level storage volumes for use with Alibaba Cloud ECS instance. You can choose different Cloud Disk type depending on your requirement:

Disk Category	Basic Cloud Disk	Ultra Cloud Disk	SSD Cloud Disk
Max size of single disk	2 TB	32.768 TB	32.768 TB
Max IOPS per disk	300+ IOPS	3,000 IOPS	20,000 IOPS
Max throughput per disk	20~40 MBps	80 MBps	300 MBps
Access latency	5.0~10.0 ms	1.0~3.0 ms	0.5~2.0 ms
Typical scenarios	Data is not frequently accessed or with low I/O loads.	<ul style="list-style-type: none"> - Small and medium sized databases. - Development and testing. - Cloud Server logging. 	<ul style="list-style-type: none"> - I/O intensive applications. - Medium sized or large relational databases. - NoSQL databases.

For **Data reliability**, with the strength of the Alibaba Cloud distributed storage technology, which uses a triplicate storage system, all these 3 disk types ensure data integrity of 99.9999999%. |

In General, we recommend following disk layout:

Disk Layout	Usage	Cloud Disk Type
System Disk	Operating System	Ultra Cloud Disk
Data Disk 1	Executives, profiles etc. of SAP Business One and HANA Database	SSD Cloud Disk
Data Disk 2	Data files of HANA database	SSD Cloud Disk
Data Disk 3	Log files of HANA database	SSD Cloud Disk

For SAP Business One on Alibaba Cloud, we recommend using SSD Cloud Disk.

For more information about how to setup storage system for SAP HANA, please kindly refer to [SAP HANA Deployment Guide](#).

Object Storage Service (OSS)

Alibaba Cloud Object Storage Service is an object store for files of any type or format; it has virtually unlimited storage and you do not have to worry about provisioning it or adding more capacity.

It's common practice to use OSS to store backup files for long term storage.

Network and Security

Security Group

A security group functions similarly to virtual firewalls, and is used to set network access controls for one or more ECS instances. When creating instances, you must select a security group. You can also add security group rules to control outbound and inbound network access for all ECS instances in the security group.

SSH Key Pairs

Alibaba Cloud offers two authentication methods for remote logon to ECS instances:

Password logon: A standard authentication method using the administrator password. It applies to both Windows instances and Linux instances.

SSH Key Pair logon: This method only applies to Linux instances. If you are running Linux, we recommend that you choose this authentication method to protect your ECS instances' security.

An SSH Key Pair is a pair of keys generated by an encryption algorithm: one key is intentionally available, known as the public key; and the other key is kept confidential, known as the private key.

If you have placed the public key in a Linux instance, you can use the private key to log on to the instance using SSH commands or related tools from local computer or another instance, without the need to enter a password.

Router configuration

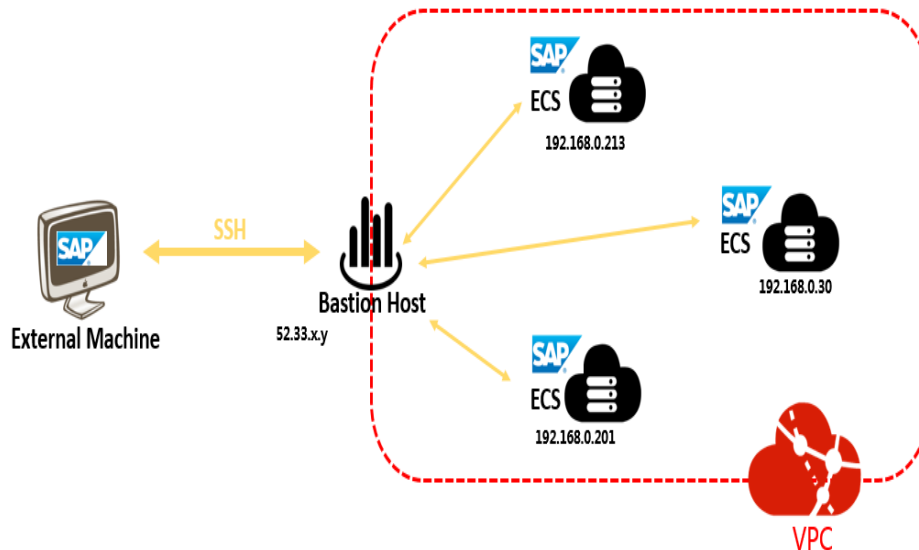
When you create a VPC network on Alibaba Cloud, a vRouter and route table are automatically created after the VPC creation. You cannot create or delete them directly. They will be deleted automatically with the deletion of the VPC. You can add route entries to the route table to route network traffic.

Each entry in the route table is a route entry determining where network traffic is directed. A route entry with the destination CIDR block 100.64.0.0/10 is added by the system by default, when you create a VPC. You are allowed to add customized route entries for your VPC.

If an ECS instance in the VPC, without external IP address, wants to access the Internet, a NAT gateway is needed.

Bastion Server

Bastion hosts provide an external facing point of entry into a VPC network containing private-network VMs. This host can provide a single point of fortification or audit and can be started and stopped to enable or disable inbound SSH communication from the Internet.



SSH access to VMs that do not have an external IP address can be achieved by first connecting to a bastion host.

When using a bastion host, you log into the bastion host first, and then into your target private ECS instance through an SSH based tool, like putty.

NAT Gateway

When an ECS instance is created within VPC and without an assigned external IP address, it cannot make direct connections to external services.

To allow these ECS instances to access the Internet, you can set up and configure a NAT gateway. The NAT gateway can route traffic on behalf of any ECS instance in the VPC. You should have one NAT gateway per VPC.

VPN Gateway

You can securely connect your existing IDC to your VPC on Alibaba Cloud through a VPN connection using IPsec by using VPN gateway on Alibaba Cloud. Traffic traveling between the two networks is encrypted by one VPN gateway, then decrypted by the other VPN gateway. This protects your data as it travels over the Internet. For more information, please kindly check Alibaba Cloud official site.

Security document

Following additional resources will help you to further understand your SAP environment on Alibaba Cloud from security and compliance perspective:

Security & Compliance Center

Alibaba Cloud Security Whitepaper

Licensing

SAP Application License

Running SAP on Alibaba Cloud requires you to bring your own license (BYOL).

For more information about SAP licensing, please contact SAP.

Linux License

In Alibaba Cloud, there are two ways to license SUSE Linux:

Pay-As-You-Go licensing model: Alibaba Cloud provides SLES 11 SP4 and SLES 12 SP2 as public images, and the SLES license cost is included in ECS instance price.

BYOL model: Customer can purchase their own SLES license and import SLES operating system as customized images.

Database Licenses

- SAP HANA: SAP HANA uses a bring-your-own-license (BYOL) model.

SAP Business One Installation media

There are two main options for copying SAP Business One installation media to ECS instance:

Download from SAP Service Marketplace to ECS instance directly. From your ECS instance,

connect to the SAP Service Marketplace and download the required installation media. This option will most likely be the fastest method for getting SAP Business One installation media to Alibaba Cloud, because ECS instances have very fast connections to the Internet. You can create a dedicated ECS instance with Windows Operating System, for downloading and storing the SAP installation media.

Copy from your network to ECS instance. If you already have the required SAP installation media downloaded to a location in your network, you can copy the media from your network directly to an ECS instance.

Support

Alibaba Cloud support: Customers can request assistance with SAP Business One provisioning and configuration questions on ECS instances.

SAP Support: Customers can also contact SAP Support for SAP-related issues. SAP does the initial evaluation of the support ticket and transfers the ticket to the Alibaba Cloud queue if SAP considers it an infrastructure issue about ECS instances.

SAP B1 Implementation Guide

- SAP Business One implementation Guide
- Implementing SAP Business One system
 - Deployment architecture
- Prerequisites
 - Account setup
 - Basic network and security settings
 - Connect ECS instance from Internet
- Create and configure an ECS instance for SAP Business One and SAP HANA
 - Open ECS Purchase page
 - Choose Pricing Model
 - Choose the Datacenter Region and Zone
 - Choose the instance type
 - Choose Network Type
 - Choose the base operating system
 - Provision and configure storage

- Security Setting
- Purchase Plan
- Launch instances
- Instance post-configuration
 - Add a DNAT entry
 - Add an SNAT entry
 - Connect to SAP ECS instances
 - Harden OS security
 - Change hostname
 - Prepare SAP Business One installation media
 - Check the operating system
- Install the SAP Business One solution
- Support

Version Control

Version	Revision Date	Types Of Changes	Effective Date
1.0			2018/05/07
1.1	2018/07/31	1.Certified IaaS platforms is updated.	2018/07/31

SAP Business One implementation Guide

This guide provides instructions for implement your own SAP Business One System on Alibaba Cloud.

For more information about planning your implementation, see the SAP Business One planning guide on Alibaba Cloud.

Implementing SAP Business One system

For SAP Business One on Alibaba Cloud, you can choose SAP Business One, version for SAP HANA. This solution uses an ECS instance to sets up SAP Business One on Alibaba Cloud, uses the following software:

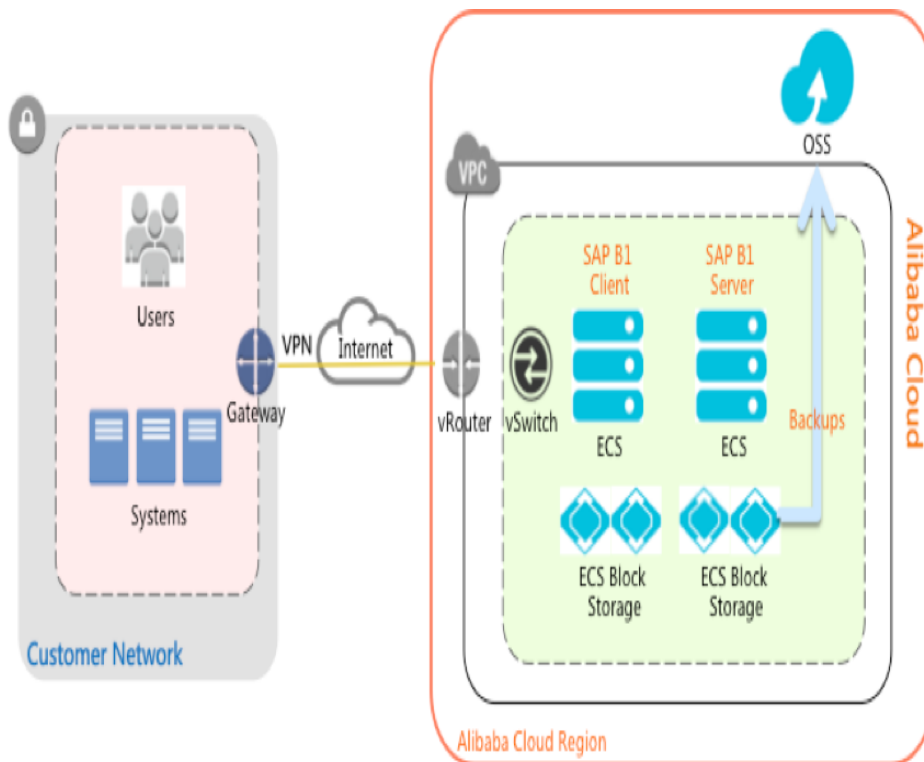
SAP HANA 1.0 SP12

SAP Business One 9.0

SLES 11 SP4

Deployment architecture

The implementation of an SAP Business One environment on Alibaba Cloud follows the standard SAP process used with traditional infrastructure. However, Implementing an SAP Business One system on Alibaba Cloud can greatly reduce the effort and time.



SAP Business One ServerOn Alibaba Cloud, to implement the Business One server component, follow the standard SAP installation procedures and tools that you use for any other physical or virtual environment.

SAP Business One ClientOn Alibaba Cloud, when you're running SAP Business One on a remote hosted ECS instance, the standard best practice is to host the SAP Business One client software by using a virtual desktop solution on another ECS instance. So, install and manage a virtual desktop service like Microsoft Remote Desktop Services on Alibaba Cloud ECS.Business One Database.

SAP Business One, powered by SAP's in-memory computing platform, can help you supercharge application performance and analyze massive volumes of data in real time – without complicating your IT landscape. SAP Business One and SAP HANA are installed on same ESC instance.

Prerequisites

For SAP administrators who have experience in deploying and running SAP systems on traditional an infrastructure, the following prerequisite knowledge will help to understand some public cloud specific tasks before starting to create an ECS instance for SAP system deployment.

Account setup

Signing up for Alibaba Cloud

Adding a payment method

Real-name registration, it is required only if you have to create an ECS instance in a region inside mainland China

Basic network and security settings

Creating a VPC and VSwitch for creating an ECS instance in a private network you provisioned

Creating a security group that have the rules meeting your business needs for the inbound and outbound access of your ECS instance

Creating an SSH key pair for creating a Linux instance authenticated by using SSH key pair

Connect ECS instance from Internet

VPC is a private network established in Alibaba Cloud. VPCs are logically isolated from other virtual networks in Alibaba Cloud. You can use NAT Gateway or EIP (Elastic IP) to connect ECS instances from Internet.

NAT Gateway is an enterprise-class public network gateway that provides NAT proxy services (SNAT and DNAT), up to 10 Gbps forwarding capacity, and cross-zone disaster recovery. As a public network gateway, NAT Gateway requires configured public IPs and bandwidth. Public IPs for NAT Gateway are grouped into abstract groups called shared bandwidth packages.

An EIP address is a type of NAT IP address. It is located in a public network gateway of Alibaba Cloud, and is mapped to the private network interface card (NIC) of the bound ECS instance in the way of

NAT. Therefore, the ECS instance bound with the EIP address can communicate with the Internet without disclosing the EIP address on the NIC.

Create and configure an ECS instance for SAP Business One and SAP HANA

To create an ECS instance for implementing SAP Business One on Alibaba Cloud, follow these steps:

Open ECS Purchase page

Log on to the ECS console.

On the left-side navigation pane, click **Instances**.

On the **Instance List** page, click **Create Instance**.

Open ECS Purchase page, and switch to the tab "Advanced Purchase" .

Choose Pricing Model

You can choose either **Subscription** or **Pay-As-You-Go** as the billing method of your instance.

Currently, ECS instances support two billing methods:

Subscription: A type of prepayment whereby instances can be used only after payment is made. Instance usage is billed on a monthly basis, and the billing unit is US\$/month. Subscription is applicable to fixed 24/7 services, such as Web service.

Pay-As-You-Go: A type of post payment whereby payment is made after instance usage. Instance usage is billed on a minute basis, and the billing unit is US\$/hour. The minimum charge for the lifecycle of an ECS instance (from creation to release) is 0.01 US\$. Pay-As-You-Go is applicable to scenarios with sudden traffic spikes, such as temporary scaling, interim testing, and scientific computing.

See Purchase ECS instances in the ECS Purchase Guide for the differences between these two billing methods.

Choose the Datacenter Region and Zone

Usually, All SAP applications (SAP ERP, CRM, SRM, and so on) and systems (SAP DB, SAP Application servers) should be deployed in the same Zone. The region and zone cannot be changed after the instance is created. When choosing a region and zone, consider the following:

Generally, if the region where your instance is located is close proximity to your customers, they will experience shorter network latency and faster download speed when using your service.

Some features, such as the number of zones, instance types, storage types, and network service pricing, vary by region. Select an appropriate region to meet your business needs.

ECS instances in regions outside Mainland China do not support interchange between Linux systems.

If you are creating multiple instances for your SAP system,

- If it requires shorter network latency, we recommend that you create the instances in the same zone.
- If it has higher requirements for disaster recovery, we recommend that you create the instances in different zones of one region.

Instances in different regions cannot communicate with each other over intranet.

Choose the instance type

The availability of instance types varies by region. See [Instance generations and type families in Product Instruction](#) for scenarios of each instance type.

Note: If you chose pricing model as 'Pay-As-You-Go', you cannot purchase all ECS instances from instance types. If the instance you need is not in the list, you can submit a ticket for purchasing to Alibaba Cloud support.

Alibaba Cloud ECS instance offers a number of instance types (virtual machine sizes) for deploying SAP solutions. You can only run your SAP applications on ECS instances that had been certified by SAP. For a list of SAP-certified instance types approved for production use, see following,

Instance Type	vCPU	Memory (GiB)
ecs.se1.14xlarge	56	480
ecs.re4.20xlarge	80	960
ecs.re4.40xlarge	160	1920

Choose Network Type

Network Type: For your SAP Business One system, please choose Virtual Private Cloud (VPC) as the network type. You can select your own VPC and VSwitch. If you do not have one, use the default VPC and VSwitch.

Security Group: A security group functions similarly to virtual firewalls, and is used to set network access controls for one or more ECS instances. When creating instances, you must select a security group. Please add security group rules to control outbound and inbound network access for all SAP system ECS instances in the security group.

Network Billing Type: Billing by **Data Transfer**. With this billing method, charges are determined by the amount of the data transferred to an instance every hour (usually calculated by GB). The traffic price varies by region. Check the Internet traffic fee on the bottom of the page.

Network Bandwidth Peak: To help prevent high charges from sudden traffic spikes, you can specify a peak bandwidth for the Instance.

Network type	Internet access?	Network bandwidth peak
VPC	Yes	If no Elastic IP (EIP) address is used, set the peak bandwidth to a non-zero value and an Internet IP address will be bound to your instance. The address cannot be changed or unbound.
VPC	No	Set the peak bandwidth to 0 Mbps.

Choose the base operating system

Public Image: It contains the image of an operating system officially provided by Alibaba Cloud. On top of this, you will need to install the related software and configure the application environment based on your specific requirements. Alibaba Cloud currently supports the following operating systems for running SAP NetWeaver systems:

- SUSE Linux Enterprise Server (SLES)

Provision and configure storage

You have to select cloud disks for the system disk and data disks. Alibaba Cloud provides you with flexible, cost-effective, and easy-to-use data storage options for your ECS instances.

System Disk is required. It is for installing the operating system.

- Local, temporary, instance based storages.
- Data stored on instance storage volumes will be persistent until ECS instance is released.
- For system disk, we recommend using Ultra Cloud Disks; you can choose SSD Cloud Disk to get better performance.

Data Disk that you add here will be released with the instance and cannot be detached from the instance. You can create a cloud disk independently.

- Persistent block-level storage volumes for use with ECS instances.
- For data disk, we recommend using Ultra Cloud Disks in your SAP non-production environments, using SSD Cloud Disks in production environments.

Each user account can own up to 250 cloud disks simultaneously, with a maximum capacity of 32768 GB per data disk.

You can add up to 16 data disks, blank or from a snapshot, based on business needs.

Cloud disk types vary by region. See [Disk parameters and performance test](#) for differences of cloud disk features. Three different volume types, each option has a unique combination of performance and durability.

SSD cloud disks

Ideal for I/O intensive applications, and provide stable and high random IOPS performance.

Ultra cloud disks

Ideal for application scenarios with medium I/O load and provide a storage performance of up to 3000 random IOPS for ECS instances.

