Log Tank Service

Best Practices

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Contents

1 Overview

This document describes the following best practices of Log Tank Service (LTS):

Table 1-1 Best practice overview

Category	Best Practice	Scenario
Log ingestion	**Collecting Host Logs from Third-Party Clouds, Internet Data Centers, and Other Huawei Cloud Regions to LTS**	This practice describes how to collect Alibaba Cloud host logs to Huawei Cloud LTS. The method is similar to that of collecting logs from Internet Data Centers (IDCs) or across Huawei Cloud regions.
Log ingestion	**Collecting Kubernetes Logs from Third-Party Clouds, IDCs, and Other Huawei Cloud Regions to LTS**	This practice describes how to collect Alibaba Cloud Kubernetes logs to Huawei Cloud LTS. The method is similar to that of collecting logs from IDCs or across Huawei Cloud regions.
Log ingestion	**Collecting Syslog Aggregation Server Logs to LTS**	This practice describes how to use the syslog protocol to upload logs to LTS. You need to buy an Elastic Cloud Server (ECS) as a syslog aggregation server. Syslog comes preinstalled by default on Linux servers. However, Huawei Cloud ECSs do not receive remote syslog writes by default. You need to enable this function.
Log ingestion	**Importing Logs of Self-built ELK to LTS**	This practice describes how to use a custom Python script and ICAgent (LTS collector) to transfer logs from Elasticsearch to LTS.
Log ingestion	**Using Flume to Report Logs to LTS**	This practice describes how to collect logs using Flume and report logs using Kafka provided by LTS.

Category	Best Practice	Scenario
Log ingestion	**Collecting Zabbix Data Through ECS Log Ingestion**	This practice describes how to collect monitoring data from Zabbix to an LTS log stream.
Log ingestion	**Collecting Logs from Multiple Channels to LTS**	This practice describes how to collect log data from multiple channels to LTS.
Log search and analysis	**Analyzing Huawei Cloud ELB Logs on LTS**	This practice describes how to search for and analyze logs after Elastic Load Balance (ELB) logs are ingested to and structured in LTS.
Log search and analysis	**Viewing ELB Log Analysis Results on the LTS Dashboards**	This practice describes how to display logs in dashboards after ELB logs are ingested to and structured in LTS.
Log search and analysis	**Analyzing Huawei Cloud WAF Logs on LTS**	This practice describes how to search for and analyze logs after Web Application Firewall (WAF) logs are ingested to and structured in LTS.
Log search and analysis	**Embedding the LTS Log Query Page into a User-built System**	This practice describes how to use the federation proxy mechanism of Identity and Access Management (IAM) for custom identity broker and embed a login link to your systems so you can view LTS logs in your systems without logging in to the Huawei Cloud console.
Log search and analysis	**Displaying Query and Analysis Results on Pages**	This practice describes how to display query and analysis results on multiple pages.
Log search and analysis	**Optimizing Regular Expressions for Faster Log Parsing**	This practice describes how to optimize regular expressions to improve parsing efficiency.
Log transfer	**Changing File Time Zones for Log Transfer in a Batch**	This practice describes how to use Python scripts and LTS APIs to implement custom operations in a batch.
Log alarms	**Using Multi-Chart Query Results for Alarm Detection and Notification**	This practice describes how to use the query results of multiple charts to configure alarm rules.

Category	Best Practice	Scenario
Billing	**Collecting Statistics on LTS Expenses of Different Departments Based on Log Stream Tags**	This practice describes how to collect statistics on the LTS expenses of different departments in an enterprise. You can add tags to LTS log streams to distinguish business departments. LTS will add these tags to CDRs sent to the Billing Center.
Suggestions on LTS security configuration	**Suggestions on LTS Security Configuration**	This section provides actionable guidance for enhancing the overall security of LTS. You can continuously evaluate the security of your LTS resources and enhance their overall defensive capabilities by combining different security capabilities provided by LTS. By doing this, data stored in LTS can be protected from leakage and tampering both at rest and in transit.

2 Log Ingestion

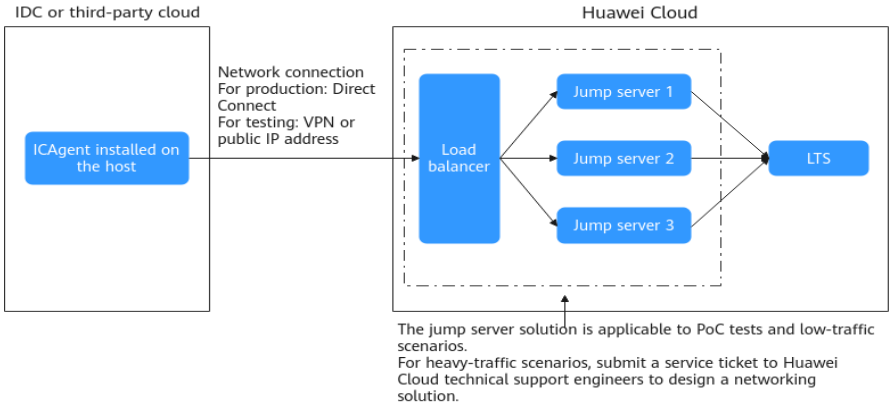
2.1 Collecting Host Logs from Third-Party Clouds, Internet Data Centers, and Other Huawei Cloud Regions to LTS

Solution Overview

Users often need to collect logs across clouds or regions. There are two typical scenarios:

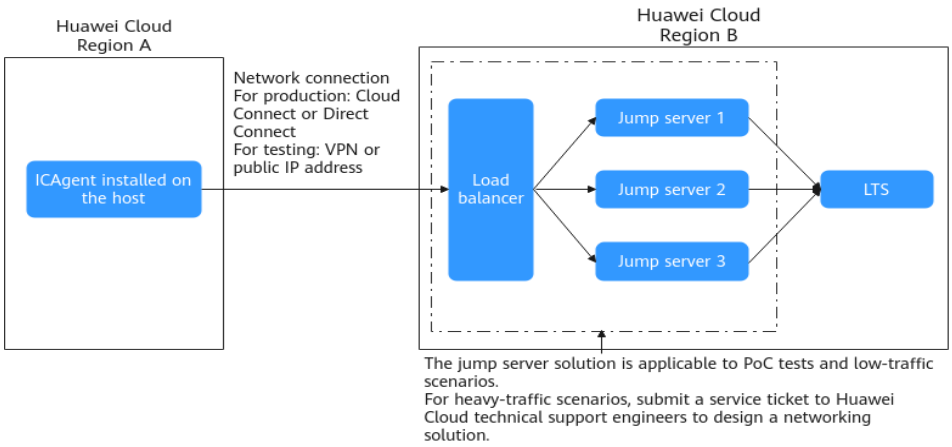
- Scenario 1: collecting logs from IDCs or third-party clouds to Huawei Cloud LTS

  Figure 2-1 Third-party cloud log collection



- Scenario 2: collecting logs from one Huawei Cloud region to LTS in another Huawei Cloud region

Figure 2-2 Cross-region log collection



In both scenarios, you need to establish a network connection, install ICAgent, and follow the log ingestion wizard.

- **ICAgent:** the log collector of Huawei Cloud LTS. After being installed on a host, it collects logs from the host to LTS. Ensure that the time and time zone of your local browser are consistent with those of the host to install ICAgent.
- **Networking**
  - Scenario 1: Direct Connect is a typical method for connecting a customer-built IDC or third-party cloud to Huawei Cloud. If Direct Connect is unavailable, you can use a VPN or public IP address.
  - Scenario 2: Cloud Connect or Direct Connect is a typical method for interconnecting Huawei Cloud regions. You can also use a VPN or public IP address.
- **Jump server**
  - ICAgent installed in customer-built IDCs, third-party clouds, or other Huawei Cloud regions cannot directly access the network segment used by the Huawei Cloud management plane for log reporting, necessitating a jump server for data forwarding. Use the jump server solution for Proof of Concept (PoC) tests or when log traffic is light. If you do not want to use jump servers for heavy traffic scenarios in production environments, **submit a service ticket** to obtain Huawei Cloud technical support to design a network passthrough solution.
  - A typical jump server configuration is 2 vCPUs and 4 GB memory, allowing it to forward traffic at approximately 30 MB/s. Configure a proper number of jump servers based on your log traffic and use a load balancer to distribute traffic among them.

This section describes how to collect Alibaba Cloud host logs to Huawei Cloud LTS. The method is similar to that of collecting logs from IDCs or across Huawei Cloud regions.

Below are the steps to collect the logs from a Linux host in Alibaba Cloud's China (Beijing) region to LTS in Huawei Cloud's CN East-Shanghai1 region.

Planning Resources

Table 2-1 Planning resources

Region	Resource	Description
CN East-Shanghai 1	ECS	You are advised to use **CentOS 6.5 64bit** or later images. The minimum flavor for the ECS is 1 vCPU and 1 GB of memory, while the recommended flavor is 2 vCPUs and 4 GB of memory.
	Load balancer	• When buying a load balancer, select the same VPC as the ECS. • Create an EIP for connecting to the jump servers. • Buy the bandwidth based on the service requirements.

Step 1: Purchasing a Load Balancer and an ECS as a Jump Server in Huawei Cloud CN East-Shanghai1

Step 1 Log in to the ECS console and buy an ECS.

Before installing ICAgent on a non-Huawei Cloud host, buy an ECS as a jump server from Huawei Cloud.

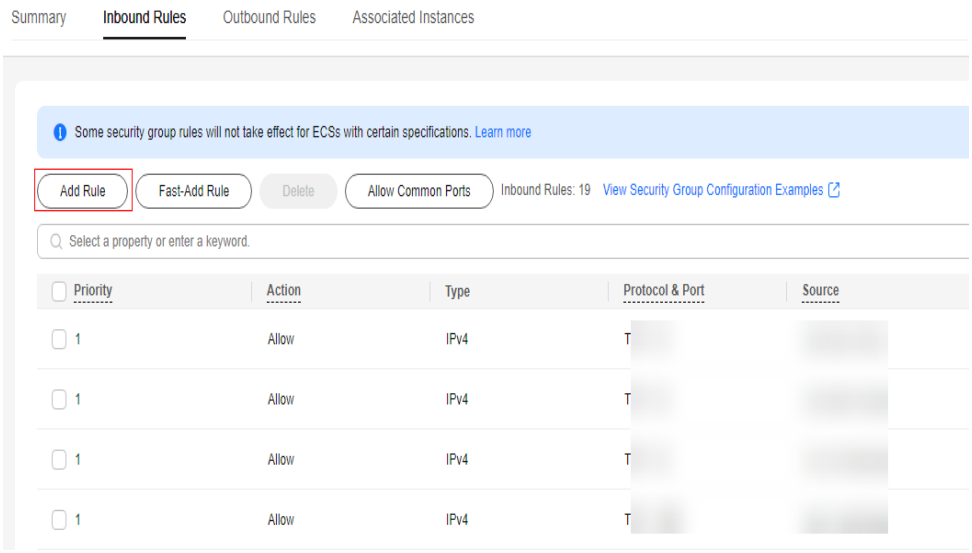
Step 2 Buy a load balancer, add TCP listeners, and associate a backend server group with it.

1. Add listeners for ports 30200, 30201, 8149, 8923, and 8102. For details, see **Adding a TCP Listener**.
2. Add the jump server to a backend server group. For details, see **Backend Server**.

Step 3 Configure a security group rule for the jump server and open forwarding ports.

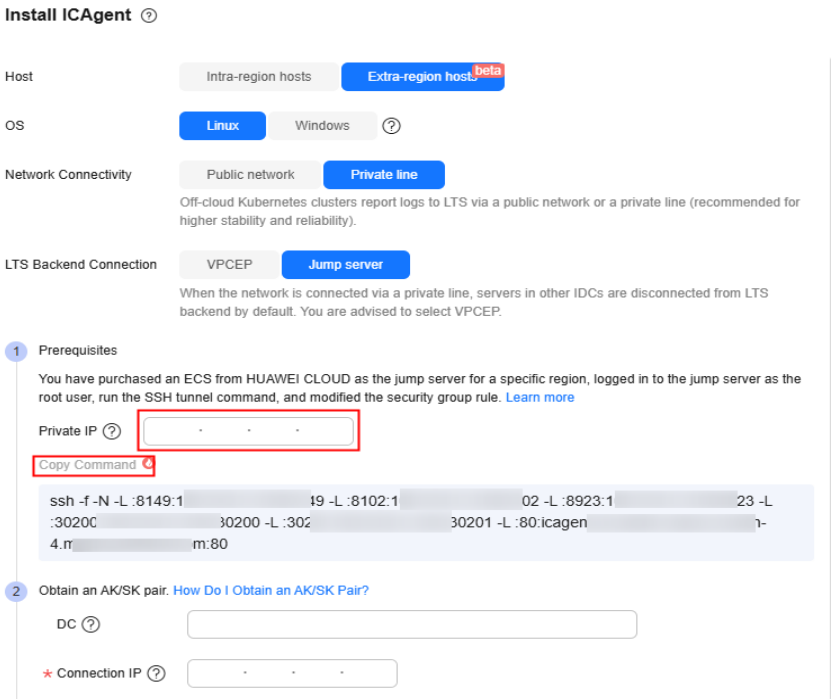
1. Modify the security group rule used by the jump server.
   a. On the ECS console, click the name of the ECS used as the jump server to go to the details page.
   b. On the **Security Groups** tab page, click a security group name to go to the details page.
   c. Click the **Inbound Rules** tab and click **Add Rule**. Open the inbound ports 8149, 8102, 8923, 30200, 30201, and 80 to ensure that data can be transmitted from the non-Huawei Cloud host to the jump server.

Figure 2-3 Modifying a security group rule



2. On the LTS console, choose **Host Management** > **Hosts** in the navigation pane, and click **Install ICAgent** in the upper right corner. Set parameters as shown in the following figure. Set **Private IP** to the private IP address of the ECS to generate an installation password.

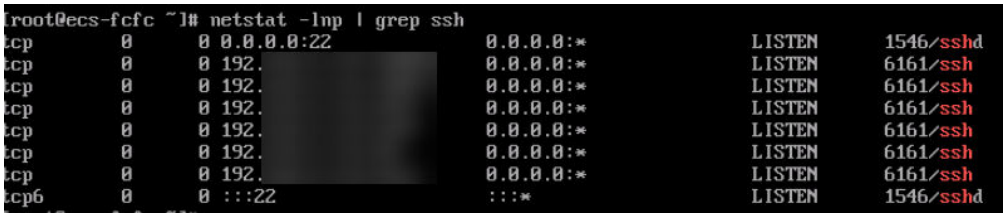
Figure 2-4 Installing ICAgent



3. Copy the command, log in to the jump server as user **root**, run the SSH tunneling command, and enter the password of user **root** as prompted.
4. Run the **netstat -lnp | grep ssh** command to check whether the corresponding TCP ports are being listened to. If the command output similar to the following is returned, the ports are open.

- Enter **http://***Jump server IP address* in the address bar of a browser. If the access is successful, the security group rule has taken effect.
- If the jump server is powered off and then restarted, run the installation command generated on the ICAgent installation page again. If you use the jump server in a production environment, configure the SSH tunneling command to run upon system startup.

