ModelArts

Resource Management

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HUAWEI

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Contents

1 Resource Pool

ModelArts Resource Pools

When using ModelArts for AI development, you can use either of the following resource pools:

- **Dedicated resource pool**: It delivers more controllable resources and cannot be shared with other users. Create a dedicated resource pool and select it during AI development. The dedicated resource pool can be an elastic cluster or an elastic BMS.
  - Elastic cluster: It can be Standard or Lite.
    - In a Standard elastic cluster, exclusive computing resources are provided, with which you can deliver instances during job training, model deployment, and environment development on ModelArts.
    - A Lite elastic cluster provides hosted Kubernetes clusters with mainstream AI development plug-ins and acceleration plug-ins for Kubernetes resource users. You can operate the nodes and Kubernetes clusters in the resource pool with provided AI Native resources and tasks.
  - Elastic BMS: It provides different models of *x*PU BMSs. You can access an elastic BMS through an EIP and install GPU- and NPU-related drivers and software on a specified OS image. To meet the routine training requirements of algorithm engineers, SFS and OBS can be used to store and read data.
- **Public Resource Pool**: provides large-scale public computing clusters, which are allocated based on job parameter settings. Resources are isolated by job. You can use ModelArts public resource pools to deliver training jobs, deploy models, or run DevEnviron instances and will be billed on a pay-per-use basis.

Differences Between Dedicated Resource Pools and Public Resource Pools

- Dedicated resource pools provide dedicated computing clusters and network resources for users. The dedicated resource pools of different users are physically isolated, while public resource pools are only logically isolated. Compared with public resource pools, dedicated resource pools feature better performance in isolation and security.

- When a dedicated resource pool is used for creating jobs and the resources are sufficient, the jobs will not be queued. When a public resource pool is used for creating jobs, there is a high probability that the jobs will be queued.
- A dedicated resource pool is accessible to your network. All running jobs in the pool can access storage and resources in your network. For example, if you select a dedicated resource pool with an accessible network when creating a training job, you can access SFS data after the training job is created.
- Dedicated resource pools allow you to customize the runtime environment of physical nodes, for example, you can upgrade GPU or Ascend drivers. This function is not supported by public resource pools.

2 Elastic Cluster

2.1 Comprehensive Upgrades to ModelArts Resource Pool Management Functions

ModelArts dedicated resource pools have been upgraded and taken effect at 00:00 GMT+08:00 on March 1, 2023. In the new system, there are only unified ModelArts dedicated resource pools, which are no longer classified as the pools dedicated for development/training and the pools dedicated for service deployment. The new-version dedicated resource pools support flexible configuration of job types, and allow you to manage networks and interconnect VPCs with the networks.

The new dedicated resource pool management page provides more comprehensive functions and displays more information about the resource pools. More details about how to use and manage dedicated resource pools are provided in subsequent sections of this document. If you are new to ModelArts dedicated resource pools, try new-version dedicated resource pools. If you have used ModelArts dedicated resource pools, the old-version pools will be smoothly switched to new-version pools.

Read the following contents to learn about new-version dedicated resource pools.

Features of New-Version Dedicated Resource Pools

The new-version dedicated resource pool management is a comprehensive technology and product improvement. The main improvements are as follows:

- **Single dedicated resource pool type for diverse purposes**: Dedicated resource pools are no longer classified into those for development/training and those for service deployment. You can run both training and inference workloads in a dedicated resource pool. You can also set the job types supported by a dedicated resource pool based on your needs.
- **Dedicated resource pool network connection**: You can create and manage dedicated resource pool networks on the ModelArts management console. If you need to access resources in your VPC for jobs running in a dedicated resource pool, interconnect the VPC with the dedicated resource pool network.

- **More cluster details**: The new-version dedicated resource pool details page provides more cluster details, such as jobs, nodes, and resource monitoring, helping you learn about the cluster status and better plan and use resources.
- **Cluster GPU/NPU driver management**: On the new-version dedicated resource pool details page, you can select an accelerator card driver and perform change upon submission or smooth upgrade of the driver based on service requirements.
- **Fine-grained resource allocation (coming soon)**: You can divide your dedicated resource pool into multiple small pools and assign different quotas and permissions to each small pool for flexible and refined resource allocation and management.

More features will be provided in later versions for a better user experience.

Can I Continue to Use the Existing Dedicated Resource Pools After the Upgrade Takes Effect?

If you have created dedicated resource pools, you can still access the old-version dedicated resource pool (elastic cluster) management page on the ModelArts management console and use the created resource pools, but you cannot create dedicated resource pool on that page. ModelArts allows you to migrate existing dedicated resource pools to the new management page. You will be contacted to complete the migration and this does not require you to perform any operations. In addition, the migration does not affect the workloads running in the dedicated resource pools. Pay attention to the easy-to-use new management functions of dedicated resource pools. There is no change in creating training jobs or inference services.

Will New-Version Dedicated Resource Pools Be More Expensive?

The charging unit and unit price of the new-version dedicated resource pools are the same as those of the old-version dedicated resource pools. If you do not scale in or out your dedicated resource pools, the fee will not change. In addition, more value-added features, such as subpool division, elastic sharing, and data acceleration, will be provided in later versions to better allocate compute resources and improve cost-effectiveness.

Differences Between New and Old Dedicated Resource Pools

- In the old version, the dedicated resource pools dedicated for development/training are separated from those dedicated for service deployment. In addition, the pools of the two types offer different functions and their user experience varies. In the new version, the dedicated resource pools of the two types are unified. You only need to configure one or multiple job types. Then, the dedicated resource pool automatically supports the configured job type.
- New dedicated resource pools inherit all functions of the old ones and have greatly improved user experience in key functions such as purchasing and resizing a resource pool. Use new dedicated resource pools for smooth, transparent experience.
- Additionally, the new dedicated resource pools offer enhanced functions, for example, allowing you to upgrade GPU or Ascend drivers, view details about job queuing, and use one network for multiple pools. More new functions of the new dedicated resource pools are coming soon.

How Can I Get Help or Provide Feedback if I Encounter Problems During Use?

Similar to other ModelArts functions, you can report problems or obtain help in the sidebar of the console. In addition, you are advised to read the subsequent sections of this document to further understand how to use ModelArts dedicated resource pools. Submit a service ticket for more requirements.

Instructions of Dedicated Resource Pools

- If you use dedicated resource pools for the first time, get started by reading **Resource Pool**.
- Create a dedicated resource pool by referring to **Creating a Resource Pool**.
- View the details about a created dedicated resource pool by referring to **Viewing Details About a Resource Pool**.
- If the specifications of a dedicated resource pool do not meet your service requirements, adjust the specifications by referring to **Resizing a Resource Pool**.
- Set or change job types supported by a dedicated resource pool by referring to **Changing Job Types Supported by a Resource Pool**.
- Upgrade the GPU/Ascend driver of your dedicated resource pools by referring to **Upgrading a Resource Pool Driver**.
- If a dedicated resource pool is no longer needed, delete it by referring to **Deleting a Resource Pool**.
- If any exception occurs when you use a dedicated resource pool, handle the exception by referring to **Abnormal Status of a Dedicated Resource Pool**.
- Manage dedicated resource pool networks or interconnect VPCs with the networks by referring to **ModelArts Network**.

2.2 Creating a Resource Pool

This section describes how to create a dedicated resource pool.

Procedure

1. Log in to the ModelArts console. In the navigation pane, choose **Dedicated Resource Pools** > **Elastic Cluster**.

   NOTE

   For new users, only new-version elastic clusters are available on the ModelArts console. For users who have used old-version dedicated resource pools, they can access both old-version and new-version elastic clusters.

2. On the **Resource Pools** tab, click **Create** and configure parameters.

Table 2-1 Dedicated resource pool parameters

Parameter	Sub-Parameter	Description
Name	N/A	Name of a dedicated resource pool. Only lowercase letters, digits, and hyphens (-) are allowed. The value must start with a lowercase letter and cannot end with a hyphen (-).
Description	N/A	Brief description of a dedicated resource pool.
Billing Mode	N/A	You can select **Pay-per-use**.
Resource Pool Type	N/A	You can select **Physical** or **Logical**. If there is no logical specification, **Logical** is not displayed.
Job Type	N/A	Select job types supported by the resource pool based on service requirements. • **Physical**: **DevEnviron**, **Training Job**, and **Inference Service** are supported. • **Logical**: Only **Training Job** is supported.
Network	N/A	Network in which the target service instance is deployed. The instance can exchange data with other cloud service resources in the same network. Select a network from the drop-down list box. If no network is available, click **Create** on the right to create a network. For details about how to create a network, see **Creating a Network**.
Specification Management	Specifications	Select required specifications. Due to system loss, the actual available resources are less than those specified in the specifications. After a dedicated resource pool is created, you can view the actual available resources on the **Nodes** tab page of the dedicated resource pool details page.

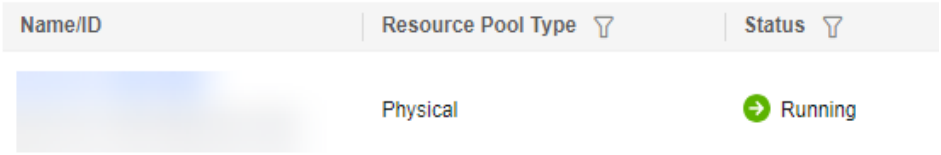
Parameter	Sub-Parameter	Description
	AZ	You can select **Automatically allocated** or **Specifies AZ**. An AZ is a physical region where resources use independent power supplies and networks. AZs are physically isolated but interconnected over an intranet. • **Automatically allocated**: AZs are automatically allocated. • **Specifies AZ**: Specify AZs for resource pool nodes. To ensure system disaster recovery, deploy all nodes in the same AZ. You can set the number of nodes in an AZ.
	Nodes	Select the number of nodes in a dedicated resource pool. More nodes mean higher computing performance. If **AZ** is set to **Specifies AZ**, you do not need to configure **Nodes**. **NOTE** It is a good practice to create no more than 30 nodes at a time. Otherwise, the creation may fail due to traffic limiting.
	Advanced Configuration	This allows you to set the container engine space. You must enter an integer for the container engine space. It cannot be less than 50 GB, which is the default and minimum value. The maximum value depends on the specifications. To see the valid values, check the console prompt. Customizing the container engine space does not increase costs.
Custom Driver	N/A	This parameter is available only when a GPU or Ascend flavor is selected. Enable this function and select a driver.
GPU Driver	N/A	This parameter is available only when custom driver is enabled. Select a GPU accelerator driver.
Required Duration	N/A	Select the time length for which you want to use the resource pool. This parameter is mandatory only when the **Yearly/Monthly** billing mode is selected.
Auto-renewal	N/A	Specifies whether to enable auto-renewal. This parameter is mandatory only when the **Yearly/Monthly** billing mode is selected. • Monthly subscriptions renew each month. • Yearly subscriptions renew each year.

Parameter	Sub-Parameter	Description
Advanced Options	N/A	Select **Configure Now** to set the tag information, CIDR block, and controller node distribution.
Tags	N/A	ModelArts can work with Tag Management Service (TMS). When creating resource-consuming tasks in ModelArts, for example, training jobs, configure tags for these tasks so that ModelArts can use tags to manage resources by group. For details about how to use tags, see **How Does ModelArts Use Tags to Manage Resources by Group?** **NOTE** You can select a predefined TMS tag from the tag drop-down list or customize a tag. Predefined tags are available to all service resources that support tags. Customized tags are available only to the service resources of the user who has created the tags.
CIDR block	N/A	You can select **Default** or **Custom**. • **Default**: The system randomly allocates an available CIDR block to you, which cannot be modified after the resource pool is created. For commercial use, customize your CIDR block. • **Custom**: You need to customize K8S container and K8S service CIDR blocks. – **K8S Container Network**: used by the container in a cluster, which determines how many containers there can be in a cluster. The value cannot be changed after the resource pool is created. – **K8S Service Network**: used when the containers in the same cluster access each other, which determines how many Services there can be. The value cannot be changed after the resource pool is created.
Master Distribution	N/A	Distribution locations of controller nodes. You can select **Random** or **Custom**. • **Random**: Use the AZs randomly allocated by the system. • **Custom**: Select AZs for controller nodes. Distribute controller nodes in different AZs for disaster recovery.

3. Click **Next** and confirm the settings. Then, click **Submit** to create the dedicated resource pool.

- After a resource pool is created, its status changes to **Running**. Only when the number of available nodes is greater than 0, tasks can be delivered to this resource pool.

Figure 2-1 Viewing a resource pool



- Hover the cursor over **Creating** to view the details about the creation process. Click **View Details**. The operation record page is displayed.

Figure 2-2 Creating

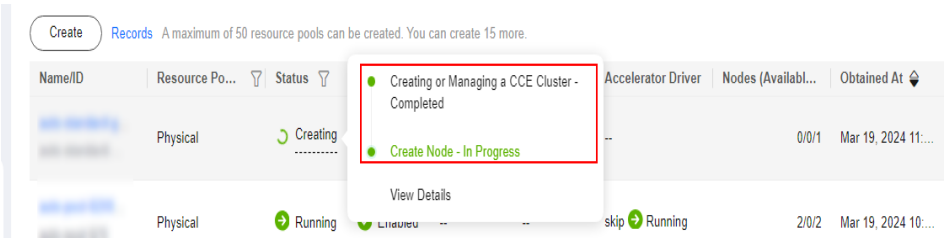
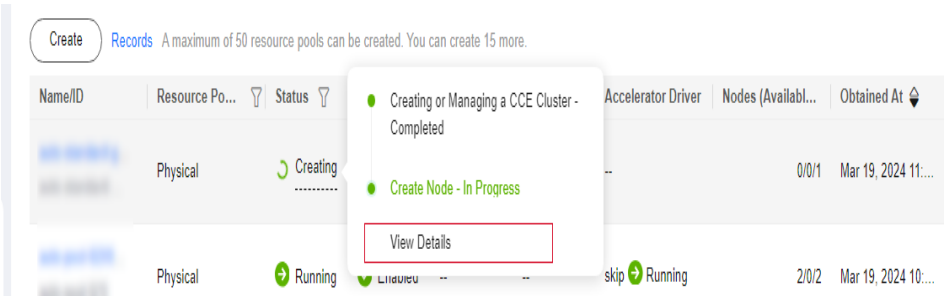


Figure 2-3 Viewing details



- You can view the task records of the resource pool by clicking **Records** in the upper left corner of the resource pool list.

Figure 2-4 Operation records

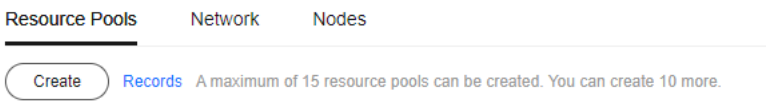
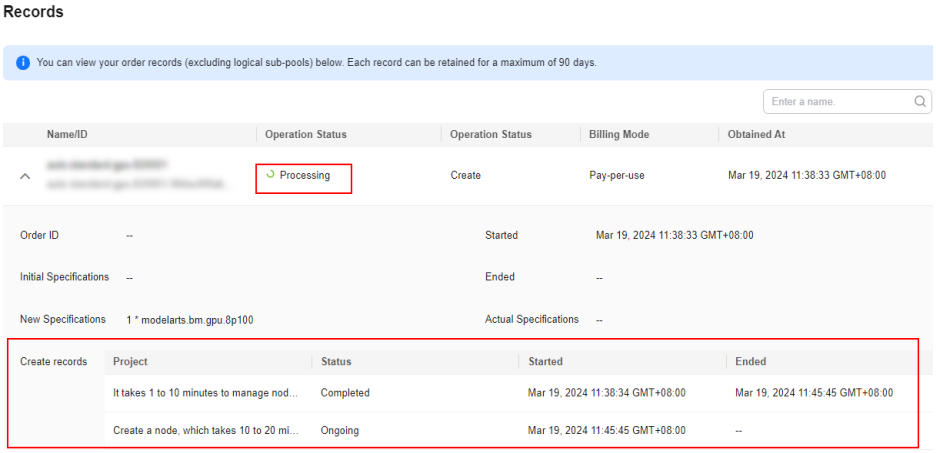


Figure 2-5 Viewing the resource pool status



FAQs

What if I choose a flavor for a dedicated resource pool, but get an error message saying no resource is available?

The flavors of dedicated resources change based on real-time availability. Sometimes, you might choose a flavor on the purchase page, but it is sold out before you pay and create the resource pool. This causes the resource pool creation to fail.

You can try a different flavor on the creation page and create the resource pool again.

Q: Why cannot I use all the CPU resources on a node in a resource pool?

Resource pool nodes have systems and plug-ins installed on them. These take up some CPU resources. For example, if a node has 8 vCPUs, but some of them are used by system components, the available resources will be fewer than 8 vCPUs.

You can check the available CPU resources by clicking the **Nodes** tab on the resource pool details page, before you start a task.

2.3 Viewing Details About a Resource Pool

Resource Pool Details Page

- Log in to the ModelArts console. In the navigation pane, choose **Dedicated Resource Pools** > **Elastic Cluster**.
- Click next to the resource pool type or status in the table header. In the top right corner of the list, select **Name** or **Resource ID** to filter resource pools. To obtain the resource ID, go to the **Billing Center** > **Orders** > **My Orders** page and click **Details** in the **Operation** column of the target order.
- In the resource pool list, click a resource pool to go to its details page and view its information.
  - If there are multiple resource pools, click in the top left corner of the details page of one resource pool to switch between resource pools. Click **More** in the top right corner to perform operations such as resize or

delete the resource pool. The available operations vary depending on the resource pool.

- In the **Network** area of **Basic Information**, you can click the number of resource pools associated to view associated resource pools.
- In the extended information area, you can view the monitoring information, jobs, nodes, specifications, and events. For details, see the following section.

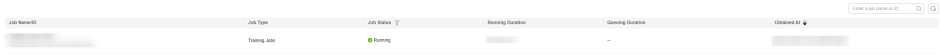
Viewing Jobs in a Resource Pool

On the resource pool details page, click **Jobs**. You can view all jobs running in the resource pool. If a job is queuing, you can view its queuing position.

NOTE

Only training jobs can be viewed.

Figure 2-6 Jobs



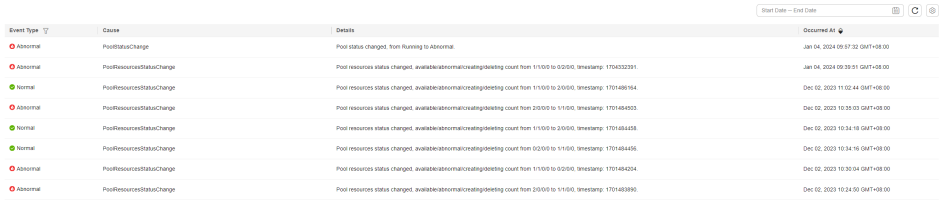
Viewing Resource Pool Events

On the resource pool details page, click **Events**. You can view all events of the resource pool. The cause of an event is **PoolStatusChange** or **PoolResourcesStatusChange**.