Basic cloud disks

Ideal for application scenarios with low I/O load and provide an I/O performance of several hundred IOPS for ECS instances.

For your SAP Business One and SAP HANA environments, recommended storage options as below. For more information about HANA storage configuration, please refer to [SAP HANA Deployment Guide on Alibaba Cloud](#).

Directory	Disk type
SAP Business One and HANA software	Ultra cloud disks

HANA data files	SSD cloud disks
HANA log files	SSD cloud disks
HANA shared	SSD cloud disks
Intermediate backup storage	Ultra cloud disks

Security Setting

You can set the authentication method based on the operating system.

Operating system	Authentication method
Linux	SSH key pairs or password

- You have two choices: Set authentication method now or later.
- If you want to set the authentication method later, after the instance is created, reset the password or bind an SSH key pair in the ECS console.

Purchase Plan

Subscription Type: If you are creating an ECS instance of the Subscription billing method, you have to set **Subscription Type** to either **1 Month** or **1 Year**. If you do not want to manually renew your instance after it expires, select Auto-renew to activate automatic renewal. For more information, see **Auto-renewal** in Purchase Guide.

Instance Name: We recommend that you specify a name for the instance for efficient management.

Number of Instances: You can create up to 10 instance of the Pay-As-You-Go billing method at the same time, but no quota for instances of the Subscription billing method.

Launch instances

Overview and cost. Check the overview and cost information to make sure that the selected configuration details are correct.

Click either **Add to Cart** (if you decide to continue shopping) or **Buy Now** (if you want to confirm the purchase).

On the **Confirm Order** page, confirm the order information, and then,

For an instance of the Subscription billing method, click **Place Order**, make payment, and then activate the instance.

For an instance of the Pay-As-You-Go billing method, click **Activate**, and then activate the instance.

When the instance is activated, you can go to the ECS console to check the instance details, such as the instance name, Internet IP address, and private IP address for VPC network.

Instance post-configuration

Add a DNAT entry

Adding a DNAT entry, you can use the DNAT function to map a public IP to a private IP. Then, the ECS instance with the specified public IP can provide public services or access over the Internet.

Add an SNAT entry

Adding an SNAT entry, when an ECS instance in the specified VSwitch initiates an Internet access request, the NAT gateway will provide it with the Internet proxy service and then the ECS instance can use the specified public IP to access the Internet. The SNAT function provides the Internet proxy service for VPC ECS instances that do not have a public IP.

Connect to SAP ECS instances

Generally, don't use an external IP for SAP Business One ECS instances, you can only connect to the SAP system instances through the bastion instance using SSH.

To connect to SAP system ECS instances through the bastion instance, connect to the bastion host and then to the SAP system ECS instances by using an SSH client of your choice.

To install or maintain SAP Business One system via Business One Tools from your Business One Client, you should install this Client ECS with Windows Operating System. It is easy to run GUI or browser.

To connect to the SAP HANA database through SAP HANA Studio, use a remote desktop client to connect to the Windows Server instance. After connection, manually install SAP

HANA Studio and start accessing your SAP HANA database.

Harden OS security

After you create an instance, for security of your instance, we recommend that you perform security compliance inspection and configuration on:

- Linux instances: See [Harden operating system security for Linux in Security Advisories](#).

Change hostname

The default naming of ECS instance is Instance ID, the naming of hosts running SAP software has to be done according to general standards and some SAP specific restrictions, for example, the maximum length of the hostname is up to 13 characters for SAP rel. 4.6 or higher. Please refer to [SAP note 611361 - Hostnames of SAP servers](#) for more details.

For your SAP system on SUSE Linux Server:

```
# vi /etc/HOSTNAME
```

or

```
# echo 'newhostname' > /etc/HOSTNAME
```

This will change hostname permanently.

Reboot the server and verify before your SAP installation.

Prepare SAP Business One installation media

Download the SAP Business One product package (installation package or upgrade package) from the SAP Support Portal, as follows:

Go to the SAP Business One Software Download Center on the SAP Support Portal at <https://support.sap.com/b1software>.

Do one of the following:

- To download an installation package, click **Installation**.
- To download an upgrade package, click **Updates**.

There are two main options for copying SAP Business One installation media to ECS instance on

Alibaba Cloud:

Download from SAP Service Marketplace to ECS instance on Alibaba Cloud

From your Alibaba Cloud ECS instance, connect to the SAP Service Marketplace and download the required installation media. This option will most likely be the fastest method for getting SAP installation media to Alibaba Cloud, because Alibaba Cloud instances have very fast connections to the Internet. You can create a dedicated Alibaba Cloud OSS volume to store installation media, and then attach the volume to different instances as needed. You can also create a snapshot of the Alibaba Cloud volume and create multiple volumes that you can attach to multiple instances in parallel.

Copy from your network to ECS instance on Alibaba Cloud

If you already have the required SAP installation media downloaded to a location on your network, you can copy the media from your network directly to an Alibaba Cloud ECS instance.

Check the operating system

After launching ECS, consult the relevant SAP notes on installation and ensure that your system includes the software components specified:

- 1310037 - SUSE LINUX Enterprise Server 11: Installation notes
- 1984787 - SUSE LINUX Enterprise Server 12: Installation notes
- 2001528 - SAP HANA Database SPS 08 revision 80 (or higher) on RHEL 6 or SLES 11
- 2240716 - Recommended OS settings for SLES 11 / SLES for SAP Applications 11 SP4

Install the SAP Business One solution

Once you have provisioned and configured the required ECS instance on Alibaba Cloud, you are ready to begin the installation of the SAP Business One solution. Before that, please refer to the SAP official installation guides.

Both SAP Business One and the HANA database are installed in a single ECS instance. You should size the ECS instance to support running both SAP Business One and the database instance together. For SAP HANA requires more memory resources than other databases, so you would need to size the system to support at least the minimum requirements for SAP HANA.

The primary steps are to implement SAP Business One as follows:

For SAP HANA installation, you can refer to SAP HANA Deployment Guide on Alibaba Cloud.

For SAP Business One installation, you need to install the following components on the server:

- Server tools, including the following:
 - SLD, license manager, extension manager
 - Data interface server
 - Job service
 - Workflow service
- Repository
It includes the shared folder B1_SHR, the common database SBOCOMMON, and online help files in all supported languages
- Microsoft Outlook integration server
- Remote support platform
- Integration framework
- Add-ons
By installing the SAP add-ons as part of the server installation process, you register them to all companies on the server. If you do not install them now, you will have to register the add-ons manually later in the SAP Business One client.

Support

Alibaba Cloud support: Customers can request assistance with SAP Business One provisioning and configuration questions on ECS instances.

SAP Support: Customers can also contact **SAP Support** for SAP-related issues. SAP does the initial evaluation of the support ticket and transfers the ticket to the Alibaba Cloud queue if SAP considers it an infrastructure issue about ECS instances.

IBM Db2

IBM Db2 for SAP Deployment Guide

IBM Db2 for SAP Deployment Guide

- Prerequisites
 - Account setup
 - Creating a VPC and VSwitch
 - Creating a security group
 - Creating an SSH key pair
 - Connecting ECS instance from Internet
 - RAM service role setup
- Create and Configure ECS VM
 - File System Configuration
- SAP System installation
 - SWPM
 - Upgrade SAP kernel
 - Check Host Agent version
 - Upgrade Host Agent
 - Installation of a scale-out system
 - Installation of a single-node system
- Post-Installation

Version Control:

Version	Revision Date	Types Of Changes	Effective Date
1.0			2019/2/28

This deployment guide shows you how to deploy the SAP system with IBM Db2 for Windows and Linux on Alibaba Cloud.

For more details about planning your deployment, please kindly refer to **IBM Db2 for SAP Planning Guide**.

Prerequisites

For SAP administrators who have experience in deploying and running SAP systems on traditional an infrastructure, the following prerequisite knowledge will help to understand some public cloud specific tasks before starting to create an ECS instance for SAP and the SAP system deployment.

Account setup

- Signing up for Alibaba Cloud
- Adding a payment method
- Real-name registration, it is required only if you have to create an ECS instance in a region inside mainland China

Creating a VPC and VSwitch

Log on to the VPC console.

In the left-side navigation pane, click **VPC**.

Choose the region where the VPC is created.

Click **Create VPC** in the upper-right corner.

In the pop-up dialog, enter a VPC name and select the IP address range for the VPC in the form of a Classless Inter-Domain Routing block.

Use the one of the following standard CIDR blocks as the IP address range. The CIDR block cannot be modified after you create the VPC. For more details, refer to [Create a VPC](#).

- 10.0.0.0/8 (10.0.0.0 - 10.255.255.255)
- 172.16.0.0/12 (172.16.0.0 - 172.31.255.255)
- 192.168.0.0/16 (192.168.0.0 - 192.168.255.255)

Create VPC

Create VPC Create VSwitch

*VPC Name : VPC1

The name must be 2-128 characters long and start with English letters or Chinese characters. Only numbers, special characters, "_" and "-" are allowed.

Description :

This field is not required. A description must contain 2-256 characters, and cannot begin with "http://" or "https://".

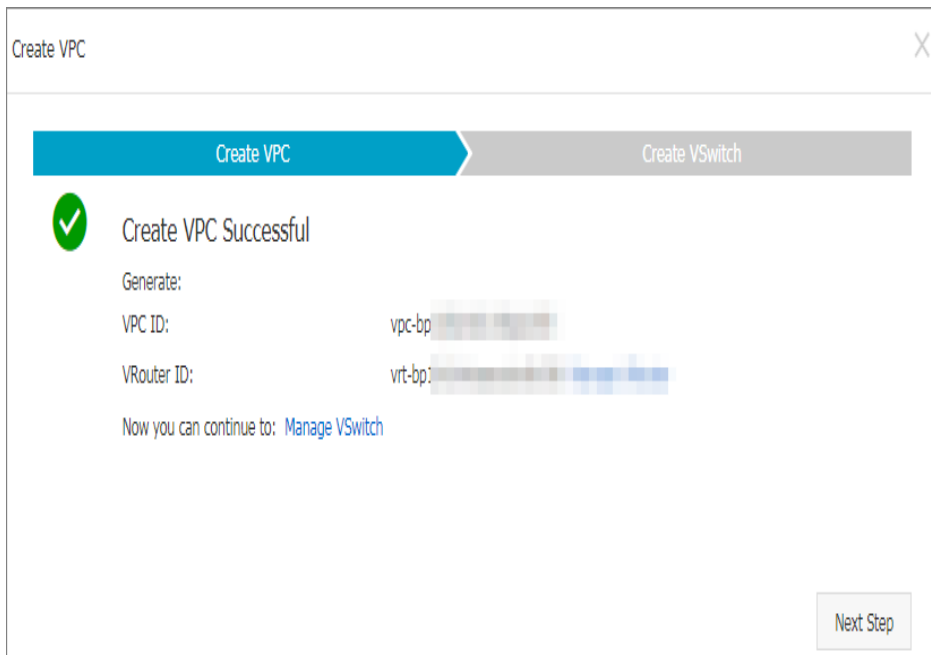
*CIDR : 192.168.0.0/16

ⓘ The CIDR cannot be changed once the VPC is created.

Create VPC

Click **Create VPC**.

A VPC ID is generated after the VPC is created, and a VRouter is created by the system for the VPC.



Click **Next Step** to create a VSwitch.

In the **Create VSwitch** tab, provide the following information and click **Create VSwitch**.

- Name: Enter a name for the VSwitch.
- Zone: Select a zone for the VSwitch.
- CIDR block: Specify the IP address range of the VSwitch in the form of a Classless Inter-Domain Routing block.

The allowed block size for a VSwitch is between a /16 netmask and /29 netmask, and the CIDR block of the VSwitch can be the same as that of the VPC that it belongs to, or the subset of the VPC CIDR block.

Note: If the CIDR block of the VSwitch is the same as that of the VPC, you can only create one VSwitch.

Create VPC

Create VSwitch

*VPC :

- / vpc-bp1kjfpne61vi8qezvt0h

VPC CIDR Block :

192 . 168 . 0 . 0 / 16

Display Binary

*Name :

VS1

The name must be 2-128 characters long and start with English letters or Chinese characters. Only numbers, special characters, "_" and "-" are allowed.

*Zone :

China East 1 Zone E

① It cannot be modified after creation.

*CIDR :

192 . 168 . 1 . 0 / 24

Display Binary

① It cannot be modified after creation.

The specified CIDR must be the same as, or belong to, that of the VPC. The allowed block size is between a /29 netmask and /16 netmask.
For example:192.168.247.0/24
[How to Configure VSwitch CIDR Block](#)

Number of Available Private
IPs :

252 IPs

Description :

This field is not required. A description must contain 2-256 characters, and cannot begin with "http://" or "https://".

Create VSwitch

Click **Done**.

Creating a security group

You can add security group rules to enable or disable access to and from the Internet, intranet, or private networks for ECS instances in the security group. For your VPC network: You only need to set outbound and inbound rules, and do not need different rules for private networks and Internet.

To create a security group, perform the following:

Log on to the ECS console.

In the left-side navigation pane, click Security Groups.

Select a region.

Click Create Security Group. In the displayed dialog box, enter the following:

Security Group Name

The length must be 2–128 characters. It can contain uppercase letters, lowercase letters, and Chinese characters. It cannot contain numbers, underscores (_), or hyphens (-).

Description

The length must be 2–256 characters. Do not start with http:// or https://.

Network Type

You should select VPC as a network type; you must select a specific VPC. If no VPCs have been created in the current region, you must create one first.

Create Security Group



* Security Group

Name:

SAP_NetWeaver

2 - 128 characters long. Do not start with a special character or a digit. It can contain the following special characters: ".", "_", and "-".

Description:

Security Group for SAP NetWeaver testing

It must contain 2-256 characters and it cannot begin with http:// or https://

Network Type:

VPC

*VPC:

vpc-bp1amqrofjwq4v8ufbk2f

[Create VPC](#)

OK

Cancel

Click OK.

Adding a security group rule

To add a security group rule, follow these steps:

Log on to the ECS console.

In the left-side navigation pane, select Networks & Security > Security Groups.

Select a region.

Find the security group to add authorization rules, and in the Action column click Configure Rules.

On the Security Group Rules page, click Add Security Group Rules.

(Optional) If you do not need to enable or disable all ports for all protocols, ICMP, or GRE, you can select Quickly Create Rules.

In the dialog box, set the following parameters:

NIC:

- If the security group is for VPC, you do not need to select the NIC.
- If your instances can access the Internet, the rules work for both the Internet and intranet.

Rule Direction:

- **Outbound:** ECS instances access other ECS instances over intranet, private networks, or through Internet resources.
- **Inbound:** Other ECS instances in the intranet or private networks and Internet resources access the ECS instance.

Authorization Policy: Select Allow or Drop.

Note: **Drop** policy discards the data packet without returning a response. If two security groups overlap except the authorization policy, the **Drop** rule takes priority over the **Allow** rule.

Protocol Type and Port Range

The port range setting is affected by the selected protocol type. SAP requires access to certain ports, so add firewall rules to allow access to the ports outlined by SAP. The following table shows the relationship between all major ones.

Protocol type	Port range	Scenarios
All	Shown as -1/-1, indicating all ports.	Used in scenarios: - No limit to outbound calls; - Both applications are fully mutually trusted.
RDP	Shown as 3389/3389, the default RDP port 3389.	Shown as 3389/3389, the default RDP port 3389.
SSH	Shown as 22/22, the default SSH port 22.	Used for remotely connecting to Linux

		instances.
TELNET	Shown as 23/23.	Used to remotely log on to instances by using Telnet.
HTTP	Shown as 80/80.	The instance is used as a server for a website or a web application.
HTTPS	Shown as 443/443.	The instance is used as a server for a website or a web application that supports the HTTPS protocol.
MS SQL	Shown as 1433/1433.	The instance is used as a MS SQL server.
Oracle	Shown as 1521/1521.	The instance is used as an Oracle SQL server.
MaxDB	Shown as 7210/7210.	The instance is used as an MaxDB.
SAP HANA	Shown as 30015-39915.	The instance is used as an SAP HANA.
SAP Dispatcher	Range 3200-3299	Used by SAP GUI for Windows and Java.
SAP Gateway	Range 3300-3399	Used for CPIC and RFC communication.
SAP Message server	Range 3600-3699	Used for SAP message server communication.

For more details, see [TCP/IP Ports of All SAP Products](#)

Priority

1–100. The smaller the number is, the higher the priority is. For more information on priority, see [Security group rule priority](#).

Authorization Type and Authorization Object

The authorization object affects setting of authorization type. The following table shows the relationship between them.

Authorization type	Authorization object
Address Field Access	Use the IP or CIDR block format such as 10.0.0.0 or 192.168.0.0/24. Only IPv4 addresses are supported. 0.0.0.0/0 indicates all IP addresses.
Security Group Access	Authorize the instances in a security group under your account or another account to

access the instances in this security group.

- **Authorize This Account:** Select a security group under your account.

- **Authorize Other Account:** Enter the target security group ID and the Account ID. You can view the account ID in **Account Management > Security Settings**.

For VPC network instances, **Security Group Access** works for private IP addresses only. If you want to authorize Internet IP address access, use **Address Field Access**.

- Click OK to add the security group rule to the specified security group.

Add Security Group Rules?×

NIC:

Intranet

Rule Direction:

Inbound

Authorization Policy:

Allow

Protocol Type:

Custom TCP

* Port Range:

3200/3201

i

Priority:

1

i

Authorization Type:

Address Field Access

* Authorization Object:

192.168.1.0/32

i

 Tutorial

Description:

It must contain 2-256 characters and it cannot begin with http:// or https://

OK

Cancel

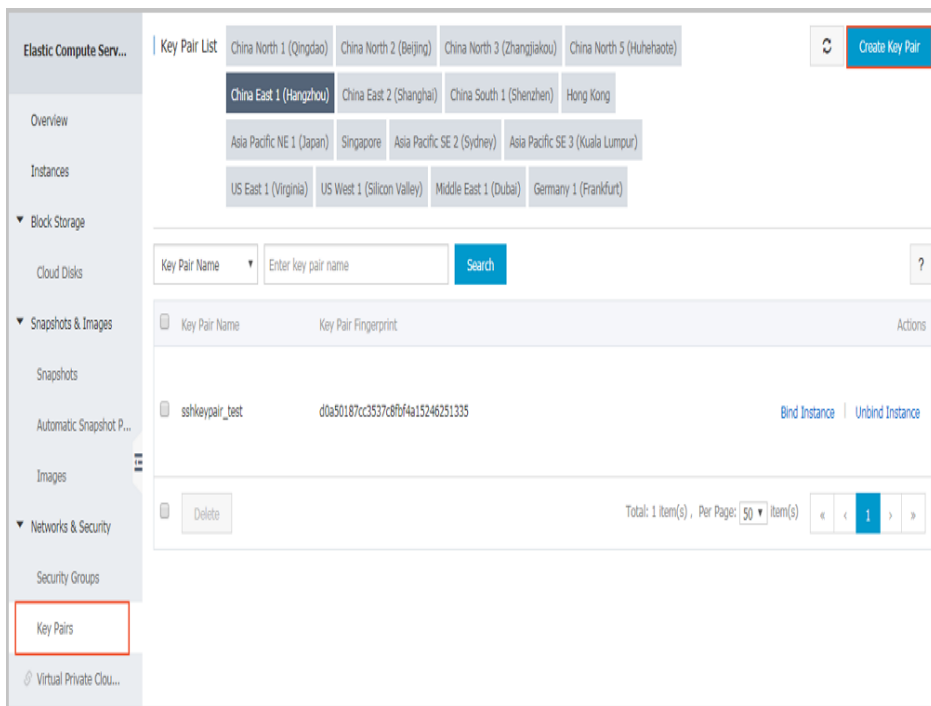
Creating an SSH key pair(Linux only)

To create an SSH key pair, follow these steps:

Log on to the ECS console.