Figure 2-5 Viewing ports



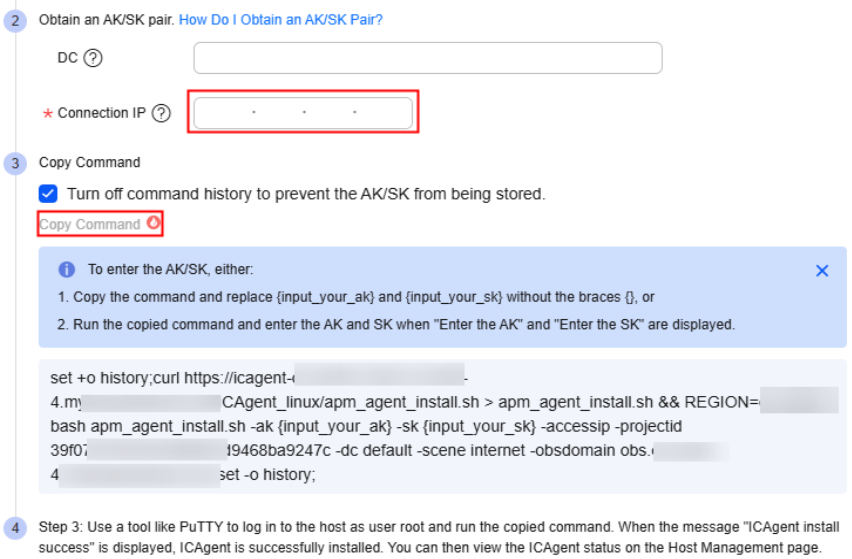
----End

Step 2: Installing ICAgent on an Alibaba Cloud Host

Step 1 Obtain an AK/SK. For details, see **How Do I Obtain an Access Key (AK/SK)?**

Step 2 On the **Install ICAgent** page of the LTS console, enter the connection IP address of the jump server to generate the ICAgent installation command.

Figure 2-6 ICAgent installation page

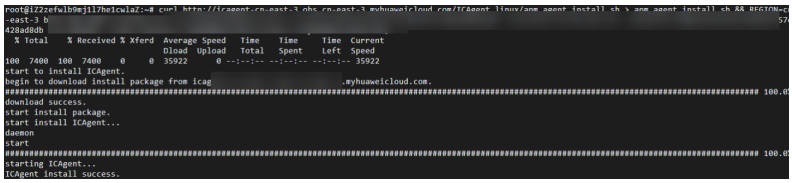


- Replace the AK/SK in the command with the correct AK/SK. Otherwise, ICAgent cannot be installed.
- **Connection IP**: connection IP address of the jump server. If the jump server uses an EIP to connect to the extra-region host, enter the EIP created by the load balancer. If the jump server and extra-region host use Virtual Private Cloud (VPC) peering connection of Direct Connect, enter the private IP address of the ECS.

Step 3 Log in to the Alibaba Cloud host as user **root** and run the ICAgent installation command. If the message **ICAgent install success** is displayed, ICAgent is successfully installed.

If you use LTS to collect logs across Huawei Cloud regions, for example, collecting logs from the CN East-Shanghai1 region to the CN South-Guangzhou region, you need to buy a load balancer and an ECS used as a jump server in CN South-Guangzhou, and then run the ICAgent installation command on the jump server in CN East-Shanghai1.

Figure 2-7 Checking the ICAgent installation status



Step 4 Choose **Host Management** > **Hosts** in the navigation pane of the LTS console and check whether the ICAgent status is **Running**.

----End

Step 3: Ingesting Logs to LTS

Step 1 Log in to the LTS console and choose **Host Management** > **Host Groups** in the navigation pane. Click **Create Host Group**. On the displayed page, enter a host group name and select hosts.

Step 2 Configure a log ingestion rule. For details, see **Ingesting ECS Text Logs to LTS**.

----End

Step 4: Viewing the Log Stream

On the **Log Management** page of LTS, click the target log stream to go to its details page. If there are logs, the Alibaba Cloud logs have been reported to LTS.

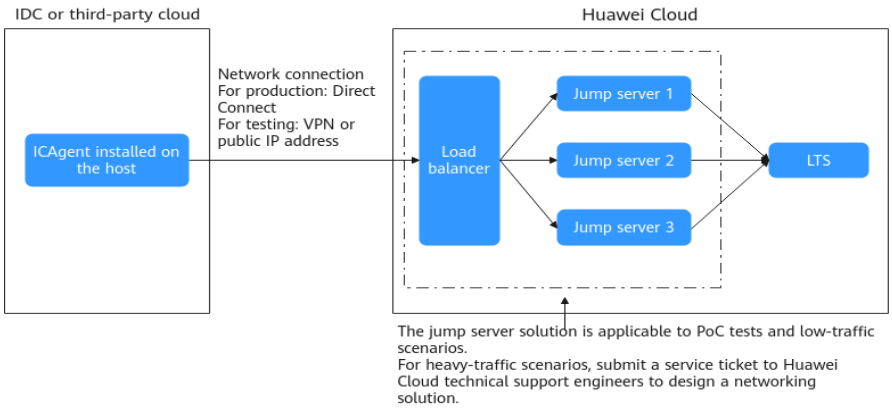
2.2 Collecting Kubernetes Logs from Third-Party Clouds, IDCs, and Other Huawei Cloud Regions to LTS

Solution Overview

Users often need to collect Kubernetes logs across clouds or regions. There are two typical scenarios:

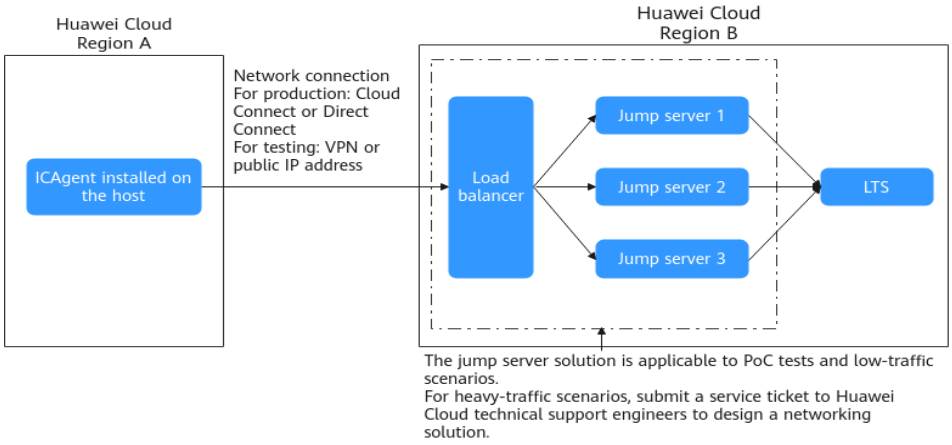
- Scenario 1: collecting logs from IDCs or third-party clouds to Huawei Cloud LTS

Figure 2-8 Third-party cloud log collection



- Scenario 2: collecting logs from one Huawei Cloud region to LTS in another Huawei Cloud region

Figure 2-9 Cross-region log collection



In both scenarios, you need to establish a network connection, install ICAgent, and follow the log ingestion wizard.

- **ICAgent:** the log collector of Huawei Cloud LTS. After being installed on a host, it collects logs from the host to LTS. Ensure that the time and time zone of your local browser are consistent with those of the host to install ICAgent.
- **Networking**
  - Scenario 1: Direct Connect is a typical method for connecting a customer-built IDC or third-party cloud to Huawei Cloud. If Direct Connect is unavailable, you can use a VPN or public IP address.
  - Scenario 2: Cloud Connect or Direct Connect is a typical method for interconnecting Huawei Cloud regions. You can also use a VPN or public IP address.
- **Jump server**
  - ICAgent installed in customer-built IDCs, third-party clouds, or other Huawei Cloud regions cannot directly access the network segment used by the Huawei Cloud management plane for log reporting, necessitating a jump server for data forwarding. Use the jump server solution for Proof of Concept (PoC) tests or when log traffic is light. If you do not want to

use jump servers for heavy traffic scenarios in production environments, **submit a service ticket** to obtain Huawei Cloud technical support to design a network passthrough solution.

- A typical jump server configuration is 2 vCPUs and 4 GB memory, allowing it to forward traffic at approximately 30 MB/s. Configure a proper number of jump servers based on your log traffic and use a load balancer to distribute traffic among them.

This section describes how to collect logs from third-party cloud Kubernetes clusters to Huawei Cloud LTS. The method is similar to that of collecting logs from IDCs or across Huawei Cloud regions.

Planning Resources

Table 2-2 Planning resources

Region	Resource	Description
CN East-Shanghai1	ECS	You are advised to use **CentOS 6.5 64bit** or later images. The minimum flavor for the ECS is 1 vCPU and 1 GB of memory, while the recommended flavor is 2 vCPUs and 4 GB of memory.
	Load balancer	• When buying a load balancer, select the same VPC as the ECS. • Create an EIP for connecting to the jump servers. • Buy the bandwidth based on the service requirements.

Step 1: Purchasing a Load Balancer and an ECS as a Jump Server in Huawei Cloud CN East-Shanghai1

Step 1 Log in to the ECS console and buy an ECS.

Before installing ICAgent on a non-Huawei Cloud host, buy an ECS as a jump server from Huawei Cloud.

Step 2 Buy a load balancer, add TCP listeners, and associate a backend server group with it.

1. Add listeners for TCP ports 30200, 30201, 8149, 8923, and 8102. For details, see **Adding a TCP Listener**.
2. Add the jump server to a backend server group. For details, see **Backend Server**.

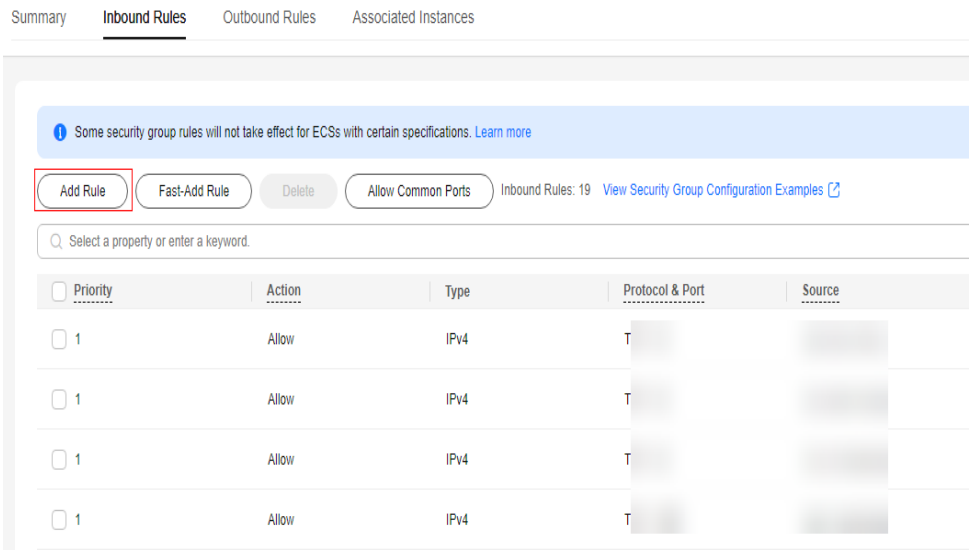
Step 3 Configure a security group rule for the jump server and open forwarding ports.

1. Modify the security group rule used by the jump server.
   a. On the ECS console, click the name of the ECS used as the jump server to go to the details page.

b. On the **Security Groups** tab page, click a security group name to go to the details page.

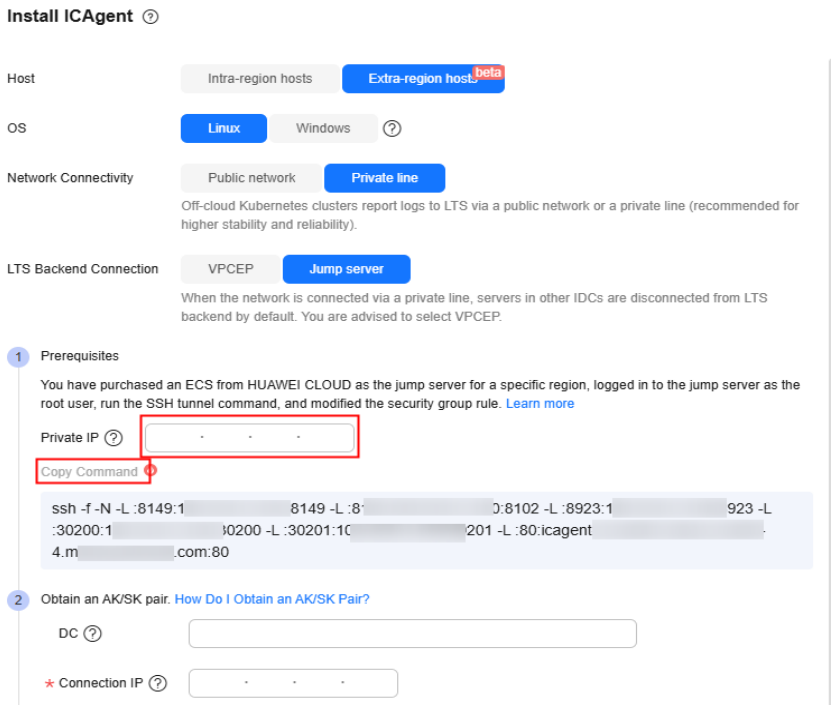
c. Click the **Inbound Rules** tab and click **Add Rule**. Open the inbound ports 8149, 8102, 8923, 30200, 30201, and 80 to ensure that data can be transmitted from the non-Huawei Cloud host to the jump server.

Figure 2-10 Modifying a security group rule



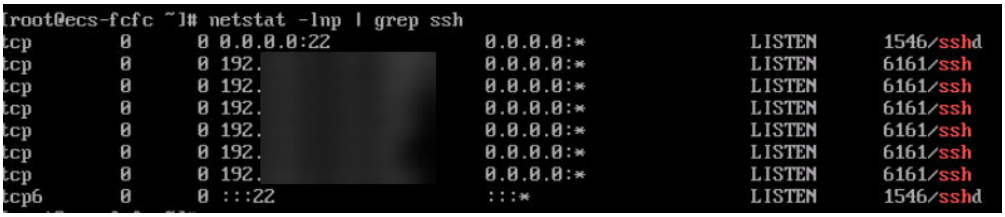
2. On the LTS console, choose **Host Management** > **Hosts** in the navigation pane, and click **Install ICAgent** in the upper right corner. Set parameters as shown in the following figure. Set **Private IP** to the private IP address of the ECS to generate an installation password.

Figure 2-11 Installing ICAgent



3. Copy the command, log in to the jump server as user **root**, run the SSH tunneling command, and enter the password of user **root** as prompted.
4. Run the **netstat -lnp | grep ssh** command to check whether the corresponding TCP ports are being listened to. If the command output similar to the following is returned, the ports are open.
   - Enter **http://***Jump server IP address* in the address bar of a browser. If the access is successful, the security group rule has taken effect.
   - If the jump server is powered off and then restarted, run the installation command generated on the ICAgent installation page again. If you use the jump server in a production environment, configure the SSH tunneling command to run upon system startup.

Figure 2-12 Viewing ports



----End

Step 2: Configuring Log Ingestion

For a Kubernetes cluster, simply install ICAgent on one node, not all nodes.