In the event list, click on the right of **Event Type** to filter events.

- When a resource pool starts to be created or becomes abnormal, the resource pool status changes and the change will be recorded as an event.
- When the number of nodes that are available or abnormal or in the process of being created or deleted changes, the resource pool node status changes and the change will be recorded as an event.

Figure 2-7 Events



Viewing Resource Pool Nodes

On the resource pool details page, click **Nodes**. You can view all nodes in the resource pool and the resource usage of each node.

Some resources are reserved for cluster components. Therefore, **CPUs (Available/Total)** does not indicate the number of physical resources on the node. It only displays the number of resources that can be used by services. CPU cores are metered in milicores, and 1000 milicores equal 1 physical core.

- Replacing a node:

  On the **Nodes** tab, locate the node to be replaced. In the **Operation** column, click **Replace**. No fee is charged for this operation.

  Check the node replacement records on the **Records** page. **Running** indicates that the node is being replaced. After the replacement, you can check the new node in the node list.

  The replacement can last no longer than 24 hours. If no suitable resource is found after the replacement times out, the status changes to **Failed**. Hover over  to check the failure cause.

  NOTE

  - The number of replacements per day cannot exceed 20% of the total nodes in the resource pool. The number of nodes to be replaced cannot exceed 5% of the total nodes in the resource pool.
  - Ensure that there are idle node resources. Otherwise, the replacement may fail.
  - If there are any nodes in the **Resetting** state in the operation records, nodes in the resource pool cannot be replaced.

- Resetting a node

  On the **Nodes** tab, locate the node you want to reset. Click **Reset** in the **Operation** column to reset a node. You can also select multiple nodes, and click **Reset** to reset multiple nodes.

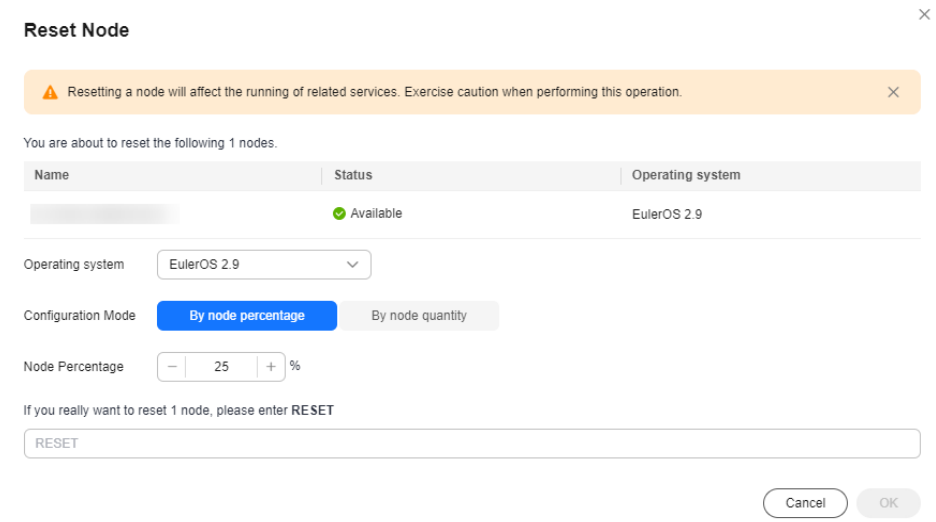
  Configure the parameters described in the table below.

  Table 2-2 Parameters

Parameter	Description
Operating System	Select an OS from the drop-down list box.
Configuration Mode	Select a configuration mode for resetting the node. • **By node percentage**: the maximum ratio of nodes that can be reset if there are multiple nodes in the reset task • **By node quantity**: the maximum number of nodes that can be reset if there are multiple nodes in the reset task

  Check the node reset records on the **Records** page. If the node is being reset, its status is **Resetting**. After the reset is complete, the node status changes to **Available**. Resetting a node will not be charged.

Figure 2-8 Resetting a node

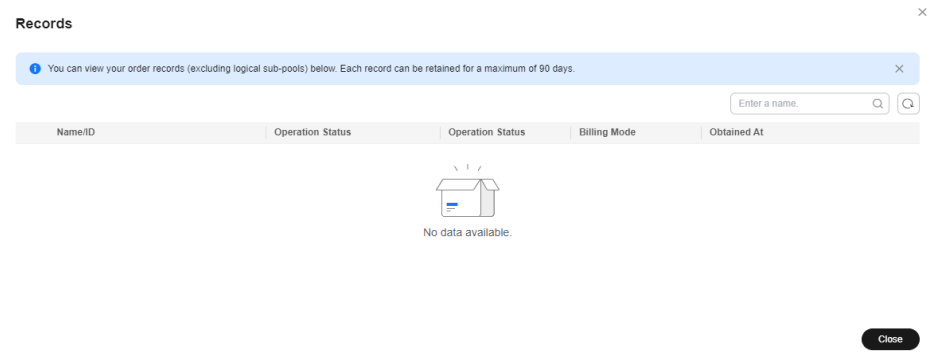


NOTE

- Resetting a node will affect running services.
- Only nodes in the **Available** state can be reset.
- A single node can be in only one reset task at a time. Multiple reset tasks cannot be delivered to the same node at a time.
- If there are any nodes in the **Replacing** state in the operation records, nodes in the resource pool cannot be reset.
- When the driver of a resource pool is being upgraded, nodes in this resource pool cannot be reset.
- For GPU and NPU specifications, after the node is reset, the driver of the node may be upgraded. Wait patiently.

Figure 2-9 Nodes

Figure 2-10 Operation records



- Deleting, unsubscribing from, or releasing a node
  - For a pay-per-use resource pool, click **Delete** in the **Operation** column.

To delete nodes in batches, select the check boxes next to the node names, and click **Delete**.

- For a yearly/monthly resource pool whose resources are not expired, click **Unsubscribe** in the **Operation** column.
- For a yearly/monthly resource pool whose resources are expired (in the grace period), click **Release** in the **Operation** column.

If the delete button is available for a yearly/monthly node, the node is an inventory node, click **Delete**.

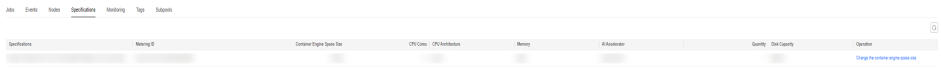
NOTE

- Before deleting, unsubscribing from, or releasing a node, ensure that there are no running jobs on this node. Otherwise, the jobs will be interrupted.
- Delete, unsubscribe from, or release abnormal nodes in a resource pool and add new ones for substitution.
- If there is only one node, it cannot be deleted, unsubscribed from, or released.

Viewing Resource Pool Specifications

On the resource pool details page, click **Specifications**. You can view the specifications used by the resource pool and the number of each specification.

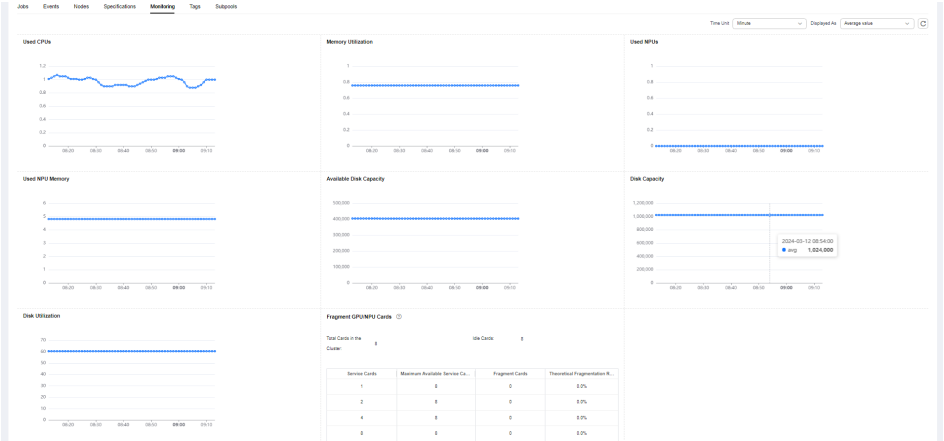
Figure 2-11 View resource pool specifications (The container engine size is displayed as the default value if it is not set.)



Viewing Resource Pool Monitoring Information

On the resource pool details page, click **Monitoring**. The resource usage including used CPUs, memory usage, and available disk capacity of the resource pool is displayed. If AI accelerators are used in the resource pool, the GPU and NPU monitoring information is also displayed.

Figure 2-12 Viewing resource views

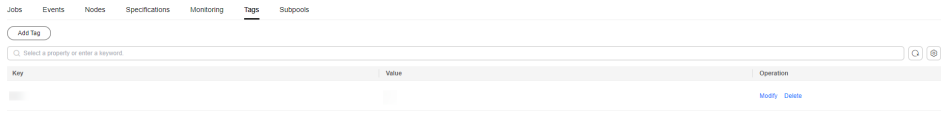


Viewing Tags

You can add tags to a resource pool for quick search.

On the resource pool details page, click **Tags**. You can view, add, modify, and delete tags of a resource pool. For details about how to use tags, see **How Does ModelArts Use Tags to Manage Resources by Group?**

Figure 2-13 Tags



NOTE

You can add up to 20 tags.

2.4 Resizing a Resource Pool

Description

The demand for resources in a dedicated resource pool may change due to the changes of AI development services. In this case, you can resize your dedicated resource pool in ModelArts.

- You can add nodes for existing flavors in the resource pool.
- You can delete nodes for existing flavors in the resource pool.

NOTE

Before scaling in a resource pool, ensure that there are no services running in the pool. Alternatively, go to the resource pool details page, delete the nodes where no services are running to scale in the pool.

Constraints

- Only dedicated resource pools in the **Running** status can be resized.
- When scaling in a dedicated resource pool, the number of flavors or nodes of a flavor cannot be decreased to 0.

Resizing a Dedicated Resource Pool

You can resize a resource pool in any of the following ways:

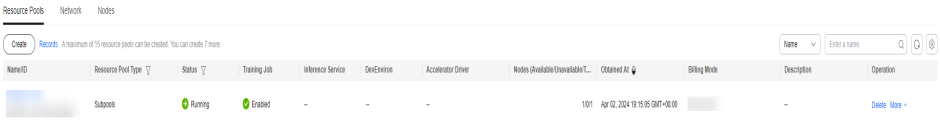
- Adjusting the number of nodes of existing specifications
- Resizing the container engine space

1. Log in to the ModelArts management console. In the navigation pane, choose **Dedicated Resource Pools** > **Elastic Cluster**.

   NOTE

   A resource pool is suspended when it is migrated from the old version to the new version. You cannot adjust the capacity of such a resource pool or unsubscribe from it.

Figure 2-14 Resource Pools



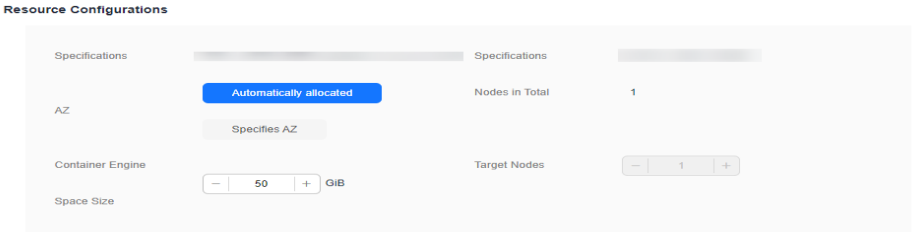
2. Add or delete nodes.

   Click **Adjust Capacity** in the **Operation** column of the target resource pool.

   In the **Resource Configurations** area, set **AZ** to **Automatically allocated** or **Specifies AZ**. Click **Submit** and then **OK** to save the changes.

   - If **AZ** is set to **Automatically allocated**, you can increase or decrease the number of nodes to scale out or in the resource pool. After the scaling, nodes are automatically allocated to AZs.
   - If you select **Specifies AZ**, you can allocate nodes to different AZs.

   Figure 2-15 Resource Configurations

3. Resize the container engine space.

   If you need larger container engine size, perform any of the following operations:

   - For new resources, you can specify the container engine space when creating a resource pool. For details, see advanced configurations of **Specification Management** in **Creating a Resource Pool**.
   - For existing resources, the container engine space can be modified.
     - Method 1: Click the target resource pool to view its details. Click the **Specifications** tab, locate the target specifications, and click **Change the container engine space size** in the **Operation** column.
     - Method 2: Locate the target resource pool and click **Adjust Capacity** in the **Operation** column.

   NOTICE

   Resizing the container engine space is only applicable to new nodes. Furthermore, dockerBaseSize may vary across nodes of this flavor within the resource pool. Consequently, this can lead to discrepancies in the status of tasks distributed among different nodes.

Figure 2-16 Resizing the container engine space (**Specifications** tab)

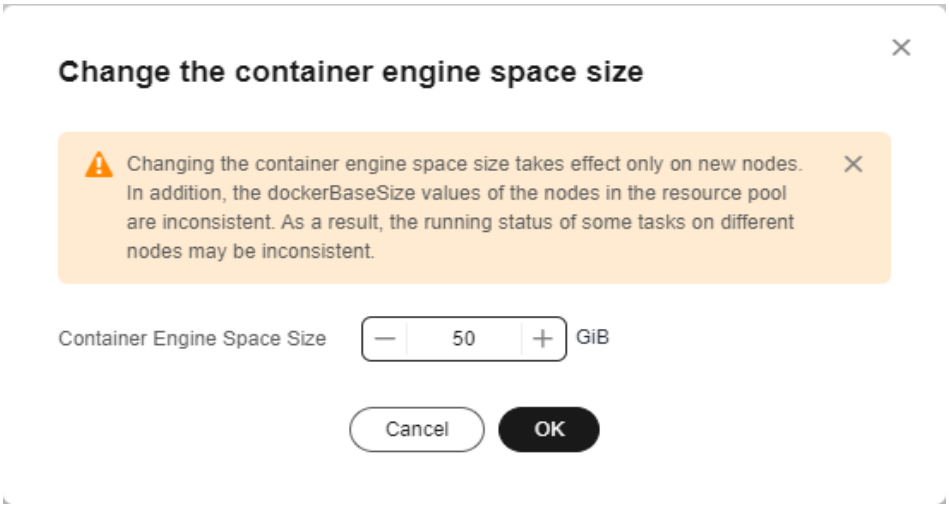
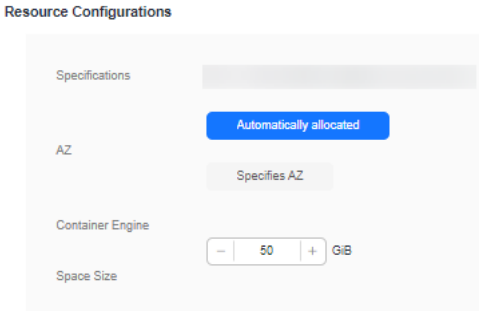


Figure 2-17 Resizing the container engine space (**Resize** page)



2.5 Setting a Renewal Policy

Description

ModelArts allows you to perform the following operations for yearly/monthly resource pools:

- Enable auto-renewal.
- Modify auto-renewal settings.
- Manually renew them.

Constraints

The target dedicated resource pool must be running.

Procedure

1. Log in to the ModelArts console. In the navigation pane, choose **Dedicated Resource Pools** > **Elastic Cluster**.
2. In the resource pool list, choose **More** > **Set Renewal Policy** in the **Operation** column of the target resource pool.

3. In the dialog box that appears, click **OK**. You will see the **Renewals** page of the billing center.
4. Set the renewal policy.
   - To enable auto-renewal for a yearly/monthly resource pool, click the **Manual Renewals** tab, locate the target resource pool, and choose **More** > **Enable Auto-Renewal** in the **Operation** column.
   - To modify auto-renewal settings for a yearly/monthly resource pool, click the **Auto Renewals** tab, locate the target resource pool, and choose **More** > **Modify Auto-Renew** in the **Operation** column to modify auto-renewal settings, such as the renewal mode, renewal duration, and number of renewals.
   - To manually renew a yearly/monthly resource pool, locate it and click **Renew** in the **Operation** column.

2.6 Modifying the Expiration Policy

Description

ModelArts allows you to change the expiration policy of a yearly/monthly resource pool to pay-per-use or non-renewal after expiration.

Constraints

The target dedicated resource pool must be running.

Procedure

1. Log in to the ModelArts console. In the navigation pane, choose **Dedicated Resource Pools** > **Elastic Cluster**.
2. In the resource pool list, choose **More** > **Change Billing Mode** in the **Operation** column of the target resource pool.
3. In the dialog box that appears, click **OK**. You will see the **Renewals** page of the billing center.
4. Modify the expiration policy.
   - If auto-renewal has not been enabled for the target resource pool, click the **Manual Renewals** tab, and choose **More** > **Change to Pay-per-Use After Expiration** or **More** > **Cancel Renewal** in the **Operation** column of the target resource pool.
   - If auto-renewal has been enabled for the target resource pool, click the **Auto Renewals** tab, and choose **More** > **Cancel Renewal** in the **Operation** column of the target resource pool.

2.7 Migrating the Workspace

Context

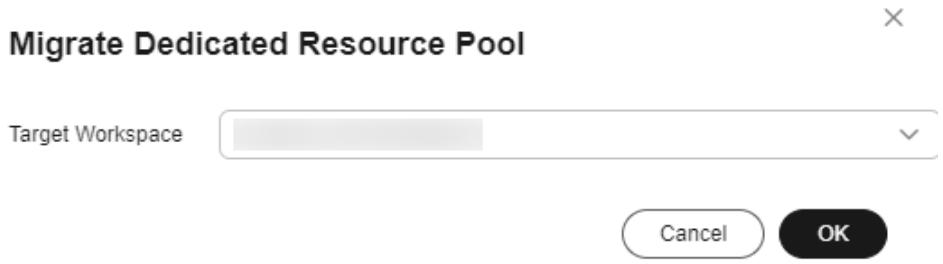
The workspace of a dedicated resource pool is associated with an enterprise project, which involves bill collection. ModelArts provides workspaces to isolate

resource operation permissions of different IAM users. Workspace migration includes resource pool migration and network migration. For details, see the following sections.

Migrating the Workspace for a Resource Pool

1. Log in to the ModelArts management console. In the navigation pane, choose **Dedicated Resource Pools** > **Elastic Cluster**.
2. In the resource pool list, choose **More** > **Migrate Workspace** in the **Operation** column of the target resource pool.
3. In the **Migrate Dedicated Resource Pool** dialog box that appears, select the target workspace and click **OK**.

Figure 2-18 Migrating the workspace



Migrating the Workspace for a Network

1. Log in to the ModelArts management console. In the navigation pane, choose **Dedicated Resource Pools** > **Elastic Cluster**. Then, click the **Network** tab.
2. In the network list, choose **More** > **Migrate Workspace** in the **Operation** column of the target network.
3. In the dialog box that appears, select the target workspace and click **OK**.