In the left-side navigation pane, choose Networks & Security > Key Pairs.

On the Key Pairs page, select a region, and click Create Key Pair.



On the Create Key Pair page, enter a name for the key pair, and select Automatically Create a Key Pair for the Creation Type.

Note: The specified key pair name must be unique. It must not match with the existing key pair or a key pair that was deleted when it was still bound to an instance. Otherwise, an error message “The key pair already exists” appears.

Click OK to create a key pair.

Note: After a key pair is created, you must download and save the private key for further use. If you do not have the private key, you cannot log on to your ECS instance that is bound to this key pair.

After creating the key pair, you can view the information, including Key Pair Name and Key Pair Fingerprint, in the key pair list.

Connecting ECS instance from Internet

VPC is a private network established in Alibaba Cloud. VPCs are logically isolated from other virtual networks in Alibaba Cloud. You can use NAT Gateway or EIP (Elastic IP) to connect ECS instances from Internet.

NAT Gateway is an enterprise-class public network gateway that provides NAT proxy services (SNAT and DNAT), up to 10 Gbps forwarding capacity, and cross-zone disaster recovery. As a public network gateway, NAT Gateway requires configured public IPs and bandwidth. Public IPs for NAT Gateway are grouped into abstract groups called shared bandwidth packages.

An EIP address is a type of NAT IP address. It is located in a public network gateway of Alibaba Cloud, and is mapped to the private network interface card (NIC) of the bound ECS instance in the way of NAT. Therefore, the ECS instance bound with the EIP address can communicate with the Internet without disclosing the EIP address on the NIC.

For each ECS instance that runs SAP applications, ECS Metrics Collector needs to be installed. So, your SAP ECS instances also require access to the Internet for SAP system monitoring. There are two ways to enable this access, you should bind an EIP to the ECS instance directly; or you can use a NAT Gateway, configure SNAT for your ECS instances.

Creating a NAT gateway

Create a NAT gateway

Log on to the VPC console.

In the left-side navigation pane, click NAT Gateway.

In the upper-right corner of the NAT Gateway page, click Create NAT Gateway.

Configure the NAT gateway with the following information.

Configuration	Description
Region	Select the region of the NAT gateway. Make sure the regions of the NAT gateway and VPC are the same.
VPC	Choose the VPC for the NAT gateway. Once the gateway is created, you cannot change the VPC. If you cannot find the required VPC in the VPC

	<p>list, troubleshoot the following: Check whether the VPC already has a NAT gateway configured. A VPC can be configured with only one NAT gateway.</p> <p>Check whether a custom route entry, where the destination CIDR block is 0.0.0.0/0, already exists in the VPC. If so, delete this custom route entry.</p>
Specification	<p>Select a specification for the NAT gateway. The specification affects the maximum number of connections and the number of new connections allowed per second for the SNAT proxy service, but does not affect data throughput.</p> <p>Note: The specification has no impact on the DNAT function. For more details, see Gateway specification.</p>
Billing Cycle	Display the billing cycle.

NAT Gateway (Pay-As-You-Go)

Basic Configuration

Region

China North 1 (Qingdao)	China North 2 (Beijing)	China North 3 (Zhangjiakou)	China North 5 (Huhehaote)	China East 1 (Hangzhou)	China East 2 (Shanghai)
China South 1 (Shenzhen)	Hong Kong	Asia Pacific NE 1 (Japan)	Singapore	Asia Pacific SE 2 (Sydney)	Asia Pacific SE 3 (Kuala Lumpur)
	US West 1 (Silicon Valley)		EU Central 1 (Frankfurt)		
US East 1 (Virginia)		Middle East 1 (Dubai)			

VPC ID

vpc-bp f

A VPC can have only one NAT Gateway. You cannot change the VPC once the NAT Gateway is created.

Specification

Small

Medium

Large

Super Large-1

For details on the specifications, refer to [NAT Gateway specifications >>](#)

You can change the specification at any time.

After creating a NAT Gateway, you have to buy a shared bandwidth package that contains the public IPs for use.

Purchase Plan

Billing Cycle

By Day

NAT Gateway has different specifications. Different specifications correspond to different performance metrics (maximum connections and the number of new connections per second). The specifications only affect the SNAT performance and have no impact on the DNAT performance.

The following table lists the available specifications. Generally, for or your SAP solution, small size is OK.

Specification	Max Connection	New Connections Per Second (CPS)
Small	10,000	1,000
Medium	50,000	5,000
Large	200,000	10,000

Click Buy Now and complete the creation.

Note: The creation of a NAT gateway generally takes 1-5 minutes.

After the NAT gateway is created, the system automatically creates a DNAT table and an SNAT table. A custom route entry with the destination CIDR block 0.0.0.0/0 pointing to the NAT gateway is automatically added to the VPC route table.

China North 1 (Qingdao)

China North 2 (Beijing)

China North 3 (Zhangjiakou)

China North 5 (Huhehaote)

Refresh

Create NAT Gateway

China East 1 (Hangzhou)

China East 2 (Shanghai)

China South 1 (Shenzhen)

Hong Kong

Asia Pacific NE 1 (Japan)

Singapore

Asia Pacific SE 2 (Sydney)

Asia Pacific SE 3 (Kuala Lumpur)

US East 1 (Virginia)

US West 1 (Silicon Valley)

Middle East 1 (Dubai)

Germany 1 (Frankfurt)

Maintain a name for NAT gateway

In the right side of NAT gateway, choose More and click Edit to change the name of NAT gateway.

Edit

* Name:

NetWeaver-testing

The name must be 1-64 characters long and can contain English letters, digits and "-".

Description:

E2E testing

The description can contain up to 128 characters.

OK

Cancel

Enter a name for your NET gateway, click OK to finish configuration.

Create a shared bandwidth package

Find the target NAT gateway, and click the Buy Shared Bandwidth Package link.

Note: If the NAT gateway already has a shared bandwidth package, click **Manage** and then click **Shared Bandwidth Package**.

On the Shared Bandwidth Package page, click Buy Shared Bandwidth Package again.

Configure the shared bandwidth package according to the following information.

Configuration	Description
Public IP count	Select the number of public IPs that you want to purchase. You can adjust the number of public IPs at any time once a shared bandwidth package is created. You need at least 1 public IP for SNAT to

	deploy ECS Metrics Collector.
Peak Bandwidth	Set a peak bandwidth. You can adjust the peak bandwidth at any time.
ISP Type	BGP multi-pathing is used to connect the Internet.
Billing method	The shared bandwidth package is billed based on traffic usage. For more details, see Billing overview .
Billing cycle	Display the billing cycle.

| Shared Bandwidth Package (Pay-As-You-Go)

Basic Configuration

Public IP Count

2

The number of public IPs. You can adjust the IP count at any time.

Peak Bandwidth

50Mbps

100Mbps

200Mbps

2 Mbps

All the public IPs share this bandwidth, and you can change the bandwidth at any time.

ISP Type

BGP (Multipathing)

Billing Method

Pay By Traffic

Billing Cycle

By Hour

Purchase Plan

Quantity

1

Click Buy Now.

Note: The creation of a shared bandwidth package generally takes 1-5 minutes.

Creating an Elastic IP (EIP)

Elastic IP (EIP) is a public IP address resource that you can purchase and possess independently. It can

be dynamically bound to a VPC ECS instance without restarting the ECS instance.

Log on to the EIP console and click Create EIP.

On the purchase page, select the region, bandwidth, and purchase quantity for the EIP address, and click Buy Now.

Elastic IP

Basic Configuration	Region	China North 2	China East 1	China North 1	Hong Kong	China South 1	China East 2
		Singapore	US West 1	US East 1	Japan	Middle East 1	Asia Pacific SE 2
					China North 5		
		EU Central 1	China North 3	Asia Pacific SE 3	(Huhehaote)		
	Network traffic	By traffic					
	Max bandwidth	<input type="text" value="1"/> Mbps 50Mbps 100Mbps 200Mbps					
Fee	Billing cycle	Hour					
Purchase Plan	Quantity	<input type="text" value="1"/> You currently have 2 instances. You can create 18 more instances					

Complete the payment.

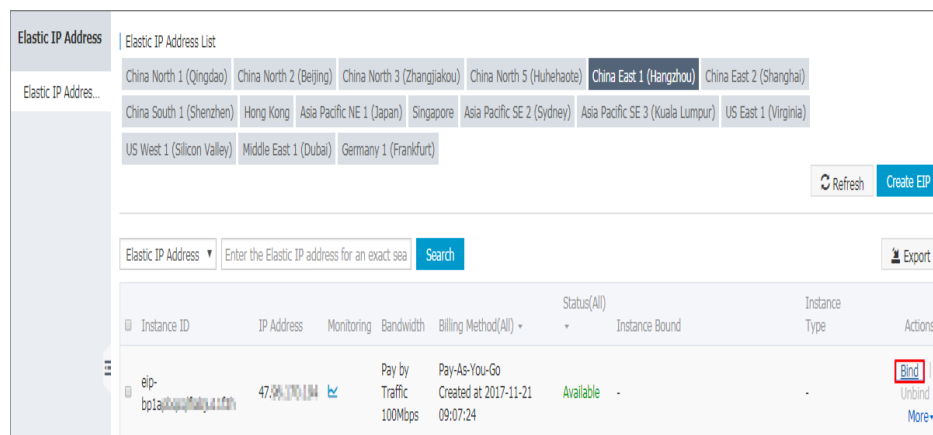
You can bind an EIP address to an ECS instance in any VPC as needed to make the instance accessible to the Internet, and release it whenever the Internet communication is not needed. Before binding an EIP address to an ECS instance, ensure that the following conditions are met:

- The regions of the EIP address and ECS instance to be bound are the same.
- The ECS instance to be bound is not allocated any public IP address. Procedure

Log on to the EIP console.

Choose a region. All Elastic IP addresses under the selected region are displayed.

Click Bind in the Actions column of the target EIP address.



In the **Bind** dialog box, perform the following operations:

- Instance type: Select **ECS Instance**.
- ECS instance: Select the ECS instance to be bound.
- Click **OK**.

After the EIP address is bound to the ECS instance, the ECS instance can communicate with the Internet. Make sure the configured security group rules do not block the Internet access.

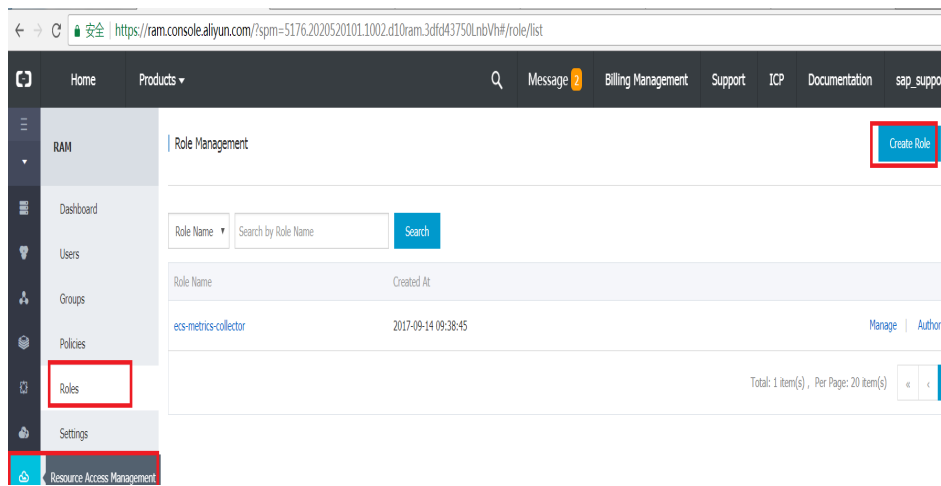
RAM service role setup

The monitoring agent **ECS Metrics Collector**, which is designed for SAP systems running on Alibaba Cloud infrastructure, needs a specific RAM service role setup. Please be noticed that this is just a one-time effort, because it's effective at your account level. For more information about RAM (Resource Access Management) Role setup, please refer to [How to use the instance RAM role on the console](#).

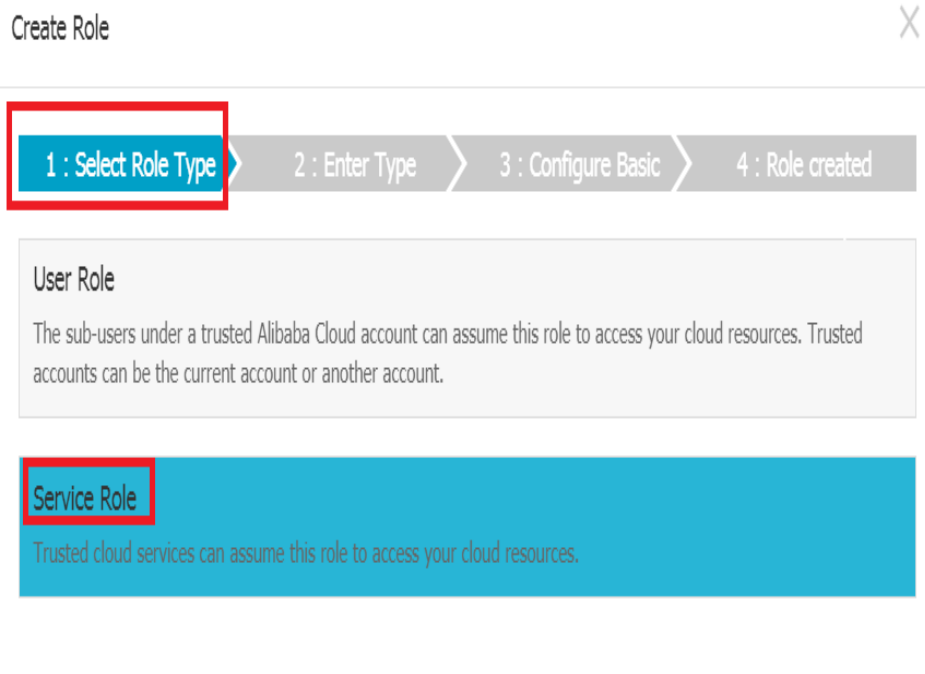
Log on to the ECS console.

On the left-side navigation pane, click Resource Access Management.

Open Resource Access Management Console, selects the tab **Roles**, then click **Create Role**



Select **Service Role** in step **Select Role Type**



In step **Enter Type**, find the service **ECS Elastic Compute Service**

Create Role ✕

1 : Select Role Type

2 : Enter Type

3 : Configure Basic

4 : Role created

Select the trusted services that can use this role to access your cloud resources.

LOG Log Service

When the Log Service imports collected logs to OSS, you must create a Log Service trusted service role. The Log Service can then assume this role to write data to your OSS.

ApiGateway Service

When configure the FunctionCompute as API Gateway backend service , you must create an API Gateway trusted service role. The API Gateway will play the role to call your FunctionCompute.

ECS Elastic Compute Service

Elastic Compute Service will play the role to access your other resources.

In step **Configure Basic**, you need to define a role name. For example, you can add **ecs-metrics-collector** as the role name. Then click **Create**

Create Role ✕

1 : Select Role Type

2 : Enter Type

3 : Configure Basic

4 : Role created

* Role Name :

ecs-metrics-collector

Names must be 1-64 characters long. They may only contain letters, numbers, and hyphens.

Description :

Previous

Create

The service role is created. Click **Authorize** for next steps

Create Role ✕

1 : Select Role Type

2 : Enter Type

3 : Configure Basic

4 : Role created

✓

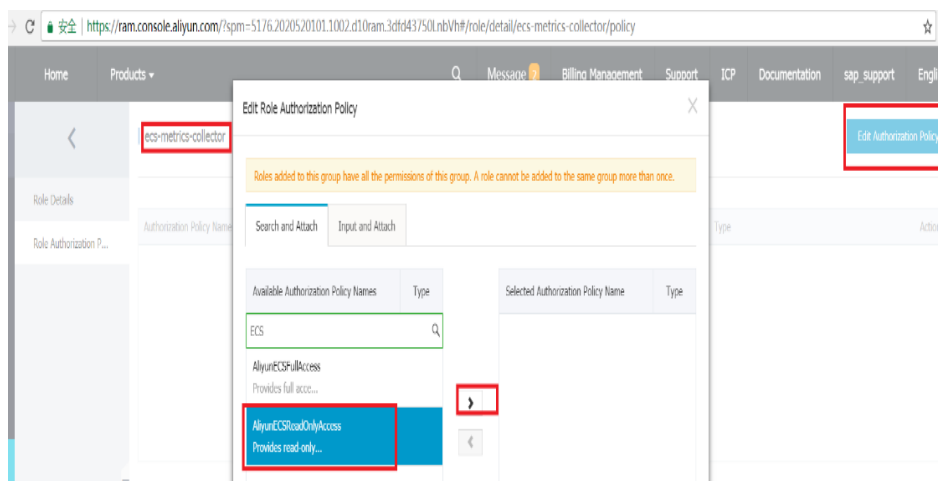
Role created successfully.

You have created a role that currently has no permissions. Please grant permissions to this role.

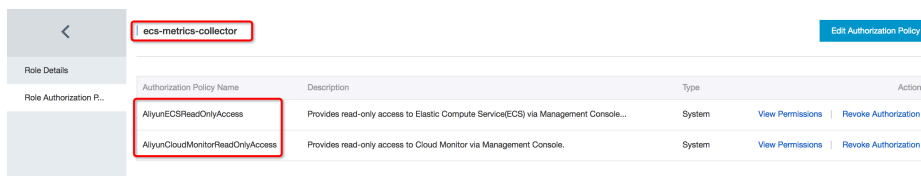
Close

Authorize

Click **Edit Authorization Policy**. By typing the Policy Name **AliyunECSReadOnlyAccess** and **AliyunCloudMonitorReadOnlyAccess** in the search bar, it will be easy for you to pick up the required policy. Select Policy Name **AliyunECSReadOnlyAccess** and **AliyunCloudMonitorReadOnlyAccess** and assign it to your RAM service role



Click OK, the policy assignment is completed.



Create and Configure ECS VM

For details of ECS creation and general configuration, please kindly refer to SAP Netweaver Implementation Guide. Within this guide, we just focus on the IBM Db2 specific requirement.