Obtain an AK/SK in advance. For details, see **How Do I Obtain an Access Key (AK/SK)?**

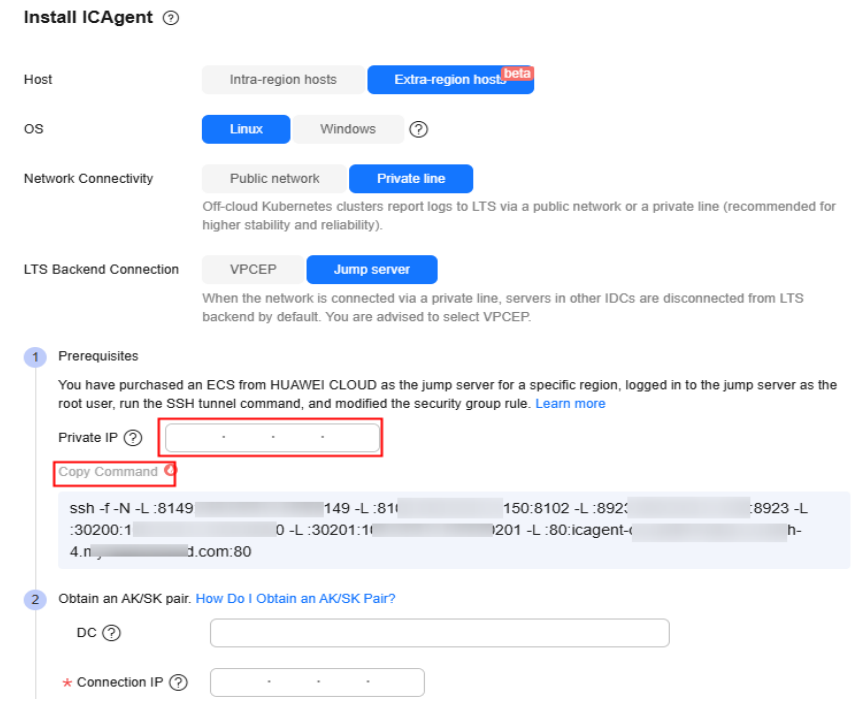
Step 1 Configure the jump server.

1. On the ECS console, locate the jump server and obtain its private IP address.

Figure 2-13 Obtaining the private IP address

2. On the LTS console, choose **Host Management** > **Hosts** in the navigation pane and click **Install ICAgent**. On the page displayed, set parameters as follows, set **Private IP** to the private IP address of the ECS to generate an installation command, and copy the command.

Figure 2-14 Installing ICAgent



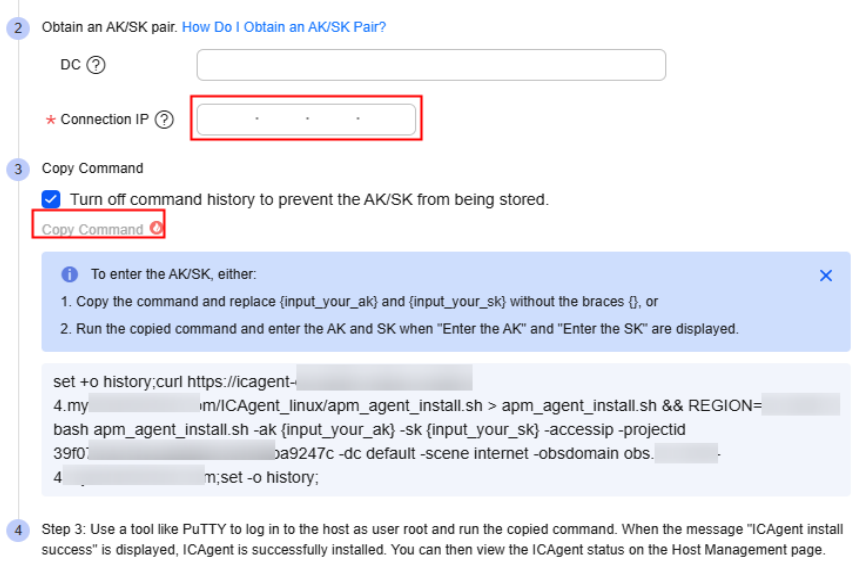
3. Log in to the ECS, run the command copied in the previous step, and enter the node password as prompted. If no error is reported, the installation is successful.

Figure 2-15 Running the generated installation command

4. On the **Install ICAgent** page, set **Connection IP** and select the checkbox next to **Turn off command history to prevent the AK/SK from being stored**.

   Connection IP: connection IP address of the jump server. If the jump server uses an EIP to connect to the extra-region host, enter the EIP created by the load balancer. If the jump server and extra-region host use VPC peering connection of Direct Connect, enter the private IP address of the ECS.

Figure 2-16 ICAgent installation page



5. Copy the ICAgent installation command and run it on the jump server. Enter the AK and SK of the current account as prompted. If the message **ICAgent install success** is displayed, ICAgent is successfully installed.

Step 2 Configure a log ingestion rule. For details, see **Ingesting Self-Built Kubernetes Application Logs to LTS**.

----End

Step 3: Viewing the Log Stream

On the **Log Management** page of LTS, click the target log stream to go to its details page. If there are logs, the Kubernetes logs have been reported to LTS.

2.3 Collecting Syslog Aggregation Server Logs to LTS

Introduction

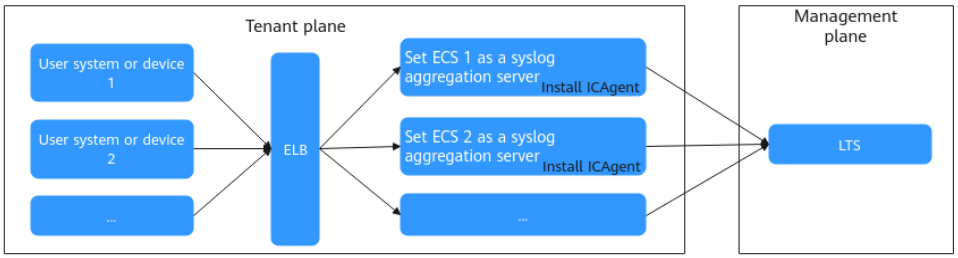
System Logging Protocol (Syslog) is a data protocol used by network devices to collect logs to a logging server. It can record log messages of multiple event types and is supported by almost all network devices, such as routers, switches, and printers. Even Unix-like servers can generate syslog messages to record user logins, firewall events, and Apache or Nginx access.

Syslog defines related format specifications based on RFC5424 and RFC3164. RFC3164 was released in 2001, and RFC5424 was an upgraded version released in 2009. The new version is compatible with the old version and solves many problems of the old version. Therefore, RFC 5424 is recommended.

This section describes how to use the syslog protocol to upload logs to LTS. You need to buy an ECS as a syslog aggregation server. Rsyslog comes preinstalled by default on Linux servers. However, Huawei Cloud ECSs do not receive remote syslog writes by default. You need to enable this function.

Solution Overview

Figure 2-17 Solution flowchart



- You can buy a Linux ECS and configure it as a syslog aggregation server to receive log data from other devices. If the size of a log received by a syslog server exceeds 1,024 bytes, the log will be truncated.
- The log processing rate of a single syslog server is 10 MB/s. To process a large number of logs or ensure high reliability, you can buy multiple ECSs as syslog servers and configure load balancers for distributing traffic.
- You need to install ICAgent on syslog servers and configure log collection rules to collect logs to LTS.

Planning Resources

Buy two ECSs. One serves as a syslog aggregation server, and the other serves as a service ECS to simulate user systems or devices to send logs.

Buying an ECS

Step 1 Log in to the management console and choose **Compute** > **Elastic Cloud Server**.

Step 2 Buy an ECS as a syslog aggregation server.

You are advised to use **CentOS 6.5 64bit** or later images. The recommended specifications are 2 vCPUs and 4 GB of memory.

Step 3 Log in to the syslog server as user **root** to install ICAgent.

1. Allow TCP ports 30200, 30201, 8149, 8923, and 8102 in the outbound rules of the syslog server, and then allow UDP port 514 in the inbound rules as the default listening port.
2. Go to the LTS console and choose **Host Management** > **Hosts** in the navigation pane.
3. On the page displayed, click **Install ICAgent**. Set **OS** to **Linux** and **Host** to **Intra-region hosts**. Then, select **Obtain AK/SK** for **Installation Mode**. Click **Copy Command** to copy the ICAgent installation command and manually replace the AK/SK.
4. Log in to the syslog server as user **root** and run the ICAgent installation command. If the message **ICAgent install success** is displayed, ICAgent is successfully installed. You can then view the ICAgent status by choosing **Host Management** in the navigation pane of the LTS console and then clicking **Hosts**.

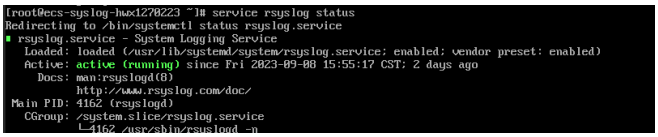
Step 4 Enable the rsyslog listening and receiving functions.

By default, rsyslog of Huawei Cloud ECSs does not receive remote syslog writes. You need to manually enable this function.

1. Log in to the ECS.
2. Modify the rsyslog configuration file.
   ```
   vi /etc/rsyslog.conf
   ```
3. Add the following content to the configuration file to enable TCP and UDP remote receiving:
   ```
   # Provides UDP syslog reception
   $ModLoad imudp
   $UDPServerRun 514
   # Provides TCP syslog reception
   $ModLoad imtcp
   $InputTCPServerRun 514
   ```
4. Save the settings. Click **More** > **Restart** in the **Operation** column to restart the ECS.
5. Run any of the following commands. If the command output is normal, the service is working.

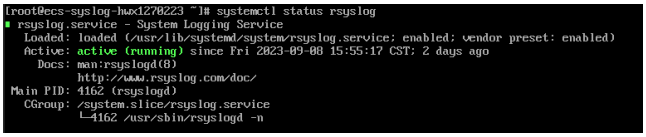
   Run **service rsyslog status** to check whether the rsyslog running status is running.

   Figure 2-18 Checking the rsyslog status

   Run **systemctl status rsyslog** to check whether the rsyslog running status is running.

   Figure 2-19 Rsyslog status

   Run **netstat -anp | grep 514** to check whether the listening function is enabled.

   Figure 2-20 Checking whether listening is enabled

Step 5 Configure syslog collection.

1. Choose **Host Management** > **Host Groups** in the LTS navigation pane and click **Create Host Group**. On the displayed page, enter a host group name and select hosts.
2. Choose **Log Ingestion** > **Ingestion Center** in the navigation pane and click **ECS (Elastic Cloud Server)**.

3. Set the collection path to **/var/log/messages**. For details, see **Ingesting ECS Text Logs to LTS**.

Step 6 Log in to the service ECS for verification.

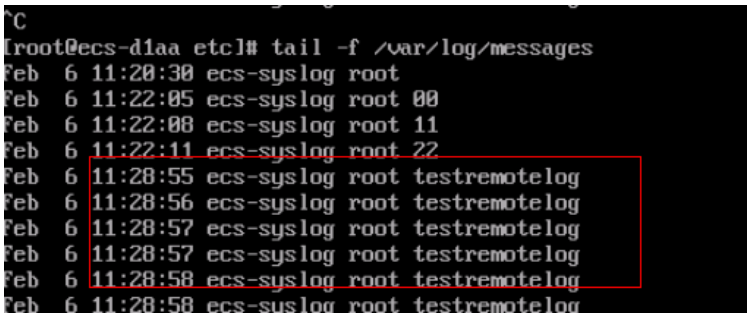
After your service system or device generates logs, you can view the logs on the LTS console. Log in to the ECS backend and run the **logger -n** *x.x.x.x* **-P 514 testremotelog** command to send syslog messages to the aggregation server. *x.x.x.x* indicates the IP address (public or private) of the syslog server. **testremotelog** indicates the log content, which can be customized.

After the command is executed, you can view the log in the configured log group and log stream.

Alternatively, log in to the syslog aggregation server and check whether the **testremotelog** log exists in **/var/log/messages**.

```
tail -f /var/log/messages
```

Figure 2-21 Checking whether the testremotelog log exists



Step 7 Use multiple syslog servers and load balancers to implement load balancing.

The log processing rate of a single syslog server is 10 MB/s. To process a large number of logs, you can use multiple syslog servers and load balancers.

1. Create syslog aggregation servers and install ICAgent.
2. Create a load balancer. For details, see **Using ELB to Distribute Traffic to a Web Application Across ECSs**.
3. Add listeners for TCP/UDP ports and port 514. For details, see **Adding a Listener**.
4. Add backend servers to the backend server group. For details, see **Backend Server Group**.

----End

2.4 Importing Logs of Self-built ELK to LTS

Solution Overview

ELK is an acronym that stands for Elasticsearch, Logstash, and Kibana. Together, these three tools provide a most commonly used log analysis and visualization solution in the industry.

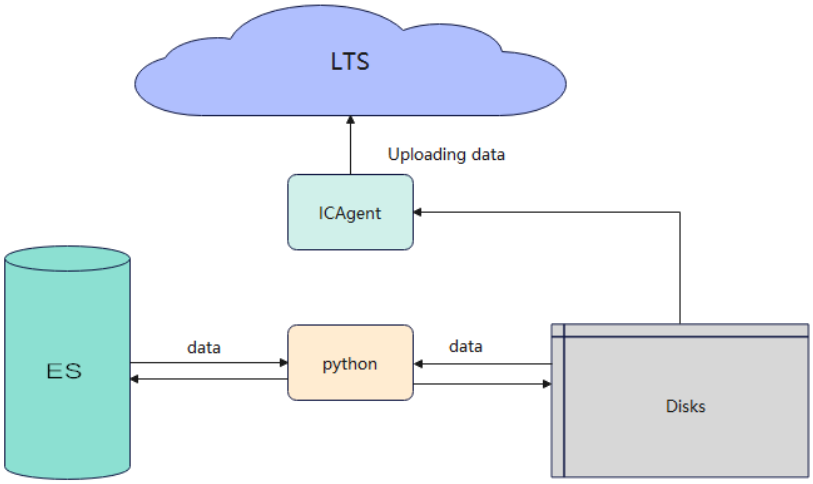
- Elasticsearch is an open-source, distributed, and RESTful search and analysis engine based on Lucene.
- Logstash is an open-source data processing pipeline on the server side. It allows you to collect and transform data from multiple sources in real time, and then send the data to your repository. It is usually used to collect, filter, and forward logs.
- Kibana is an open-source platform for data analysis and visualization, enabling you to create dashboards and search and query data. It is usually used together with Elasticsearch.

LTS outperforms the ELK solution in terms of function diversity, costs, and performance. For an in-depth comparison, see **What Are the Advantages of LTS Compared with Self-built ELK Stack?** This section describes how to use custom Python scripts and ICAgent to migrate logs from Elasticsearch to LTS.

ICAgent can be installed on ECSs to collect their log files. With this function, you can import Elasticsearch logs to LTS.

You can flush Elasticsearch data to ECSs using Python scripts, and then collect the flushed log files to LTS using its log ingestion function.

Figure 2-22 Solution flowchart



Importing Logs of Self-built ELK to LTS

Step 1 Log in to the **LTS console**.

Step 2 **Install ICAgent** on the ECS.

Step 3 Configure ECS log ingestion on the LTS console. For details, see **Ingesting ECS Text Logs to LTS**.

Step 4 Prepare for script execution. The following example is for reference only. Enter your actual information.

- If you use Python for the first time, you need to install the Python environment.

- If you use Elasticsearch for the first time, you need to install the Python data package of the corresponding Elasticsearch version. Elasticsearch 7.10.1 is used in this solution test.
  ```
  pip install elasticsearch==7.10.1
  ```
- Elasticsearch used in this solution test is created by Huawei Cloud Search Service (CSS).

Step 5 Run the python script for constructing index data. If the index already has data, skip this step and go to **Step 6**.

The python script must be executed on the ECS and named *xxx***.py**. The following is an example of constructing data:

Modify the following italic fields as required. In this example, 1,000 data records with the content **This is a test log,Hello world!!!\n** are inserted.