Figure 2-19 Migrating the workspace

2.8 Changing Job Types Supported by a Resource Pool

Description

ModelArts supports many types of jobs. Some of them can run in dedicated resource pools, including training jobs, inference services, and notebook development environments.

You can change job types supported by a dedicated resource pool. Available options for **Job Type** are **Training Job**, **Inference Service**, and **DevEnviron**.

Only selected types of jobs can be delivered to the corresponding dedicated resource pool.

CAUTION

To support different job types, different operations are performed in the backend, such as installing plug-ins and setting the network environment. Some operations use resources in the resource pool. As a result, available resources for you decrease. Therefore, select only the job types you need to avoid resource waste.

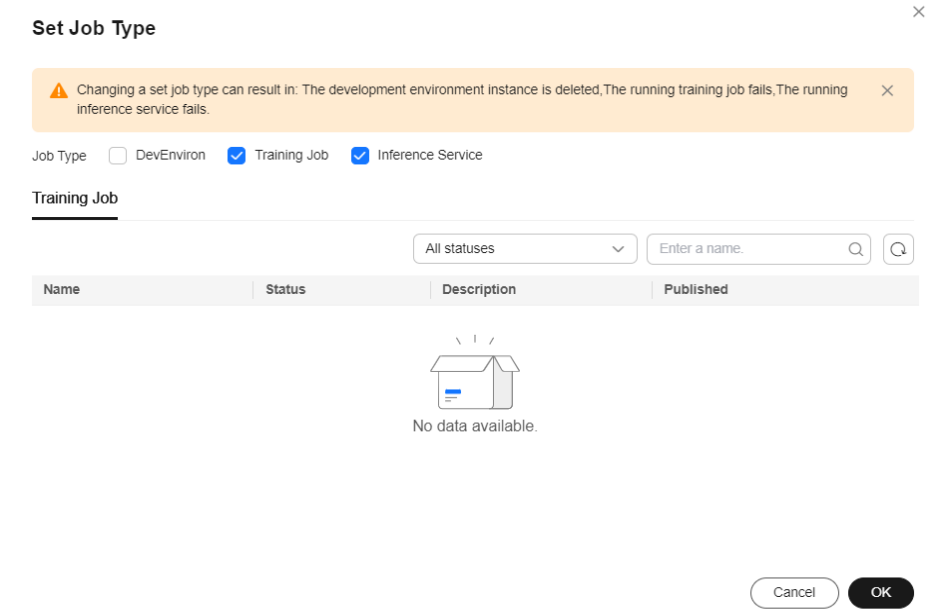
Constraints

The target dedicated resource pool must be running.

Procedure

1. Log in to the ModelArts management console. In the navigation pane, choose **Dedicated Resource Pools** > **Elastic Cluster**.
2. In the **Operation** column of a resource pool, choose **More** > **Set Job Type**.
3. In the **Set Job Type** dialog box, select job types.

Figure 2-20 Setting the job type



4. Click **OK**.

2.9 Upgrading a Resource Pool Driver

Description

If GPUs or Ascend resources are used in a dedicated resource pool, you may need to customize GPU or Ascend drivers. ModelArts allows you to upgrade GPU or Ascend drivers of your dedicated resource pools.

There are two driver upgrade modes: secure upgrade and forcible upgrade.

NOTE

- Secure upgrade: Running services are not affected. After the upgrade starts, the nodes are isolated (new jobs cannot be delivered). After the existing jobs on the nodes are complete, the upgrade is performed. The secure upgrade may take a long time because the jobs must be completed first.
- Forcible upgrade: The drivers are directly upgraded, regardless of whether there are running jobs.

Constraints

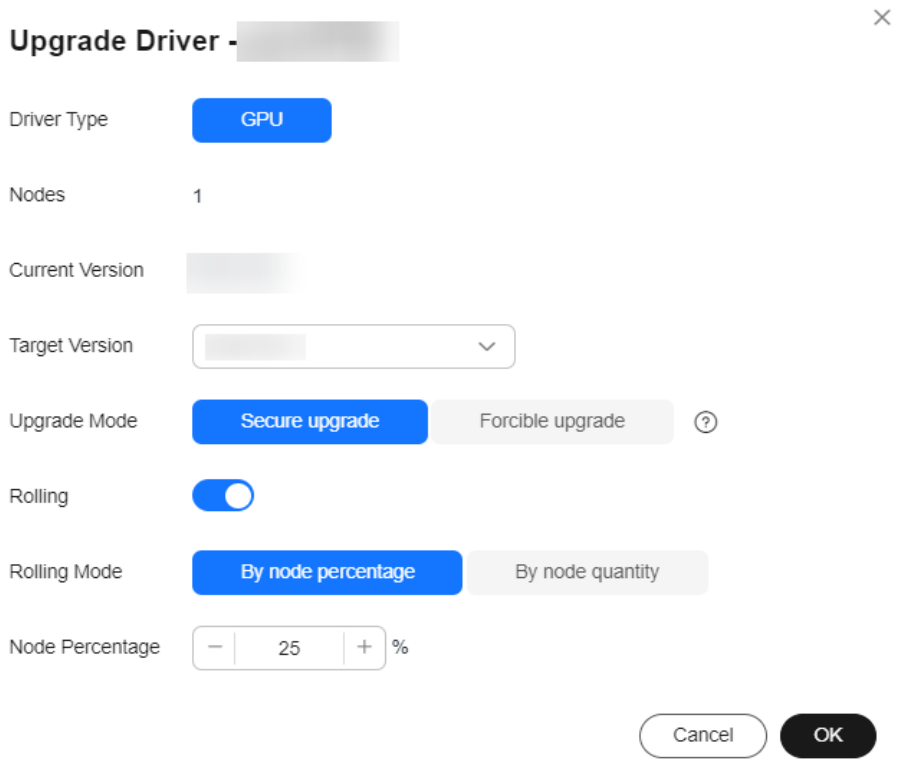
- The target dedicated resource pool must be running, and the resource pool contains GPU or Ascend resources.
- For a logical resource pool, the driver can be upgraded only after node binding is enabled. To enable node binding, submit a service ticket to contact Huawei engineers.

Upgrading the Driver

1. Log in to the ModelArts management console. In the navigation pane, choose **Dedicated Resource Pools** > **Elastic Cluster**.

2. In the **Operation** column of the target resource pool, choose **More** > **Upgrade Driver**.
3. In the **Upgrade Driver** dialog box, the driver type, number of nodes, current version, target version, and upgrade mode of the dedicated resource pool are displayed.
   - **Target Version**: Select a target driver version from the drop-down list.
   - **Upgrade Mode**: Select **Secure upgrade** or **Forcible upgrade**.
   - **Rolling Mode**: Once enabled, you can upgrade the driver in rolling mode. Currently, rolling by node percentage and by node quantity are supported. If **By node percentage** is selected, the number of nodes to be upgraded in each batch is the node ratio multiplied by the total number of nodes in the resource pool. If **By node quantity** is selected, the number of nodes to be upgraded in each batch is what you configured.

Figure 2-21 Upgrading a driver



4. Click **OK** to start the driver upgrade.

2.10 Deleting a Resource Pool

If a dedicated resource pool is no longer needed for AI service development, you can delete the resource pool to release resources.

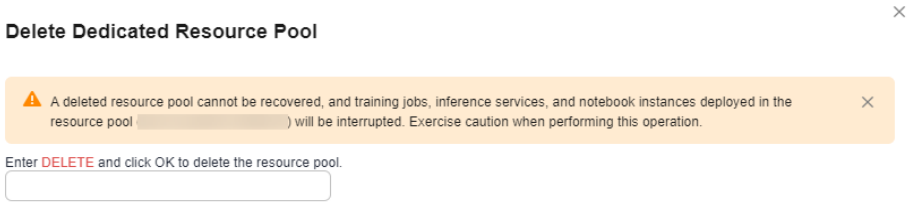
NOTE

After a dedicated resource pool is deleted, the development environments, training jobs, and inference services that depend on the resource pool are unavailable. A dedicated resource pool cannot be restored after being deleted.

1. Log in to the ModelArts management console. In the navigation pane, choose **Dedicated Resource Pools** > **Elastic Cluster**.
2. Locate the row that contains the target resource pool, choose **More** > **Delete** in the **Operation** column.
3. In the **Delete Dedicated Resource Pool** dialog box, enter **DELETE** in the text box and click **OK**.

   You can switch between tabs on the details page to view the training jobs and notebook instances created using the resource pool, and inference services deployed in the resource pool.

Figure 2-22 Deleting a resource pool



2.11 Abnormal Status of a Dedicated Resource Pool

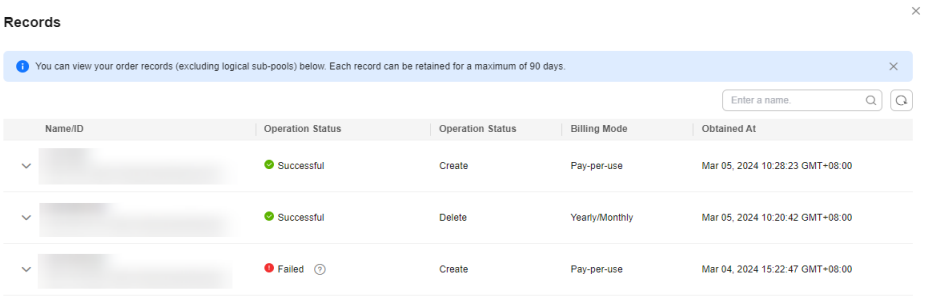
Resource Quota Limit

When you use a dedicated resource pool (for example, scaling resources, creating a VPC, creating a VPC and subnet, or interconnecting a VPC), if the system displays a message indicating that the resource quota is limited, **submit a service ticket**.

Creation Failed/Change Failed

1. Log in to the ModelArts management console. In the navigation pane, choose **Dedicated Resource Pools** > **Elastic Cluster**.
2. Click **Records** on the right of **Create**. On the **Records** dialog box, view failed task records.

Figure 2-23 Creating a resource pool failed



3. Hover the cursor over , view the cause of task failures.

NOTE

By default, failed task records are sorted by application time. A maximum of 500 failed task records can be displayed and retained for three days.

Locating Faulty Node

ModelArts will add a taint on a detected K8S faulty node so that jobs will not be affected or scheduled to the tainted node. The following table lists the faults can be detected. You can locate the fault by referring to the isolation code and detection method.

Table 2-3 Isolation code

Isolation Code	Category	Sub-Category	Description	Detection Method
A050101	GPU	GPU memory	GPU ECC error exists.	Run the **nvidia-smi -a** command and check whether **Pending Page Blacklist** is **Yes** or the value of **multi-bit Register File** is greater than 0. For Ampere GPUs, check whether the following content exists: • Uncorrectable SRAM error • Remapping Failure records • Xid 95 events in **dmsg** (For details, see **NVIDIA GPU Memory Error Management**.) The Ampere architecture has the following levels of GPU memory errors: • L1: These are single-bit ECC errors that can be corrected. They do not affect the running services. To check for these errors, run the **nvidia-smi -a** command and look for **Volatile Correctable**. • L2: These are multi-bit ECC errors that cannot be corrected. They cause the running services to fail and require a process restart to recover. To check for these errors, run the **nvidia-smi -a** command and look for **Volatile Uncorrectable**. • L3: These are unsuppressed errors and may affect other services. They require a card reset or a node reboot to clear. To check for these errors, look for the Xid events that contain the number 95. (The Remapped Pending records are only for reference. You need to reset the cards when the service is idle to trigger the remapping process.) • L4: These are errors that require a card replacement. To check for these errors, look for the **SRAM**

Isolation Code	Category	Sub-Category	Description	Detection Method
				Uncorrectable field that is greater than 4 or the **Remapped Failed** field that is not zero.
A05 0102	GPU	Other	The **nvidia-smi** output contains ERR.	Run **nvidia-smi -a** and check whether the output contains ERR. Normally, the hardware, such as the power supply or the fan, is faulty.
A05 0103	GPU	Other	The execution of **nvidia-smi** times out or does not exist.	Check that exit code of **nvidia-smi** is not **0**.
A05 0104	GPU	GPU Memory	ECC error occurred 64 times.	Run the **nvidia-smi -a** command, locate **Retired Pages**, and check whether the sum of **Single Bit** and **Double Bit** is greater than 64.
A05 0148	GPU	Other	An infoROM alarm occurs.	Run the **nvidia-smi** command and check whether the output contains the alarm "infoROM is corrupted".
A05 0109	GPU	Other	Other GPU errors	Check whether other GPU error exists. Normally, there is a faulty hardware. Contact the technical engineer.
A05 0147	IB	Link	The IB NIC is abnormal.	Run the **ibstat** command and check whether the NIC is not in active state.
A05 0121	NPU	Other	A driver exception is detected by NPU DCMI.	The NPU driver environment is abnormal.
A05 0122	NPU	Other	The NPU DCMI device is abnormal.	The NPU device is abnormal. The Ascend DCMI interface returns a major or urgent alarm.
A05 0123	NPU	Link	The NPU DCMI net is abnormal.	The NPU network connection is abnormal.
A05 0129	NPU	Other	Other NPU errors	Check whether other NPU error exists. You cannot rectify the fault. Contact the technical engineer.

Isolation Code	Category	Sub-Category	Description	Detection Method
A050149	NPU	Link	Check whether the network port of the hccn tool is intermittently disconnected.	The NPU network is unstable and intermittently disconnected. Run the **hccn_tool-i ${device_id} -link_stat -g** command and the network is disconnected more than five times within 24 hours.
A050951	NPU	GPU memory	The number of NPU ECCs reaches the maintenance threshold.	The NPU's HBM Double Bit Isolated Pages Count value is greater than or equal to 64.
A050146	Runtime	Other	The NTP is abnormal.	The ntpd or chronyd service is abnormal.
A050202	Runtime	Other	The node is not ready.	The node is unavailable. The K8S node contains one of the following taints: ● node.kubernetes.io/unreachable ● node.kubernetes.io/not-ready
A050203	Runtime	Disconnection	The number of normal AI cards does not match the actual capacity.	The GPU or NPU is disconnected.
A050206	Runtime	Other	The Kubelet hard disk is read-only.	The **/mnt/paas/kubernetes/kubelet** directory is read-only.
A050801	Node management	Node O&M	Resource is reserved.	The node is marked as the standby node and contains a taint.
A050802	Node management	Node O&M	An unknown error occurs.	The node is marked with an unknown taint.
A200001	Node management	Driver upgrade	The GPU is being upgraded.	The GPU is being upgraded.

Isolation Code	Category	Sub-Category	Description	Detection Method
A200002	Node management	Driver upgrade	The NPU is being upgraded.	The NPU is being upgraded.
A200008	Node management	Node admission	The admission is being examined.	The admission is being examined, including basic node configuration check and simple service verification.
A050933	Node management	Fault tolerance Failover	The Failover service on the tainted node will be migrated.	The Failover service on the tainted node will be migrated.
A050931	Training toolkit	Pre-check container	A GPU error is detected in the pre-check container.	A GPU error is detected in the pre-check container.
A050932	Training toolkit	Pre-check container	An IB error is detected in the pre-check container.	An IB error is detected in the pre-check container.

2.12 ModelArts Network

ModelArts Network and VPC

ModelArts networks are backed by VPCs and used for interconnecting nodes in a ModelArts resource pool. You can only configure the name and CIDR block for a network. To ensure that there is no IP address segment in the CIDR block overlapped with that of the VPC to be accessed, multiple CIDR blocks are available for you to select.

A VPC provides a logically isolated virtual network for your instances. You can configure and manage the network as required. VPC provides logically isolated, configurable, and manageable virtual networks for cloud servers, cloud containers, and cloud databases. It helps you improve cloud service security and simplify network deployment.

Prerequisites

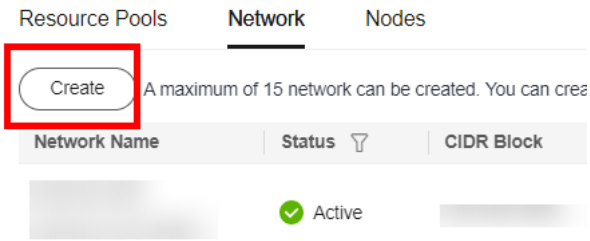
- A VPC is available.

- A subnet is available.

Creating a Network

1. Log in to the ModelArts management console. In the navigation pane, choose **Dedicated Resource Pools** > **Elastic Cluster**.
2. Click **Network** and then **Create**.

   Figure 2-24 Network list

3. In the **Create Network** dialog box, set parameters.
   - **Network Name**: customizable name
   - **CIDR Block**: You can select **Preset** or **Custom**.

   NOTE

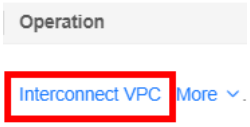
   - Each user can create a maximum of 15 networks.
   - Ensure there is no IP address segment in the CIDR block overlaps that of the VPC to be accessed. The CIDR block cannot be changed after the network is created. Possible conflict CIDR blocks are as follows:
     - Your VPC CIDR block
     - Container CIDR block (consistently to be 172.16.0.0/16)
     - Service CIDR block (consistently to be 10.247.0.0/16)
4. Confirm the settings and click **OK**.

(Optional) Interconnecting a VPC with a ModelArts Network

VPC interconnection allows you to use resources across VPCs, improving resource utilization.

1. On the **Network** page, click **Interconnect VPC** in the **Operation** column of the target network.

   Figure 2-25 Interconnect VPC

2. In the displayed dialog box, click the button on the right of **Interconnect VPC**, and select an available VPC and subnet from the drop-down lists.

   NOTE

   The peer network to be interconnected cannot overlap with the current CIDR block.

Figure 2-26 Parameters for interconnecting a VPC with a network

- If no VPC is available, click **Create VPC** on the right to create a VPC.
- If no subnet is available, click **Create Subnet** on the right to create a subnet.
- Multiple subnets in a VPC can be interconnected. You can click + to add up to 10 subnets.

Enabling a Dedicated Resource Pool to Access the Internet

To enable a dedicated resource pool to access the Internet, follow these steps:

Step 1 Interconnect a VPC. For details, see **(Optional) Interconnecting a VPC with a ModelArts Network** .

Step 2 For details about how to configure an SNAT server for a VPC, see **Configuring an SNAT Server**.

----End

Deleting a Network

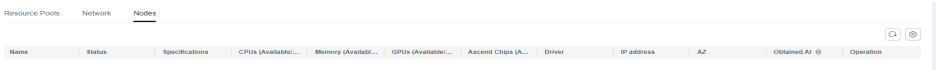
If a network is no longer needed for AI service development, you can delete the network.

1. Go to the **Network** tab page and click **Delete** in the **Operation** column of a network.
2. Confirm the information and click **OK**.

2.13 ModelArts Nodes

Nodes that are not managed by the resource pool are considered as free nodes. To view the information about free nodes, log in to the ModelArts management console, choose **Dedicated Resource Pools** > **Elastic Cluster**, and click the **Nodes** tab.