File System Configuration

As mentioned in IBM Db2 for SAP Planning Guide, you need to set specific file system layout. In Linux, you can use either Logical Volume Manager (LVM) to format disks and split it into the required directories or non-LVM. Below you can find an example of using LVM:

Set up file system directory

```
sudo mkdir -p /db2
sudo mkdir -p /db2/[DB_SID]
sudo mkdir -p /db2/[DB_SID]/log_dir
sudo mkdir -p /db2/[DB_SID]/db2dump
sudo mkdir -p /db2/[DB_SID]/sapdata
sudo mkdir -p /db2/[DB_SID]/saptmp
```

Initialize the disk or a partition for use by LVM:

```
pvcreate /dev/vdb /dev/vdc
```

Create a volume group:

```
vgcreate db2vg /dev/vdb /dev/vdc
```

Create logical volumes for each drive with the size needed from your business workload:

```
lvcreate -L 8G -n db2lv db2vg  
lvcreate -L 8G -n db2dbsidlv db2vg  
lvcreate -L 30G -n db2logdirlv db2vg  
lvcreate -L 10G -n db2dumplv db2vg  
lvcreate -L 10G -n db2jldlv db2vg  
lvcreate -L 10G -n db2sapdatalv db2vg  
lvcreate -L 10G -n db2saptmplv db2vg
```

Format the volumes:

```
mkfs.ext3 /dev/db2vg/db2lv  
mkfs.ext3 /dev/db2vg/db2dbsidlv  
mkfs.ext3 /dev/db2vg/db2logdirlv  
mkfs.ext3 /dev/db2vg/db2dumplv  
mkfs.ext3 /dev/db2vg/db2jldlv  
mkfs.ext3 /dev/db2vg/db2sapdatalv  
mkfs.ext3 /dev/db2vg/db2saptmplv
```

Modify /etc/fstab to mount all above logical volumes

SAP System installation

Once you have provisioned and configured the required ECS instance on Alibaba Cloud, you are ready to begin the installation of the SAP solution. Before that, please refer to the following SAP official guides.

System Provisioning Guide

- Check the section of Installation Guides - Application Server Systems > and find **Installing SAP Systems Based on SAP NetWeaver 7.1 and Higher - Using Software Provisioning Manager 1.0** which is appropriate to your database, SAP product release, operating system and technical stack.

More specific installation guides for all supported combinations of technologies (ABAP, Java, or ABAP and Java), databases and operating systems, available at:

<http://support.sap.com/sltoolset>

Start SWPM

The Software Provisioning Manager (SWPM) chooses the disk drive with the most free space as an installation suggestion for each component. Be sure to assign the disks to their proper roles in the SWPM dialog boxes.

You can download the latest SWPM as per the [SAP note 1680045](#). You need to verify that you have installed JAVA JDK software on your SAP ECS instance.

Note: When you run SWPM to perform an installation, if you want to connect to the SWPM with the browser, it is required using root user. So the password has to be set for root even if the customer selected to connect with a certificate.

After installation, to secure the system, if required, the customer can disable password login within the ssh configuration.

Upgrade SAP kernel

After you have installed SAP NetWeaver, make sure that you apply the latest kernel as described in the Installation Guide, or update the SAP kernel to the minimum supported patch level.

In addition to that, please also make sure it contains the minimum SAP kernel patch level, as described in the [SAP note 2533233 - Linux on Alibaba Cloud \(IaaS\): Adaption of your SAP License](#).

Check Host Agent version

SAP Host Agent is an agent that can accomplish several life-cycle management tasks, such as operating system monitoring, database monitoring, system instance control and provisioning. Usually SAP Host Agent is automatically started when the operating system is booted. You can also manually control it using the saphostexec program.

You are running SAP in a Linux ECS instance on Alibaba cloud and want to configure Enhanced Monitoring as required by SAP in cloud environments. In addition you should reference [SAP Note 2564176](#)

The steps to check SAP Host Agent version, please follow below steps to check version:



On Linux

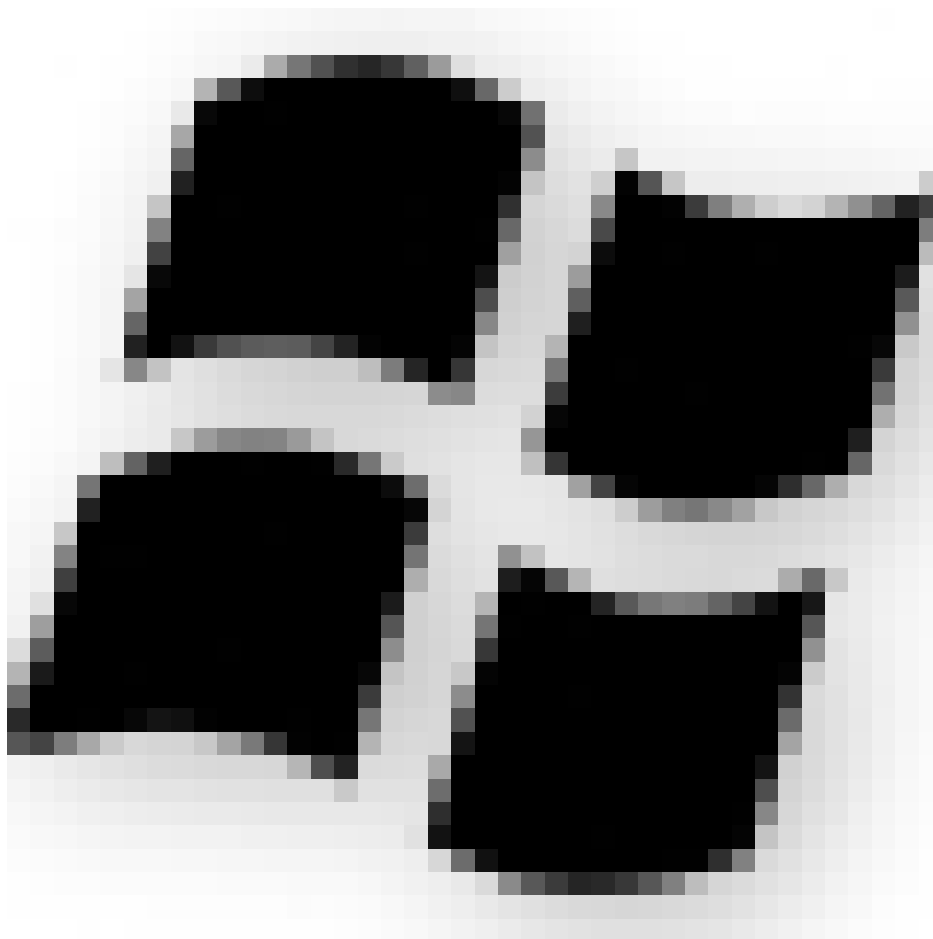
Login as root, since sidadm user doesn' t have permission for executing SAP HOST AGENT commands

navigate to directory where SAP Host Agent is installed

```
cd /usr/sap/hostctrl/exe
```

execute command

```
./saphostexec -version
```

On Windows

- You are logged on as a member of the local Administrator group.
- Open a command-line window.
- Change to the directory where the saphostexec executable of SAP Host Agent is located:

```
cd %ProgramFiles%\SAP\hostctrl\exe
```

- Execute the following command:

```
saphostexec.exe -version
```

The minimum SAP Host Agent version for Enhanced Monitoring is release 7.21 patch level 32. To include Alibaba cloud performance counters in the SAP enhanced monitoring, SAP has enhanced the SAP Host Agent and its monitoring transaction ST06.

For the required SAP NetWeaver support package levels please check SAP Note 1102124.

Upgrade Host Agent

Please ensure that you run at least the minimum SAP Host Agent version required for the Alibaba

Cloud environment. We recommend upgrading SAP Host Agent independently from the SAP instance, either by doing this manually or by configuring automated upgrade.

To update your SAP Host Agent by default on a regular basis, see [SAP Note 1473974 - Using the SAP Host Agent Auto Upgrade Feature](#).

Installation of a scale-out system

In a 3-tier scale-out SAP system, you should deploy several ECS instances as different SAP instances.

ASCS: ABAP Central Services Instance, you can install ASCS on independent ECS instance, containing the enqueue server and the message server. There can only be one such instance in the SAP system, and it can be made into a high availability instance.

SCS: SAP Central Services, for Java systems the Central Services are referred to as SCS.

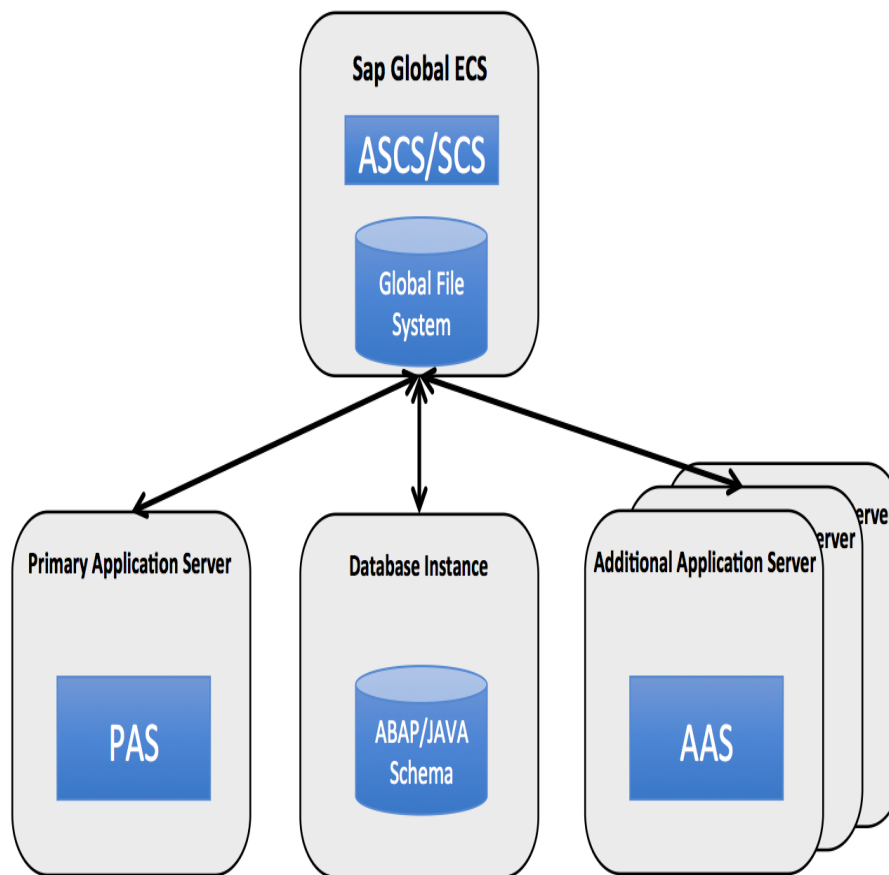
PAS: Primary Application Server Instance, a primary ECS instance that runs the SAP NetWeaver application server (AS), this ECS instance also hosts a shared file-system that contains the shared profile and must be accessible from each ECS instances which run parts of the same SAP SID. If it's also used for the transport share it has to be shared with all SAP SIDs using the same transport directories.

You also can install ASCS or SCS on this primary ECS instance.

AAS: Additional Application Server Instances, some number of additional VMs that run the AS, for scaling purposes.

DB Instance: An ECS instance that is dedicated to the central database.

Everything needs to run in the same zone.



The primary steps are as follows:

- DB instance: Create the ECS instance that hosts the database and then install the database instance.
- PAS :
 - Run SWPM on the ECS instance that you want to run SAP NetWeaver.
 - Install central services, ASCS or SCS.
 - Install the AS ABAP or AS JAVA.
 - Connect to the existing database instance.
- AAS:
 - Run SWPM on each additional ECS instances that you want to run SAP NetWeaver.
 - Install the AAS.
 - Connect to the existing database instance.
 - Point to the network share that contains the profiles and is managed by the primary instance.

Installation of a single-node system

The steps to deploy SAP NetWeaver in a 2-tier configuration on Linux are very similar to the steps for

setting up a 3-tier configuration. In a 2-tier configuration:

- Both SAP NetWeaver and the database instance are installed a single ECS instance.
- Install the database instance before you install SAP NetWeaver.

Post-Installation

Before using your SAP system with IBM Db2 instance on Alibaba Cloud, it is recommended to perform the following post-installation tasks:

- Update your IBM Db2 software with the latest patches.
- Install any additional components based on your usage.
- Configure and back up your new IBM Db2 database.

For additional post-deployment guidance, see the Post-installation Tasks section of the installation guide that applies to the SAP system that you are using with IBM Db2.

IBM Db2 for SAP High Availability and Disaster Recovery

IBM Db2 for SAP High Availability and Disaster Recovery

- Solution Overview
 - Overview
 - Architecture Overview
 - Network Design
- Infrastructure Preparation
 - Infrastructure List
 - Creating VPC
 - Creating ECS Instances
 - Creating HAVIP
 - Create HAVIP
 - Configure Network Interface
 - Bind Primary Db2 Node
- Deployment
 - Enviroment Preparation
 - SAP ASCS Instance Installation
 - Primary IBM Db2 Instance Installation

- SAP PAS Instance Installation
- Standby IBM Db2 Installation
- IBM Db2 HADR Configuration
- HADR Verification

Version Control:

Version	Revision Date	Types Of Changes	Effective Date
1.0			2019/3/15

This guide shows you how to set up SAP Netweaver system with IBM Db2 high-availability disaster recovery(HADR) without cluster manager, e.g. TSAMP, on the Linux operation system on Alibaba cloud.

Solution Overview

Overview

These instructions are targeted for pure IBM Db2 HADR requirement without cluster manager which means manual takeover and failback operation is required.

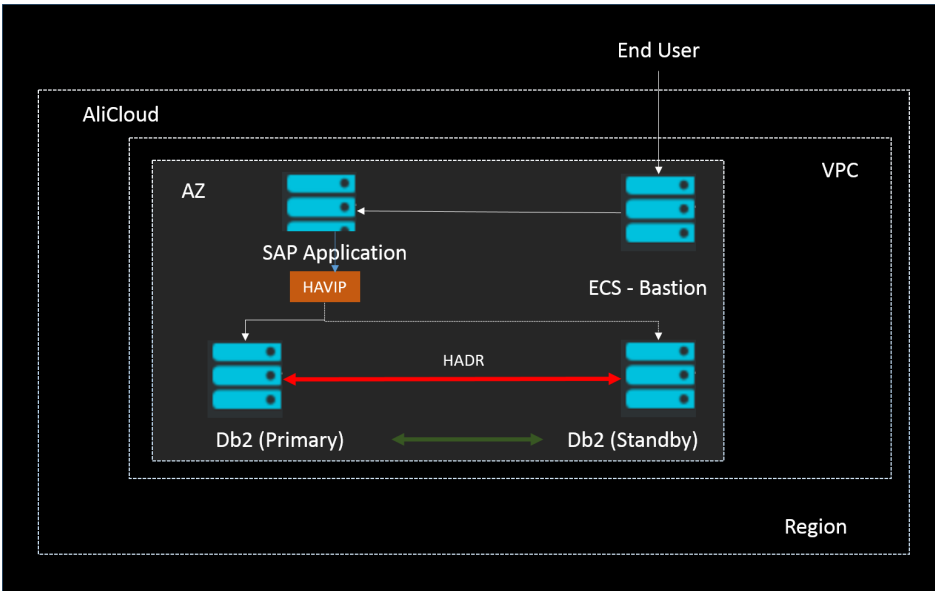
This implementation uses HAVIP which is a high availability virtual IP service implemented by Alibaba cloud.

These instructions show you how to set up an IBM Db2 HADR for SAP that consists of a SAP application server, a primary IBM Db2 server and one secondary or standby IBM Db2 server, each of which are deployed on a separate ECS(VM). IBM Db2 High-Availability Disaster Recovery (HADR) function is used to replicate logged data changes to the standby database.

Architecture Overview

This document guides you on how to deploy a SAP Netweaver system with IBM Db2 HADR feature enabled but without cluster manager within one zone. Following is a brief architecture:

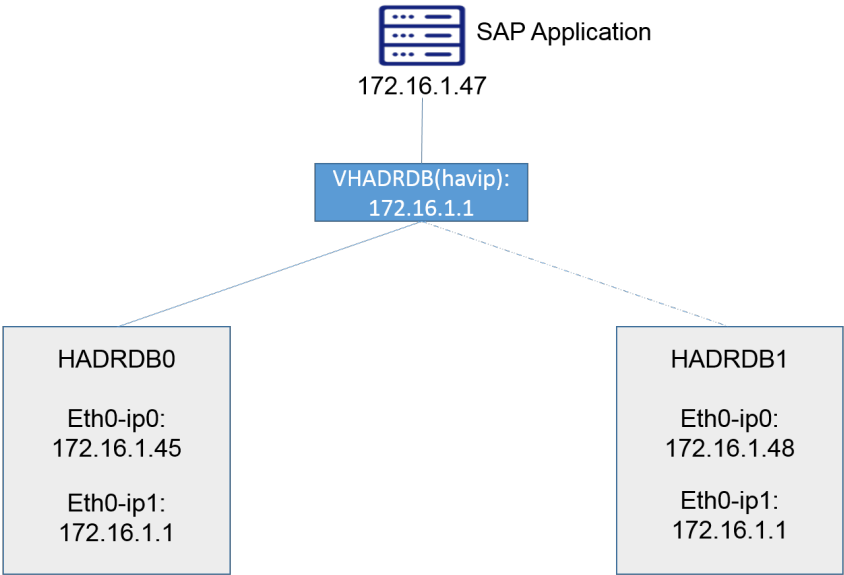
- IBM Db2 HADR is activated between the two database nodes;
- One SAP application node, two Db2 nodes locates in one zone of the same Region;
- Alibaba Cloud Specific Virtual IP Resource which can be used to control which Db2 server the SAP application should refer to;



Network Design

In this section, you can find below network design example which can help you understand the implementation.