- **index**: name of the index to be created. It is **test** in this example.
- **es**: URL for accessing Elasticsearch. It is **http://127.0.0.1:9200** in this example.

```
from elasticsearch import Elasticsearch
def creadIndex(index):
    mappings = {
        "properties": {
            "content": {
                "type": "text"
            }
        }
    }
    es.indices.create(index=index, mappings=mappings)
def reportLog(index):
    i = 0
    while i < 1000:
        i = i + 1
        body = {"content": "This is a test log,Hello world!!!\n"}
        es.index(index=index,body=body)
if __name__ == '__main__':
    # Index name
    index = 'test'
    # Link to Elasticsearch
    es = Elasticsearch("http://127.0.0.1:9200")
    creadIndex(index)
    reportLog(index)
```

Step 6 Construct the Python read and write script to write Elasticsearch data to the disk. The output file path must be the same as that configured in the log ingestion rule.

The script must be executed on the ECS and named *xxx***.py**. The following is an example of the script for writing data to the disk:

Modify the following italic fields as required.

- **index**: index name. It is **test** in this example.
- **pathFile**: absolute path for writing data to the disk. It is **/tmp/test.log** in this example.
- **scroll_size**: size of the index rolling query. It is **100** in this example.
- **es**: URL for accessing Elasticsearch. It is **http://127.0.0.1:9200** in this example.

```
from elasticsearch import Elasticsearch
def writeLog(res, pathFile):
    data = res.get('hits').get('hits')
    i = 0
    while i < len(data):
        log = data[i].get('_source').get('content')
```



```
            file = open(pathFile, 'a', encoding='UTF-8')
            file.writelines(log)
            i = i + 1
        file.flush()
        file.close()
if __name__ == '__main__':
    # Index name
    index = 'test'
    # Output file path
    pathFile = '/tmp/' + index + '.log'
    # Size for each scrolling query. The default value is 100.
    scroll_size = 100
    # Link to Elasticsearch
    es = Elasticsearch("http://127.0.0.1:9200")
    init = True
    while 1:
        if (init == True):
            res = es.search(index=index, scroll="1m", body={"size": scroll_size})
            init =False
        else:
            scroll_id = res.get("_scroll_id")
            res = es.scroll(scroll="1m", scroll_id=scroll_id)
        if not res.get('hits').get('hits'):
            break
        writeLog(res, pathFile)
```

Step 7 Ensure that Python has been installed and run the following command on the ECS to write the Elasticsearch index data to the disk:

```
python xxx.py
```

Step 8 Check whether the data was successfully queried and written into the disk.

In this example, the path for writing data to the disk is **/tmp/test.log**. Replace it with your actual path. Run the following command to check whether the data has been written to the disk:

```
tail -f /tmp/test.log
```

Step 9 Log in to the LTS console. On the **Log Management** page, click the target log stream to go to its details page. If log data is displayed on the **Log Search** tab page, log collection is successful.

----End

2.5 Using Flume to Report Logs to LTS

Flume is a reliable, high-availability, and distributed system for collecting, aggregating, and transporting massive logs. It allows you to customize various data senders in a log system for better data collection. Flume can also process data simply and write data to various data receivers.

You can collect logs using Flume and report logs using the Kafka protocol supported by LTS. The following are some common data collection scenarios:

1. **Using Flume to Collect Text Logs to LTS**
2. **Using Flume to Collect Database Table Data to LTS**
3. **Using Flume to Collect Logs Transmitted with the Syslog Protocol to LTS**
4. **Using Flume to Collect Logs Transmitted with the TCP/UDP Protocol to LTS**
5. **Using Flume to Collect Device Management Data Reported with the SNMP Protocol to LTS**

6. **Using Default Interceptors to Process Logs**
7. **Using a Custom Interceptor to Process Logs**
8. **Enriching Logs with External Data Sources and Reporting the Logs to LTS**

Prerequisites

- The Java Development Kit (JDK) has been installed on the host.
- Flume has been installed and the JDK path has been configured in the Flume configuration file.

Using Flume to Collect Text Logs to LTS

You can add the **conf** file to use Flume to collect text logs and report them to LTS by referring to the following example. For details about the following parameters, see **Using Kafka to Report Logs to LTS**.

```
#Named
a1.sources = r1
a1.channels = c1
a1.sinks = k1

#Source
a1.sources.r1.type = TAILDIR
a1.sources.r1.channels = c1
a1.sources.r1.filegroups = f1
a1.sources.r1.filegroups.f1 = /tmp/test.txt
a1.sources.r1.fileHeader = true
a1.sources.r1.maxBatchCount = 1000

#Channel
a1.channels.c1.type = memory
a1.channels.c1.capacity = 10000
a1.channels.c1.transactionCapacity = 100

#Sink
a1.sinks.k1.type = org.apache.flume.sink.kafka.KafkaSink
a1.sinks.k1.kafka.topic = ${logGroupId}_${logStreamId}
a1.sinks.k1.kafka.bootstrap.servers = ${ip}:${port}
a1.sinks.k1.kafka.producer.acks = 0
a1.sinks.k1.kafka.producer.security.protocol = SASL_PLAINTEXT
a1.sinks.k1.kafka.producer.sasl.mechanism = PLAIN
a1.sinks.k1.kafka.producer.compression.type = gzip
a1.sinks.k1.kafka.producer.sasl.jaas.config=org.apache.kafka.common.security.plain.PlainLoginModule
required username="${projectId}" password="${accessKey}#${accessSecret}";

#Bind
a1.sources.r1.channels = c1
a1.sinks.k1.channel = c1
```

Using Flume to Collect Database Table Data to LTS

You can use Flume to collect database table data and report it to LTS to monitor table data changes. For details about the following parameters, see **Using Kafka to Report Logs to LTS**.

Step 1 Download the **flume-ng-sql-source** plug-in and compress it into a JAR package named **flume-ng-sql-source.jar**. Before packaging, ensure that the version of flume-ng-core in the POM file is the same as that of Flume to be installed. Then, place the JAR package in the **lib** directory in the Flume package installation path, for example, *FLUME_HOME*/**lib**. Replace *FLUME_HOME* with the actual installation path.

Step 2 Add the MySQL driver to the *FLUME_HOME*/**lib** directory.

1. Download the MySQL driver package.
   ```
   wget https://dev.mysql.com/get/Downloads/Connector-J/mysql-connector-java-5.1.35.tar.gz
   ```
2. Decompress the driver package and compress it into a JAR package.
   ```
   tar xzf mysql-connector-java-5.1.35.tar.gz
   ```
3. Place the JAR package in the *FLUME_HOME*/**lib/** directory.
   ```
   cp mysql-connector-java-5.1.35-bin.jar  FLUME_HOME/lib/
   ```

Step 3 Add the **conf** file for collecting MySQL data.

```
# a1 indicates the agent name.
# source indicates the input source of a1.
# channels indicates a buffer.
# sinks indicates the output destination of a1. In this example, Kafka is used.
a1.channels = c1
a1.sources = r1
a1.sinks = k1

#source
a1.sources.r1.type = org.keedio.flume.source.SQLSource
# Connect to MySQL: Replace {mysql_host} with the IP address of your VM and {database_name} with the database name. You can run the ifconfig or ip addr command to obtain the IP address.
# Add ?useUnicode=true&characterEncoding=utf-8&useSSL=false to the URL. Otherwise, the connection may fail.
a1.sources.r1.hibernate.connection.url = jdbc:mysql://{mysql_host}:3306/{database_name}?useUnicode=true&characterEncoding=utf-8&useSSL=false
# Hibernate Database connection properties
# MySQL account, which generally is root.
a1.sources.r1.hibernate.connection.user = root
# Enter your MySQL password.
a1.sources.r1.hibernate.connection.password = xxxxxxxx
a1.sources.r1.hibernate.connection.autocommit = true
# MySQL driver.
a1.sources.r1.hibernate.dialect = org.hibernate.dialect.MySQL5Dialect
a1.sources.r1.hibernate.connection.driver_class = com.mysql.jdbc.Driver
# Store the status file.
a1.sources.r1.status.file.path = FLUME_HOME/bin
a1.sources.r1.status.file.name = sqlSource.status
# Custom query
# Replace {table_name} with the name of the data table to be collected. You can also use the following method:
a1.sources.r1.custom.query = select * from {table_name}


#Sink
a1.sinks.k1.type = org.apache.flume.sink.kafka.KafkaSink
a1.sinks.k1.kafka.topic = ${logGroupId}_${logStreamId}
a1.sinks.k1.kafka.bootstrap.servers = ${ip}:${port}
a1.sinks.k1.kafka.producer.acks = 0
a1.sinks.k1.kafka.producer.security.protocol = SASL_PLAINTEXT
a1.sinks.k1.kafka.producer.sasl.mechanism = PLAIN
a1.sinks.k1.kafka.producer.compression.type = gzip
a1.sinks.k1.kafka.producer.sasl.jaas.config=org.apache.kafka.common.security.plain.PlainLoginModule required username="${projectId}" password="${accessKey}#${accessSecret}";


a1.channels.c1.type = memory
a1.channels.c1.capacity = 10000
a1.channels.c1.transactionCapacity = 10000
a1.channels.c1.byteCapacityBufferPercentage = 20
a1.channels.c1.byteCapacity = 800000
```

Step 4 After being started, Flume collects table data from the database to LTS.

----End

Using Flume to Collect Logs Transmitted with the Syslog Protocol to LTS

Syslog is a protocol used to transmit log messages on an IP network. Flume collects logs transmitted using syslog and reports them to LTS. For details about the following parameters, see **Using Kafka to Report Logs to LTS**.

- To receive UDP logs, add the **conf** file for collecting logs transmitted using syslog. Example:

```
a1.sources = r1
a1.sinks = k1
a1.channels = c1

a1.sources.r1.type=syslogudp
# host_port indicates the port number of the syslog server.
a1.sources.r1.port = {host_port}
# host_ip indicates the IP address of the syslog server.
a1.sources.r1.host = {host_ip}
a1.sources.r1.channels = c1

a1.channels.c1.type = memory

#Sink
a1.sinks.k1.type = org.apache.flume.sink.kafka.KafkaSink
a1.sinks.k1.kafka.topic = ${logGroupId}_${logStreamId}
a1.sinks.k1.kafka.bootstrap.servers = ${ip}:${port}
a1.sinks.k1.kafka.producer.acks = 0
a1.sinks.k1.kafka.producer.security.protocol = SASL_PLAINTEXT
a1.sinks.k1.kafka.producer.sasl.mechanism = PLAIN
a1.sinks.k1.kafka.producer.compression.type = gzip
a1.sinks.k1.kafka.producer.sasl.jaas.config=org.apache.kafka.common.security.plain.PlainLoginModule
required username="${projectId}" password="${accessKey}#${accessSecret}";
a1.sinks.k1.channel = c1
```

- To receive TCP logs, add the **conf** file for collecting logs transmitted using syslog. Example:

```
a1.sources = r1
a1.sinks = k1
a1.channels = c1

a1.sources.r1.type=syslogtcp
# host_port indicates the port number of the syslog server.
a1.sources.r1.port = {host_port}
# host_ip indicates the IP address of the syslog server.
a1.sources.r1.host = {host_ip}
a1.sources.r1.channels = c1

a1.channels.c1.type = memory

#Sink
a1.sinks.k1.type = org.apache.flume.sink.kafka.KafkaSink
a1.sinks.k1.kafka.topic = ${logGroupId}_${logStreamId}
a1.sinks.k1.kafka.bootstrap.servers = ${ip}:${port}
a1.sinks.k1.kafka.producer.acks = 0
a1.sinks.k1.kafka.producer.security.protocol = SASL_PLAINTEXT
a1.sinks.k1.kafka.producer.sasl.mechanism = PLAIN
a1.sinks.k1.kafka.producer.compression.type = gzip
a1.sinks.k1.kafka.producer.sasl.jaas.config=org.apache.kafka.common.security.plain.PlainLoginModule
required username="${projectId}" password="${accessKey}#${accessSecret}";
a1.sinks.k1.channel = c1
```

Using Flume to Collect Logs Transmitted with the TCP/UDP Protocol to LTS

You can use Flume to collect logs transmitted with the TCP/UDP protocol and report them to LTS. For details about the following parameters, see **Using Kafka to Report Logs to LTS**.

- To collect TCP port logs, add the **conf** file of the collection port. Example:

```
a1.sources = r1
a1.sinks = k1
a1.channels = c1

a1.sources.r1.type = netcat
a1.sources.r1.bind = 0.0.0.0
a1.sources.r1.port = {host_port}

a1.sinks.k1.type = org.apache.flume.sink.kafka.KafkaSink
a1.sinks.k1.kafka.topic = ${logGroupId}_${logStreamId}
a1.sinks.k1.kafka.bootstrap.servers = ${ip}:${port}
a1.sinks.k1.kafka.producer.acks = 0
a1.sinks.k1.kafka.producer.security.protocol = SASL_PLAINTEXT
a1.sinks.k1.kafka.producer.sasl.mechanism = PLAIN
a1.sinks.k1.kafka.producer.compression.type = gzip
a1.sinks.k1.kafka.producer.sasl.jaas.config=org.apache.kafka.common.security.plain.PlainLoginModule required username="${projectId}" password="${accessKey}#${accessSecret}";

a1.channels.c1.type = memory
a1.channels.c1.capacity = 1000
a1.channels.c1.transactionCapacity = 100

a1.sources.r1.channels = c1
a1.sinks.k1.channel = c1
```

- To collect UDP port logs, add the **conf** file of the collection port. Example:

```
a1.sources = r1
a1.sinks = k1
a1.channels = c1

a1.sources.r1.type = netcatudp
a1.sources.r1.bind = 0.0.0.0
a1.sources.r1.port = {host_port}

a1.sinks.k1.type = org.apache.flume.sink.kafka.KafkaSink
a1.sinks.k1.kafka.topic = ${logGroupId}_${logStreamId}
a1.sinks.k1.kafka.bootstrap.servers = ${ip}:${port}
a1.sinks.k1.kafka.producer.acks = 0
a1.sinks.k1.kafka.producer.security.protocol = SASL_PLAINTEXT
a1.sinks.k1.kafka.producer.sasl.mechanism = PLAIN
a1.sinks.k1.kafka.producer.compression.type = gzip
a1.sinks.k1.kafka.producer.sasl.jaas.config=org.apache.kafka.common.security.plain.PlainLoginModule required username="${projectId}" password="${accessKey}#${accessSecret}";

a1.channels.c1.type = memory
a1.channels.c1.capacity = 1000
a1.channels.c1.transactionCapacity = 100

a1.sources.r1.channels = c1
a1.sinks.k1.channel = c1
```

Using Flume to Collect Device Management Data Reported with the SNMP Protocol to LTS

You can use Flume to collect device management data reported with SNMP and send the data to LTS. For details about the following parameters, see **Using Kafka to Report Logs to LTS**.