Figure 2-27 Nodes



Release the free nodes resources according to the following content:

- For a pay-per-use node, click **Delete** in the **Operation** column.
- For a yearly/monthly node whose resources are not expired, click **Unsubscribe** in the **Operation** column.
- For a yearly/monthly node whose resources are expired (in the grace period), click **Release** in the **Operation** column.

If the delete button is available for a yearly/monthly node, click the button to delete the node.

NOTE

Deletion, unsubscription, and release operations cannot be undone. Exercise caution when performing this operation.

3 Audit Logs

3.1 Key Operations Recorded by CTS

With CTS, you can obtain operations associated with ModelArts for later query, audit, and backtrack operations.

Prerequisites

CTS has been enabled.

Key Data Management Operations Traced by CTS

Table 3-1 Key data management operations traced by CTS

Operation	Resource Type	Trace
Creating a dataset	Dataset	createDataset
Deleting a dataset	Dataset	deleteDataset
Updating a dataset	Dataset	updateDataset
Publishing a dataset version	Dataset	publishDatasetVersion
Deleting a dataset version	Dataset	deleteDatasetVersion
Synchronizing the data source	Dataset	syncDataSource
Exporting a dataset	Dataset	exportDataFromDataset
Creating an auto labeling task	Dataset	createAutoLabelingTask
Creating an auto grouping task	Dataset	createAutoGroupingTask

Operation	Resource Type	Trace
Creating an auto deployment task	Dataset	createAutoDeployTask
Importing samples to a dataset	Dataset	importSamplesToDataset
Creating a dataset label	Dataset	createLabel
Updating a dataset label	Dataset	updateLabel
Deleting a dataset label	Dataset	deleteLabel
Deleting a dataset label and their labeled samples	Dataset	deleteLabelWithSamples
Adding samples	Dataset	uploadSamples
Deleting samples	Dataset	deleteSamples
Stopping an auto labeling task	Dataset	stopTask
Creating a team labeling task	Dataset	createWorkforceTask
Deleting a team labeling task	Dataset	deleteWorkforceTask
Starting the acceptance of a team labeling task	Dataset	startWorkforceSampling-Task
Approving, rejecting, or canceling the acceptance of a team labeling task	Dataset	updateWorkforceSam-plingTask
Submitting sample review comments for an acceptance task	Dataset	acceptSamples
Adding a label to a sample	Dataset	updateSamples
Sending an email to team labeling members	Dataset	sendEmails
Starting a team labeling task as the team manager	Dataset	startWorkforceTask
Updating a team labeling task	Dataset	updateWorkforceTask
Adding a label to a team-labeled sample	Dataset	updateWorkforceTask-Samples

Operation	Resource Type	Trace
Reviewing team labeling results	Dataset	reviewSamples
Creating a labeling team member	Workforce	createWorker
Updating labeling team members	Workforce	updateWorker
Deleting a labeling team member	Workforce	deleteWorker
Deleting labeling team members in a batch	Workforce	batchDeleteWorker
Creating a labeling team	Workforce	createWorkforce
Updating a labeling team	Workforce	updateWorkforce
Deleting a labeling team	Workforce	deleteWorkforce
Automatically creating an IAM agency	IAM	createAgency
Logging in to the labeling console as a team labeling member	labelConsoleWorker	workerLoginLabelConsole
Logging out of the labeling console as a team labeling member	labelConsoleWorker	workerLogOutLabelConsole
Changing the password for logging in to the labeling console as a team labeling member	labelConsoleWorker	workerChangePassword
Handling the issue that the password for logging in to the labeling console as a team labeling member is lost	labelConsoleWorker	workerForgetPassword
Resetting the password for logging in to the labeling console through the URL as a team labeling member	labelConsoleWorker	workerResetPassword

Key DevEnviron Operations Traced by CTS

Table 3-2 Key DevEnviron operations traced by CTS

Operation	Resource Type	Trace
Creating a notebook instance	Notebook	createNotebook
Deleting a notebook instance	Notebook	deleteNotebook
Opening a notebook instance	Notebook	openNotebook
Starting a notebook instance	Notebook	startNotebook
Stopping a notebook instance	Notebook	stopNotebook
Updating a notebook instance	Notebook	updateNotebook
Deleting a NotebookApp	NotebookApp	deleteNotebookApp
Switching CodeLab specifications	NotebookApp	updateNotebookApp

Key Training Job Operations Traced by CTS

Table 3-3 Key training job operations traced by CTS

Operation	Resource Type	Trace
Creating a training job	ModelArtsTrainJob	createModelArtsTrainJob
Creating a training job version	ModelArtsTrainJob	createModelArtsTrainVersion
Stopping a training job	ModelArtsTrainJob	stopModelArtsTrainVersion
Modifying the description of a training job	ModelArtsTrainJob	updateModelArtsTrainDesc
Deleting a training job version	ModelArtsTrainJob	deleteModelArtsTrainVersion
Deleting a training job	ModelArtsTrainJob	deleteModelArtsTrainJob
Configuring training job	ModelArtsTrainConfig	createModelArtsTrainConfig

Operation	Resource Type	Trace
Modifying a training job configuration	ModelArtsTrainConfig	updateModelArtsTrain-Config
Deleting a training job configuration	ModelArtsTrainConfig	deleteModelArtsTrain-Config
Creating a visualization job	ModelArtsTensorboard-Job	createModelArtsTensor-boardJob
Deleting a visualization job	ModelArtsTensorboard-Job	deleteModelArtsTensor-boardJob
Modifying the description of a visualization job	ModelArtsTensorboard-Job	updateModelArtsTensor-boardDesc
Stopping a visualization job	ModelArtsTensorboard-Job	stopModelArtsTensor-boardJob
Restarting a visualization job	ModelArtsTensorboard-Job	restartModelArtsgTensor-boardJob

Key AI Application Management Operations Traced by CTS

Table 3-4 Key AI application management operations traced by CTS

Operation	Resource Type	Trace
Creating an AI application	Model	addModel
Updating an AI application	Model	updateModel
Deleting an AI application	Model	deleteModel
Creating a model conversion task	Convert	addConvert
Updating a model conversion task	Convert	updateConvert
Deleting a model conversion task	Convert	deleteConvert

Key Service Management Operations Traced by CTS

Table 3-5 Key service management operations traced by CTS

Operation	Resource Type	Trace
Deploying a service	Service	addService
Deleting a service	Service	deleteService
Updating a service	Service	updateService
Starting or stopping a service	Service	startOrStopService
Adding a user access key	Service	addAkSk
Deleting a user access key	Service	deleteAkSk
Creating a dedicated resource pool	Cluster	createCluster
Deleting a dedicated resource pool	Cluster	deleteCluster
Adding a node to a dedicated resource pool	Cluster	addClusterNode
Deleting a node from a dedicated resource pool	Cluster	deleteClusterNode
Obtaining a result of creating a dedicated resource pool	Cluster	createClusterResult

Key AI Gallery Operations Traced by CTS

Table 3-6 Key AI Gallery operations traced by CTS

Operation	Resource Type	Trace
Publishing an asset	ModelArts_Market	create_content
Modifying asset information	ModelArts_Market	modify_content
Publishing an asset version	ModelArts_Market	add_version
Subscribing to an asset	ModelArts_Market	subscription_content
Removing an asset from favorites	ModelArts_Market	cancel_star_content

Operation	Resource Type	Trace
Liking an asset	ModelArts_Market	like_content
Unliking an asset	ModelArts_Market	cancel_like_content
Publishing an activity	ModelArts_Market	publish_activity
Signing up an activity	ModelArts_Market	regist_activity
Modifying user information	ModelArts_Market	update_user

Key Resource Management Operations Traced by CTS

Table 3-7 Key resource management operations traced by CTS

Operation	Resource Type	Trace
Creating a resource pool	PoolV2	CreatePoolV2
Deleting a resource pool	PoolV2	DeletePoolV2
Updating a resource pool	PoolV2	UpdatePoolV2
Creating a network	NetworksV1	CreateNetworksV1
Deleting a network	NetworksV1	DeleteNetworksV1
Update a network	NetworksV1	UpdateNetworksV1

3.2 Viewing Audit Logs

After CTS is enabled, CTS starts recording operations related to ModelArts. The CTS management console stores the last seven days of operation records. This section describes how to query operation records of the last seven days on the CTS management console.

Procedure

1. Log in to the CTS management console.
2. Click  in the upper left corner of the page and select a region.
3. In the left navigation pane, click **Trace List**.
4. Specify the filter criteria used for querying traces. The following four filter criteria are available:
   - **Trace Source**, **Resource Type**, and **Search By**

     Select a filter criterion from the drop-down list.

     If you select **Trace name** for **Search By**, you need to select a specific trace name.

If you select **Resource ID** for **Search By**, you need to enter a specific resource ID.

If you select **Resource name** for **Search By**, you need to select or enter a specific resource name.

- **Operator**: Select a specific operator (a user rather than an account).
- **Trace Status**: Available options include **All trace statuses**, **normal**, **warning**, and **incident**. You can only select one of them.
- **Time Range**: You can view traces generated during any time range of the last seven days.

5. Click ⌄ on the left of a trace to expand its details.
6. Click **View Trace** in the **Operation** column. In the displayed **View Trace** dialog box, the trace structure details are displayed.

   For details about the key fields in the CTS trace structure, see **Cloud Trace Service User Guide**.

4 Monitoring Resources

4.1 Overview

All metrics reported by ModelArts are stored in AOM, which enables you to consume metrics. You can view metric threshold alarms and reported alarms on the AOM console or use visualization tools such as Grafana to view and analyze the alarms. Grafana provides different views and templates for monitoring, which allow you to see the real-time resource usage on dashboards clearly.

4.2 Using Grafana to View AOM Monitoring Metrics

4.2.1 Procedure

Grafana supports various monitoring views and templates, meeting your diverse requirements. After adding the data source in Grafana, you can view all ModelArts monitoring metrics stored in AOM using Grafana.

To view AOM monitoring metrics using Grafana plugins, perform the following steps:

1. **Installing and Configuring Grafana**

   NOTE

   You can install and configure Grafana using any of the following ways: **Installing and Configuring Grafana on Windows**, **Installing and Configuring Grafana on Linux**, and **Installing and Configuring Grafana on a Notebook Instance**.

2. **Configuring a Grafana Data Source**
3. **Using Grafana to Configure Dashboards and View Metric Data**

4.2.2 Installing and Configuring Grafana

4.2.2.1 Installing and Configuring Grafana on Windows

Application Scenario

This section describes how to install and configure Grafana on a Windows operating system.

Procedure

1. Download the Grafana installation package.

   Go to the **download link**, click **Download the installer**, and wait until the download is successful.

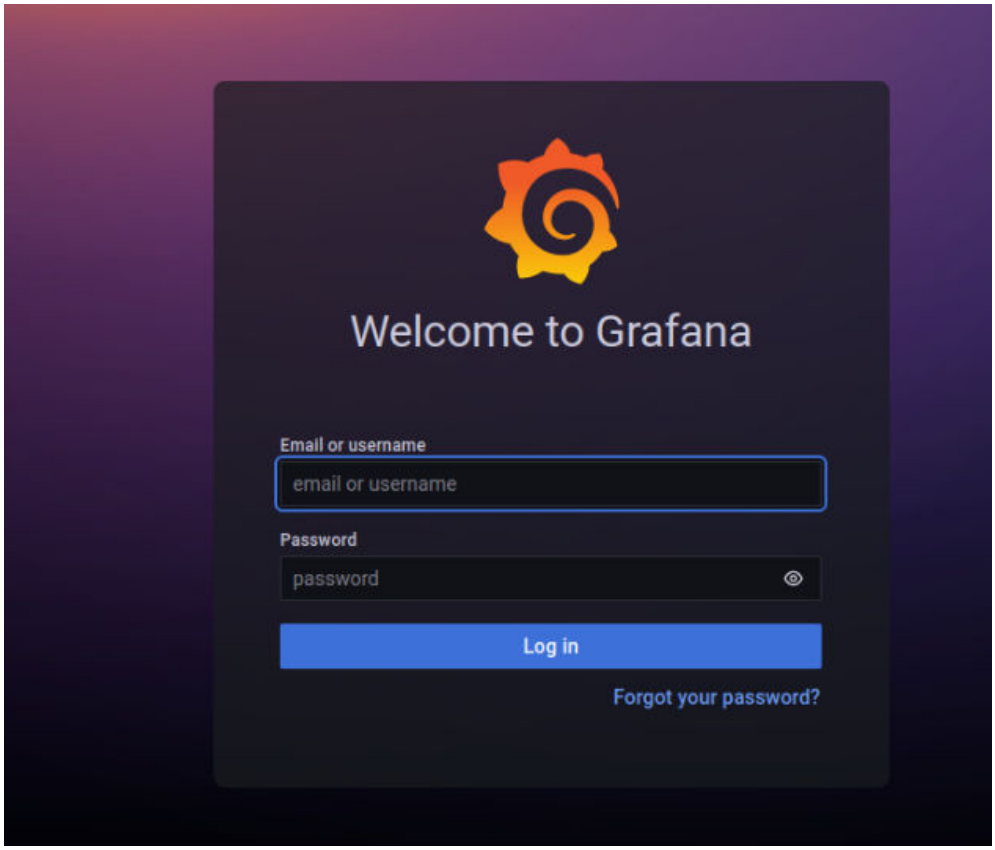
2. Install Grafana.

   Double-click the installation package and install Grafana as instructed.

3. In Windows Services Manager, enable Grafana.

4. Log in to Grafana.

   Grafana runs on port 3000 by default. After you open http://localhost:3000, the Grafana login page is displayed. The default username and password for the first login are **admin**. After the login is successful, change the password as prompted.



4.2.2.2 Installing and Configuring Grafana on Linux

Prerequisites

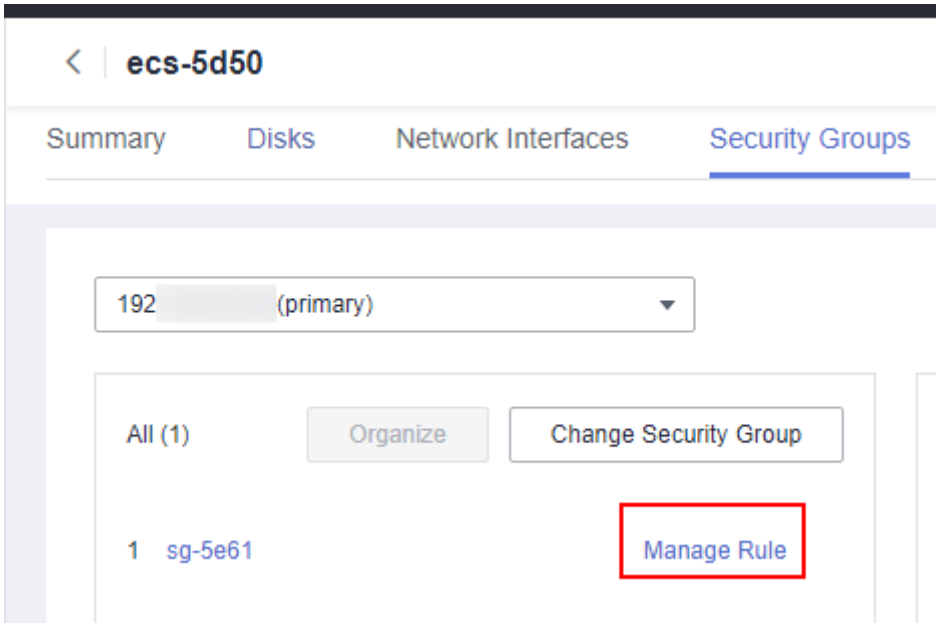
- An Ubuntu server that is accessible to the Internet is available. If no, the following conditions must be met:
- You have obtained an ECS. (You are advised to select 8 vCPUs or higher, Ubuntu image of 22.04 version, and 100 GB local storage.) For details, see **Purchasing an ECS**.
- You have purchased an EIP and bound it to the ECS. For details, see **Assigning an EIP and Binding It to an ECS**.

Procedure

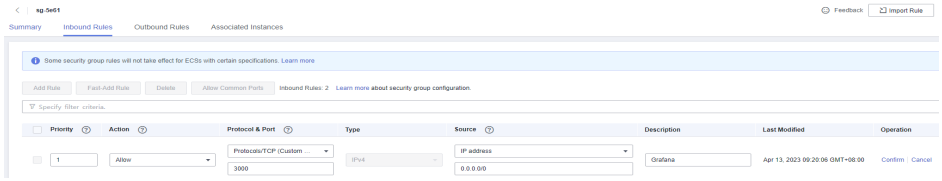
1. Log in to the ECS. Select a login method. For details, see .
2. Run the following command to install libfontconfig1:
   ```
   sudo apt-get install -y adduser libfontconfig1
   ```
   The operation is successful if the following information is displayed:
   ```
   root@ecs-9ec3:~# sudo apt-get install -y adduser libfontconfig1
   Reading package lists... Done
   Building dependency tree... Done
   Reading state information... Done
   adduser is already the newest version (3.118ubuntu5).
   adduser set to manually installed.
   libfontconfig1 is already the newest version (2.13.1-4.2ubuntu5).
   libfontconfig1 set to manually installed.
   The following packages were automatically installed and are no longer required:
     eatmydata libeatmydata1 libflashrom1 libftdi1-2 python-babel-localedata python3-babel python3-certifi python3-jinja2
     python3-json-pointer python3-jsonpatch python3-jsonschema python3-markupsafe python3-pyrsistent python3-requests python3-tz
     python3-urllib3
   Use 'sudo apt autoremove' to remove them.
   0 upgraded, 0 newly installed, 0 to remove and 4 not upgraded.
   ```
3. Run the following command to download the Grafana installation package:
   ```
   wget https://dl.grafana.com/oss/release/grafana_9.3.6_amd64.deb --no-check-certificate
   ```
   Download completed:
   ```
   root@ecs-9ec3:~# wget https://dl.grafana.com/oss/release/grafana_9.3.6_amd64.deb --no-check-certificate
   --2023-03-07 10:22:12--  https://dl.grafana.com/oss/release/grafana_9.3.6_amd64.deb
   Resolving dl.grafana.com (dl.grafana.com)... 151.101.42.217
   Connecting to dl.grafana.com (dl.grafana.com)|151.101.42.217|:443... connected.
   HTTP request sent, awaiting response... 200 OK
   Length: 89252050 (85M) [application/octet-stream]
   Saving to: 'grafana_9.3.6_amd64.deb'

   grafana_9.3.6_amd64.deb         100%[=====================================================>]  85.12M   379KB/s    in 2m 21s

   2023-03-07 10:24:36 (617 KB/s) - 'grafana_9.3.6_amd64.deb' saved [89252050/89252050]
   ```
4. Run the following command to install Grafana:
   ```
   sudo dpkg -i grafana_9.3.6_amd64.deb
   ```
   ```
   root@ecs-9ec3:~# sudo dpkg -i grafana_9.3.6_amd64.deb
   Selecting previously unselected package grafana.
   (Reading database ... 80788 files and directories currently installed.)
   Preparing to unpack grafana_9.3.6_amd64.deb ...
   Unpacking grafana (9.3.6) ...
   Setting up grafana (9.3.6) ...
   Adding system user `grafana' (UID 116) ...
   Adding new user `grafana' (UID 116) with group `grafana' ...
   Not creating home directory `/usr/share/grafana'.
   ### NOT starting on installation, please execute the following statements to configure grafana to start automatically using syst
   emd
    sudo /bin/systemctl daemon-reload
    sudo /bin/systemctl enable grafana-server
   ### You can start grafana-server by executing
    sudo /bin/systemctl start grafana-server
   ```
5. Run the following command to start Grafana:
   ```
   sudo /bin/systemctl start grafana-server
   ```
6. Access Grafana configurations on your local PC.