Physical Hostname	Virtual Hostname	Role	IP1	VIP
HADRSAP		SAP application	172.16.1.47	
HADRDB0	VHADRDB	Db2	172.16.1.45	172.16.1.1
HADRDB1	VHADRDB	Db2	172.16.1.48	172.16.1.1



Infrastructure Preparation

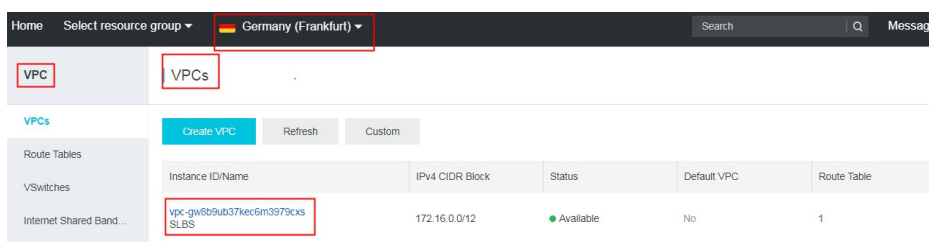
Infrastructure List

- 1 VPC network;
- 3 ECS instances in one zones of the same VPC;
- Alibaba Cloud specific virtual IP service called **HAVIP**

Creating VPC

Creating VPC

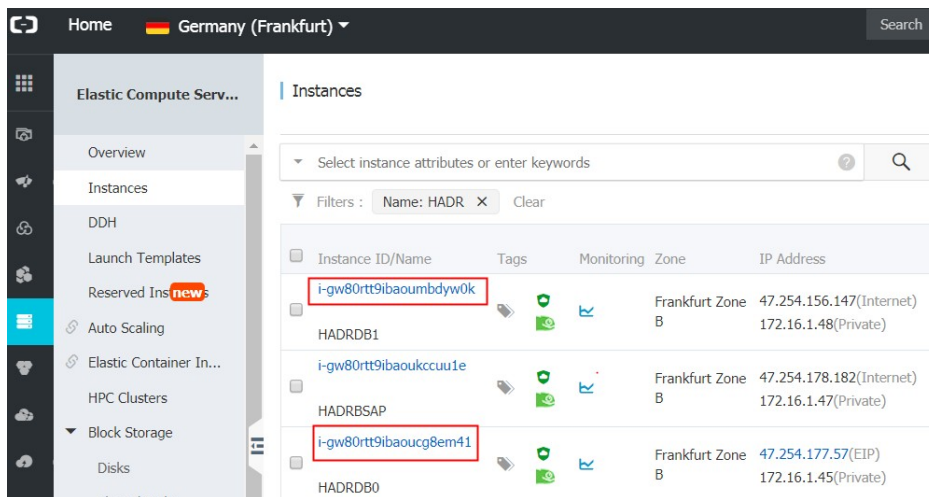
First, create a VPC via **Console→Virtual Private Cloud→VPCs→Create VPC**. In this example, a VPC named SLBS in the Region EU Central 1 (Frankfurt) has been created:



Creating ECS Instances

Two ECS instances are created in one zone of the above created VPC via **Console→Elastic Compute Service ECS→Instances→Create Instance**. Choose the “SUSE Linux Enterprise Server” image from the public image tab.

In this example, 3 ECS instances (hostname: HADRSAP, HADRDB0 and HADRDB1) are created in eu-central-1 Region zone B, within VPC: SLBS, with SUSE Linux Enterprise Server 12 SP2 image. Host HADRSAP is the SAP application server. Host HADRDB0 is the original primary Db2 node, and HADRDB1 is the original standby node.

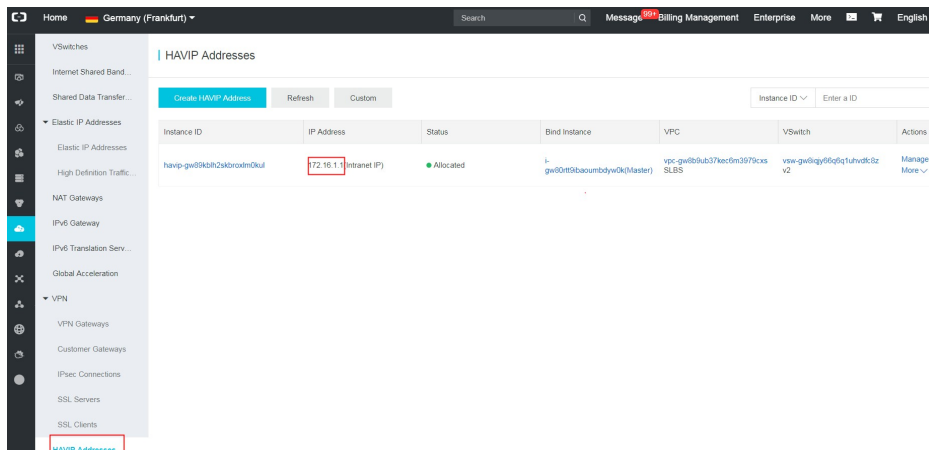


Creating HAVIP

High-Availability Virtual IP Address (HAVIP) is a private IP resource which can be created and released independently. The uniqueness of HaVip is that you can broadcast the IP address on ECS using ARP. In this deployment, the HaVip is used as the virtual IP address of the Db2 instance and is attached to primary Db2 node.

Create HAVIP

HAVIP is created via **Console->VPC->HAVIP->Create HAVIP Address**, then assign the VPC and corresponding vswitch which was created before and also the HAVIP address which will be used as virtual IP address. Please kindly refer to below figure for our example:



Create HAVIP Address



Region

Germany (Frankfurt)

VPC

SLBS/vpc-gw8b9ub37kec6m3979cxs

VSwitch

v2/vsw-gw8iqjy66q6q1uhvdfc8z

VSwitch CIDR Block

172.16.1.0/24

Private IP Address

172

.

16

.

1

.

1

OK

Cancel

Configure Network Interface

In order to let the vip take effect, you need to add the HAVIP address as an additional address of your network interface and update **/etc/hosts** file with vip and vhost information as below.

```
HADRDB0:~ # cat /etc/sysconfig/network/ifcfg-eth0
BOOTPROTO='dhcp'
STARTMODE='auto'
USERCONTROL='no'
BROADCAST=''
ETHTOOL_OPTIONS=''
IPADDR=''
MTU=''
NAME=''
NETWORK=''
REMOTE_IPADDR=''
PREFIXLEN='24'
IPADDR_0='172.16.1.1/24'
```

```
HADRDB0:~ # ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 brd 127.255.255.255 scope host lo
        valid_lft forever preferred_lft forever
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc mq state UP group default qlen 1000
    link/ether 00:16:3e:00:0f:12 brd ff:ff:ff:ff:ff:ff
    inet 172.16.1.45/24 brd 172.16.1.255 scope global eth0
        valid_lft forever preferred_lft forever
    inet 172.16.1.1/24 brd 172.16.1.255 scope global secondary eth0
        valid_lft forever preferred_lft forever
```

```
HADRDB1:~ # cat /etc/sysconfig/network/ifcfg-eth0
BOOTPROTO='dhcp'
STARTMODE='auto'
USERCONTROL='no'
BROADCAST=''
ETHTOOL_OPTIONS=''
IPADDR=''
MTU=''
NAME=''
NETWORK=''
REMOTE_IPADDR=''
PREFIXLEN='24'
IPADDR_0='172.16.1.1/24'
```

```
HADRDB1:~ # ip a
1: lo: <LOOPBACK,UP,LOWER_UP> mtu 65536 qdisc noqueue state UNKNOWN group default qlen 1
    link/loopback 00:00:00:00:00:00 brd 00:00:00:00:00:00
    inet 127.0.0.1/8 brd 127.255.255.255 scope host lo
        valid_lft forever preferred_lft forever
2: eth0: <BROADCAST,MULTICAST,UP,LOWER_UP> mtu 1500 qdisc mq state UP group default qlen 1000
    link/ether 00:16:3e:00:13:98 brd ff:ff:ff:ff:ff:ff
    inet 172.16.1.48/24 brd 172.16.1.255 scope global eth0
        valid_lft forever preferred_lft forever
    inet 172.16.1.1/24 brd 172.16.1.255 scope global secondary eth0
        valid_lft forever preferred_lft forever
```

Moreover, the `/etc/hosts` file on the 3 ECS VMs should contains below entries:

```
172.16.1.47 HADRSAP HADRSAP
172.16.1.45 HADRDB0 HADRDB0
172.16.1.48 HADRDB1 HADRDB1
172.16.1.1 VHADRDB VHADRDB
```

Bind Primary Db2 Node

In the created HAVIP page, attach Db2 node HADRDB0 as primary by clicking “attach” button as below.

HAVIP Details

Information

ID

havip-gw89kblh2skbroxm0kul

Region

Germany (Frankfurt)

VPC ID

vpc-gw8b9ub37kec6m3979cxs

VSwitch

vsw-gw8qgy66qg1uhvdfc6z

Resources

No EIP Bound

HAVIP Address

No ECS Bound

Bind an ECS Instance

HAVIP Address

havip-gw89kblh2skbroxm0kul

Intranet IP

172.16.1.1

ECS Instance

Select

HAVIP Details

Information

ID

havip-gw89kblh2skbroxm0kul

Region

Germany (Frankfurt)

VPC ID

vpc-gw8b9ub37kec6m3979cxs

VSwitch

vsw-gw8qgy66qg1uhvdfc6z

Status

Allocated

Intranet IP

172.16.1.1

Created At

02/21/2019, 1:

Description

- Edit

Resources

No EIP Bound

HAVIP Address: 172.16.1.1(Intranet IP)

ECS Instance(1 Master)

i-gw80rtt9lbaouc98em41

Running

Deployment

Enviroment Preparation

Before deployment, please download required SAP software at SAP Software Center. And also initialize the file system of Db2 servers as mentioned at IBM Db2 for SAP Deployment Guide.

SAP ASCS Instance Installation

If you want to make the SAP central services instance highly available, you must install the instance on a virtual host name. You can do this by using the parameter SAPINST_USE_HOSTNAME when you start the SAP installer.

In this example, since HA feature is not required for SAP central service, you can directly start the installer without hostname parameter.

For more information about the installation, see your relevant installation guide at https://help.sap.com/viewer/30839dda13b2485889466316ce5b39e9/CURRENT_VERSION/en-US/c8ed609927fa4e45988200b153ac63d1.html.

Primary IBM Db2 Instance Installation

Install the database server as described in the appropriate installation guide at https://help.sap.com/viewer/30839dda13b2485889466316ce5b39e9/CURRENT_VERSION/en-US/c8ed609927fa4e45988200b153ac63d1.html.

In our example, since HA is required for the DB instance, therefore please use **SAPINST_USE_HOSTNAME=VHADRDB** during installation.

Standby IBM Db2 Installation

If you set up the switchover cluster based on the Db2 feature HADR, you have to create a standby database as a copy of the primary database. You can use the SAP homogeneous system copy for setting up the standby database server. For details please kindly refer to **IBM Db2 High Availability Solution: IBM Tivoli System Automation for Multiplatforms**.

SAP PAS Instance Installation

The installation of SAP application servers is not covered in this document. For more information, see the respective installation guide that you use to install the database server. You can find the installation guides at https://help.sap.com/viewer/30839dda13b2485889466316ce5b39e9/CURRENT_VERSION/en-US/c8ed609927fa4e45988200b153ac63d1.html.

IBM Db2 HADR Configuration

Please refer to Initializing high availability disaster recovery (HADR) for details.

In summary, you need to :

- Add HADR service entry in **/etc/services** file. In our example, we have **DB2HADR 5917/tcp** into the service file.
- Execute command db2 "UPDATE DB CFG FOR JLD USING LOGINDEXBUILD ON on both Db2 nodes.
- HADR configuration
 - Primary:

```
db2 "UPDATE DB CFG FOR JLD USING HADR_LOCAL_HOST HADRDB0 HADR_LOCAL_SVC
DB2HADR HADR_SYNCMODE NEARSYNC";
db2 "UPDATE DB CFG FOR JLD USING HADR_TARGET_LIST HADRDB1:DB2HADR";
db2 "UPDATE DB CFG FOR JLD USING HADR_REMOTE_HOST HADRDB1 HADR_REMOTE_SVC
DB2HADR HADR_REMOTE_INST db2jld";
```

- Standby:

```
db2 "UPDATE DB CFG FOR JLD USING HADR_LOCAL_HOST HADRDB1 HADR_LOCAL_SVC
DB2HADR HADR_SYNCMODE NEARSYNC";
db2 "UPDATE DB CFG FOR JLD USING HADR_TARGET_LIST HADRDB0:DB2HADR";
db2 "UPDATE DB CFG FOR JLD USING HADR_REMOTE_HOST HADRDB0 HADR_REMOTE_SVC
DB2HADR HADR_REMOTE_INST db2jld";
```

- tart HADR on both nodes
 - On host HADRDB1, execute:

```
Db2 "START HADR ON DB JLD AS STANDBY"
```

- On host HADRDB0, execute:

```
Db2 "START HADR ON DB JLD AS PRIMARY"
```

HADR Verification

After you have finished above actions, you should be able to verify the HADR status as below:

```
HADRDB0:~ # su - db2jld
HADRDB0:db2jld 51> db2pd -d jld -hadr

Database Member 0 -- Database JLD -- Active -- Up 2 days 06:09:43 -- Date 2019-03-17-03.4

      HADR_ROLE = PRIMARY
      REPLAY_TYPE = PHYSICAL
      HADR_SYNCMODE = NEARSYNC
      STANDBY_ID = 1
      LOG_STREAM_ID = 0
      HADR_STATE = PEER
      HADR_FLAGS =
PRIMARY_MEMBER_HOST = HADRDB0
PRIMARY_INSTANCE = db2jld
PRIMARY_MEMBER = 0
STANDBY_MEMBER_HOST = HADRDB1
STANDBY_INSTANCE = db2jld
STANDBY_MEMBER = 0
HADR_CONNECT_STATUS = CONNECTED
HADR_CONNECT_STATUS_TIME = 03/14/2019 21:32:12.559678 (1552570332)
HEARTBEAT_INTERVAL(seconds) = 30
HEARTBEAT_MISSED = 0
HEARTBEAT_EXPECTED = 6477
HADR_TIMEOUT(seconds) = 120
TIME_SINCE_LAST_RECV(seconds) = 2
PEER_WAIT_LIMIT(seconds) = 0
LOG_HADR_WAIT_CUR(seconds) = 0.000
LOG_HADR_WAIT_RECENT_AVG(seconds) = 0.000015
```

```

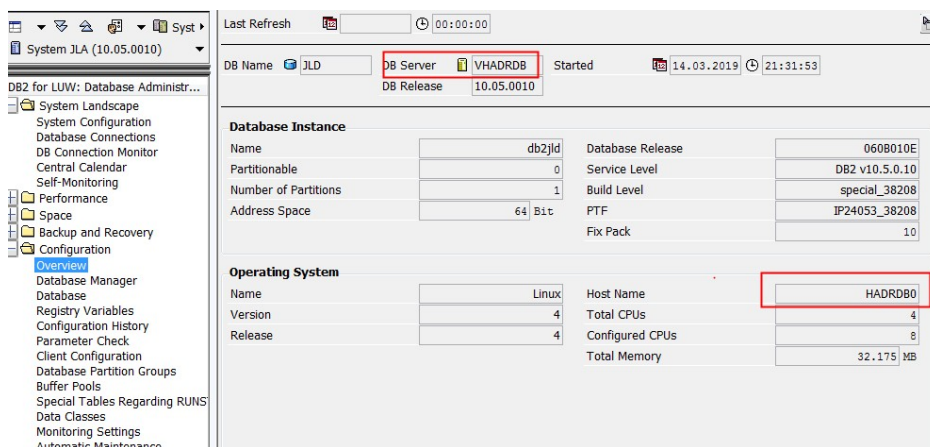
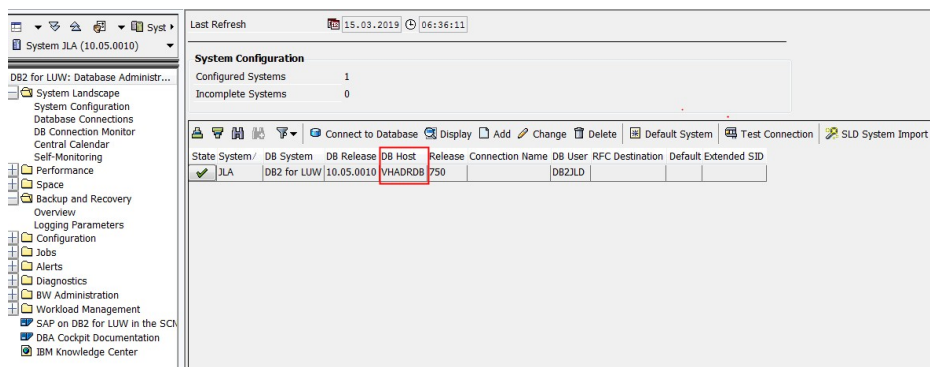
HADRDB1:db2jld 53> db2pd -d jld -hadr

Database Member 0 -- Database JLD -- Standby -- Up 2 days 06:29:04 -- Dat

      HADR_ROLE = STANDBY
      REPLAY_TYPE = PHYSICAL
      HADR_SYNCMODE = NEARSYNC
      STANDBY_ID = 0
      LOG_STREAM_ID = 0
      HADR_STATE = PEER
      HADR_FLAGS =
      PRIMARY_MEMBER_HOST = HADRDB0
      PRIMARY_INSTANCE = db2jld
      PRIMARY_MEMBER = 0
      STANDBY_MEMBER_HOST = HADRDB1
      STANDBY_INSTANCE = db2jld
      STANDBY_MEMBER = 0
      HADR_CONNECT_STATUS = CONNECTED
      HADR_CONNECT_STATUS_TIME = 03/14/2019 21:32:12.558341 (15525
      HEARTBEAT_INTERVAL(seconds) = 30
      HEARTBEAT_MISSED = 6
      HEARTBEAT_EXPECTED = 6515
      HADR_TIMEOUT(seconds) = 120
      TIME_SINCE_LAST_RECV(seconds) = 14
      REPLAY_WAIT_TIME(seconds) = 0

```

From SAP application transaction **DBACOCKPIT**, you should be able to find out:



Afterwards, you can perform a takeover on current standby Db2, i.e. HADRDB1 and then unbind HADRDB0 in HAVIP and bind HADRDB1 as below:

```

HADRDB1:db2jld 55> db2 TAKEOVER HADR ON DATABASE JLD
DB20000I The TAKEOVER HADR ON DATABASE command completed successfully.
HADRDB1:db2jld 56> db2pd -d jld -hadr

Database Member 0 -- Database JLD -- Active -- Up 4 days 03:26:24 -- Date 2019-03-17-03.

      HADR_ROLE = PRIMARY
      REPLAY_TYPE = PHYSICAL
      HADR_SYNCMODE = NEARSYNC
      STANDBY_ID = 1
      LOG_STREAM_ID = 0
      HADR_STATE = PEER
      HADR_FLAGS =
PRIMARY_MEMBER_HOST = HADRDB1
PRIMARY_INSTANCE = db2jld
PRIMARY_MEMBER = 0
STANDBY_MEMBER_HOST = HADRDB0
STANDBY_INSTANCE = db2jld
STANDBY_MEMBER = 0
HADR_CONNECT_STATUS = CONNECTED
HADR_CONNECT_STATUS_TIME = 03/14/2019 21:32:12.558341 (1552570332)
HEARTBEAT_INTERVAL(seconds) = 30
      HEARTBEAT_MISSED = 6
      HEARTBEAT_EXPECTED = 11910