- Listen to port number 161 of the SNMP communication by adding the **conf** file for receiving SNMP logs. Example:

```
a1.sources = r1
a1.sinks = k1
a1.channels = c1

a1.sources.r1.type = netcatudp
a1.sources.r1.bind = 0.0.0.0
```



```
a1.sources.r1.port = 161

a1.sinks.k1.type = org.apache.flume.sink.kafka.KafkaSink
a1.sinks.k1.kafka.topic = ${logGroupId}_${logStreamId}
a1.sinks.k1.kafka.bootstrap.servers = ${ip}:${port}
a1.sinks.k1.kafka.producer.acks = 0
a1.sinks.k1.kafka.producer.security.protocol = SASL_PLAINTEXT
a1.sinks.k1.kafka.producer.sasl.mechanism = PLAIN
a1.sinks.k1.kafka.producer.compression.type = gzip
a1.sinks.k1.kafka.producer.sasl.jaas.config=org.apache.kafka.common.security.plain.PlainLoginModule
required username="${projectId}" password="${accessKey}#${accessSecret}";

a1.channels.c1.type = memory
a1.channels.c1.capacity = 1000
a1.channels.c1.transactionCapacity = 100

a1.sources.r1.channels = c1
a1.sinks.k1.channel = c1
```

- Listen to port number 162 of SNMP trap communication by adding the **conf** file for receiving SNMP logs. Example:

```
a1.sources = r1
a1.sinks = k1
a1.channels = c1



a1.sources.r1.type = netcatudp
a1.sources.r1.bind = 0.0.0.0
a1.sources.r1.port = 162



a1.sinks.k1.type = org.apache.flume.sink.kafka.KafkaSink
a1.sinks.k1.kafka.topic = ${logGroupId}_${logStreamId}
a1.sinks.k1.kafka.bootstrap.servers = ${ip}:${port}
a1.sinks.k1.kafka.producer.acks = 0
a1.sinks.k1.kafka.producer.security.protocol = SASL_PLAINTEXT
a1.sinks.k1.kafka.producer.sasl.mechanism = PLAIN
a1.sinks.k1.kafka.producer.compression.type = gzip
a1.sinks.k1.kafka.producer.sasl.jaas.config=org.apache.kafka.common.security.plain.PlainLoginModule
required username="${projectId}" password="${accessKey}#${accessSecret}";

a1.channels.c1.type = memory
a1.channels.c1.capacity = 1000
a1.channels.c1.transactionCapacity = 100

a1.sources.r1.channels = c1
a1.sinks.k1.channel = c1
```

Using Default Interceptors to Process Logs

In Flume, an interceptor is a simple pluggable component between a source and channels. Before a source writes received events to channels, the interceptor can convert or delete the events. Each interceptor processes only the events received by a given source.

- Timestamp interceptor

  This interceptor inserts a timestamp into Flume event headers. If no interceptor is used, Flume receives only messages. To configure the connection between a source and a timestamp interceptor, set **type** to **timestamp** and the class name full path **preserveExisting** to **false**. You can also set **preserveExisting** to **true**, indicating the value of the timestamp header will not be replaced if the header already exists in the event. Configuration example:


```
a1.sources.r1.interceptors = timestamp
a1.sources.r1.interceptors.timestamp.type=timestamp
a1.sources.r1.interceptors.timestamp.preserveExisting=false
```

- Regex filtering interceptor

  This interceptor filters out unnecessary logs during collection or selectively collects logs that meet a specified regular expression. Set **type** to **REGEX_FILTER**. If you set **excludeEvents** to **false**, events that match a specified regular expression are collected. If you set **excludeEvents** to **true**, matched events are deleted and unmatched events are collected. Example configuration for connecting a source to a regex filtering interceptor:

  ```
  a1.sources.r1.interceptors = regex
  a1.sources.r1.interceptors.regex.type=REGEX_FILTER
  a1.sources.r1.interceptors.regex.regex=(today)|(Monday)
  a1.sources.r1.interceptors.regex.excludeEvents=false
  ```

  In this way, the configured interceptor collects only the logs containing **today** or **Monday** in the log messages.

- Search and replace interceptor

  This interceptor provides a simple string-based search and replacement function based on Java regular expressions. Configuration example:

  ```
  # Interceptor alias
  a1.sources.r1.interceptors = search-replace
  # Interceptor type. The value must be search_replace.
  a1.sources.r1.interceptors.search-replace.type = search_replace

  # Delete characters from the event body and match the event content based on a specified regular expression.
  a1.sources.r1.interceptors.search-replace.searchPattern = today
  # Replace the matched event content.
  a1.sources.r1.interceptors.search-replace.replaceString = yesterday
  # Set a character set. The default value is utf8.
  a1.sources.r1.interceptors.search-replace.charset = utf8
  ```

Using a Custom Interceptor to Process Logs

The following example demonstrates how to customize an interceptor in Flume using Java. *FLUME_HOME* specifies where Flume is installed and should be replaced with the actual Flume installation directory. In this example, it is **/tools/flume**.

Step 1 Create a Maven project and introduce the Flume dependency.

Ensure that the dependency matches the Flume version in the target cluster.

```
<dependencies>
    <dependency>
      <groupId>org.apache.flume</groupId>
      <artifactId>flume-ng-core</artifactId>
      <version>1.10.1</version>
      <scope>provided</scope>
    </dependency>
  </dependencies>
```

The dependency does not need to be packaged into the final JAR package. Therefore, set the scope to **provided**.

Step 2 Create a class to implement the **Interceptor** interface and related methods.

- **initialize()** method: initializes the interceptor, reads configuration information, and establishes connections.

- **intercept(Event event)** method: intercepts and processes a single event, and receives an event object as input and returns a modified event object.
- **intercept(List<Event> list)** method: processes events in a batch, and intercepts and processes the event list.
- **close ()** method: closes the interceptor, releases the resources, and closes the connections.

```
import org.apache.flume.Event;
import org.apache.flume.interceptor.Interceptor;

import java.nio.charset.StandardCharsets;
import java.util.ArrayList;
import java.util.List;

public class TestInterceptor implements Interceptor {
    @Override
    public void initialize() {

    }
    @Override
    public Event intercept(Event event) {

        // Obtain event data.
        String eventData = new String(event.getBody(), StandardCharsets.UTF_8);
        // Check whether the event data contains a specified string.
        if (eventData.contains("hello")) {
            // If an event contains the specified string, the event is excluded and null is returned.
            return null;
        }

        return event;
    }

    @Override
    public List<Event> intercept(List<Event> events) {
        // Create a new list to store the processed events.
        List<Event> interceptedEvents = new ArrayList<>();
        for (Event event : events) {
            Event interceptedEvent = intercept(event);
            if (interceptedEvent != null) {
                interceptedEvents.add(interceptedEvent);
            }
        }
        return interceptedEvents;
    }

    @Override
    public void close() {

    }

}
```

Step 3 Build an interceptor. The creation and configuration of an interceptor is usually implemented in Builder mode. The complete code is as follows:

```
import org.apache.flume.Context;
import org.apache.flume.Event;
import org.apache.flume.interceptor.Interceptor;

import java.nio.charset.StandardCharsets;
import java.util.ArrayList;
import java.util.List;

public class TestInterceptor implements Interceptor {
    @Override
    public void initialize() {
    }
```



```
    @Override
    public Event intercept(Event event) {
        // Obtain event data.
        String eventData = new String(event.getBody(), StandardCharsets.UTF_8);
        // Check whether the event data contains a specified string.
        if (eventData.contains("hello")) {
            // If an event contains the specified string, the event is excluded and null is returned.
            return null;
        }
        return event;
    }
    @Override
    public List<Event> intercept(List<Event> events) {
        List<Event> interceptedEvents = new ArrayList<>();
        for (Event event : events) {
            Event interceptedEvent = intercept(event);
            if (interceptedEvent != null) {
                interceptedEvents.add(interceptedEvent);
            }
        }
        return interceptedEvents;
    }

    @Override
    public void close() {

    }

// Build an interceptor.
    public static class Builder implements Interceptor.Builder {

        @Override
        public void configure(Context context) {

        }

        @Override
        public Interceptor build() {
            return new TestInterceptor();
        }

    }

}
```

Step 4 Convert the interceptor to a JAR package and upload it to the **lib** folder in your Flume installation directory.

Step 5 Compile the configuration file and configure the custom interceptor in it.

When configuring the full class name of the interceptor, note that the format is *Full class name of the interceptor*$Builder.

```
# Configuration of the interceptor.
#Definition of the interceptor.
a1.sources.r1.interceptors = i1
# Full class name of the interceptor.
a1.sources.r1.interceptors.i1.type = TestInterceptor$Builder
```

Step 6 Run Flume.

----End

KV parsing logs: Strings are separated by spaces and converted into strings of the Map type.

```
public class TestInterceptor implements Interceptor {
    @Override
    public void initialize() {
```



```
    }

    @Override
    public Event intercept(Event event) {
        // Obtain event data.
        String eventData = new String(event.getBody(), StandardCharsets.UTF_8);
        Map<String, Object> splitMap = new HashMap<>();
        String[] splitList = eventData.split(" ");
        for (int i = 0; i < splitList.length; i++) {
            splitMap.put("field" + i, splitList[i].trim());
        }
        eventData.setBody(splitMap.toString().getBytes(StandardCharsets.UTF_8));
        return event;
    }

    @Override
    public List<Event> intercept(List<Event> events) {
        List<Event> interceptedEvents = new ArrayList<>();
        for (Event event : events) {
            Event interceptedEvent = intercept(event);
            if (interceptedEvent != null) {
                interceptedEvents.add(interceptedEvent);
            }
        }
        return interceptedEvents;
    }

    @Override
    public void close() {
    }
}
```

Enriching Logs with External Data Sources and Reporting the Logs to LTS

An event is the basic unit for Flume to transmit data from a source to a destination. An event consists of a header and a body. The header stores certain attributes of the event in the K-V structure, and the body stores the data in the byte array format.

If an external data source is available and you want to enrich the log content, such as modifying or deleting log content, or adding fields, add the content changes to the event's body so that Flume can report them to LTS. The following example shows how to use Java to extend the log content. For details about the following parameters, see **Using Kafka to Report Logs to LTS**.

```
import com.alibaba.fastjson.JSONObject;

import org.apache.flume.Context;
import org.apache.flume.Event;
import org.apache.flume.interceptor.Interceptor;

import java.nio.charset.StandardCharsets;
import java.util.ArrayList;
import java.util.List;

public class TestInterceptor implements Interceptor {
    @Override
    public void initialize() {
    }

    @Override
    public Event intercept(Event event) {
        // Obtain the event data, convert the original data into JSON strings, and add extra fields.
        String eventData = new String(event.getBody(), StandardCharsets.UTF_8);
        JSONObject object = new JSONObject();
        object.put("content", eventData);
```



```
        object.put("workLoadType", "RelipcaSet");
        eventData = object.toJSONString();
        eventData.setBody(eventData.getBytes(StandardCharsets.UTF_8));
        return event;
    }

    @Override
    public List<Event> intercept(List<Event> events) {
        List<Event> interceptedEvents = new ArrayList<>();
        for (Event event : events) {
            Event interceptedEvent = intercept(event);
            if (interceptedEvent != null) {
                interceptedEvents.add(interceptedEvent);
            }
        }
        return interceptedEvents;
    }

    @Override
    public void close() {
    }
}
```

2.6 Collecting Zabbix Data Through ECS Log Ingestion

Zabbix is a common open-source monitoring system with various alarm rules. LTS collects monitoring data from Zabbix to log streams. This section describes how LTS collects Zabbix data through ECS log ingestion.

Prerequisites

- Prepare an ECS for log collection. For details, see **Purchasing an ECS**. If you already have an available ECS, skip this step.
- Zabbix has been downloaded and installed on the ECS. For details, see **Download and install Zabbix**.

Configuring a Path for Storing Monitoring Data

Zabbix saves monitoring data on the server where Zabbix is located. You can perform the following steps to set a monitoring data storage path:

1. Log in to the server where Zabbix is located.
2. Open the **zabbix_server.conf** file.
   ```
   vim /etc/zabbix/zabbix_server.conf
   ```
3. Set the data storage path in the file.
   ```
   ExportDir=/tmp/
   ```
4. Restart the Zabbix service for the configuration to take effect.
   ```
   systemctl restart zabbix-server
   ```
   After the configuration takes effect, Zabbix generates a file (with the extension .ndjson) in the **/tmp** directory to save monitoring data.

Ingesting ECS Logs to LTS

Step 1 Choose **Log Ingestion** > **Ingestion Center** in the navigation pane and click **ECS (Elastic Cloud Server)**.

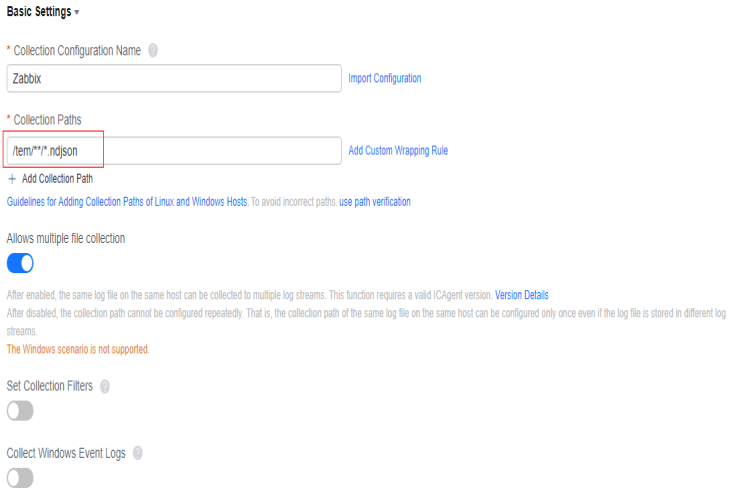
Step 2 The page for selecting a log stream is displayed.

1. Select a log group from the drop-down list of **Log Group**, for example, **lts-group-ECS**.
2. Select a log stream from the drop-down list of **Log Stream**, for example, **lts-topic-ECS**.
3. Click **Next: (Optional) Select Host Group**.

Step 3 Select host groups and click **Next: Configurations**.

Step 4 Set the collection path to **/tem/**/*.ndjson** and retain the default values for other parameters. For details, see **Ingesting ECS Text Logs to LTS**.

Figure 2-23 Configuring the collection



Step 5 Click **Next: Index Settings**. On the displayed page, retain the default parameter settings. After configuring the index, you can query and analyze logs. For more information, see **Setting Indexes**.

Step 6 Click **Submit**. After the ingestion configuration is complete, click **Back to Ingestion Configurations**. An ingestion configuration will be displayed on the **Ingestion Management** page.

Step 7 After the log ingestion is configured, you can view the reported logs on the LTS console in real time.

Click the log stream name in the **Log Stream** column of the target ingestion rule to access the stream details page.

Step 8 Click the **Real-Time Logs** tab to view logs in real time.

Logs are reported to LTS once every five seconds. You may wait for at most five seconds before the logs are displayed.

----End

2.7 Collecting Logs from Multiple Channels to LTS

Log ingestion is the process of collecting log data generated during the running of applications or services and storing the data to specified locations for subsequent analysis and use. Log data includes system running status, error information, and

user operation records. Log data is important for system O&M, troubleshooting, and service analysis.

LTS enables real-time log ingestion via various methods. Logs can be collected using ICAgent, ingested from cloud services, or reported to LTS via custom software, APIs, or SDKs, meeting requirements in different scenarios.

- More than 40 Huawei Cloud services
- Web, iOS, Android, and applets
- Open-source software, such as Logstash, Flume, and Beats
- Standard protocols, such as HTTP, HTTPS, syslog, and Kafka

Applications Scenarios

This practice uses a food take-out and delivery platform as an example. This platform allows order foods via websites, apps, WeChat, and Alipay. Once restaurants confirm and prepare the orders, the platform notifies nearby delivery drivers, who then deliver the foods to customers.

During data-based operations, data collection is challenging for the following reasons:

- **Multiple channels:** Data is scattered across channels, including advertisers and promoters.
- **Various devices:** Data comes from websites, official accounts, mobile phones, browsers (web and mobile pages), etc.
- **Heterogeneity:** Data sources include VPCs, customer-built IDCs, and Huawei Cloud ECSs.
- **Multiple development languages:** Different languages are used, with Java for the core system, Nginx for the frontend server, and C++ for the backend payment system.
- **Diverse architectures:** Restaurant devices run on both x86 and Arm.

In this case, you can use LTS to collect internal and external logs for **central management**.