   Ensure that an EIP has been bound to the ECS and the **security group** configuration is correct (the inbound traffic from TCP port 3000 and all outbound traffic are allowed). Configuration process:

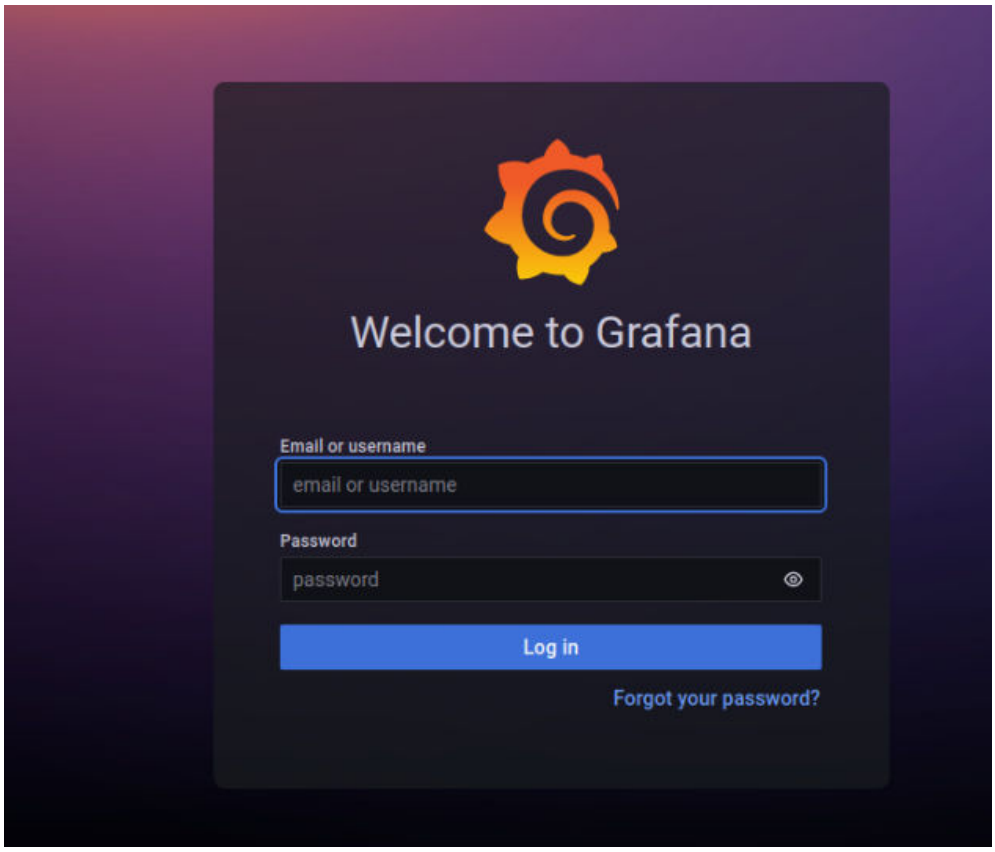
a. Click the ECS name to go to the ECS details page. Then, click the **Security Groups** tab, and click **Manage Rule**.



b. Click **Inbound Rules** and allow inbound traffic from TCP port 3000. By default, all outbound traffic is allowed.



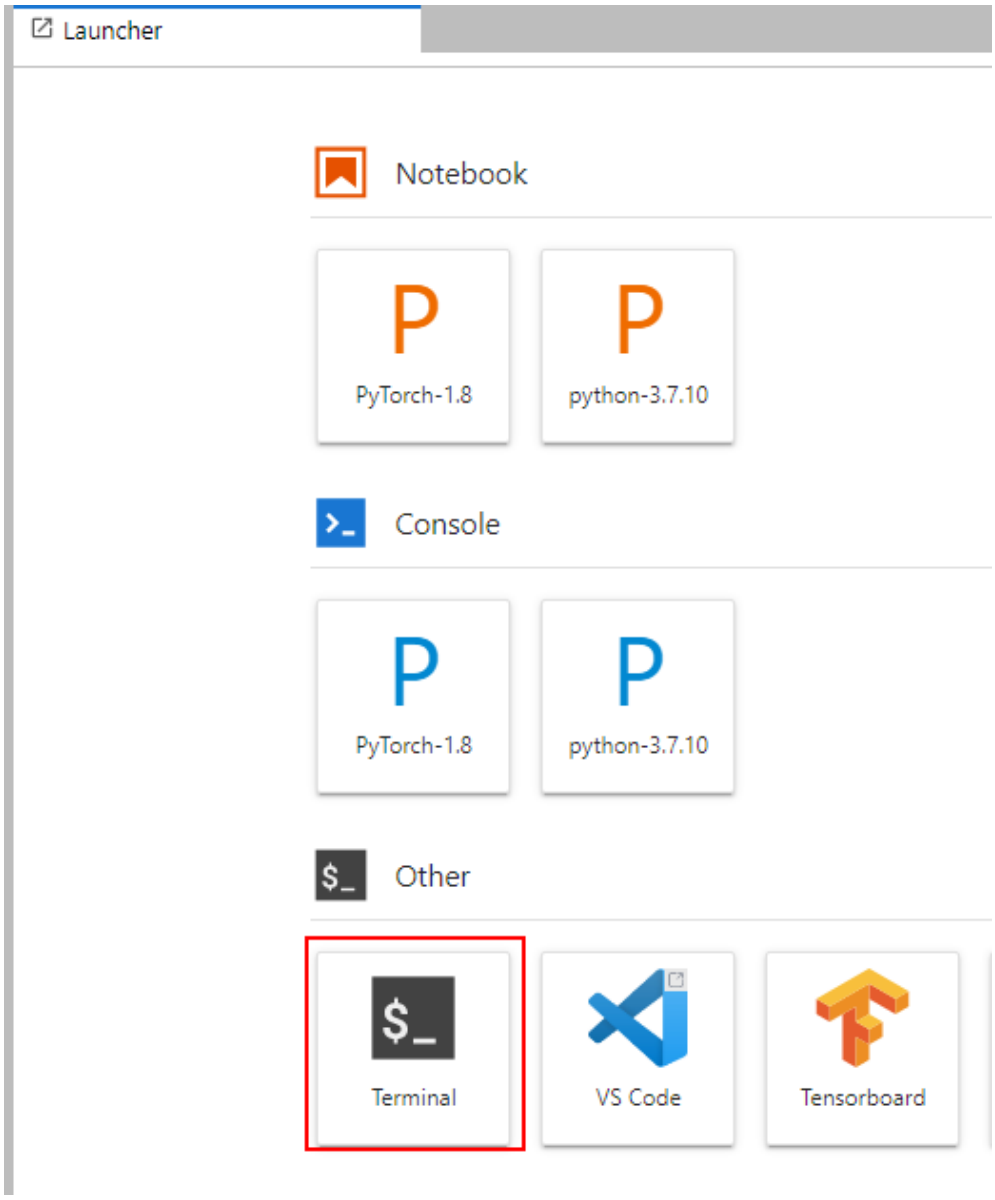
7. Access **http://{*EIP*}:3000** in a browser. The default username and password for the first login are **admin**. After the login is successful, change the password as prompted.



4.2.2.3 Installing and Configuring Grafana on a Notebook Instance

Prerequisites

- A running CPU- or GPU-based notebook instance is available.
- A terminal is opened.



Procedure

1. Run the following commands in sequence in your terminal to download and install Grafana:

```
mkdir -p /home/ma-user/work/grf
cd /home/ma-user/work/grf
wget https://dl.grafana.com/oss/release/grafana-9.1.6.linux-amd64.tar.gz
tar -zxvf grafana-9.1.6.linux-amd64.tar.gz
```

2. Register Grafana with jupyter-server-proxy.

   a. Run the following commands in your terminal:

```
mkdir -p /home/ma-user/.local/etc/jupyter
vi /home/ma-user/.local/etc/jupyter/jupyter_notebook_config.py
```



```
(PyTorch-1.8) [ma-user grf]$mkdir -p /home/ma-user/.local/etc/jupyter
(PyTorch-1.8) [ma-user grf]$vi /home/ma-user/.local/etc/jupyter/jupyter_notebook_config.py
```

b. In **jupyter_notebook_config.py**, add the following code, press **Esc** to exit, and type **:wq** to save the changes:

```
c.ServerProxy.servers = {
  'grafana': {
    'command': ['/home/ma-user/work/grf/grafana-9.1.6/bin/grafana-server', '--homepath', '/home/ma-user/work/grf/grafana-9.1.6', 'web'],
    'timeout': 1800,
    'port': 3000
  }
}
```

NOTE

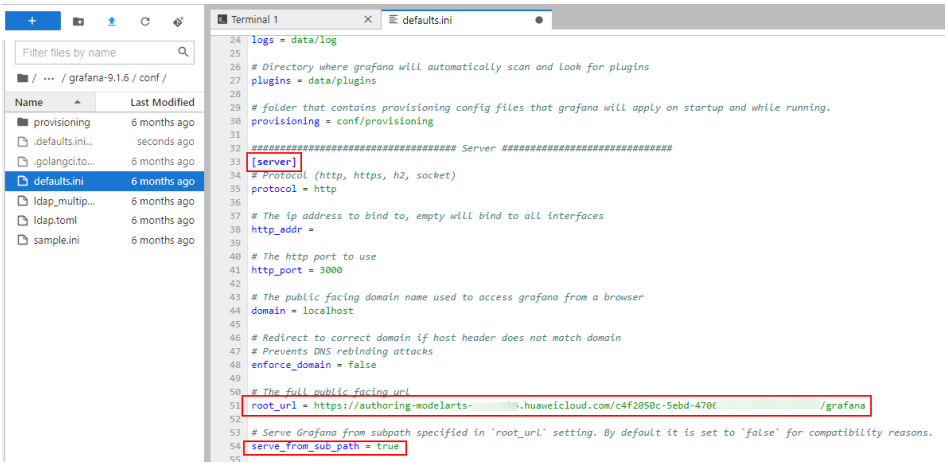
If **jupyter_notebook_config.py** (path: **/home/ma-user/.local/etc/jupyter/jupyter_notebook_config.py**) contains the **c.ServerProxy.servers** field, add the corresponding key-value pair.

3. Modify the URL for accessing Grafana in JupyterLab.

a. In the navigation pane on the left, open the **vi /home/ma-user/work/grf/grafana-9.1.6/conf/defaults.ini** file.

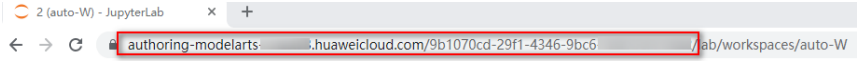
b. Change the **root_url** and **serve_from_sub_path** fields in **[server]**.

Figure 4-1 Modifying the **defaults.ini** file



In the file:

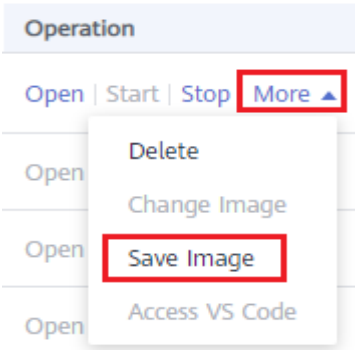
- The value of **root_url** is in the format of **https:{***Jupyterlab domain name***}/{***Instance ID***}/grafana**. You can obtain the domain name and instance ID from the address box of the JupyterLab page.



- Set **Serve_from_sub_path** to **true**.

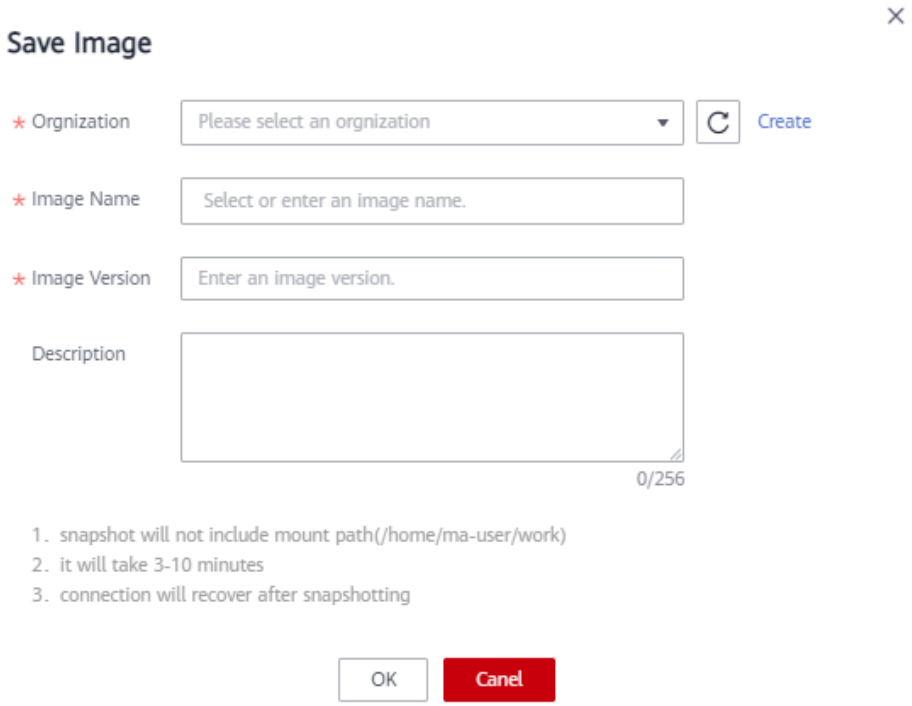
4. Save the image of the notebook instance.

a. Log in to the ModelArts console and choose **DevEnviron** > **Notebook**. In the notebook instance list, choose **More** > **Save Image** in the **Operation** column of the target instance.



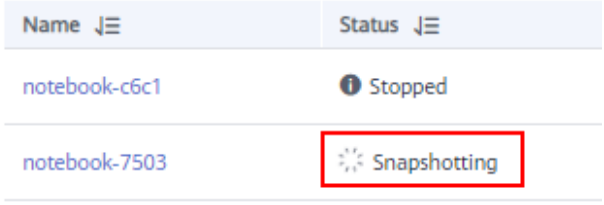
b. In the **Save Image** dialog box, configure parameters. Click **OK** to save the image.

Figure 4-2 Saving an image



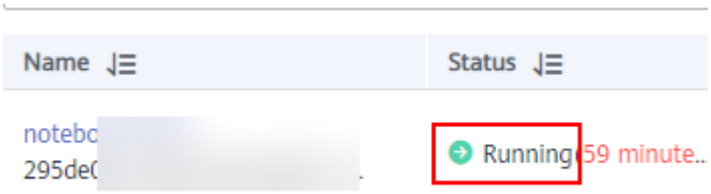
c. The image will be saved as a snapshot, and it will take about 5 minutes. During this period of time, do not perform any operations on the instance.

Figure 4-3 Snapshotting



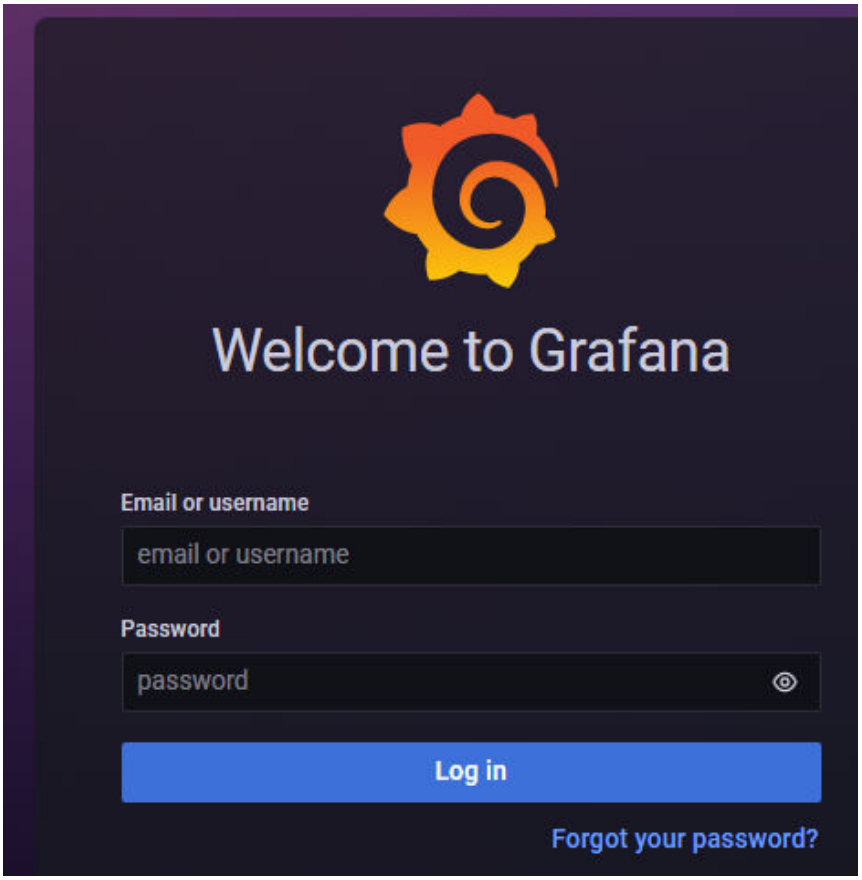
d. After the image is saved, the instance status changes to **Running**. Then, restart the notebook instance.

Figure 4-4 Image saved



5. Open the Grafana page.

   Open a browser window and type the value of **root_url** configured in **3** in the address box. If the Grafana login page is displayed, Grafana is installed and configured in the notebook instance. The default username and password for the first login are **admin**. After the login is successful, change the password as prompted.



4.2.3 Configuring a Grafana Data Source

Before viewing ModelArts monitoring data on Grafana, configure the data source.