```

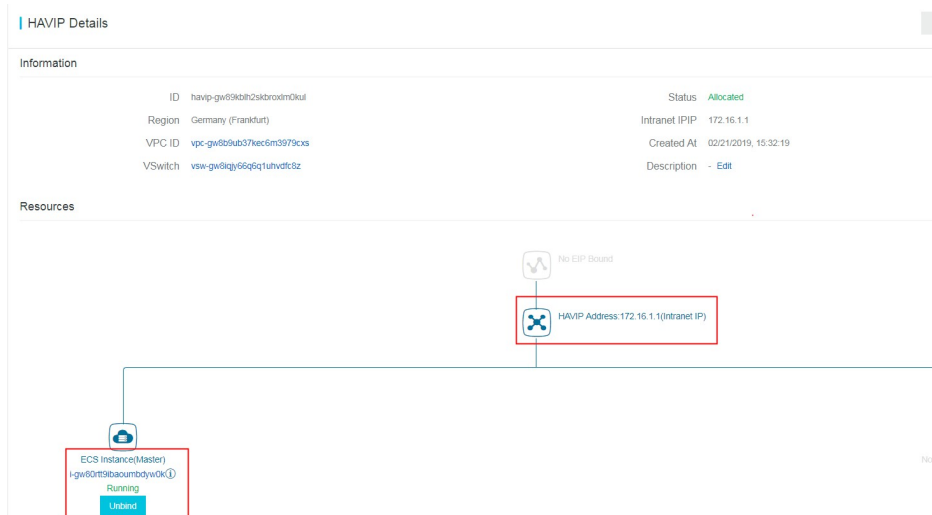
```

HADRDB0:~ # su - db2jld
HADRDB0:db2jld 54> db2pd -d jld -hadr

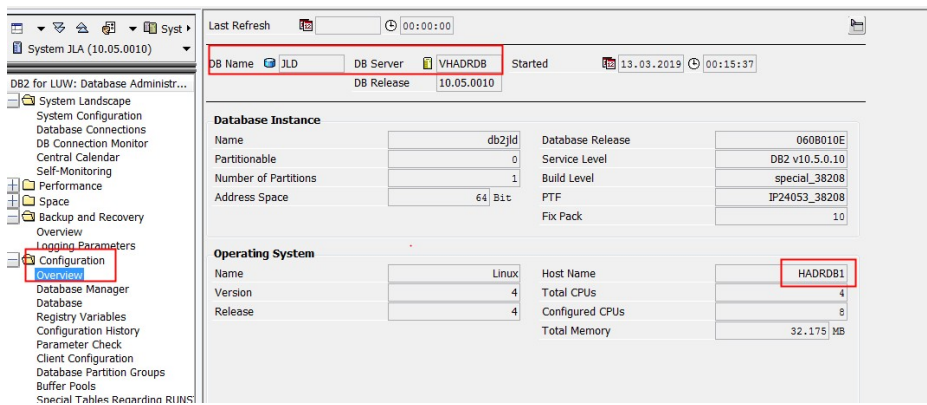
Database Member 0 -- Database JLD -- Standby -- Up 0 days 09:16:27 -- Date 2019-03-15-06.48.36.712204

      HADR_ROLE = STANDBY
      REPLAY_TYPE = PHYSICAL
      HADR_SYNCMODE = NEARSYNC
      STANDBY_ID = 0
      LOG_STREAM_ID = 0
      HADR_STATE = PEER
      HADR_FLAGS =
PRIMARY_MEMBER_HOST = HADRDB1
PRIMARY_INSTANCE = db2jld
PRIMARY_MEMBER = 0
STANDBY_MEMBER_HOST = HADRDB0
STANDBY_INSTANCE = db2jld
STANDBY_MEMBER = 0
HADR_CONNECT_STATUS = CONNECTED
HADR_CONNECT_STATUS_TIME = 03/14/2019 21:32:12.559678 (1552570332)
HEARTBEAT_INTERVAL(seconds) = 30
      HEARTBEAT_MISSED = 0
      HEARTBEAT_EXPECTED = 1112
      HADR_TIMEOUT(seconds) = 120
      TIME_SINCE_LAST_RECV(seconds) = 6
      PEER_WAIT_LIMIT(seconds) = 0
      LOG_HADR_WAIT_CUR(seconds) = 0.000
      LOG_HADR_WAIT_RECENT_AVG(seconds) = 0.000088
      LOG_HADR_WAIT_ACCUMULATED(seconds) = 10.928
      LOG_HADR_WAIT_COUNT = 62968

```



After all the changes, you should find out that the Database host name in SAP application has changed to HADRDB1 as below:



IBM Db2 for SAP Planning Guide

IBM Db2 for SAP Planning Guide

- Overview of Alibaba Cloud
- Deployment Architecture
- Planning
 - Regions and Zones
 - Supported ECS Types
 - Supported Operation Systems
 - Networking and Security
 - Security Group
 - SSH Key Pairs
 - Router configuration
 - Bastion Server
 - NAT Gateway
 - VPN Gateway
 - Security document
 - Storage
 - Supported IBM Db2 Versions
 - Supported IBM Db2 Scenarios
 - IBM Db2 Backup and Recovery
- Licensing
 - SAP License
 - Linux License
 - Windows License
 - IBM Db2 License

Version Control:

Version	Revision Date	Types Of Changes	Effective Date
1.0			2019/2/28

This guide provides information that you can use to plan for the installation of an IBM Db2 system that supports SAP applications on Alibaba Cloud.

For more information about certified SAP products on Alibaba Cloud, including IBM Db2, please kindly refer to SAP Note 2552731.

Overview of Alibaba Cloud

Alibaba Cloud is built on a global infrastructure providing all kinds of IaaS products and services. Alibaba Cloud services are available to use in different geographical regions across the globe. Before running your SAP NetWeaver with IBM Db2 on Alibaba Cloud, following basic knowledge must be understood well:

- Alibaba Cloud Elastic Compute Service (ECS)

Alibaba Cloud Elastic Compute Service (ECS) is a web service that provides resizable compute capacity in the cloud. Its simple web service interface allows you to obtain and configure computing capacity with minimal effort. You are able to quickly scale capacity up and down as your computing requirements change, and you only pay for capacity that you actually need.

You can use the standard Alibaba Cloud methods to deploy your ECS instances on Alibaba Cloud platform, including ECS Console (the Cloud Platform Console web UI) and REST API. You can read the following pages to get more useful information.

- Create an ECS instance
- Start and view an ECS instance

For detailed information and step-by-step instructions about deploying your SAP system with IBM Db2 on ECS, please refer to IBM Db2 for SAP Deployment Guide on Alibaba Cloud.

- Alibaba Cloud Block Storage (Cloud Disk)

Alibaba Cloud Block Storage (Cloud Disk) provides persistent block-level storage volumes for use with Alibaba Cloud ECS instance on the Alibaba Cloud Platform. Cloud Disk volumes provide the consistent and low-latency performance needed to run your workloads. With Cloud Disk, you can scale your usage up or down within minutes – all while paying a low price for only what you provision.

- Alibaba Cloud Network Attached Storage (NAS)

Alibaba Cloud Network Attached Storage (NAS) is a file storage service for Alibaba Cloud ECS

instances, Alibaba Cloud E-HPC and Container Service. It provides standard file access protocols, so you do not have to modify existing applications. This enables you to have a distributed file system with unlimited capacity and performance scaling, with a single namespace, multi-party sharing, high reliability, and high availability.

- Alibaba Cloud Virtual Private Cloud (VPC)

Virtual Private Cloud (VPC) creates an isolated network environment for users on Alibaba Cloud. You can select an IP address range, divide networks, and configure the routing list and gateway. SAP NetWeaver and the Alibaba Cloud services work together in particular ways to deliver combined business application and infrastructure capabilities to our customers.

SAP NetWeaver system and IBM Db2 use Alibaba Cloud ECS instances storage services as well as Virtual Private Cloud service.

SAP Host Agent/SAPOSCOL is deployed with standard installation of SAP NetWeaver and is able to make calls to the monitoring agent component provided by Alibaba Cloud.

Alibaba Cloud ECS Metrics Collector is the monitoring agent that collects required CPU\Memory\Disk\Network monitoring data and makes these metrics available to SAP applications.

For more information about SAP Netweaver on Alibaba Cloud, please kindly refer to [SAP NetWeaver Planning Guide](#) and [SAP NetWeaver Implementation Guide](#).

Deployment Architecture

Depends on your business workload, you can setup your SAP system with IBM Db2 on 2-Tier or 3-Tier enviroment. The different is whether SAP application instance is located on same ECS instance as the underlying database or not. For more details information, please kindly refer to [SAP NetWeaver Planning Guide](#).

In this guide, we take 2-Tier as example which requires:

- 1 supported ECS
- File storage system layout:
 - The database id volume: /db2/<DBSID>/
 - The instance volume: /db2/db<DBSID>/, which contains the home directory of db[DBSID] user and instance data.
 - The log volume: /db2/<DBSID>/log_dir, which contains at least online log files.
 - The dump volume: /db2/<DBSID>/db2dump, which contains Db2 dump and dianostic files.
 - The data volume: /db2/<DBSID>/sapdata<n>. SAP data for container type database managed space (DMS) FILE or for use of Db2' s automatic storage management.
 - The temporary tablespace volume: /db2/<DBSID>/saptemp<n>, which contains temporary tablespace.

Planning

Regions and Zones

When you deploy a VM, you must choose a region and zone. The Alibaba Cloud infrastructure is built around Regions and Zones. A Region is a physical location in the world, where for most cases, we have multiple Zones. Zones consist of one or more discrete data centers, each with redundant power, networking and connectivity, housed in separate facilities. These Zones offer you the ability to operate production applications and databases which are more highly available, fault tolerant and scalable than it would be possible from a single data center.

Following factors need to be taken into consider when you choose the region and zone:

- The location of your end users and your resources, such as your IDC and network in order to reduce the latency.
- The location of your SAP applications and databases. One system which consiste of SAP application and database should be located within 1 zone.

For more information please kindly refer to [Regions and Zones](#).

Supported ECS Types

Alibaba Cloud ECS offers a number of instance types (virtual machine sizes) for deploying SAP solutions. Each instance type offers different CPU, memory, and I/O capabilities. You can only run your SAP applications with IBM Db2 on ECS instances which have been certified by SAP. Each SAP-certified ECS instance type has been sized using SAP' s Standard Application Sales and Distribution (SD) benchmark toolkit. For details about SAP certified instance, please kindly refer to:

[SAP Note 2552731 - SAP Applications on Alibaba Cloud: Supported Products and IaaS VM types](#)

In case you do not have access to SAP note, please refer to [SAP NetWeaver Planning Guide](#). For detailed descriptions of ECS instance types, please kindly check the official website of Alibaba Cloud.

As mentioned above, SAP supports various of ECS VM types on Alibaba Cloud, you need to choose correct one based on your current business workload and potential increase. For more details about SAP sizing, please kindly refer to official [SAP Sizing](#).

Supported Operation Systems

When you create an ECS instance, you use an image that contains a pre-installed base operating system. Alibaba Cloud works with operating system partners to provide you with up-to-date, optimized operating system images. There are several ways you can specify an image for your ECS instance.

Public image

Licenses for the operating system in public images are already included in the price of ECS instance charge. You are not required to provide your own operating system licenses. Following ones are the required operating systems for SAP applications usage available in Public Image list:

- SLES-11-SP4
- SLES-12-SP1
- SLES-12-SP2
- Windows Server 2016 Data Center Edition 64 bit
- Windows Server 2012 R2 Data Center Edition 64 bit
- Windows Server 2008 R2 Enterprise Edition 64 bit

Marketplace image

Marketplace image: OS vendor certified images which contains preinstalled operation system and configured user environment. Alibaba Cloud currently supports the following images for running SAP NetWeaver systems::

- Red Hat Enterprise Linux Server (RHEL)

For the most current supported operating systems please kindly refer to

SAP Note 2552731 - SAP Applications on Alibaba Cloud: Supported Products and IaaS VM types.

Networking and Security

Security Group

A security group functions similarly to virtual firewalls, and is used to set network access controls for one or more ECS instances. When creating instances, you must select a security group. You can also add security group rules to control outbound and inbound network access for all ECS instances in the security group.

SSH Key Pairs

Alibaba Cloud offers two authentication methods for remote logon to ECS instances:

- **Password logon:** A standard authentication method using the administrator password. It applies to both Windows instances and Linux instances.
- **SSH Key Pair logon:** This method only applies to Linux instances. If you are running Linux, it is recommended that you choose this authentication method to protect your ECS instance' s security.

An SSH Key Pair is a pair of keys generated by an encryption algorithm: one key is intentionally available, known as the public key; and the other key is kept confidential, known as the private key.

Alibaba Cloud can help you to generate the key pair using 2048-bit RSA key by default. You are also

welcome to import the public key of a key pair that has been generated by other key pair generation tool. For more details, please kindly see SSH key pair on Alibaba Cloud as follows:

<https://www.alibabacloud.com/help/doc-detail/51792.htm>.

If you have placed the public key in a Linux instance, you can use the private key to log on to the instance using SSH commands or related tools from local computer or another instance, without the need to enter a password.

Router configuration

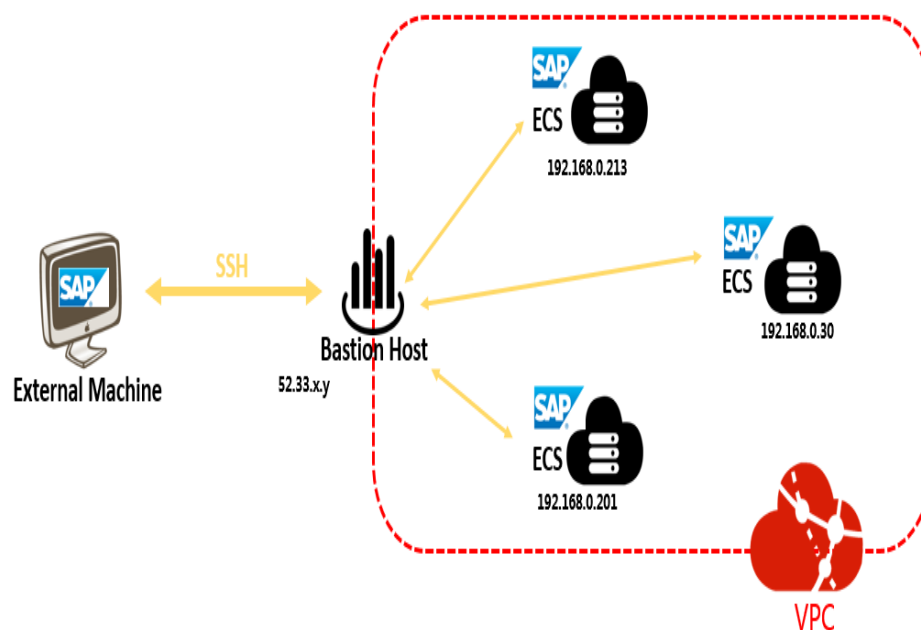
When you create a VPC network on Alibaba Cloud, a vRouter and route table are automatically created after the VPC creation. You cannot create or delete them directly. They will be deleted automatically with the deletion of the VPC. You can add route entries to the route table to route network traffic.

Each entry in the route table is a route entry determining where network traffic is directed. A route entry with the destination CIDR block 100.64.0.0/10 is added by the system by default, when you create a VPC. You are allowed to add customized route entries for your VPC.

If an ECS instance in the VPC, without external IP address, wants to access the internet, a NAT gateway is needed. You can see more details about NAT gateway from following link: <https://www.alibabacloud.com/product/NAT>.

Bastion Server

Bastion hosts provide an external facing point of entry into a VPC network containing private-network VMs. This host can provide a single point of fortification or audit and can be started and stopped to enable or disable inbound SSH communication from the Internet.



SSH access to VMs that do not have an external IP address can be achieved by first connecting to a bastion host.

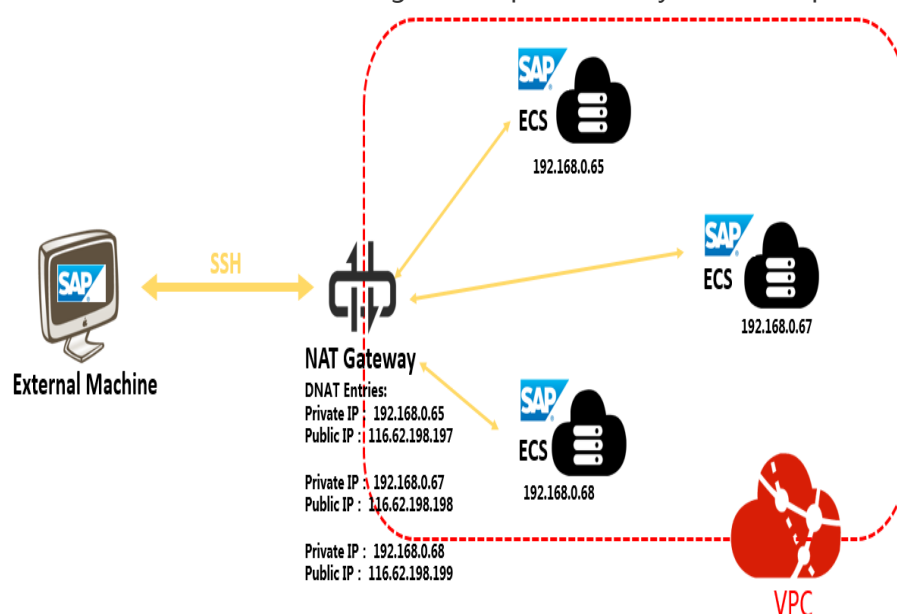
When using a bastion host, you log into the bastion host first, and then into your target private ECS instance through an SSH based tool, like putty.

NAT Gateway

When an ECS instance is created within VPC and without an assigned external IP address, it cannot make direct connections to external services.

To allow these ECS instances to access the Internet, you can set up and configure a NAT gateway. The NAT gateway can route traffic on behalf of any ECS instance in the VPC. You should have one NAT gateway per VPC.

In the case of deploying an SAP solution, an NAT gateway configure with SNAT for the VPC is a must. For more details about this configuration, please kindly refer to Implementation guide.



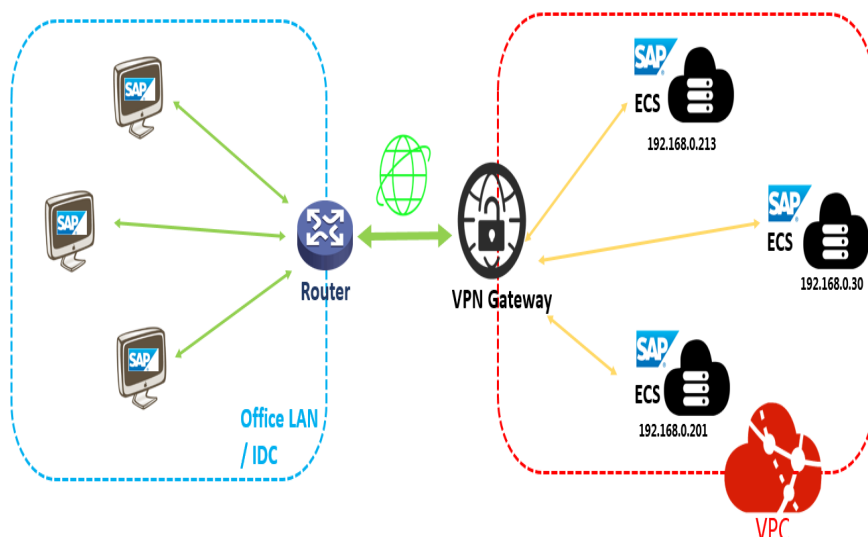
See more details about NAT Gateway, from Alibaba Cloud official site as follows:

<https://www.alibabacloud.com/product/NAT>

If you want to allow the access to your SAP system from Internet, it is suggested that you use a NAT gateway.