- **Collecting Promotion Logs**
- **Collecting Device User Logs**
- **Collecting Server Logs**
- **Collecting Logs from Various Network Environments**

Centrally Managing Logs

1. On the LTS console, create a log group. For details, see **Managing Log Groups**.
2. Create log streams for logs generated by different data sources. For details, see **Managing Log Streams**. The following log streams are for reference only.
   - **wechat-server** for storing WeChat server access logs
   - **wechat-app** for storing WeChat server application logs
   - **wechat-error** for storing error logs

- **alipay-server**
- **alipay-app**
- **deliver-app** for storing the app statuses of delivery drivers
- **deliver-error** for storing error logs
- **web-click** for storing logs of HTML5 page clicks
- **server-access** for storing server-side access logs
- **server-app** for storing server application logs
- **coupon** for storing application coupon logs
- **pay** for storing payment logs
- **order** for storing order logs

Collecting Promotion Logs

Restaurants usually use the following promotion ways:

- Issue coupons when customers sign up.
- Distribute coupons via QR codes on flyers, web pages or other channels.

Before promotion, set the following registration server address to generate a QR code for flyers or web pages. When a customer scans the QR code for registration, the platform recognizes that the customer is accessing it from the specific source and records a log.

```
http://example.com/login?source=10012&ref=kd4b
```

When the server side receives a request, the server generates a log like the following one:

```
2024-06-20 19:00:00 e41234ab342ef034,102345,5k4d,467890
```

Promotion logs can be collected in the following ways:

- Applications output logs to hard disks, and ICAgent collects logs. For details, see **Ingesting ECS Text Logs to LTS**.
- Application logs are written to LTS via SDKs. For details, see **SDK Overview**.

Collecting Device User Logs

LTS collects logs from various devices, including web browsers, iOS, Android, Baidu applets, WeChat applets, DingTalk applets, and quick apps. You can quickly integrate LTS's mobile SDKs to your devices to enable functions such as cache sending, retry upon exceptions, and batch sending.

Collection solution:

- Mobile devices: Use iOS and Android SDKs to ingest logs.
- Arm devices: Use Native C for cross compilation.
- Restaurant devices: Use SDKs for x86 devices, and Native C for cross compilation for Arm devices.

You can use the following methods to collect device user logs:

- Create a log collection task to write logs to a specified log stream.

- Ingest CCE logs to LTS to collect logs generated in Docker. For details, see **Ingesting CCE Application Logs to LTS**.
- Use SDKs to write C#, Python, Java, PHP, and C logs into LTS. For details, see **SDK Overview**.

Collecting Server Logs

The following server logs are for reference only.

- Syslog logs
  ```
  Aug 31 11:07:24 zhouqi-mac WeChat[9676]: setupHotkeyListenning event NSEvent: type=KeyDown loc=(0,703) time=115959.8 flags=0 win=0x0 winNum=7041 ctxt=0x0 chars="u" unmodchars="u" repeat=0 keyCode=32
  ```
- Application debug logs
  ```
  __FILE__:build/release64/sls/shennong_worker/ShardDataIndexManager.cpp
  __LEVEL__:WARNING
  __LINE__:238
  __THREAD__:31502
  offset:816103453552
  saved_cursor:1469780553885742676
  seek count:62900
  seek data redo
  log:pangu://localcluster/redo_data/41/example/2016_08_30/250_1472555483
  user_cursor:1469780553885689973
  ```
- Trace logs
  ```
  [2013-07-13 10:28:12.772518]  [DEBUG] [26064]  __TRACE_ID__:661353951201  __item__:[Class:Function]_end__  request_id:1734117  user_id:124 context:.....
  ```

You can use the following methods to collect server logs:

- Create a log collection task to write logs to a specified log stream.
- Ingest CCE logs to LTS to collect logs generated in Docker. For details, see **Ingesting CCE Application Logs to LTS**.
- Use SDKs to write C#, Python, Java, PHP, and C logs into LTS. For details, see **SDK Overview**.

Collecting Logs from Various Network Environments

LTS provides access points in each region, enabling three access methods:

- Intranet (classic network): Cloud services in the same region as LTS can access LTS via the intranet, which features high-bandwidth links and is the recommended method.
- Public network (classic network): Any access is allowed. The access speed depends on the link quality. In this case, HTTPS is recommended for transmission security.
- Private network (VPC): Cloud services in the same region as LTS can access LTS through VPCs.

3 Log Search and Analysis

3.1 Analyzing Huawei Cloud ELB Logs on LTS

Solution Overview

When distributing external traffic, ELB logs details of HTTP and HTTPS requests, such as URIs, client IP addresses and ports, and status codes.

You can use ELB access logs for auditing or search for logs by time and keyword. You can also obtain external access statistics by running SQL aggregation queries. For example, you can check the number of requests with 404 responses within a certain day, or analyze the unique visitors (UVs) or page views (PVs) within a week.

Planning Resources

You have purchased and used a Huawei Cloud load balancer.

Restrictions

ELB access logs only record layer 7 requests sent to the dedicated and shared load balancers. Requests to layer 4 shared load balancers are not logged.

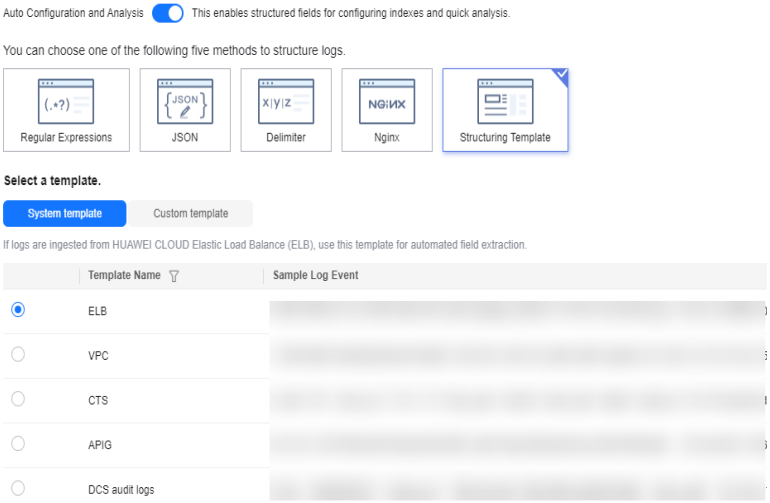
Analyzing Huawei Cloud ELB Logs on LTS

Step 1 Ingest ELB access logs to LTS. For details, see **Access Logging**.

Step 2 Click  in the upper left corner and choose **Management & Governance** > **Log Tank Service**.

Step 3 On the **Log Management** page, click a log stream name. On the log stream details page displayed, click  in the upper right corner. Go to the **Cloud Structuring Parsing** tab page, retain the default setting (enabled) of **Auto Configuration and Analysis**, click **Structuring Template**, select the ELB system template, and click **Save**. For details about quick analysis, see **Quick analysis**.

Figure 3-1 Selecting the ELB structuring template



Step 4 On the log stream details page, click the **Log Analysis** tab and run SQL queries and analysis. For details about how to visualize query results, see **Setting Cloud Structuring Parsing**.

- To count the PVs within a week, run the following SQL statement:
  ```
  select count(*) as pv
  ```
- To count the UVs within a week, run the following SQL statement:
  ```
  select count(distinct remote_port) as uv
  ```
- Statistics on 2xx/3xx/4xx/5xx (return codes) returned by all URIs in one day are collected to show the service execution result. The SQL query and analysis statements are as follows:
  ```
  select host, router_request_uri as url, count(*) as pv,
  sum(case when status >= 200 and status < 300 then 1 else 0 end )  as "2xx times",
  sum(case when status >= 300 and status < 400 then 1 else 0 end )  as "3xx times",
  sum(case when status >= 400 and status < 500 then 1 else 0 end )  as "4xx times",
  sum(case when status >= 500 and status < 600 then 1 else 0 end )  as "5xx times"
  group by host, router_request_uri
  order by pv desc
  limit 100
  ```

  The query results can be displayed in a table, or bar, line, pie, or number chart. For details, see **Statistical Charts**.

----End

3.2 Viewing ELB Log Analysis Results on the LTS Dashboards

You can run SQL statements to query and analyze ELB logs ingested to LTS in real time, save the results as charts, and view the charts in dashboards.

Prerequisites

- ELB logs have been collected. For details, see **Ingesting ELB Logs to LTS**.
- Log structuring has been configured. For details, see **Setting Cloud Structuring Parsing**.

Restrictions

- Up to 100 charts can be created for a log stream.
- Up to 50 charts can be added to a dashboard.
- Up to 10 filters can be added for a dashboard.
- Up to 100 dashboards can be created for a HUAWEI ID.
- Up to 100 dashboard templates can be created for a HUAWEI ID.
- Up to 200 dashboard groups can be created for a HUAWEI ID.
- Up to 200 dashboard template groups can be created for a HUAWEI ID.

Procedure

1. **Creating a Visual Chart**
2. **Adding a Chart to a Dashboard**
3. **Adding a Filter**

Creating a Visual Chart

Step 1 Use SQL statements to query and analyze logs.

1. Log in to the LTS console. In the navigation pane, choose **Log Management**.
2. In the log group list, click ⌄ on the left of a group, and click the desired log stream to go to its details page.
3. Click the **Log Analysis** tab. On the tab page displayed, select a time range, enter a SQL statement in the SQL search box, and click **Searching Logs**.
   - If the number of logs generated within the specified time range exceeds 1 billion, iterative query is triggered so you can view all logs in multiple queries. The message **Query status: Results are accurate** is displayed.
   - You can select various charts to display the query result.
   - For details about SQL queries, see **SQL Analysis Syntax**.

Step 2 Create a chart.

1. Click **Create**.

   You can also click **Save** to save the current query result as a new chart.
2. On the **Create Chart** page, set parameters as required.

   You can enable **Add to Dashboard** to add the new chart to a dashboard group.
3. Click **OK**.

Step 3 View the chart.

Click **Show Chart** to view the chart.

----End

Adding a Chart to a Dashboard

You can add a chart to a dashboard in either of the following ways:

Method 1:

Step 1 Hover your cursor over a chart name, and  will be displayed. Move the cursor onto the icon, and choose **Add to Dashboard** from the hover menu.

Step 2 In the dialog box displayed, select the target dashboard.

Step 3 Click **OK**.

----End

Method 2:

Step 1 Create a dashboard.

1. In the navigation pane, choose **Dashboards**.
2. On the page displayed, select a dashboard group under **Dashboards**.
3. Click **Add Dashboard**. On the **Create Dashboard** page, set parameters as required.

   For details about dashboard parameters, see **Visualizing Logs in Dashboards**.

Step 2 Add a chart to the dashboard.

1. On the **Create Dashboard** page, click **Add Chart**. On the page displayed, select the desired **chart**.
2. Click **OK**.

----End

Adding a Filter

To add a filter based on the configured variables, perform the following steps:

Step 1 In the navigation pane, choose **Dashboards**.

Step 2 On the page displayed, select a dashboard group under **Dashboards**.

Step 3 Click the name of the desired dashboard. Its details page is displayed.

Step 4 Click  . On the **Filter** page, set parameters and click **OK**.

For details about filter parameters, see **Adding a Filter**.

Step 5 Adjust the page layout and click **Save**.

Step 6 Check the filtering result.

----End

3.3 Analyzing Huawei Cloud WAF Logs on LTS

Solution Overview

WAF examines all HTTP and HTTPS requests to detect and block attacks such as SQL injections, cross-site scripting (XSS), Trojan upload, and command or code injections. You can check the access and attack logs for real-time decision-making, device O&M, and service trend analysis.

Analyzing WAF Logs in LTS

You can **analyze collected WAF logs in LTS**.

3.4 Embedding the LTS Log Query Page into a User-built System

Log query pages can be embedded into your systems. You can use the federation proxy mechanism of Identity and Access Management (IAM) for custom identity broker and embed a login link to your systems so you can view LTS logs in your systems without logging in to the Huawei Cloud console.

Application Scenarios

- With this function, you can log in to LTS from a user-built system without entering a password. However, you still need to enter a username and password when logging in to the Huawei Cloud LTS console.
- You can quickly integrate the query and analysis capabilities of LTS in external systems (such as an internal O&M or operations system).
- You do not need to manage multiple Huawei Cloud IAM users, facilitating log data sharing and viewing.

Embedding the LTS Log Query Page into a User-built System

Create an identity broker and an agency in IAM, and then embed the LTS log query page into your system.

Step 1 Log in to the IAM console, for example, as **DomainA**.

Step 2 Create an IAM user group (for example, **GroupC**) on the **User Groups** page and grant the **Agent Operator** permissions in global service to the user group. Users granted these permissions can only switch to the delegated account to access the authorized services. For details, see **Creating a User Group and Assigning Permissions**.

Step 3 Create an IAM user (for example, **UserB**) on the IAM console and add the user to **GroupC** by referring to **Adding Users to a User Group**.

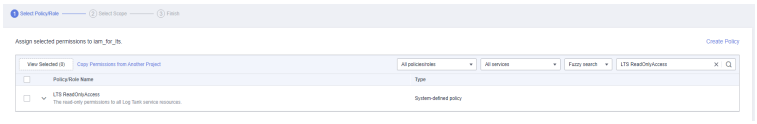
Ensure that the IAM user can use LTS through **programmatic access** or **on the console**. For details about how to change the IAM user access mode, see **Modifying IAM User Information**.

Step 4 In the navigation pane, choose **Agencies**. Then, click **Create Agency** in the upper right corner.

Step 5 Configure agency parameters.

1. For example, set **Agency Name** to **iam_for_lts**, **Agency Type** to **Account**, **Delegated Account** to **DomainA**, and **Validity Period** to **Unlimited**, and click **Next**.
2. Set the minimum authorization scope by selecting the **LTS ReadOnlyAccess** permissions, which grant users read-only access to query LTS data without the ability to modify LTS settings, and click **Next**.

Figure 3-2 Selecting a policy/role



3. Specify the authorization scope, select **Region-specific projects**, select the corresponding region as required, and click **OK**.

Step 6 Use tools such as Postman to obtain the **X-Subject-LoginToken** parameter. (The following figures are for reference only.)

1. Obtain the **X-Subject-Token** of **UserB** using the account and password.

   API type: POST

   API URL: Enter **https://*Endpoint*/v3/auth/tokens**, select the user-defined format for the parameters, and enter the following parameters: **name** indicates the tenant name, username, and tenant name from top to bottom, and **password** indicates the user password.

   An endpoint is the request address for calling an API. For the endpoints of IAM, see **Regions and Endpoints**.

```
{
    "auth" : {
        "identity" : {
            "methods" : [
                "password"
            ],
            "password" : {
                "user" : {
                    "domain" : {
                        "name" : "xxxxxxx"
                    },
                    "name" : "xxxxxx",
                    "password" : "xxxxxx"
                }
            }
        },
        "scope" : {
            "domain" : {
                "name" : "xxxxxx"
            }
        }
    }
}
```

   Obtain the **X-Subject-Token** field in the response header.

Figure 3-3 Response

2. Obtain the temporary access key based on the **X-Subject-Token** obtained in **1**.

   Add the **X-Auth-Token** field to the request header and set its value to the value of **X-Subject-Token** obtained in **1**.

   Figure 3-4 Obtaining a temporary access key

   API type: POST

   API URL: Enter **https://***Endpoint***/v3.0/OS-CREDENTIAL/securitytokens**, select the user-defined format for the parameters, and enter the following parameters: **agency_name** indicates the agency name, **domain_name** indicates the tenant name, **duration_seconds** indicates the token expiration time (in second), and **name** indicates the username.

```
{
	"auth" : {
		"identity" : {
			"methods" : [
				"assume_role"
			],
			"assume_role" : {
				"agency_name" : "iam_for_lts",
				"domain_name" : "xxxxxx",
				"duration_seconds" : 86400,
				"session_user" : {
					"name" : "xxxxxx"
				}
			}
		}
	}
}
```

   Obtain the temporary access key from the response body.