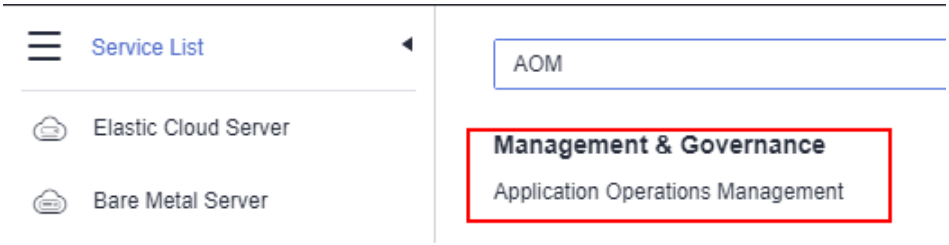
Prerequisites

- Grafana has been installed.

Procedure

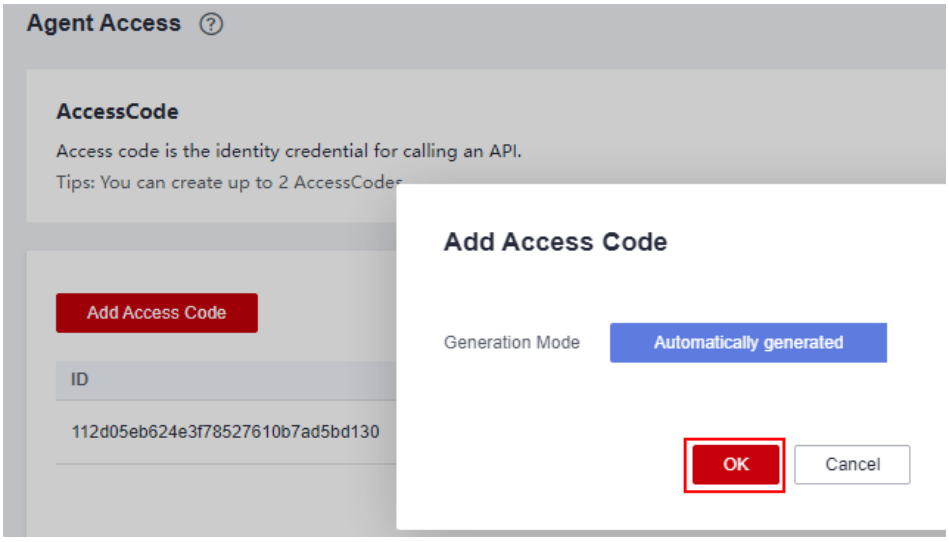
1. Add an access code.

a. Log in to the AOM console.



b. In the navigation pane on the left, choose **Configuration Management** > **Agent Access**, and click **Add Access Code** to generate an access code.

Figure 4-5 Generating an access code



c. Click  to view the generated access code.

Figure 4-6 Viewing the access code

2. Obtain the data source URL.

   The URL is in the format of **https://{*Endpoint*}/v1/{*project_id*}**.

   - You can obtain the AOM endpoint information from **Regions and Endpoints**.
   - Set **project_id** to the project ID of the corresponding region. You can obtain the project ID from **My Credentials**.

Figure 4-7 My Credentials

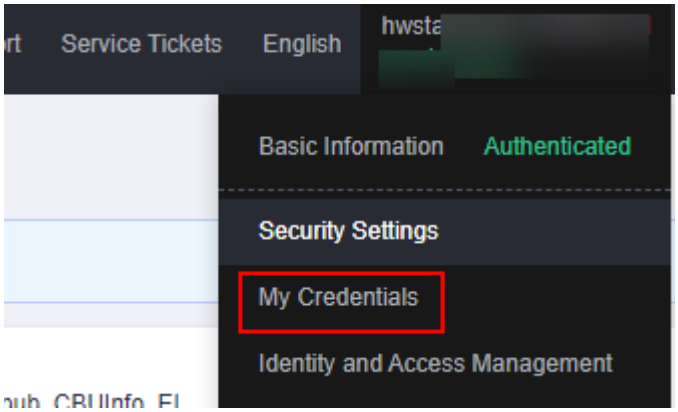
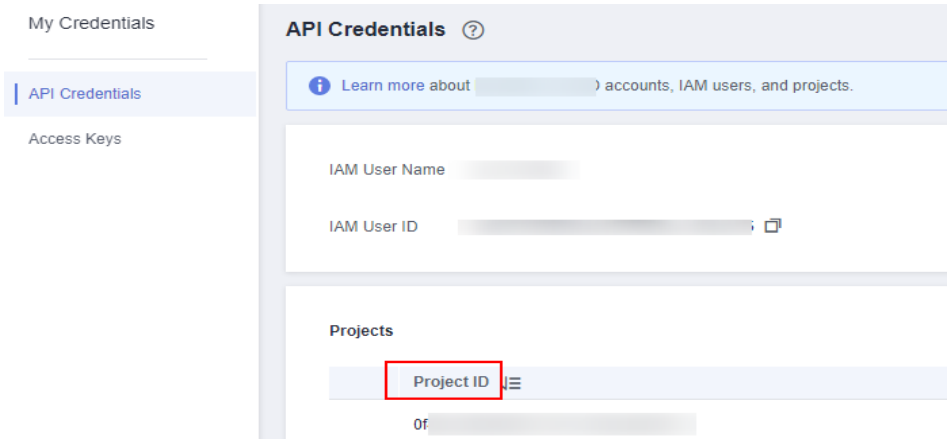
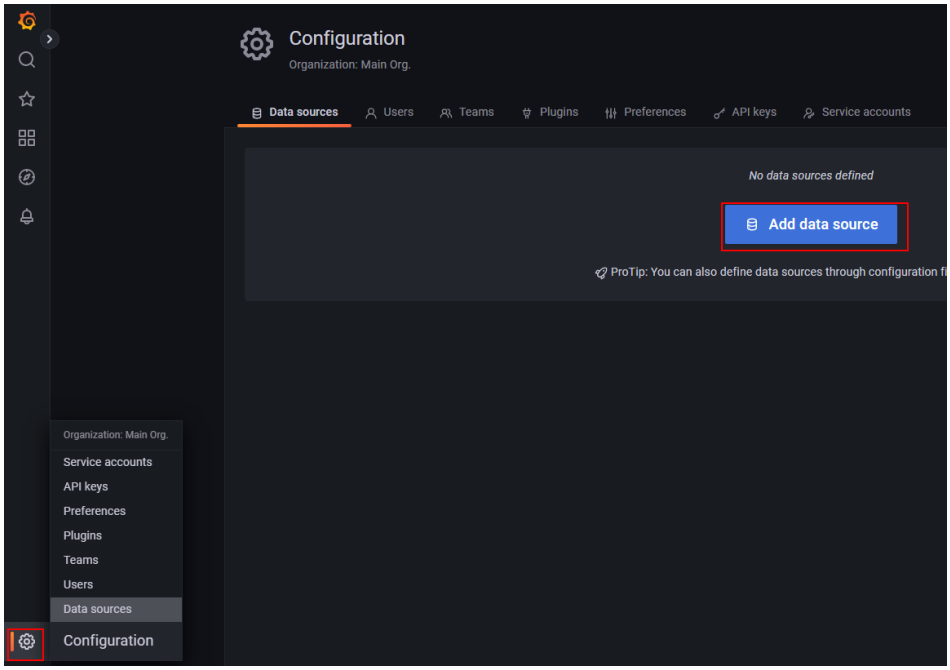


Figure 4-8 Obtaining the project ID



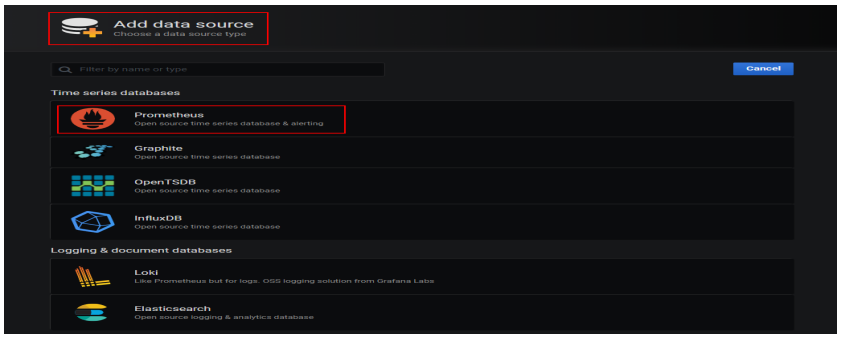
3. Add a data source to Grafana.
   a. Log in to Grafana. The default username and password for the first login are **admin**. After the login is successful, change the password as prompted.
   b. In the navigation pane, choose **Configuration** > **Data Sources**. Then, click **Add data source**.

Figure 4-9 Configuring Grafana



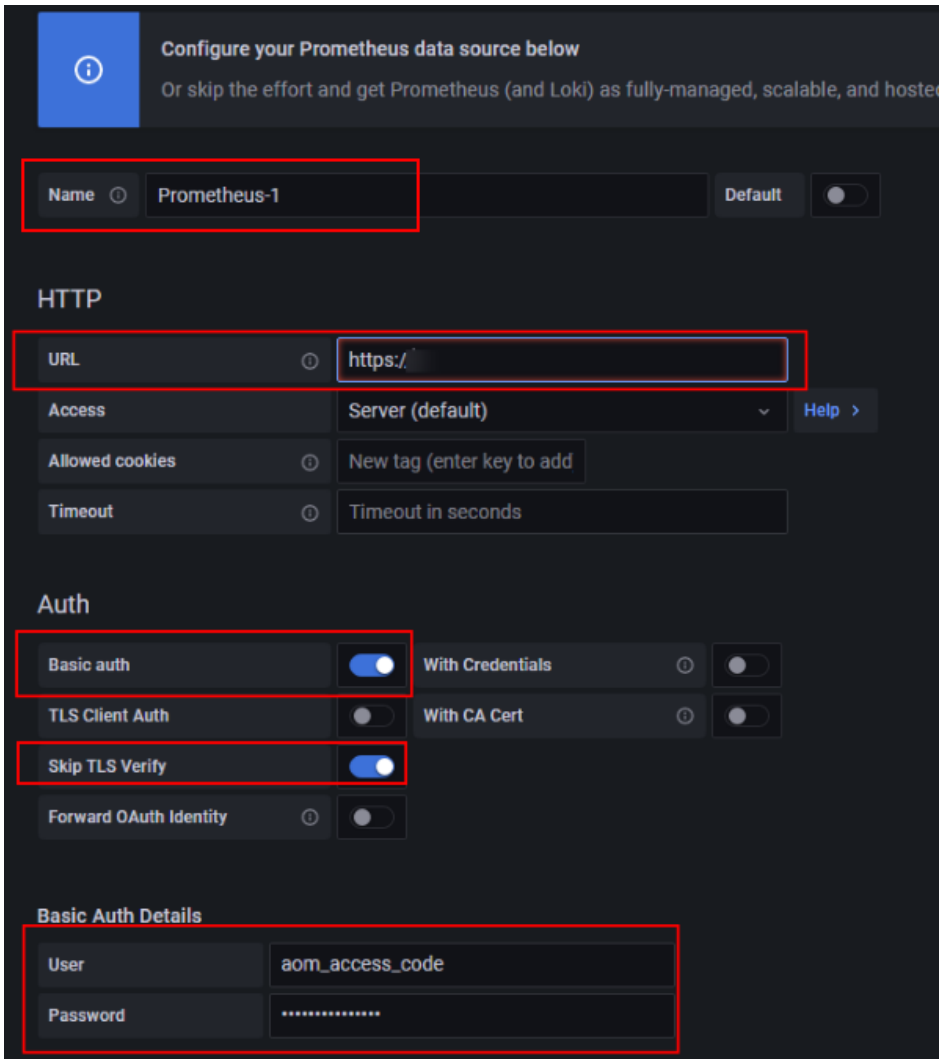
c. Click **Prometheus** to access the configuration page.

Figure 4-10 Entering the Prometheus configuration page



d. Configure parameters as shown in the following figure.

Figure 4-11 Configuring a Grafana data source



NOTE

The actual Grafana version varies depending on the installation method. **Figure 4-11** is only an example.

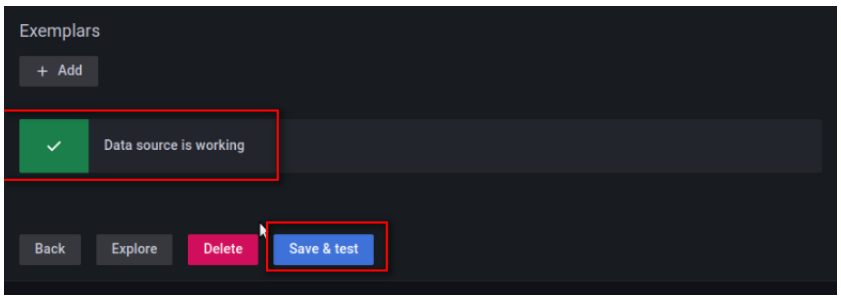
Table 4-1 Parameters

Parameter	Description
Name	Customizable name
URL	URL **https://{***Endpoint***}/v1/{***project_id***}** combined in **Obtain the data source URL.**
Basic auth	Enabled
Skip TLS Verify	Enabled
User	aom_access_code

Parameter	Description
Password	Access code generated in **Add an access code.**

e. After the configuration, click **Save & test**. If the message **Data source is working** is displayed, the data source is configured.

Figure 4-12 Data source added



4.2.4 Using Grafana to Configure Dashboards and View Metric Data

In Grafana, you can customize dashboards for various views. ModelArts also provides configuration templates for clusters. This section describes how to configure a dashboard by using a ModelArts template or creating a dashboard. For more usage, see **Grafana tutorials**.

Preparations

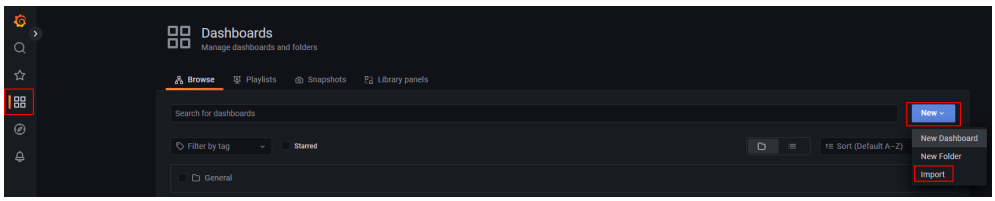
ModelArts provides templates for cluster view, node view, user view, task view, and task details view. These templates can be downloaded from Grafana official documents. You can import and use them on Dashboards.

Table 4-2 Template download URLs

Template Name	Download URL
Cluster view	https://grafana.com/grafana/dashboards/18582-modelarts-cluster-view/
Node view	https://grafana.com/grafana/dashboards/18583-modelarts-node-view/
User view	https://grafana.com/grafana/dashboards/18588-modelarts-user-view/
Task view	https://grafana.com/grafana/dashboards/18604-modelarts-task-view/
Task details view	https://grafana.com/grafana/dashboards/18590-modelarts-task-detail-view/

Using a ModelArts Template to View Metrics

1. (Optional) Select the template you want to use. **Preparations** displays the download addresses of all templates. Open the target address and click **Download JSON**.
2. Open **Dashboards** and choose **New** > **Import**.



3. Import a dashboard template in either of the following ways:
   - Method 1: Upload the JSON file downloaded in **1**, as shown in **Figure 4-13**.
   - Method 2: Copy the template download address provided in **Preparations** and click **Load**, as shown in **Figure 4-14**.