VPN Gateway

You can securely connect your existing IDC to your VPC on Alibaba Cloud through a VPN connection using IPsec by using VPN gateway on Alibaba Cloud. Traffic traveling between the two networks is encrypted by one VPN gateway, then decrypted by the other VPN gateway. This protects your data as it travels over the Internet. For more information, please kindly check Alibaba Cloud official site.



See more details of VPN Gateway from Alibaba Cloud official network as follows:
<https://www.alibabacloud.com/product/vpn-gateway>

If you only want to have access your SAP system from local data center or office LAN, it is suggested that you can connect your local data center and office LAN to VPC on Alibaba Cloud through VPN Gateway.

Security document

Following additional resources will help you to further understand your SAP environment on Alibaba Cloud from security and compliance perspective:

- Security & Compliance Center
- Alibaba Cloud Security Whitepaper

Storage

Alibaba Cloud Block Storage (Cloud Disk) provides persistent block-level storage volumes for use with Alibaba Cloud ECS instance. You can choose different Cloud Disk type depending on your requirement:

Disk Category	Basic Cloud Disk	Ultra Cloud Disk	SSD Cloud Disk
Max size of single disk	2 TB	32.768 TB	32.768 TB
Max IOPS per disk	300+ IOPS	3,000 IOPS	20,000 IOPS
Max throughput per disk	20~40 MBps	80 MBps	300 MBps
Access latency	5.0~10.0 ms	1.0~3.0 ms	0.5~2.0 ms
Typical scenarios	Data is not	- Small and medium	- I/O intensive

	frequently accessed or with low I/O loads.	sized databases. - Development and testing. - Cloud Server logging.	applications. - Medium sized or large relational databases. - NoSQL databases.
--	--------------------------------------------	---------------------------------------------------------------------------	--------------------------------------------------------------------------------------

For **Data reliability**, with the strength of the Alibaba Cloud distributed storage technology, which uses a triplicate storage system, all these 3 disk types ensure data integrity of 99.9999999%. |

Cloud disk is located independently from your ECS instance, which means you can detach or move your cloud disk between different ECS instances and also be kept after the ECS instance is dropped. Besides, you can also resize your cloud disk to meet potential workload increase requirement.

Supported IBM Db2 Versions

SAP certified SAP NetWeaver with the following editions of IBM Db2 on Alibaba Cloud:

- Db2 Advanced Enterprise Server Edition (AESE) version 11.1 for Linux, UNIX, and Windows
- Db2 Advanced Enterprise Server Edition (AESE) version 10.5 for Linux, UNIX, and Windows

You must use the SAP-certified IBM Db2 software fix pack (FP) levels. The use of other IBM Db2 software levels is not allowed.

For more information, see [SAP Note 101809 - DB6: Supported Db2 Versions and Fix Pack Levels](#).

Supported IBM Db2 Scenarios

SAP supports most IBM Db2 features on Alibaba Cloud exclude following scenarios:

- High Availability and Disaster Recovery for Db2 with cluster manager TSAMP
- Multi-partition Db2 databases
- IBM Db2 pureScale feature

IBM Db2 backup and recovery

Since most SAP NetWeaver systems are used for mission critical workloads, customers must have a data backup and restore plan to ensure that their system and database can be restored if the worst case happens.

For information about the backup and recovery of IBM Db2 systems that support SAP, please kindly refer to:

- Backup and Recovery
- Enabling Recoverability of the IBM Db2 for Linux, UNIX, and Windows Database

Licensing

SAP License

Running SAP on Alibaba Cloud requires you to bring your own license (BYOL).

For more information about SAP licensing, please contact SAP.

Linux License

In Alibaba Cloud, there are two ways to license **SUSE** Linux:

- Pay-as-you-go licensing model:

Alibaba Cloud provides SLES 11 SP4 and SLES 12 SP2 as public images, and the SLES license cost is included in ECS instance price

- BYOL model:

Customer can purchase their own SLES license and import SLES operating system as customized images.

Regarding **Red Hat Enterprise Linux**, there are two ways to consume Alibaba Cloud:

- Pay-as-you-go licensing model:

You can choose Red Hat Enterprise Linux 7.4 and 7.5 as marketplace image, while the RHEL license needs to be obtained from Red Hat separately.

- Subscription model:

You can choose Red Hat Enterprise Linux 7.4 and 7.5 as marketplace image, while the RHEL license needs to be obtained from Red Hat separately.

Windows License

In Alibaba Cloud, we provide Pas-as-you-go licensing model for following Windows version:

1. Windows Server 2016 Data Center Edition 64bit
2. Windows Server 2012 R2 Data Center Edition 64bit
3. Windows Server 2008 R2 Enterprise Edition 64bit

IBM Db2 License

In order to run your SAP with IBM Db2 on Alibaba cloud, you can bring your own license(BYOL) which can be obtained from IBM or SAP. For more information about licensing and support, please kindly refer to:

- SAP Note 1168456 - DB6: Support Process and End of Support Dates for IBM Db2 LUW
- SAP Note 1260217 - DB6: Software Components Contained in Db2 License from SAP
- SAP Note 816773 - DB6: Installing an SAP OEM license

SAP MaxDB

SAP MaxDB Deployment Guide

Version Control

Version	Revision Date	Types Of Changes	Effective Date
1.0			2018/5/25

Overview

SAP® MaxDB™ is the database management system developed and supported by SAP SE. SAP MaxDB is available on Microsoft Windows, Linux and UNIX and for the most prominent hardware platforms as well as Public Cloud. For more details about SAP MaxDB, please kindly refer to SAP official website: <http://maxdb.sap.com>

This deployment guide describes how to plan and deploy the SAP MaxDB database system on Alibaba Cloud ECS, including how to configure the ECS instances, block storage, network, and SUSE Linux Enterprise Server (SLES) operating system. This guide includes the best practices from Alibaba Cloud and SAP.

ECS Instance TypesECS Instance Types

This deployment guide describes an ECS General Purpose Instance Family (sn2ne) certified for SAP MaxDB, which runs on the Intel Broadwell architecture and belongs to one of ECS enterprise instance type families. The SSD cloud disk and Ultra cloud disk can be used to host data volumes and logs in the SAP MaxDB database. The currently supported ECS instance types are listed in the table below, for more information, please kindly refer to SAP Note: 2552731 - SAP Applications on Alibaba Cloud: Supported Products and IaaS VM Types

Instance Type	vCPU	Memory (GiB)
ecs.sn2ne.large	2	8

ecs.sn2ne.xlarge	4	16
ecs.sn2ne.2xlarge	8	32
ecs.sn2ne.4xlarge	16	64
ecs.sn2ne.8xlarge	32	128
ecs.sn2ne.14xlarge	64	256
ecs.r5.large	2	16.0
ecs.r5.xlarge	4	32.0
ecs.r5.2xlarge	8	64.0
ecs.r5.3xlarge	12	96.0
ecs.r5.4xlarge	16	128.0
ecs.r5.6xlarge	24	192.0
ecs.r5.8xlarge	32	256.0

For details about the ECS memory instance type family se1, go to <https://www.alibabacloud.com/help/doc-detail/25378.htm#se1>

Alibaba Cloud Services

The following table lists services included in the Alibaba Cloud core components used by this deployment guide.

Service	Description
ECS	Elastic Compute Service (ECS) is a type of computing service that features elastic processing capabilities. ECS has a simpler and more efficient management mode than that for the physical server. You can create instances, change the operating system, and add or release any number of ECS instances at any time to fit your business needs.
SSD Cloud Disk	It is applicable to I/O intensive applications, and provides stable and high random IOPS performance.
Ultra Cloud Disk	It is applicable to medium I/O load application scenarios and provides the storage performance of up to 3,000 random read/write IOPS for ECS instances.
VPC	The Alibaba Cloud Virtual Private Cloud (VPC) is a private network built on Alibaba Cloud. It is logically isolated from other virtual networks in Alibaba Cloud. VPC enables you to launch and use Alibaba Cloud resources in your own defined network.

OSS

Alibaba Cloud Object Storage Service (OSS) is a network-based data access service. OSS enables you to store and retrieve structured and unstructured data, including text files, images, audios, and videos.

Deploy SAP MaxDB on Alibaba Cloud

This section describes how to deploy a SAP MaxDB on Alibaba Cloud.

Preparations

Alibaba Cloud account

If you do not have an Alibaba cloud account yet, you can apply for one according to the following process:

- Perform the registration process. Go to the Alibaba Cloud homepage, and click Free Account on the upper-right of the page.
- Follow the guidance described in Sign up with Alibaba Cloud
- Then, Add a payment method

Region and Zone

1. Zone

- A zone is a physical area with independent power grids and networks in one region. The network latency for ECS instances within the same zone is shorter.
- Intranet communication can take place between zones in the same region, and fault isolation can be performed between zones. Whether to deploy ECS instances in the same zone depends on the requirements for disaster tolerance capabilities and network latency.
- If your applications require high disaster tolerance capabilities, you are advised to deploy your ECS instances in different zones of the same region.
- If your applications require low network latency between instances, you are advised to create your ECS instances in the same zone.

1. Region

Alibaba Cloud data centers are deployed in the following regions at present: China East 1 (Hangzhou), China East 2 (Shanghai), China North 1 (Qingdao), China North 2 (Beijing), China North 3 (Zhangjiakou), China South 1 (Shenzhen), Hong Kong, US West 1 (Silicon Valley), US East 1 (Virginia), Singapore, Asia Pacific NE 1 (Japan), Germany 1 (Frankfurt), and Middle East 1 (Dubai).

For more information, please kindly refer to [Regions and Zones](#).

1. How to select a region

Regions in Chinese mainland

In general cases, it is recommended that you select a data center closest to your end users to further speed up user access. Alibaba Cloud's data centers in Chinese mainland are similar to each other in terms of infrastructure, BGP network quality, service quality, and ECS operation and configuration. Domestic BGP networks ensure fast access to regions across China.

International regions

The data centers outside the Chinese mainland provide international bandwidth and target areas outside the Chinese mainland. Access to these regions from the Chinese mainland may cause high latency. Therefore, you are not advised to use them.

- If you have business requirements in Hong Kong or Southeast Asia, you can select Hong Kong or Singapore.
- If you have business requirements in Japan or South Korea, you can select Asia Pacific NE 1 (Japan).
- If you have business requirements in Australia, you can select Asia Pacific SE 2 (Sydney).
- If you have business requirements in America, you can select US West 1 (Silicon Valley) and US East 1 (Virginia).
- If you have business requirements in Continental Europe, you can select Germany 1 (Frankfurt).
- If you have business requirements in Middle East, you can select Middle East 1 (Dubai).

1. Different Alibaba Cloud products in different regions cannot communicate with each other through an intranet.

- ECS, and OSS instances in different regions cannot communicate with each other through an intranet.
- ECS instances and other cloud resources in different regions, such as OSS instances, cannot communicate with each other through the intranet.
- Server Load Balancer cannot be deployed for ECS instances in different regions, that is, ECS instances bought in different regions cannot be deployed in the same Server Load Balancer instance.
- A single VPC can only be deployed in one region. VPCs in different regions cannot be communicate with each other by default. You can select VPCs based on the actual running environment.

SAP MaxDB installation media

1. Download SAP MaxDB installation media from SAP official website;
2. Upload the SAP MaxDB installation media to ECS instance;

Deployment process

Configure a network

1. Create a VPC and switch

- Log on to the VPC console.
- In the left navigation bar, click "VPC" .
- On the VPC list page, select the region where the VPC is located, and click "Create VPC" .
- In the "Create a VPC" dialog box, enter the VPC name and select the network segment for the VPC.

You can select one of the following standard network segments of the VPC: After the VPC is created, its network segment cannot be modified. You are advised to use a large network segment to prevent subsequent resizing:

```
10.0.0.0/8 ( 10.0.0.0 - 10.255.255.255 )  
172.16.0.0/12 ( 172.16.0.0 - 172.31.255.255 )  
192.168.0.0/16 ( 192.168.0.0 - 192.168.255.255 )
```

Click Create VPC.

After the VPC is created, a VPC ID is generated. A router is created for the VPC at the same time.

Click Next to create a switch.

On the Create a Switch tab page, provide the following information, and click Create Switch.

Name: Specify the switch name. Zone: Select the zone of the switch. Network segment: Specify the network segment of the switch. The network segment of the switch can be the same as that of the VPC to which the switch belongs or the subnet of the VPC network segment. The size of the network segment of the switch must be between a 16-bit netmask and a 29-bit netmask. NOTE: If the network segment of your switch is the same as that of the VPC to which your switch belongs, you can only create one switch under the VPC.

Click Finish.

Return to the instance list page, and click the ID link of the created VPC to enter the VPC details page. Check the VPC and switch on the page.

1. Configure a security group

About security groups

A security group is a logical group that consists of instances in the same region with the same security requirements and mutual trust. Each instance belongs to at least one security group, which must be specified at the time of creation. Instances in the same security group can communicate through the network, but instances in different security groups cannot communicate through an

intranet by default. Mutual access can be authorized between two security groups.

A security group is a virtual firewall that provides the stateful packet inspection (SPI) function. Security groups are used to set network access control for one or more ECSs. As an important means of security isolation, security groups are used to divide security domains on the cloud.

Security group restrictions

- A single security group cannot contain more than 1,000 instances. If you require intranet mutual access between more than 1,000 instances, you can allocate them to different security groups and permit mutual access through mutual authorization.
- Each instance can join a maximum of five security groups.
- Each user can have a maximum of 100 security groups.
- Adjusting security groups will not affect the continuity of a user's service.
- Security groups are stateful. If an outbound packet is permitted, inbound packets corresponding to this connection will also be permitted.
- Security groups have two network types: classic network and VPC.
 - Instances of the classic network type can join security groups on the classic networks in the same region.
 - Instances of the VPC type can join security groups on the same VPC.

Security group rules

- Security group rules can be set to permit or forbid ECS instances associated with security groups to access a public network or an intranet from the inbound and outbound directions.
- You can authorize or delete security group rules at any time. Security group rules you have changed will automatically apply to ECS instances associated with the security groups. When setting security group rules, make sure security group rules are simple. If you allocate multiple security groups to an instance, up to hundreds of rules may apply to the instance. When you access the instance, the network may be disconnected.
- **Security group rule restrictions**
 - Each security group can have a maximum of 100 security group rules.

Security group configuration methods

- Log on to the ECS console.
- In the left navigation bar, click Security Group.
- Select the region on which you want to create a security group.
- Click Create Security Group. In the displayed dialog box, enter the following information:

Create Security Group

* Security Group Name: hana-default
2 - 128 characters long. Do not start with a special character or a digit. It can contain the following special characters: ".", "_", and "-".

Description: for hana vpc
It must contain 2-256 characters and it cannot begin with http:// or https://

Network Type: VPC

*VPC: vpc-gw8xd6xuhyjggn1fby83d [Create VPC](#)

vpc-gw8xd6xuhyjggn1fby83d / Tony_Zha...

OK Cancel

- Click "OK" and then click "Configuration Rule" .
- Complete rule settings by following the corresponding instructions. You are advised to keep only the ports for remote access.

Add Security Group Rules
? ×

NIC: Intranet ▼

Rule Direction: Inbound ▼

Authorization Policy: Allow ▼

Protocol Type: Custom TCP ▼

* Port Range: 22/22 ⓘ

Priority: 1 ⓘ

Authorization Type: Address Field Access ▼

* Authorization Object: e.g. 10.0.0.0/32 ⓘ Tutorial

Description:
It must contain 2-256 characters and it cannot begin with http:// or https://

OK Cancel

Port configuration reference

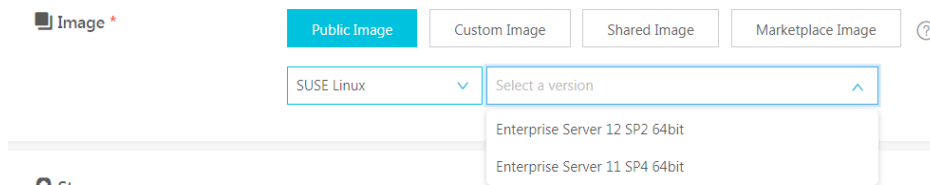
During SAP MaxDB deployment, a VPC is used. You only need to set the rules in the outbound and inbound directions, without specifying the public network or VPC. The security group rules are blank by default. When creating an ECS instance, make sure that the selected security group contains port 22 (Linux) or 3389 (Windows). Otherwise, you cannot remotely log on to the ECS instance.

For details about specific ports that SAP needs to access and the related security group rules, refer to SAP official documentation.

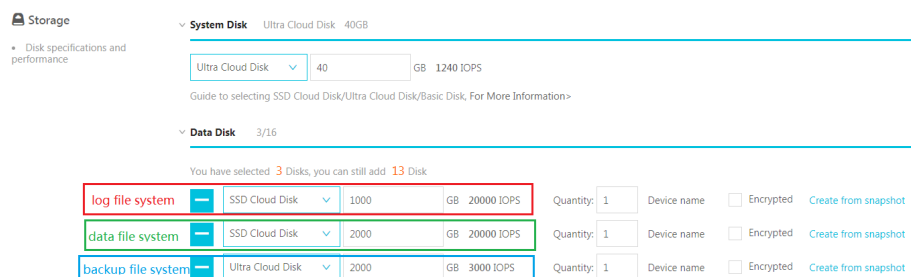
Create an SAP MaxDB ECS instance

1. Log on to Alibaba Cloud ECS ECS product purchase page.
2. Select Subscription as the payment option.
3. Select the region and zone.
4. Select "VPC" for the network type. After selecting the network type, fill in the information about the created or existing VPC and switch. In a multi-node architecture, SAP MaxDB does not provide external services directly. Therefore, set "Public IP Address" to "Not Allocate" .

5. Select an instance type. Select an instance type which is in sn2ne ECS instance family.
6. Select an operating system image. The operating system could be SUSE Linux Enterprise Server.



1. Configure storage disks. You are advised to select storage disks as follows (separate SSD Cloud Disk for log and data file systems, and separate ultra Cloud Disk for backup file system)



1. Configure initialization information.

After setting the initial password, click "Create", and wait several minutes for instance initialization.

1. Create a bastion host.

Create a bastion host with one vCPU and 2 GB memory and without additional storage in the same VPC of the same zone by following the preceding steps.