Figure 3-5 Obtaining a temporary access key

3. Obtain the login **X-Subject-LoginToken** based on the temporary access key obtained in **2**.

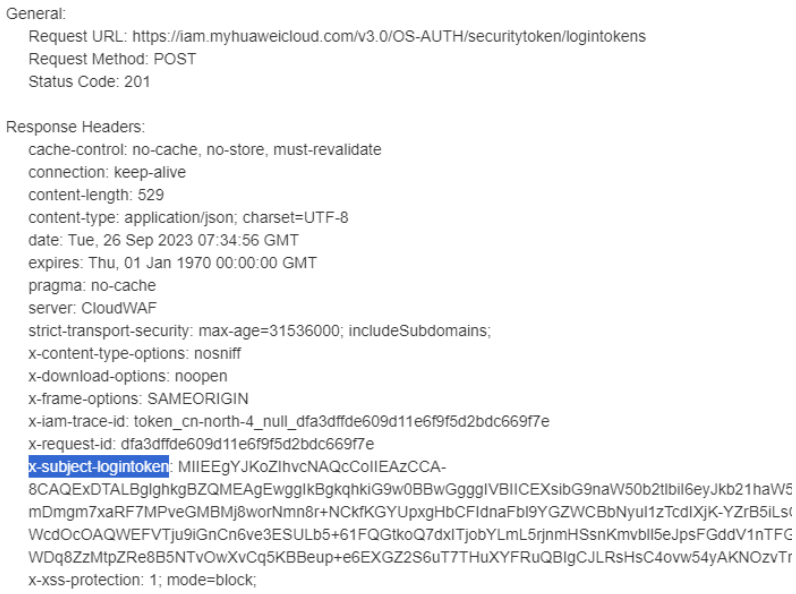
   API type: POST

   API URL: Enter **https://***Endpoint***/v3.0/OS-AUTH/securitytoken/logintokens**, select the user-defined format for the parameters, and enter the following parameters: The values of **access**, **secret**, and **id** are the values of **access**, **secret**, and **securitytoken** returned in **2**, respectively. **duration_seconds** indicates the token expiration time (in second).

```
{
    "auth" : {
        "securitytoken" : {
            "access" : "xxxxxx",
            "secret" : "xxxxxx",
            "id" : "xxxxxx",
            "duration_seconds" : 43200
        }
    }
}
```

   Obtain the **X-Subject-LoginToken** field in the response header.

Figure 3-6 Obtaining X-Subject-LoginToken



Step 7 Construct a proxy URL based on the **X-Subject-LoginToken** obtained in **3** to complete password-free login.

The rules for constructing a proxy URL are as follows:

https://auth.huaweicloud.com/authui/federation/login?service={target_console_url}&logintoken={logintoken}&idp_login_url={enterprise_system_loginURL}

Table 3-1 URL parameters

Parameter	Description
{target_console_url}	URLEncode encoding result of the LTS address description. For details, see **LTS URL**.
{logintoken}	URLEncode encoding result of **X-Subject-LoginToken** obtained in **3**.
{enterprise_system_loginURL}	(Optional) URLEncode encoding result of the customer's page address. When the loginToken verification fails, the page is displayed.

- The preceding three parameters must be encoded using URLEncode. Otherwise, password-free login may fail.
- To perform URLEncode encoding, open a browser, press **F12** to enter the developer mode, select **console**, enter **encodeURIComponent("*")**, and press **Enter** to view the returned URLEncode value. * indicates the information to be encoded.

The value of *{target_console_url}* is the URLEncode code of the URL of the LTS frontend service. The URL before encoding is as follows. **Table 3-2** describes the parameters.

https://console-intl.huaweicloud.com/lts/?region={regionId}&cfModuleHide=header_sidebar_floatlayer#/lts/logEventsLeftMenu/events?groupId={groupId}&topicId={topicId}&epsId={epsId}&condition={condition}

Table 3-2 Parameters

Parameter	Description
{regionId}	Region ID. After logging in to the console, obtain the region ID from the address bar of the browser.
{groupId}	Log group ID.
{topicId}	Log stream ID.
{epsId}	ID of the enterprise project of a log stream. If there is no enterprise project, the value is **0**.
{condition}	Log search criteria, for example, **name:a and age:12 and addr:*xx***. • Optional • The format of a single keyword is *key:value*. • Separate keywords with and. • A keyword cannot contain semicolons (;) or colons (:). • A keyword that contains special characters (+, =, ?, #, %, and &) must be converted into a hexadecimal value, that is, an ASCII code starting with % (%2B, %3D, %3F, %23, %25, and %26).

Step 8 After the preceding steps are complete, you can log in to LTS from your user-built system without entering a password.

Use the following iframe embedding. The value of **src** is the proxy URL obtained in **Step 7**.

The iframe embedding function requires that browsers allow third-party cookies. The setting procedure varies with browsers. For the Chrome browser, choose **Settings** > **Privacy and security** > **Third-party cookies** > **Allow third-party cookies**.

```
<body>
   <iframe src="target_url" width="100%" height="96%" id="ltsIframePage"></iframe>
</body>
```

----End

LTS URL

1. The basic URL of the Log Tank Service (LTS) homepage is as follows.
   https://console-intl.huaweicloud.com/lts/?region={regionId}&cfModuleHide=header_sidebar_floatlayer_rightsidebar#/cts/manager/groups

Table 3-3 Parameters

Parameter	Mandatory	Type	Description
regionId	Yes	String	Region ID. After logging in to the console, obtain the region ID from the address bar of the browser.

2. The basic URL of the log search page is as follows.

```
https://console-intl.huaweicloud.com/lts/?region={regionId}&cfModuleHide=header_sidebar_floatlayer_rightsidebar#/cts/logEventsLeftMenu/events?groupId={groupId}&topicId={topicId}&epsId={epsId}&hideHeader={hideHeader}&fastAnalysisCollapsed={fastAnalysisCollapsed}&hideDashboard={hideDashboard}&hideFeedback={hideFeedback}&isFoldLabel={isFoldLabel}&hideStreamName={hideStreamName}&showK8sFilter={showK8sFilter}&clusterId={clusterId}&hideBarChart={hideBarChart}&hideTabs={hideTabs}&condition={condition}
```

Table 3-4 Parameters

Parameter	Mandatory	Type	Default Value	Description
regionId	Yes	String	None	Region ID. After logging in to the console, obtain the region ID from the address bar of the browser.
groupId	Yes	String	None	Log group ID.
topicId	Yes	String	None	Log stream ID.
epsId	No	String	None	ID of the enterprise project of a log stream. If there is no enterprise project, the value is **0**.
hideHeader	No	Boolean	false	Whether to hide the list on the left and the horizontal log stream list on the top. If yes, set this parameter to **true**. This parameter takes effect only for iframe embedding.
fastAnalysisCollapsed	No	Boolean	false	Whether to collapse quick analysis. If yes, set this parameter to **true**.
hideDashboard	No	Boolean	false	Whether to hide the dashboard creation icon. If yes, set this parameter to **true**.
hideFeedback	No	Boolean	false	Whether to hide the comment button. If yes, set this parameter to **true**.

Parameter	Mandatory	Type	Default Value	Description
isFoldLabel	No	Boolean	true	Whether to display the **label** field in a new line in the log table. If yes, set this parameter to **true**.
hideStreamName	No	Boolean	false	Whether to hide the log stream name. If yes, set this parameter to **true**.
showK8sFilter	No	Boolean	false	Whether to display the container log filter criteria. For container log search, you can set this parameter to **true**.
clusterId	No	String	None	Cluster ID. This parameter is mandatory only when **showK8sFilter** is set to **true**.
hideBarChart	No	Boolean	false	Whether to collapse the log quantity statistics chart by default. If yes, set this parameter to **true**.
hideTabs	No	Boolean	false	Whether to hide the **Log Search**, **Log Analysis**, and **Real-Time Logs** tabs. By default, the tabs are not hidden. To hide them, set this parameter to **true**.
hideShare	No	Boolean	false	Whether to hide the sharing button. By default, the button is not hidden. To hide it, set this parameter to **true**. This parameter is available only in CN North-Beijing4.
keepOnline	No	Boolean	false	Whether to keep the login state. If you want to stay logged-in and do not log out, set this parameter to **true**.
condition	No	String	None	Log search criteria, for example, **name:a and age:12 and addr:*xx***. • Optional • The format of a single keyword is *key*:*value*. • Separate keywords with and. • A keyword cannot contain semicolons (;) or colons (:). • A keyword that contains special characters (+, =, ?, #, %, and &) must be converted into a hexadecimal value.

3. The basic URL of the visualized log search page is as follows.


```
https://console-intl.huaweicloud.com/lts/?
region={regionId}&cfModuleHide=header_sidebar_floatlayer_rightsidebar#/cts/logEventsLeftMenu/
events?visualization=true&groupId={groupId}&topicId={topicId}&epsId={epsId}&sql={sql}
```

Table 3-5 Parameters

Parameter	Mandatory	Type	Default Value	Description
regionId	Yes	String	None	Region ID. After logging in to the console, obtain the region ID from the address bar of the browser.
groupId	Yes	String	None	Log group ID.
topicId	Yes	String	None	Log stream ID.
epsId	No	String	None	ID of the enterprise project of a log stream. If there is no enterprise project, the value is **0**.
hideHeader	No	Boolean	false	Whether to hide the list on the left and the horizontal log stream list on the top. If yes, set this parameter to **true**.
sql	No	String	None	SQL query statement, for example, SELECT count (*).

4. The basic URL of the dashboard page is as follows.

```
https://console-intl.huaweicloud.com/lts/?
region={regionId}&cfModuleHide=header_sidebar_floatlayer_rightsidebar#/cts/manager/dashboard?
dashboardId={dashboardId}&hideDashboardList={hideDashboardList}&showCurrentdashboardGroup={
showCurrentdashboardGroup}&streamId={streamId}&streamDisabled={streamDisabled}&readonly={re
adonly}&filter=key1:value1,value2;key2:value3,value4&autoFresh={autoFresh}
```

Table 3-6 Parameters

Parameter	Mandatory	Type	Default Value	Description	Example Value
regionId	Yes	String	None	Region ID. After logging in to the console, obtain the region ID from the address bar of the browser.	region=xx-xx-xx

Parameter	Mandatory	Type	Default Value	Description	Example Value
dashboardId	No	String	None	ID of the dashboard to be displayed. The default value is "". Add this parameter when you want to display a dashboard by default.	dashboardId=xxxxxxxx
hideDashboardList	No	Boolean	false	Indicates whether to hide the dashboard drop-down list box. By default, the drop-down list box is not hidden. To hide it, set this parameter to **true**. Set this parameter to **true** when you want to hide the dashboard drop-down list box.	hideDashboardList=true
showCurrentdashboardGroup	No	Boolean	false	Indicates whether to display only the dashboard of the current group or template. The default value is **false**. Set this parameter to **true** when you want to display only the dashboard of the current group or template. Note: If **hideDashboardList** is set to **true**, this parameter is invalid.	showCurrentdash-boardGroup=true

Parameter	Mandatory	Type	Default Value	Description	Example Value
streamId	No	String	None	Log stream ID: The default value is "". This parameter applies only to dashboard templates. Add this parameter when you want to select a specified log stream by default.	streamId=xxxxxx
streamDisabled	No	Boolean	false	By default, log streams can be selected from the log stream drop-down list. If you set this parameter to **true**, log streams cannot be selected from the drop-down list. This parameter applies only to dashboard templates. Add this parameter when you want to disable the log stream drop-down list.	streamDisabled=true

Parameter	Mandatory	Type	Default Value	Description	Example Value
filter	No	String	None	Filter parameter. The value is the name of the filter to be selected and the selected item. **key1** and **key2** indicate the filter names. **value1** and **value2** indicate the values to be selected for **key1**. **value3** and **value4** indicate the values to be selected for **key2**. Separate filters by semicolons (;), and selected items by commas (,). Add this parameter when the keys and values of some filters need to be selected by default on the embedded dashboard page.	filter=key1:value1,value2;key2:value3,value4
readonly	No	Boolean	false	Indicates whether the scenario is read-only. In the read-only scenario, operation-related buttons are hidden, for example, creating a filter and adding, modifying, or deleting a dashboard. Add this parameter when you only need to display the dashboard and do not need the operation permission.	readonly=true

Parameter	Mandatory	Type	Default Value	Description	Example Value
autoFresh	No	String	None	Scheduled refresh interval. The default value is "". Add this parameter when you need to specify the default scheduled refresh interval. Currently, the refresh interval can be **0m** (irregular refresh), **1m** (scheduled refresh per 1 min), **5m** (scheduled refresh per 5 min), or **15m** (scheduled refresh per 15 min).	autoFresh=1m

3.5 Displaying Query and Analysis Results on Pages

If there are too many query and analysis results, the display speed and query experience are reduced. LTS can display query and analysis results on multiple pages. You can control the number of logs returned each time. This practice describes how to display query and analysis results on multiple pages.

Pagination Modes

The log search and statistical chart functions of LTS allows you to use query and analysis statements to query keywords and perform SQL analysis on the query results.

- Log search: Search raw logs by keyword. You can use the **line_num**, **search_type**, **limit**, and **is_desc** parameters in the log query API to achieve pagination effects. For more information, see **Querying Logs**.
- Statistical charts: Use SQL statements to analyze query results and obtain statistics. You can use the SQL LIMIT syntax to implement pagination. For more information, see **SQL Analysis Syntax**.

Pagination in Log Queries

The **line_num**, **search_type**, **limit**, and **is_desc** parameters in the log query API are described as follows:

- **line_num**: sequence number of the final log event in the last query result. This parameter is not required for the first query, but is required for

subsequent pagination queries. The value can be obtained from the response of the last query. The value of **line_num** should be between the values of **start_time** and **end_time**. If the custom time function is enabled, you need to use both this field and the **__time__** field for pagination queries.

- **search_type**: The value is **init** (default value) for the first query, or **forwards** or **backwards** for a pagination query. This parameter is used together with **is_desc** for pagination queries.
- **limit**: number of log events to be queried each time. The default value is **50** when this parameter is not set. You are advised to set this parameter to **100**.
- **is_desc**: whether the search order is descending or ascending. The default value is **false** (ascending order).

For pagination reading, obtain the value of **line_num** from the last query result, set **search_type** to determine the direction of pagination (backward or forward), set **limit** to the number of log events queried each time, and set the time sequence of logs with **is_desc**. If the returned value of **isQueryComplete** is **true**, all data has been read.