Figure 4-13 Uploading a JSON file to import a dashboard template

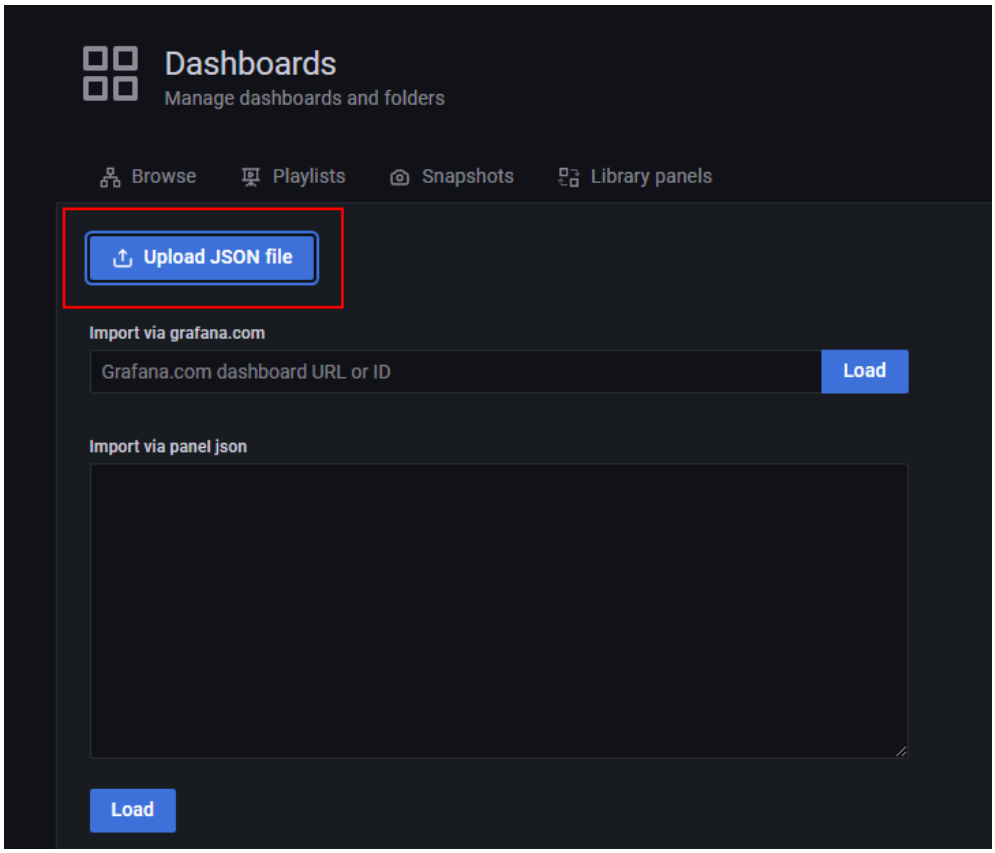
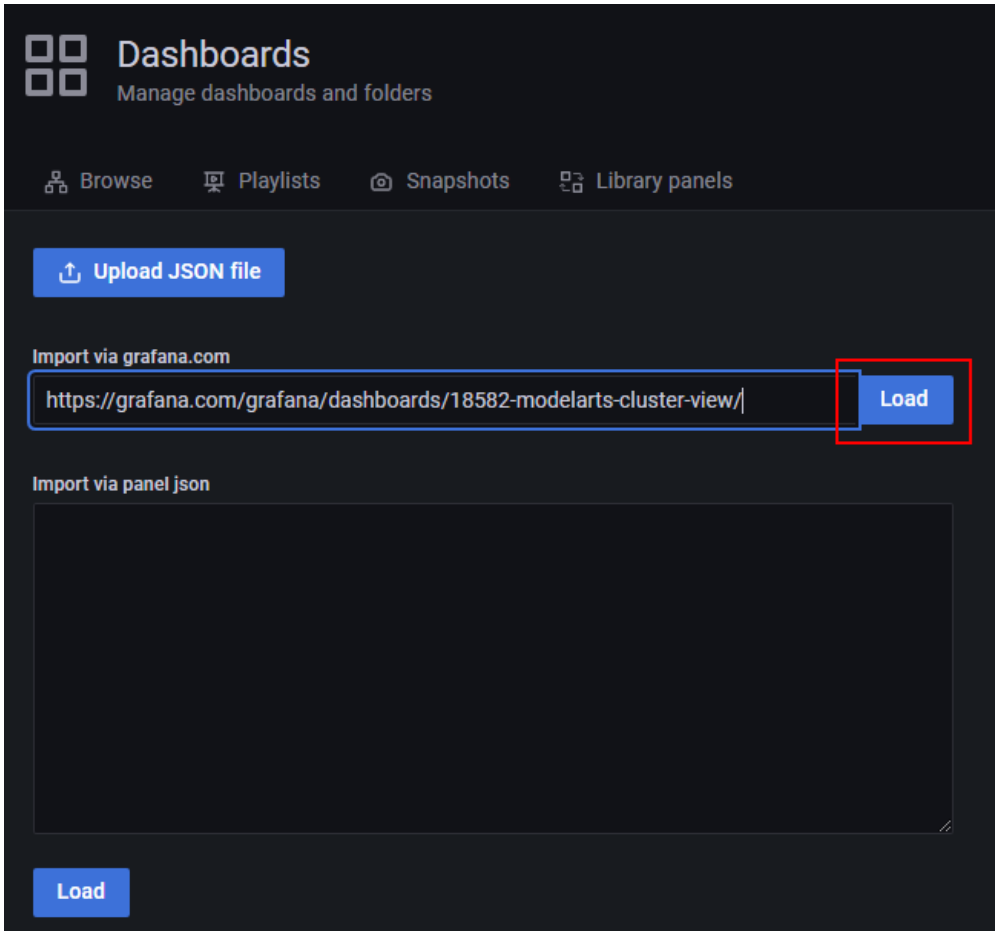
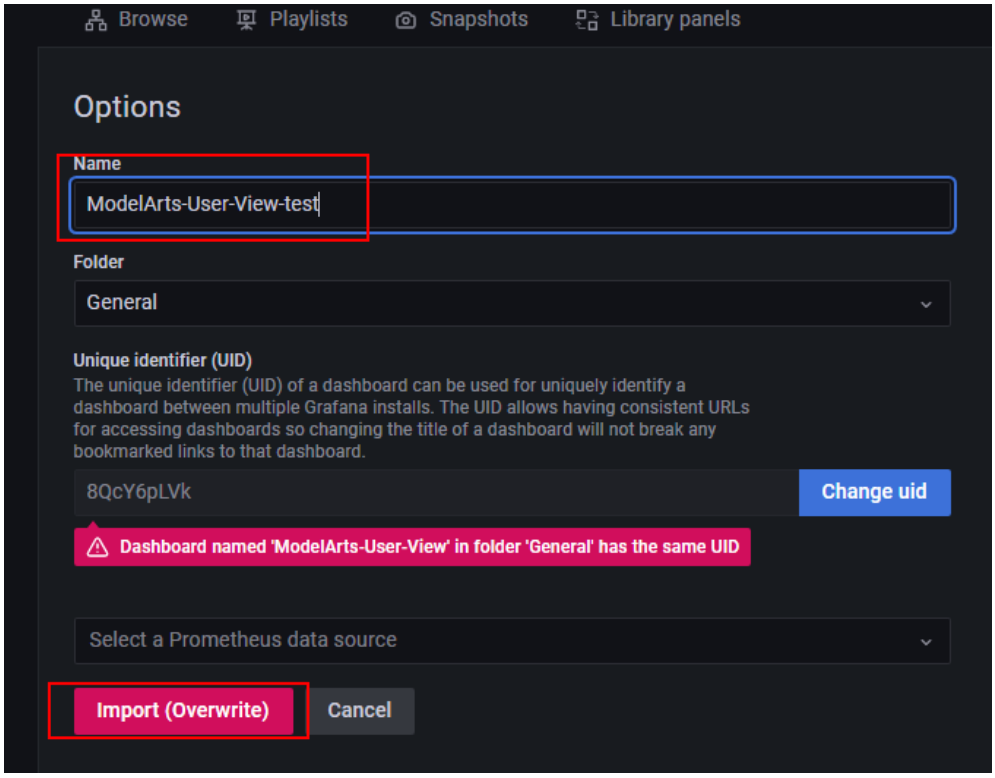


Figure 4-14 Copying the template address and importing the dashboard template



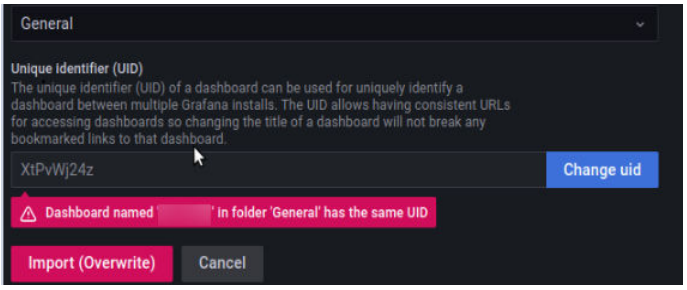
4. Change the view name and click **Import**.

Figure 4-15 Changing the view name

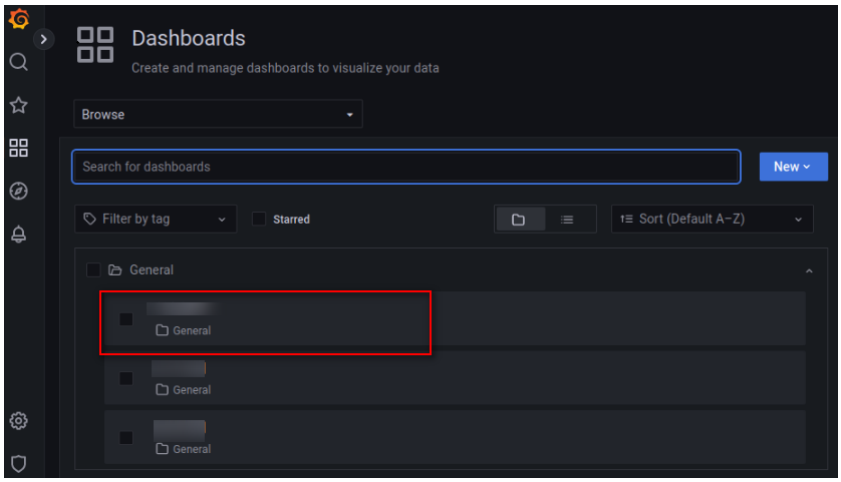


Note: If a message is displayed, indicating that the UID is duplicate, change the UID in the JSON file and click **Import**.

Figure 4-16 Changing the UID



5. After the import, view the imported views in **Dashboards**. Then, click a view to open the monitoring page.

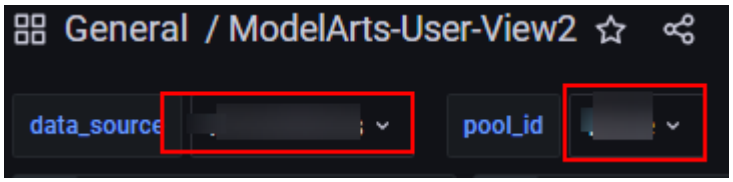


6. Use the template.

   After the import is successful, you can click the template to view its details. This section introduces some common functions.

   - Changing the data source and resource pool

     Figure 4-17 Changing the data source and resource pool

     Click the area marked by the red box. A drop-down list will appear. From there, you can change the data source and the resource pool.

   - Refreshing data

     Click the refresh button in the upper right corner to refresh all data on the dashboard. The data on each panel is also updated.

   - Changing the automatic refresh time

     The default refresh interval of a template is 15 minutes. If you need to update the interval, change the value from the drop-down list box in the upper right corner.

   - Changing the time range for obtaining dashboard data

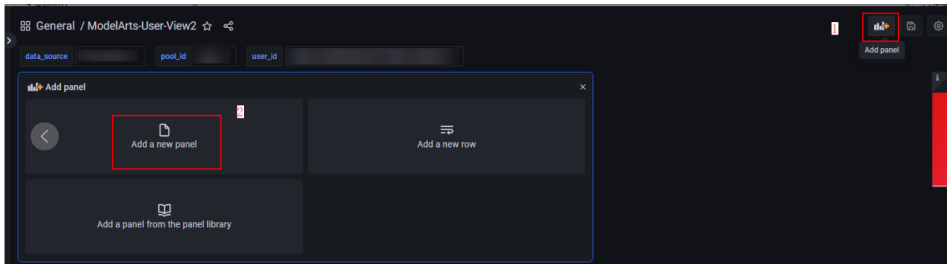
     Figure 4-18 Changing the time range for obtaining data

     Click the button in the upper right corner to change time range for obtaining data. This time range affects all panels except those with a fixed time.

   - Adding a panel

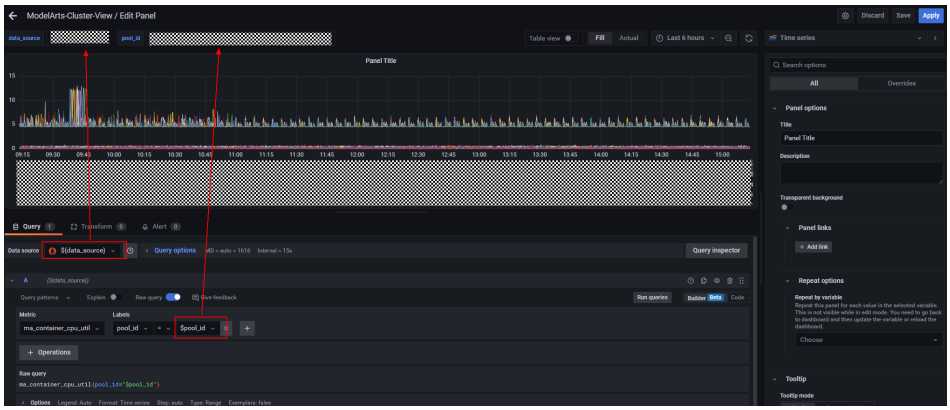
Figure 4-19 Adding a panel



Click the + icon in the upper right corner to add a panel.

After a panel is added, you can obtain the data in the panel. Configure the data source and resource pool as follows to use the current dashboard settings.

Figure 4-20 Using the current dashboard settings



Creating a Dashboard to View Metrics

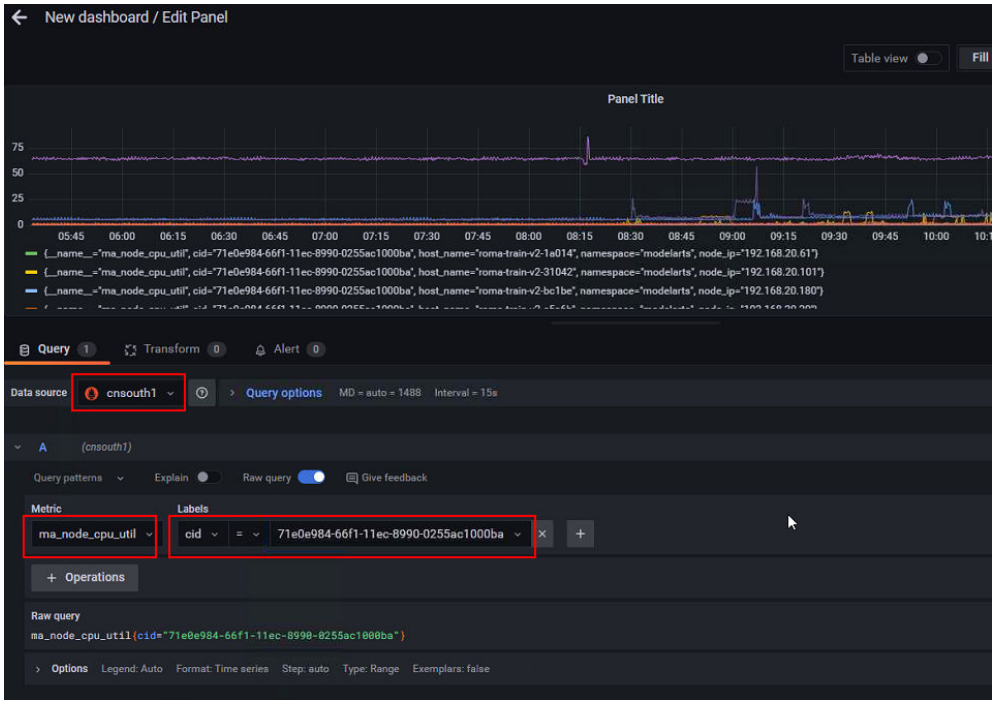
1. Open **Dashboards**, click **New**, and choose **New Dashboard**.
2. Click **Add a new panel**.
3. On the **New dashboard / Edit Panel** page, set the following parameters:

   Data source: **Configured Grafana data source**

   Metric: Metric name. You can obtain the metric to be queried by referring to **Table 4-3**, **Table 4-4**, and **Table 4-5**.

   Labels: Used for filtering the metric. For details, see **Table 4-6**.

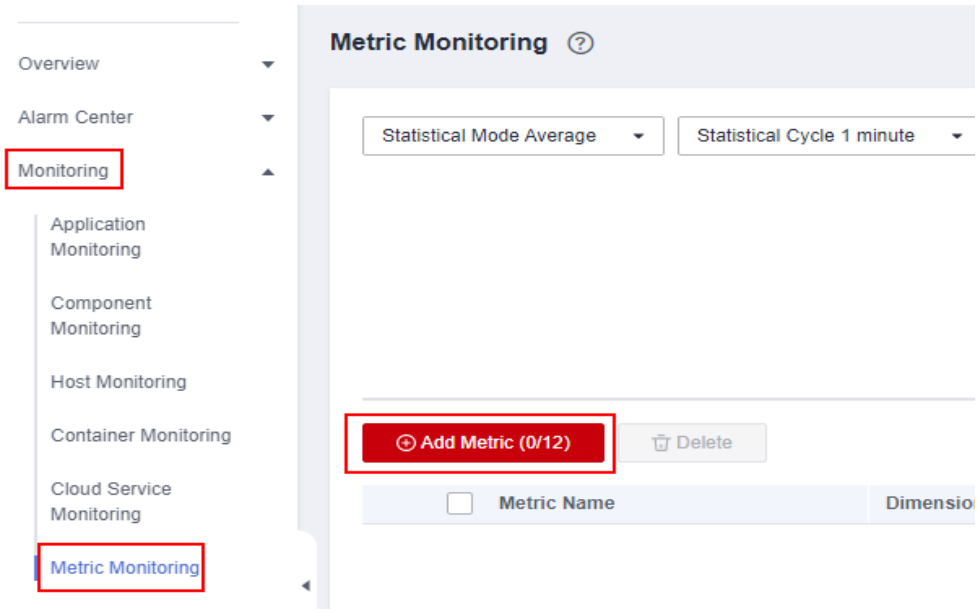
Figure 4-21 Creating a dashboard to view metrics



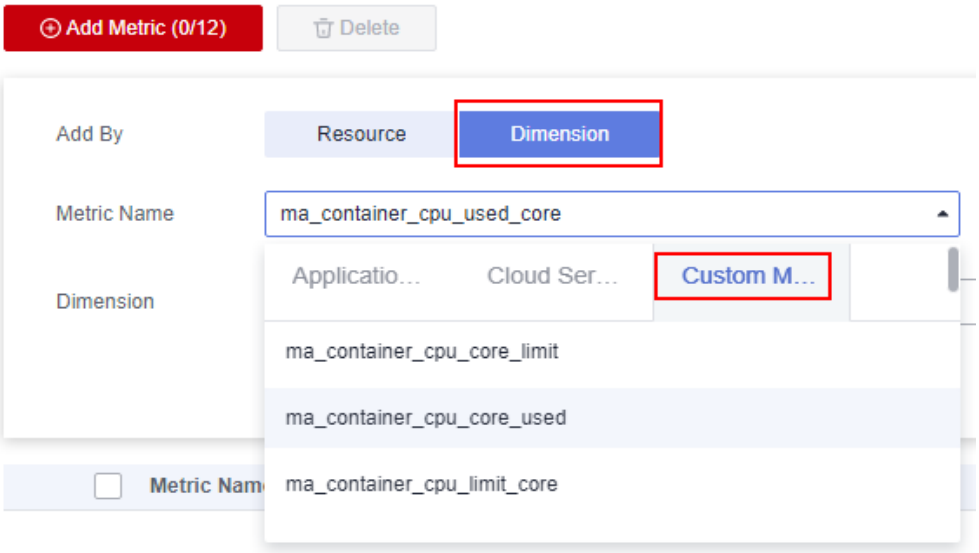
4.3 Viewing All ModelArts Monitoring Metrics on the AOM Console

ModelArts periodically collects the usage of key metrics (such as GPUs, NPUs, CPUs, and memory) of each node in a resource pool as well as the usage of key metrics of the development environment, training jobs, and inference services, and reports the data to AOM. You can view the information on AOM.

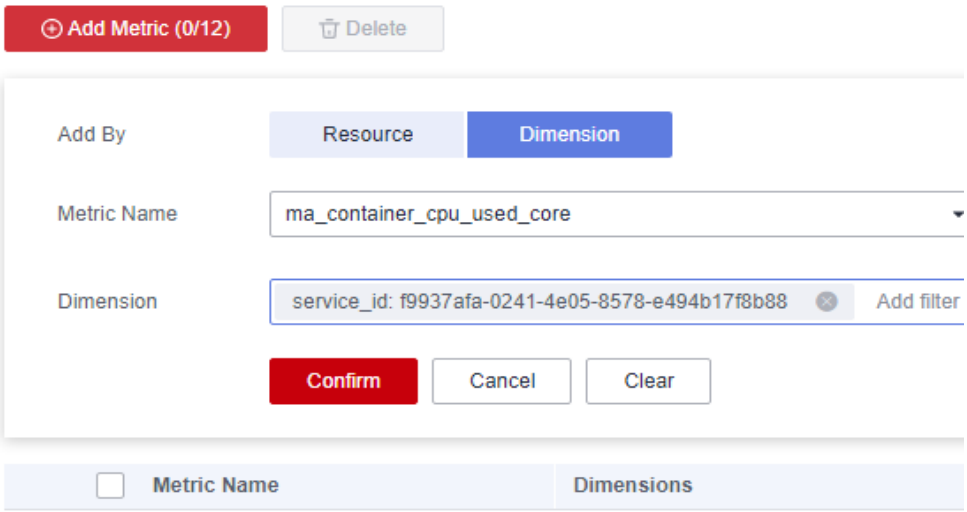
1. Log in to the console and search for **AOM** to go to the AOM console.
2. Choose **Monitoring** > **Metric Monitoring**. On the **Metric Monitoring** page that is displayed, click **Add Metric**.