1. Configure the network for the bastion host.

There are multiple ways to configure a public IP address at present. The elastic IP address (EIP) configuration is used as an example. An EIP is a public IP address resource that can be independently bought and held. It can be dynamically bound to or unbound from different ECS instances without stopping the ECS instances.

- Log on to the EIP console.
- Click "Apply for EIP".
- On the purchase page, select the region, bandwidth peak, and payment option on the EIP, click "Buy Now", and make the payment.
- NOTE: The region of the EIP must be the same as that of the ECS instance to which the EIP is to be bound.
- Return to the EIP list page, select the region of the EIP, and click "Refresh" to check the created EIP instance.
- Click "Bind".

- In the "Bind a Public EIP" dialog box, select the created ECS instance, and click "OK" .
- After the binding is complete, click "Refresh" on the EIP list page to check the EIP instance status.
- When the EIP instance status is "Allocated" , the ECS instance to which the EIP is bound can be accessed through a public network.
- Log on to the ECS instance and run the following command to test access through a public network.

```
ping www.aliyun.com
```

```
Welcome to Alibaba Cloud Elastic Compute Service !
[root@iZze6gldpwr7p8c9b59kfZ ~]# ping www.aliyun.com
PING sh.wagbridge.aliyun.com.gds.alibabads.com (140.205.62.8) 56(84) bytes of data:
64 bytes from 140.205.62.8 (140.205.62.8): icmp_seq=1 ttl=47 time=21.7 ms
64 bytes from 140.205.62.8 (140.205.62.8): icmp_seq=2 ttl=47 time=21.8 ms
64 bytes from 140.205.62.8 (140.205.62.8): icmp_seq=3 ttl=47 time=21.7 ms
64 bytes from 140.205.62.8 (140.205.62.8): icmp_seq=4 ttl=47 time=21.7 ms
64 bytes from 140.205.62.8 (140.205.62.8): icmp_seq=5 ttl=47 time=21.7 ms
64 bytes from 140.205.62.8 (140.205.62.8): icmp_seq=6 ttl=47 time=21.7 ms
64 bytes from 140.205.62.8 (140.205.62.8): icmp_seq=7 ttl=47 time=21.7 ms
```

1. Log on to an instance.

No public network is configured for the SAP MaxDB ECS instance currently. Therefore, a bastion host is required for logon to the SAP MaxDB ECS instance.

1. Install SAP system with the SAP MaxDB according to SAP installation guide.

Connect to SAP MaxDB

As no public IP address will be configured for your SAP MaxDB instance in the preceding deployment, you can only connect to the SAP MaxDB instances through the bastion host using SSH;

- To connect to SAP MaxDB through the bastion host, connect the SSH client you select to the bastion host and then to the SAP MaxDB instance.

Reference

1173395 - FAQ: SAP MaxDB and liveCache configuration

1142243 - SAP MaxDB release for virtual systems

1492000 - General Support Statement for Virtual Environments

SAP MaxDB Operation Guide

Version Control

Version	Revision Date	Types Of Changes	Effective Date
1.0			2018/5/25

Introduction

This guide provides best practices for operating SAP MaxDB systems that have been deployed on Alibaba Cloud. Note that this guide is not intended to replace any of the standard SAP documentation.

Administration

This section shows how to perform administrative tasks typically required to operate an SAP MaxDB system on Alibaba Cloud, including information about starting, stopping, and cloning systems.

Starting and Stopping ECS Instances

You can stop any SAP MaxDB hosts at any time. As a best practice, you should first stop SAP MaxDB running on the Alibaba Cloud ECS instance before you stop the instance. When you resume the instance, the ECS instance will automatically be started with the same IP address, network, and storage configuration as before.

Creating an customized image of an SAP MaxDB System

Custom images on Alibaba Cloud can help you run ECS instances effectively by allowing you to create multiple ECS instances with identical OS and environment data to meet scaling requirements.

You can create your own Custom Image based on an existing instance by using the Alibaba Cloud Management Console. For more information, see the [Create a custom image using a snapshot](#) section in the Alibaba documentation. You could use an image as following:

- Creating a full offline MaxDB system backup (of the OS, /usr/sap, data, log, backup files).
- You can use an image to create an ECS instance or change the system disk of an ECS instance;
- Moving a SAP MaxDB system from one region to another – Create an image of an existing Alibaba Cloud ECS instance and move to another region by following the instructions in the Alibaba Cloud documentation. You can also copy a custom image to another region to maintain a consistent environment and application deployment across multiple regions.
- Cloning an SAP MaxDB system – You can create an image of an existing SAP MaxDB system to create an exact clone of the system. See the next section in this document.

Note: To create an image of SAP Max system with a consistent state., you need to first stop the SAP MaxDB instance before creation.

Cloning an SAP MaxDB System

Creating a clone of a SAP MaxDB system, you can create an image of SAP MaxDB system in Alibaba Cloud ECS within the same zone. It generally includes an operating system and preinstalled SAP MaxDB software, as well as the same storage system layout.

Account Management

During management in SAP MaxDB system on Alibaba Cloud, there are 3 types of administrator accounts as below,

- Alibaba Cloud account - Before using Alibaba Cloud products and services, you have to create an Alibaba account first on Alibaba Cloud website. Using this account, you can manage ECS, configure VPC, and manage images or snapshots for your SAP MaxDB system from Alibaba Cloud website.
- ECS Instance Administrator account - When ECS instance is created, an administrator account (usually root) will be created OS level. Alibaba Cloud will not create any account within the operating system; the default Linux system user is only the root user. While using the system, users can create or delete user accounts as required by the operating system.
- SAP MaxDB Database System Administrator - The SID needs to be specified during SAP MaxDB installation, SAP MaxDB will use [sid]adm as the system account and create this account by default.

Networking

You are provisioning your SAP MaxDB system using ECS with the ECS virtual network. We strongly recommend to use Virtual Private Cloud (VPC) as the default network type for SAP MaxDB. The Alibaba Cloud VPC is a private network established in Alibaba Cloud. It is logically isolated from other virtual networks in Alibaba Cloud. VPC enables you to launch and use the Alibaba Cloud resources in your own VPC.

You have full control over your Alibaba Cloud VPC, for example, you can select its IP address range, further segment your VPC into subnets, as well as configure route tables and network gateways. see the user guide of Virtual Private Cloud in the Alibaba documentation. Additionally, you can connect your VPC with your on-premises network using a physical connection or a VPN to form an on-demand customizable network environment. This allows you to smoothly migrate your applications to Alibaba Cloud with little effort.

Security isolation

- By default, the cloud servers of different users are located in the different VPCs.
- Different VPCs are isolated by tunnel IDs. Using VSwitches and VRouters, you can segment your VPC into subnets as you do in the traditional network environment. Different cloud servers in the same subnet use the VSwitch to communicate with each other, while cloud servers in different subnets within a VPC use VRouters to communicate with each other.

- The intranets between different VPCs are completely isolated and can only be interconnected by external mapping of IP (Elastic IP and NAT IP).
- Because the IP packets of cloud servers are encapsulated with the tunneling ID, the data link layer (two-layer MAC address) of the cloud server will not transfer to the physical network. Therefore, the two-layer network of different cloud servers is isolated. In another word, the two-layer networks between different VPCs are isolated.
- The ECS instances within a VPC use a security group firewall to control the network access. This is the third layer isolation.

NAT Gateway

If your security policy requires truly internal VMs, you need to set up a NAT proxy manually on your network and a corresponding route so that VMs can reach the Internet. It is important to note that you cannot connect to a fully internal VM instance directly by using SSH. To connect to such internal machines, you must set up a bastion instance that has an external IP address and then tunnel through it. For users how to set up a bastion instance, see the SAP MaxDB Deployment Guide on Alibaba Cloud guide. When VMs do not have external IP addresses, they can only be reached by other VMs on the network, or through a managed VPN gateway. You can provision VMs in your network to act as trusted relays for inbound connections, called bastion hosts, or network egress, called NAT gateways. For more transparent connectivity without setting up such connections, you can use a managed VPN gateway resource.

Security Groups

A security group is a logical group that groups instances in the same region with the same security requirements and mutual trust. Each instance belongs to at least one security group, which must be specified at the time of creation. Instances in the same security group can communicate through the network, but instances in different security groups by default cannot communicate through an intranet. However, mutual access can be authorized between two security groups.

A security group is a virtual firewall that provides stateful packet inspection (SPI). Security groups are used to set network access control for one or more ECSs. As an important means of security isolation, security groups are used to divide security domains on the cloud. See the User Guide of Security Groups in the Alibaba documentation.

SAP Support Access with SAProuter

SAProuter is a software application that provides a remote connection between customer' s network and SAP. In some situations it may be necessary to allow an SAP support engineer to access your SAP MaxDB systems on Alibaba Cloud. The only pre-requisite for using SAProuter is a network connection from the customer' s network to the SAP network.

When setting up a direct support connection to SAP from ECS on Alibaba Cloud, Follow these steps:

- Launch the ECS instance that the SAProuter software will be installed on, purchase Elastic IP

(EIP) resource and dynamically bound to a VPC ECS instance without restarting the ECS instance.

- Create and configure a specific security group, which only allows the required inbound and outbound access to the SAP support network, for the SAProuter instance, along with TCP port 3299.
- Install the SAProuter software following SAP Note 1628296, and create a saprountab file that allows access from SAP to your SAP MaxDB systems on Alibaba Cloud.
- Set up the connection with SAP. For your Internet connection, use Secure Network Communication (SNC). For more information, see the SAP Remote Support – Help .

Security

For an IaaS deployment and SAP MaxDB system implement, Alibaba Cloud maintains security of the infrastructure that supports the cloud, and the customer is responsible for ensuring the security of the cloud resources and applications, which the customer uses.

Here are additional Alibaba Cloud security resources to help you achieve the level of security you require for your SAP MaxDB environment on Alibaba Cloud.

Resource Access Management

Alibaba Cloud Resource Access Management (RAM) is an identity and access control service, which enables you to centrally manage your users (including employees, systems or applications) and securely control their access to your resources through permission levels. RAM thereby allows you to securely grant access permissions for Alibaba Cloud resources to only your selected high-privileged users, enterprise personnel and partners. This helps to ensure secure and appropriate usage of your cloud resources and protects from any unsolicited access to your account. See the User Guide of Resource access management in the Alibaba documentation.

Notification on access

Alibaba Cloud Message Center allows user to subscribe notifications and configure the notification channel, including email and SMS message. Users will be notified if there are any SSH login on their servers.

Server Guard

Alibaba Cloud Server Guard is a reliable and secure service offering real-time monitoring of your servers and databases. Around the clock monitoring of exposed vulnerabilities ensure optimal availability of your services and applications. See the User Guide of Server Guard in the Alibaba documentation. There are some measures for Login Security as below,

- Monitors generic web software vulnerabilities throughout the network in real-time.
- Allows users to access Alibaba Cloud Security' s emergency vulnerability response capabilities, including vulnerability patches (available before the release of official patches).

- Lets users repair vulnerabilities with one click and intercept hacker attacks between the duration when a vulnerability is exposed and an official patch is released.

Backup and Recovery

Backups are vital for protecting your System of Record. You should create regular backups when SAP MaxDB workload is low, and you can recover from unexpected system failures. Following are some key points about backup and recovery on Alibaba Cloud.

Final Destination of SAP MaxDB Backup on Alibaba Cloud

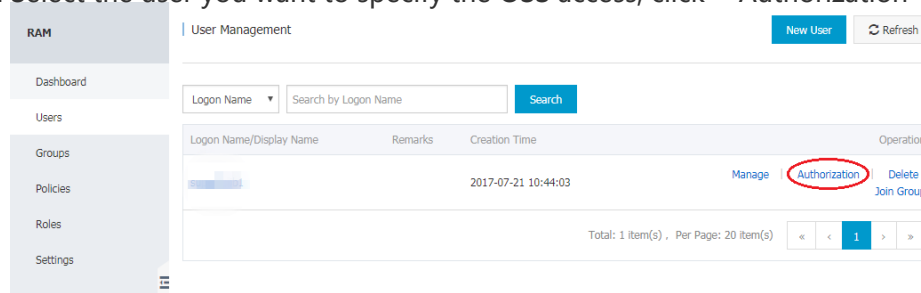
The primary difference between backing up SAP MaxDB on Alibaba Cloud compared to a traditional on-premises infrastructure is the final backup destination. The typical final backup destination used with on-premises infrastructure is tape. On Alibaba Cloud, backups are stored in OSS instead. There are many benefits to store backups in Alibaba Cloud OSS compared to tape, such as you can read, write, delete and store unlimited objects in your OSS bucket; OSS stores three copies of your objects in multiple locations to ensure 99.999999999% data reliability; built-in security mechanisms including multi-level security, monitoring of non-authorized login attempts, DDoS attack protection and data access policies, etc.

By default, on Alibaba Cloud, SAP MaxDB ECS instance are configured with Cloud Disk as SAP MaxDB database's initial local backup destination. SAP MaxDB backups are first stored on these local Cloud Disk volumes, and then copied to OSS for long-term storage.

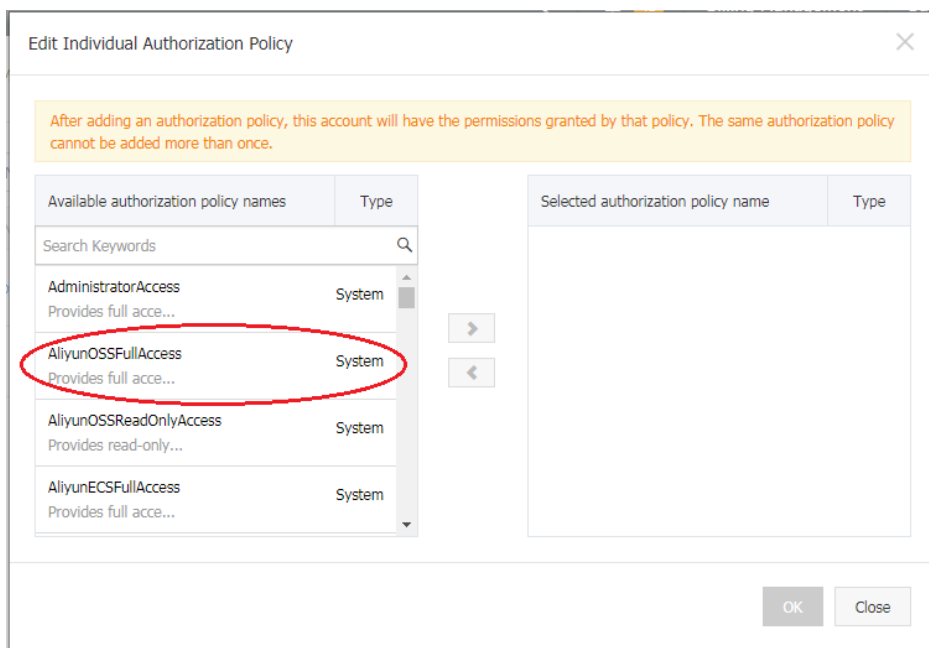
Manage identify and access to backups

To grant access to backups in OSS bucket, you need to configure the user with access rule in RAM console. Please refer to the following steps:

1. Select the user you want to specify the OSS access, click "Authorization"

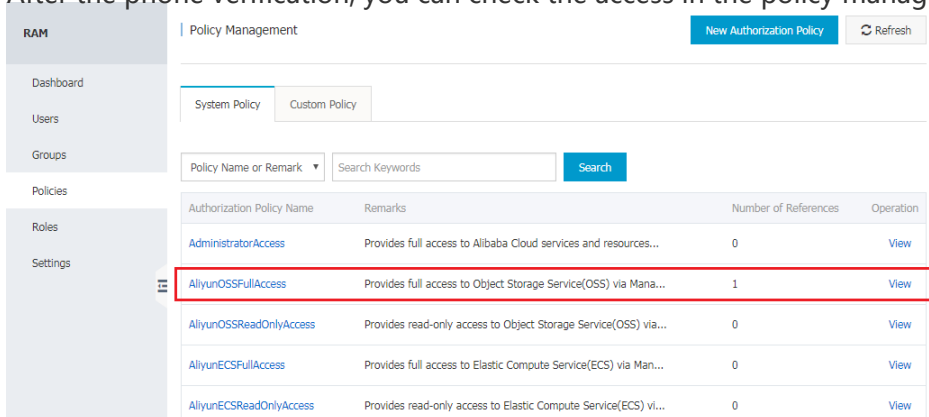


2. Select authorization policy "AliyunOSSFullAccess"



3. As the account owner, you will be asked to input a verification code via phone verification

4. After the phone verification, you can check the access in the policy management panel



5. If you want to create a customized policy, you can make it from the policy management panel as well. For more details, please refer to RAM Policy Management.

Backup and Recovery on Non-Production SAP MaxDB Database

This section provides backup options for non-production systems. Example of non-production systems are:

- Demo systems
- Training systems
- Sandbox systems
- Proof-of-concept systems
- Trail systems

Typical requirements of non-production systems:

- Infrequent backups

- No request for Point-in-time recovery
- Simple low cost

Cloud Disk Snapshot offers simple and low cost backup service, which can be leveraged to reach requirements of non-production system. It has a very flexible snapshot policy, for example, a user can take snapshots on the hour and for several times in a day, a user can choose any day as the recurring day for taking weekly snapshots, and a user can specify the snapshot retention period or choose to retain it permanently. Please be noticed that when the maximum number of automatic snapshots has been reached, the oldest automatic snapshot will be deleted. For more information about Cloud Disk Snapshot, please refer to [Snapshot overview](#).

Meanwhile, before using Cloud Disk Snapshot to do backup, please kindly check SAP Note: 1928060 - Data backup and recovery with file system backup. Some specific pre-requisite must be achieved before taking Disk snapshot.

Backup Approach

Automatic snapshot for Cloud Disk volumes attached to SAP MaxDB ECS instance, including system disk (/usr/sap), data disk for data file system and log filesystem, can be configured to create snapshot on a regular basis.

Restore Approach

Snapshots can be used to manually restore a whole SAP MaxDB ECS instance of non-production system.

Backup and Recovery on Production SAP MaxDB Database

The backup options covered in this section address the following backup requirements that are common for production systems:

- Frequent backups based on a schedule
- Point-in-time database recovery

Backup Approach

- By default, on Alibaba Cloud platform, SAP MaxDB database's initial local backup destination are configured on Cloud Disk volumes attached to the SAP MaxDB ECS instance;
- Users can use SQL commands, or the SAP DBA Cockpit to start or schedule SAP MaxDB data backups. Log backups are written automatically unless disabled;
- Users then can copy SAP MaxDB database backup files on its local Cloud disk to Alibaba Cloud OSS for long term storage;
- If cross-regions redundant is needed, backup files on the OSS can configured to be replicated to different regions.

Restore Approach

- Copy backup files in a OSS to an Cloud Disk of backup directory of the SAP MaxDB ECS Instance;
- Restore and recover SAP MaxDB Database based on the backup files of backup Cloud Disk.