3. Add metrics and click Confirm.



- **Add By**: Select Dimension.
- **Metric Name**: Click **Custom Metrics**. Select the desired ones for query. For details, see **Table 4-3**, **Table 4-4**, and **Table 4-5**.
- Dimension: Enter the tag for filtering the metric. For details, see **Table 4-6**. The following shows an example.



4. View the metrics.

Table 4-3 Container metrics

Category	Name	Metric	Description	Unit	Value Range
CPU	CPU Usage	ma_container_cpu_util	CPU usage of a measured object	%	0%–100%
	Used CPU Cores	ma_container_cpu_used_core	Number of CPU cores used by a measured object	Cores	≥ 0
	Total CPU Cores	ma_container_cpu_limit_core	Total number of CPU cores that have been applied for a measured object	Cores	≥ 1
Memory	Total Physical Memory	ma_container_memory_capacity_megabytes	Total physical memory that has been applied for a measured object	MB	≥ 0

Category	Name	Metric	Description	Unit	Value Range
	Physical Memory Usage	ma_container_memory_util	Percentage of the used physical memory to the total physical memory	%	0%–100%
	Used Physical Memory	ma_container_memory_used_megabytes	Physical memory that has been used by a measured object (**container_memory_working_set_bytes** in the current working set) (Memory usage in a working set = Active anonymous page and cache, and file-baked page ≤ **container_memory_usage_bytes**)	MB	≥ 0
Storage	Disk Read Rate	ma_container_disk_read_kilobytes	Volume of data read from a disk per second	KB/s	≥ 0
	Disk Write Rate	ma_container_disk_write_kilobytes	Volume of data written into a disk per second	KB/s	≥ 0
GPU memory	Total GPU Memory	ma_container_gpu_mem_total_megabytes	Total GPU memory of a training job	MB	> 0
	GPU Memory Usage	ma_container_gpu_mem_util	Percentage of the used GPU memory to the total GPU memory	%	0%–100%
	Used GPU Memory	ma_container_gpu_mem_used_megabytes	GPU memory used by a measured object	MB	≥ 0

Category	Name	Metric	Description	Unit	Value Range
GPU	GPU Usage	ma_container_gpu_util	GPU usage of a measured object	%	0%–100%
	GPU Memory Bandwidth Usage	ma_container_gpu_mem_copy_util	GPU memory bandwidth usage of a measured object For example, the maximum memory bandwidth of NVIDIA GPU V100 is 900 GB/s. If the current memory bandwidth is 450 GB/s, the memory bandwidth usage is 50%.	%	0%–100%
	GPU Encoder Usage	ma_container_gpu_enc_util	GPU encoder usage of a measured object	%	%
	GPU Decoder Usage	ma_container_gpu_dec_util	GPU decoder usage of a measured object	%	%
	GPU Temperature	DCGM_FI_DEV_GPU_TEMP	GPU temperature	°C	Natural number
	GPU Power	DCGM_FI_DEV_POWER_USAGE	GPU power	Watt (W)	> 0
	GPU Memory Temperature	DCGM_FI_DEV_MEMORY_TEMP	GPU memory temperature	°C	Natural number
Network I/O	Downlink Rate (BPS)	ma_container_network_receive_bytes	Inbound traffic rate of a measured object	Bytes/s	≥ 0
	Downlink Rate (PPS)	ma_container_network_receive_packets	Number of data packets received by a NIC per second	Packets/s	≥ 0

Category	Name	Metric	Description	Unit	Value Range
	Downlink Error Rate	ma_container_network_receive_error_packets	Number of error packets received by a NIC per second	Packets/s	≥ 0
	Uplink Rate (BPS)	ma_container_network_transmit_bytes	Outbound traffic rate of a measured object	Bytes/s	≥ 0
	Uplink Error Rate	ma_container_network_transmit_error_packets	Number of error packets sent by a NIC per second	Packets/s	≥ 0
	Uplink Rate (PPS)	ma_container_network_transmit_packets	Number of data packets sent by a NIC per second	Packets/s	≥ 0
Notebook service metrics	Notebook Cache Directory Size	ma_container_notebook_cache_dir_size_bytes	A high-speed local disk is attached to the **/cache** directory for GPU notebook instances. This metric indicates the total size of the directory.	Bytes	≥ 0
	Notebook Cache Directory Utilization	ma_container_notebook_cache_dir_util	A high-speed local disk is attached to the **/cache** directory for GPU notebook instances. This metric indicates the utilization of the directory.	%	0%–100%

Table 4-4 Node metrics (collected only in dedicated resource pools)

Category	Name	Metric	Description	Unit	Value Range
CPU	Total CPU Cores	ma_node_cpu_limit_core	Total number of CPU cores that have been applied for a measured object	Cores	≥ 1
	Used CPU Cores	ma_node_cpu_used_core	Number of CPU cores used by a measured object	Cores	≥ 0
	CPU Usage	ma_node_cpu_util	CPU usage of a measured object	%	0%–100%
	CPU I/O Wait Time	ma_node_cpu_iowait_counter	Disk I/O wait time accumulated since system startup	jiffies	≥ 0
Memory	Physical Memory Usage	ma_node_memory_util	Percentage of the used physical memory to the total physical memory	%	0%–100%
	Total Physical Memory	ma_node_memory_total_megabytes	Total physical memory that has been applied for a measured object	MB	≥ 0

Category	Name	Metric	Description	Unit	Value Range
Network I/O	Downlink Rate (BPS)	ma_node_network_receive_rate_bytes_seconds	Inbound traffic rate of a measured object	Bytes/s	≥ 0
	Uplink Rate (BPS)	ma_node_network_transmit_rate_bytes_seconds	Outbound traffic rate of a measured object	Bytes/s	≥ 0
Storage	Disk Read Rate	ma_node_disk_read_rate_kilobytes_seconds	Volume of data read from a disk per second (Only data disks used by containers are collected.)	KB/s	≥ 0
	Disk Write Rate	ma_node_disk_write_rate_kilobytes_seconds	Volume of data written into a disk per second (Only data disks used by containers are collected.)	KB/s	≥ 0
	Total Cache	ma_node_cache_space_capacity_megabytes	Total cache of the Kubernetes space	MB	≥ 0
	Used Cache	ma_node_cache_space_used_capacity_megabytes	Used cache of the Kubernetes space	MB	≥ 0

Category	Name	Metric	Description	Unit	Value Range
	Total Container Space	ma_node_container_space_capacity_megabytes	Total container space	MB	≥ 0
	Used Container Space	ma_node_container_space_used_capacity_megabytes	Used container space	MB	≥ 0
	Disk Information	ma_node_disk_info	Basic disk information	N/A	≥ 0
	Total Reads	ma_node_disk_reads_completed_total	Total number of successful reads	N/A	≥ 0
	Merged Reads	ma_node_disk_reads_merged_total	Number of merged reads	N/A	≥ 0
	Bytes Read	ma_node_disk_read_bytes_total	Total number of bytes that are successfully read	Bytes	≥ 0
	Read Time Spent	ma_node_disk_read_time_seconds_total	Time spent on all reads	Seconds	≥ 0
	Total Writes	ma_node_disk_writes_completed_total	Total number of successful writes	N/A	≥ 0
	Merged Writes	ma_node_disk_writes_merged_total	Number of merged writes	N/A	≥ 0

Category	Name	Metric	Description	Unit	Value Range
	Written Bytes	ma_node_disk_written_bytes_total	Total number of bytes that are successfully written	Bytes	≥ 0
	Write Time Spent	ma_node_disk_write_time_seconds_total	Time spent on all write operations	Seconds	≥ 0
	Ongoing I/Os	ma_node_disk_io_now	Number of ongoing I/Os	N/A	≥ 0
	I/O Execution Duration	ma_node_disk_io_time_seconds_total	Time spent on executing I/Os	Seconds	≥ 0
	I/O Execution Weighted Time	ma_node_disk_io_time_weighted_seconds_tota	The weighted number of seconds spent doing I/Os	Seconds	≥ 0
GPU	GPU Usage	ma_node_gpu_util	GPU usage of a measured object	%	0%–100%
	Total GPU Memory	ma_node_gpu_mem_total_megabytes	Total GPU memory of a measured object	MB	> 0
	GPU Memory Usage	ma_node_gpu_mem_util	Percentage of the used GPU memory to the total GPU memory	%	0%–100%

Category	Name	Metric	Description	Unit	Value Range
	Used GPU Memory	ma_node_gpu_mem_used_megabytes	GPU memory used by a measured object	MB	≥ 0
	Tasks on a Shared GPU	node_gpu_share_job_count	Number of tasks running on a shared GPU	Number	≥ 0
	GPU Temperature	DCGM_FI_DEV_GPU_TEMP	GPU temperature	°C	Natural number
	GPU Power	DCGM_FI_DEV_POWER_USAGE	GPU power	Watt (W)	> 0
	GPU Memory Temperature	DCGM_FI_DEV_MEMORY_TEMP	GPU memory temperature	°C	Natural number
InfiniBand or RoCE network	Total Amount of Data Received by a NIC	ma_node_infiniband_port_received_data_bytes_total	The total number of data octets, divided by 4, (counting in double words, 32 bits), received on all VLs from the port.	(counting in double words, 32 bits)	≥ 0

Category	Name	Metric	Description	Unit	Value Range
	Total Amount of Data Sent by a NIC	ma_node_infiniband_port_transmitted_data_bytes_total	The total number of data octets, divided by 4, (counting in double words, 32 bits), transmitted on all VLs from the port.	(counting in double words, 32 bits)	≥ 0

Category	Name	Metric	Description	Unit	Value Range
NFS mounting status	NFS Getattr Congestion Time	ma_node_mountstats_getattr_backlog_wait	Getattr is an NFS operation that retrieves the attributes of a file or directory, such as size, permissions, owner, etc. Backlog wait is the time that the NFS requests have to wait in the backlog queue before being sent to the NFS server. It indicates the congestion on the NFS client side. A high backlog wait can cause poor NFS performance and slow system response times.	ms	≥ 0

Category	Name	Metric	Description	Unit	Value Range
	NFS Getattr Round Trip Time	ma_node_mountstats_getattr_rtt	Getattr is an NFS operation that retrieves the attributes of a file or directory, such as size, permissions, owner, etc. RTT stands for Round Trip Time and it is the time from when the kernel RPC client sends the RPC request to the time it receives the reply34. RTT includes network transit time and server execution time. RTT is a good measurement for NFS latency. A high RTT can indicate network or server issues.	ms	≥ 0

Category	Name	Metric	Description	Unit	Value Range
	NFS Access Congestion Time	ma_node_mountstats_access_backlog_wait	Access is an NFS operation that checks the access permissions of a file or directory for a given user. Backlog wait is the time that the NFS requests have to wait in the backlog queue before being sent to the NFS server. It indicates the congestion on the NFS client side. A high backlog wait can cause poor NFS performance and slow system response times.	ms	≥ 0

Category	Name	Metric	Description	Unit	Value Range
	NFS Access Round Trip Time	ma_node_mountstats_access_rtt	Access is an NFS operation that checks the access permissions of a file or directory for a given user. RTT stands for Round Trip Time and it is the time from when the kernel RPC client sends the RPC request to the time it receives the reply34. RTT includes network transit time and server execution time. RTT is a good measurement for NFS latency. A high RTT can indicate network or server issues.	ms	≥ 0

Category	Name	Metric	Description	Unit	Value Range
	NFS Lookup Congestion Time	ma_node_mountstats_lookup_backlog_wait	Lookup is an NFS operation that resolves a file name in a directory to a file handle. Backlog wait is the time that the NFS requests have to wait in the backlog queue before being sent to the NFS server. It indicates the congestion on the NFS client side. A high backlog wait can cause poor NFS performance and slow system response times.	ms	≥ 0

Category	Name	Metric	Description	Unit	Value Range
	NFS Lookup Round Trip Time	ma_node_mountstats_lookup_rtt	Lookup is an NFS operation that resolves a file name in a directory to a file handle. RTT stands for Round Trip Time and it is the time from when the kernel RPC client sends the RPC request to the time it receives the reply34. RTT includes network transit time and server execution time. RTT is a good measurement for NFS latency. A high RTT can indicate network or server issues.	ms	≥ 0

Category	Name	Metric	Description	Unit	Value Range
	NFS Read Congestion Time	ma_node_mountstats_read_backlog_wait	Read is an NFS operation that reads data from a file. Backlog wait is the time that the NFS requests have to wait in the backlog queue before being sent to the NFS server. It indicates the congestion on the NFS client side. A high backlog wait can cause poor NFS performance and slow system response times.	ms	≥ 0

Category	Name	Metric	Description	Unit	Value Range
	NFS Read Round Trip Time	ma_node_mountstats_read_rtt	Read is an NFS operation that reads data from a file. RTT stands for Round Trip Time and it is the time from when the kernel RPC client sends the RPC request to the time it receives the reply34. RTT includes network transit time and server execution time. RTT is a good measurement for NFS latency. A high RTT can indicate network or server issues.	ms	≥ 0

Category	Name	Metric	Description	Unit	Value Range
	NFS Write Congestion Time	ma_node_mountstats_write_backlog_wait	Write is an NFS operation that writes data to a file. Backlog wait is the time that the NFS requests have to wait in the backlog queue before being sent to the NFS server. It indicates the congestion on the NFS client side. A high backlog wait can cause poor NFS performance and slow system response times.	ms	≥ 0

Category	Name	Metric	Description	Unit	Value Range
	NFS Write Round Trip Time	ma_node_mountstats_write_rtt	Write is an NFS operation that writes data to a file. RTT stands for Round Trip Time and it is the time from when the kernel RPC client sends the RPC request to the time it receives the reply34. RTT includes network transit time and server execution time. RTT is a good measurement for NFS latency. A high RTT can indicate network or server issues.	ms	≥ 0

Table 4-5 Diagnosis (InfiniBand, collected only in dedicated resource pools)

Category	Name	Metric	Description	Unit	Value Range
InfiniBand or RoCE network	PortXmitData	infiniband_port_xmit_data_total	The total number of data octets, divided by 4, (counting in double words, 32 bits), transmitted on all VLs from the port.	Total count	Natural number
	PortRcvData	infiniband_port_rcv_data_total	The total number of data octets, divided by 4, (counting in double words, 32 bits), received on all VLs from the port.	Total count	Natural number
	SymbolErrorCounter	infiniband_symbol_error_counter_total	Total number of minor link errors detected on one or more physical lanes.	Total count	Natural number
	LinkErrorRecoveryCounter	infiniband_link_error_recovery_counter_total	Total number of times the Port Training state machine has successfully completed the link error recovery process.	Total count	Natural number

Category	Name	Metric	Description	Unit	Value Range
	PortRcvErrors	infiniband_port_rcv_errors_total	Total number of packets containing errors that were received on the port including: Local physical errors (ICRC, VCRC, LPCRC, and all physical errors that cause entry into the BAD PACKET or BAD PACKET DISCARD states of the packet receiver state machine) Malformed data packet errors (LVer, length, VL) Malformed link packet errors (operand, length, VL) Packets discarded due to buffer overrun (overflow)	Total count	Natural number
	LocalLinkIntegrityErrors	infiniband_local_link_integrity_errors_total	This counter indicates the number of retries initiated by a link transfer layer receiver.	Total count	Natural number
	PortRcvRemotePhysicalErrors	infiniband_port_rcv_remote_physical_errors_total	Total number of packets marked with the EBP delimiter received on the port.	Total count	Natural number
	PortRcvSwitchRelayErrors	infiniband_port_rcv_switch_relay_errors_total	Total number of packets received on the port that were discarded when they could not be forwarded by the switch relay for the following reasons: DLID mapping VL mapping Looping (output port = input port)	Total count	Natural number

Category	Name	Metric	Description	Unit	Value Range
	PortXmitWait	infiniband_port_transmit_wait_total	The number of ticks during which the port had data to transmit but no data was sent during the entire tick (either because of insufficient credits or because of lack of arbitration).	Total count	Natural number
	PortXmitDiscards	infiniband_port_xmit_discards_total	Total number of outbound packets discarded by the port because the port is down or congested.	Total count	Natural number

Table 4-6 Metric names

Classification	Metric	Description
Container metrics	modelarts_service	Service to which a container belongs, which can be **notebook**, **train**, or **infer**
	instance_name	Name of the pod to which the container belongs
	service_id	Instance or job ID displayed on the page, for example, **cf55829e-9bd3-48fa-8071-7ae870dae93a** for a development environment **9f322d5a-b1d2-4370-94df-5a87de27d36e** for a training job
	node_ip	IP address of the node to which the container belongs
	container_id	Container ID
	cid	Cluster ID
	container_name	Name of the container
	project_id	Project ID of the account to which the user belongs
	user_id	User ID of the account to which the user who submits the job belongs

Classification	Metric	Description
	pool_id	ID of a resource pool corresponding to a physical dedicated resource pool
	pool_name	Name of a resource pool corresponding to a physical dedicated resource pool
	logical_pool_id	ID of a logical subpool
	logical_pool_name	Name of a logical subpool
	gpu_uuid	UUID of the GPU used by the container
	gpu_index	Index of the GPU used by the container
	gpu_type	Type of the GPU used by the container
	account_name	Account name of the creator of a training, inference, or development environment task
	user_name	Username of the creator of a training, inference, or development environment task
	task_creation_time	Time when a training, inference, or development environment task is created
	task_name	Name of a training, inference, or development environment task
	task_spec_code	Specifications of a training, inference, or development environment task
	cluster_name	CCE cluster name
Node metrics	cid	ID of the CCE cluster to which the node belongs
	node_ip	IP address of the node
	host_name	Hostname of a node
	pool_id	ID of a resource pool corresponding to a physical dedicated resource pool
	project_id	Project ID of the user in a physical dedicated resource pool
	gpu_uuid	UUID of a node GPU
	gpu_index	Index of a node GPU

Classification	Metric	Description
	gpu_type	Type of a node GPU
	device_name	Device name of an InfiniBand or RoCE network NIC
	port	Port number of the InfiniBand NIC
	physical_state	Status of each port on the InfiniBand NIC
	firmware_version	Firmware version of the InfiniBand NIC
	filesystem	NFS-mounted file system
	mount_point	NFS mount point
Diagnos	cid	ID of the CCE cluster to which the node with the GPU equipped belongs
	node_ip	IP address of the node where the GPU resides
	pool_id	ID of a resource pool corresponding to a physical dedicated resource pool
	project_id	Project ID of the user in a physical dedicated resource pool
	gpu_uuid	GPU UUID
	gpu_index	Index of a node GPU
	gpu_type	Type of a node GPU
	device_name	Name of a network device or disk device
	port	Port number of the InfiniBand NIC
	physical_state	Status of each port on the InfiniBand NIC
	firmware_version	Firmware version of the InfiniBand NIC