- The following uses Java code as an example. For more information, see **LTS Java SDK**.

```
package com.huaweicloud.sdk.test;
import com.huaweicloud.sdk.core.auth.ICredential;
import com.huaweicloud.sdk.core.auth.BasicCredentials;
import com.huaweicloud.sdk.core.exception.ConnectionException;
import com.huaweicloud.sdk.core.exception.RequestTimeoutException;
import com.huaweicloud.sdk.core.exception.ServiceResponseException;
import com.huaweicloud.sdk.lts.v2.region.LtsRegion;
import com.huaweicloud.sdk.lts.v2.*;
import com.huaweicloud.sdk.lts.v2.model.*;
public class ListLogsSolution  {
    public static void main(String[] args) {
        // The AK and SK used for authentication are hard-coded or stored in plaintext, which has great security risks. It is recommended that the AK and SK be stored in ciphertext in configuration files or environment variables and decrypted during use to ensure security.
        // In this example, AK and SK are stored in environment variables for authentication. Before running this example, set environment variables CLOUD_SDK_AK and CLOUD_SDK_SK in the local environment
        String ak = System.getenv("CLOUD_SDK_AK");
        String sk = System.getenv("CLOUD_SDK_SK");
        ICredential auth = new BasicCredentials()
            .withAk(ak)
            .withSk(sk);
        LtsClient client = LtsClient.newBuilder()
            .withCredential(auth)
            .withRegion(LtsRegion.valueOf("region"))
            .build();
        ListLogsRequest request = new ListLogsRequest();
        request.withLogGroupId("group_id");
        request.withLogStreamId("stream_id");
        QueryLtsLogParams body = new QueryLtsLogParams();
        // Number of raw log events returned each time
        body.withLimit(3);
        // Turn page backwards or forwards. This parameter can be left blank or set to the default value (init) for the first query.
        body.withSearchType(QueryLtsLogParams.SearchTypeEnum.fromValue("init"));
        // Whether to query log events in descending order by time.
        body.withIsDesc(false);
        // Query end time.
        body.withEndTime("1727429160000");
        // Query start time.
        body.withStartTime("1727428260000");
        // Whether to return the number of results.
        body.withIsCount(true);
```



```
        request.withBody(body);
        while (true) {
            try {
                ListLogsResponse response = client.listLogs(request);
                System.out.println(response.toString());
                // If the number of log events is equal to the value of limit, some log events have not
been queried. Continue to query logs.
                if (response.getCount() < 3) {
                    return;
                }
                // Obtain the sequence number of the final log event in the last query result. Use it as the
start sequence number of this query.
                body.withLineNum(response.getLogs().get(2).getLineNum());
                // Turn page backwards or forwards.
                body.withSearchType(QueryLtsLogParams.SearchTypeEnum.fromValue("forwards"));
            } catch (ConnectionException e) {
                e.printStackTrace();
            } catch (RequestTimeoutException e) {
                e.printStackTrace();
            } catch (ServiceResponseException e) {
                e.printStackTrace();
                System.out.println(e.getHttpStatusCode());
                System.out.println(e.getRequestId());
                System.out.println(e.getErrorCode());
                System.out.println(e.getErrorMsg());
            }
        }
    }
}
```

Pagination in Statistical Charts

You can use the Limit syntax in SQL to analyze and display analysis results.

```
limit num offset num2
```

Example:

```
* | select hostid,podname  limit 0
* | select hostid,podname  limit 500 offset 500
```

The parameters are described as follows:

- **offset**: the line from which the analysis result is read.
- **limit**: the number of lines to be read. The maximum value is 100,000. Reading too many lines at a time will increase network latency and slow down client processing.

Assume that you use the *** | select hostid,podname limit 20 offset 10** statement to query and analyze logs and specify that 100 lines of logs are to be returned. You can set the query to read 20 lines at a time and complete the task in five reads as follows.

- The following uses Java code as an example. For more information, see .

```
package com.huaweicloud.sdk.test;
import com.huaweicloud.sdk.core.auth.ICredential;
import com.huaweicloud.sdk.core.auth.BasicCredentials;
import com.huaweicloud.sdk.core.exception.ConnectionException;
import com.huaweicloud.sdk.core.exception.RequestTimeoutException;
import com.huaweicloud.sdk.core.exception.ServiceResponseException;
import com.huaweicloud.sdk.lts.v2.region.LtsRegion;
import com.huaweicloud.sdk.lts.v2.*;
import com.huaweicloud.sdk.lts.v2.model.*;
public class ListLogsSolution {
    public static void main(String[] args) {
        // The AK and SK used for authentication are hard-coded or stored in plaintext, which has great
```



```
security risks. It is recommended that the AK and SK be stored in ciphertext in configuration files or environment variables and decrypted during use to ensure security.
        // In this example, AK and SK are stored in environment variables for authentication. Before running this example, set environment variables CLOUD_SDK_AK and CLOUD_SDK_SK in the local environment
        String ak = System.getenv("CLOUD_SDK_AK");
        String sk = System.getenv("CLOUD_SDK_SK");
        ICredential auth = new BasicCredentials()
            .withAk(ak)
            .withSk(sk);
        LtsClient client = LtsClient.newBuilder()
            .withCredential(auth)
            .withRegion(LtsRegion.valueOf("region"))
            .build();
        ListLogsRequest request = new ListLogsRequest();
        request.withLogGroupId("group_id");
        request.withLogStreamId("stream_id");
        QueryLtsLogParams body = new QueryLtsLogParams();
        body.withIsAnalysisQuery(true);
        // offset indicates the query offset. Set it to 0 for the first query. limit indicates the number of returned records, with a maximum value of 10,000.
        long offset = 0;
        long limit = 3;
        // Modify the offset in the SQL statement.
        body.withQuery(String.format("* | select hostid,podname limit %s offset %s",limit,offset));
        body.withEndTime("1727429160000");
        body.withStartTime("1727428260000");
        request.withBody(body);
        while (true) {
            try {
                ListLogsResponse response = client.listLogs(request);
                System.out.println(response.toString());
                if (response.getAnalysisLogs().size() < 3) {
                    return;// Pagination query. If an empty result is returned, the query is complete and the loop exits.
                }
                offset = offset + limit;
                body.withQuery(String.format("* | select hostid,podname limit %s offset %s",limit,offset));
            } catch (ConnectionException e) {
                e.printStackTrace();
            } catch (RequestTimeoutException e) {
                e.printStackTrace();
            } catch (ServiceResponseException e) {
                e.printStackTrace();
                System.out.println(e.getHttpStatusCode());
                System.out.println(e.getRequestId());
                System.out.println(e.getErrorCode());
                System.out.println(e.getErrorMsg());
            }
        }
    }
}
```

3.6 Optimizing Regular Expressions for Faster Log Parsing

Regular expressions are widely used to extract and parse log fields in log ingestion, search, analysis, and alarm reporting. Performance testing reveals significant variations in parsing efficiency across different regular expressions. To improve log parsing efficiency, you can optimize regular expressions by refining matching rules, optimizing quantifiers, and narrowing the matching range.

Performance Test Data

1. Test the following example log. This log contains a typical structure: timestamp *[YYYY-MM-DD_HH:MM:SS]*, log level *[LEVEL]*, module name *[MODULE]*, and service data.
   ```
   est log is: [2025-06-05_10:04:36] [WARNING] [MODULE_ecdio] -
   m9nTW7s4YVSh1ImDMV2y;51+0FSNo5
   ```
2. Analyze the performance test results.

Regular Expression	Time for 10 Million Matches	Performance Improvement Ratio	Description
\[.*\]	5.0614793 s	Reference value	Greedy mode. It matches **[2025-06-05_10:04:36] [WARNING] [MODULE_ecdio]** and takes a long time.
^\[.*\]	5.0501595 s	0.22%	Adds a start limit.
\[\S*\]	1.8859162 s	62.7%	Matches on-whitespace characters, that is, **[2025-06-05_10:04:36]**.
^\[\S*\]	1.8838008 s	62.8%	Adds a start limit.
^\[\d*-\d*-\d*_ \d*:\d*:\d*\]	1.4906888 s	70.6%	Specifies a digit format.
^\[\d{4}-\d{2}-\d{2}_ \d{2}:\d{2}:\d{2}\]	851.6531 ms	83.2%	Adds a digit length limit.

3. Conclusion:
   - Replacing **.*** with **\S*** improves performance by over 60%, proving the importance of precise character definition.
   - Using the anchor **^** slightly improves performance by 0.22%, but it is critical for multi-line matching.
   - Replacing **\d*** with **\d***{Fixed length}* further improves performance, verifying the effectiveness of precise quantifiers.

Regular Expression Optimization Suggestions

Regular expression performance optimization is critical for data collection system optimization. Precise character definition, proper use of quantifiers, systematic debugging, and advanced skills can significantly reduce the matching complexity for engines and improve collection efficiency.

1. **Precisely define matching characters to narrow down the search range and reduce backtracking**.

- Replace general matching with precise character groups. For example, use **[a-zA-Z]** for letters, **\d** or **[0-9]** for digits, and **\D** or **[^0-9]** for non-digits.
- For timestamps, use **\d** to represent the year, month, day, hour, minute, and second, as they are digits.
- Delimiter **-** and _ are fixed characters and can be directly included in patterns.
- Use **\S** (equivalent to **[^\s]**) to replace non-whitespace characters.

2. **Properly use quantifiers to balance matching accuracy and efficiency.**

   Use **+** instead of ***** whenever possible to reduce unnecessary checks, as **+** requires at least one match.

3. **Use anchors (^ and $) to specify exact start and end positions, narrowing the matching range and improving efficiency.**

   Avoid using anchors **^** and **$** with **.***, for example, **^.*pattern**, as this does not improve performance.

4. **Use the boundary character \b to extract a specific log level, such as [WARNING].**
   - Inefficient: **\[.*?\]**
   - Efficient: **\bWARNING\b**. It uses word boundaries to avoid matching interference items such as **WARNINGLY**.

4 Log Transfer

4.1 Changing File Time Zones for Log Transfer in a Batch

For recurring tasks like configuring log ingestion, alarm rules, and log transfer, batch operations are not supported on the LTS console. You can use Python scripts and LTS APIs to perform custom operations in a batch.

Scenario

If you have created 1,000 rules for log transfer to OBS but set all file time zones to **(UTC) Coordinated Universal Time**, you need to change it to UTC+08:00. Currently, the LTS console does not allow batch modifying log transfer rules. Manually modifying each transfer rule will be time-consuming.

Prerequisites

1. Prepare a Linux host.
2. Check the API document.
   - Obtain information about all transfer tasks by calling the log transfer querying API.
   - Change the time zones configured for transfer tasks by calling the log transfer updating API.
3. Test API functions in API Explorer, which provides API search and platform debugging capabilities.
4. Install the Python SDK on the host by referring to the API Explorer sample code.
   - Python **SDK dependency address** and **SDK usage description**:
     ```
     pip install huaweicloudsdklts
     ```
   - API Explorer provides sample code for calling APIs using Python. Example:
     ```
     # coding: utf-8
     import os
     from huaweicloudsdkcore.auth.credentials import BasicCredentials
     from huaweicloudsdklts.v2.region.lts_region import LtsRegion
     from huaweicloudsdkcore.exceptions import exceptions
     ```



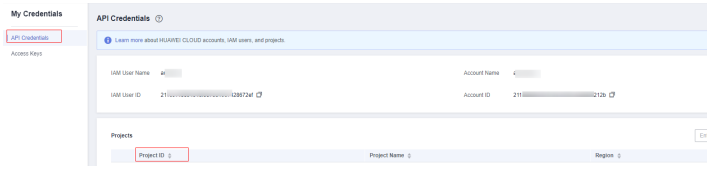
```
from huaweicloudsdklts.v2 import *
if __name__ == "__main__":
    # The AK and SK used for authentication are hard-coded or stored in plaintext, which has great security risks. It is recommended that the AK and SK be stored in ciphertext in configuration files or environment variables and decrypted during use to ensure security.
    # In this example, AK and SK are stored in environment variables for authentication. Before running this example, set environment variables CLOUD_SDK_AK and CLOUD_SDK_SK in the local environment
    /* Hardcoded or plaintext AK and SK are risky. For security, encrypt your AK and SK and store them in the configuration file or as environment variables.
    ak = os.environ["CLOUD_SDK_AK"]
    sk = os.environ["CLOUD_SDK_SK"]
    credentials = BasicCredentials(ak, sk)
    client = LtsClient.new_builder() \
        .with_credentials(credentials) \
        .with_region(LtsRegion.value_of("xx")) \
        .build()
    try:
        request = ListTransfersRequest()
        response = client.list_transfers(request)
        print(response)
    except exceptions.ClientRequestException as e:
        print(e.status_code)
        print(e.request_id)
        print(e.error_code)
        print(e.error_msg)
```

Changing File Time Zones for Log Transfer in a Batch

Step 1 Obtain the parameter and replace it with the actual value in the code.

- **Obtain an AK/SK pair of the Huawei account**.
- Obtain the project ID. For details, see **API Credentials**.

Figure 4-1 Obtaining the project ID



- Obtain the value of **Region&iam_Endpoint** from **Regions and Endpoints**.

Table 4-1 Endpoints

Region Name	Region	Endpoint	Protocol
AP-Bangkok	ap-southeast-2	lts.ap-southeast-2.myhuaweicloud.com	HTTPS
AP-Singapore	ap-southeast-3	lts.ap-southeast-3.myhuaweicloud.com	HTTPS
CN-Hong Kong	ap-southeast-1	lts.ap-southeast-1.myhuaweicloud.com	HTTPS

- Obtain the time zone and time zone ID.

  Table 4-2 Common time zones

Time Zone	Time Zone ID
UTC-12:00	Etc/GMT+12
UTC-11:00	Etc/GMT+11
UTC-10:00	Pacific/Honolulu
UTC-09:00	America/Anchorage
UTC-08:00	America/Santa_Isabel
UTC-07:00	America/Chihuahua
UTC-06:00	America/Chicago
UTC-05:00	America/New_York
UTC-04:00	America/Santiago
UTC-03:00	America/Sao_Paulo
UTC-02:00	Etc/GMT+2
UTC-01:00	Atlantic/Azoresjavik
UTC+00:00	Europe/London
UTC+01:00	Europe/Paris
UTC+02:00	Europe/Istanbul
UTC+03:00	Europe/Minsk
UTC+04:00	Europe/Moscow
UTC+05:00	Asia/Tashkent
UTC+06:00	Asia/Almaty
UTC+07:00	Asia/Bangkok
UTC+08:00	Asia/Shanghai
UTC+09:00	Asia/Tokyo
UTC+10:00	Asia/Yakutsk
UTC+11:00	Asia/Vladivostok
UTC+12:00	Pacific/Fiji
UTC+13:00	Pacific/Apia

Step 2 Run the following command on the host to check whether the **huaweicloudsdkcore** and **huaweicloudsdklts** packages have been installed:

```
pip list | grep huaweicloudsdk
```

- If they have been installed, the command output displays information about **huaweicloudsdk**.
- If not, no information is returned. Run the following command to install them:

  ```
  pip install huaweicloudsdkcore huaweicloudsdklts
  ```

Step 3 Run the **vi lts_python.py** command on the host to create the **lts_python.py** file. Then, copy the following code to the file to batch change the time zones of files to be transferred to OBS.

```
# coding: utf-8

from huaweicloudsdkcore.auth.credentials import BasicCredentials
from huaweicloudsdkcore.exceptions import exceptions
from huaweicloudsdklts.v2 import *
from huaweicloudsdklts.v2.region.lts_region import LtsRegion
/* Hardcoded or plaintext AK and SK are risky. For security, encrypt your AK and SK and store them in the configuration file or as environment variables.
if __name__ == "__main__":
AK = "your ak"
SK = "your sk"
PROJECT_ID = "your project id"
REGION = "your region"
IAM_ENDPOINT = "iam_endpoint"

OBS_TIME_ZONE = "the time_zone you want to change"
OBS_TIME_ZONE_ID = "time_zone_id"

credentials = BasicCredentials(AK, SK, PROJECT_ID).with_iam_endpoint(IAM_ENDPOINT)

client = LtsClient.new_builder() \
    .with_credentials(credentials) \
    .with_region(LtsRegion.value_of(REGION)) \
    .build()

# 1.get obs transfer task
try:
    request = ListTransfersRequest()
    request.log_transfer_type = "OBS"
    response = client.list_transfers(request)
    obs_transfer_num = len(response.log_transfers)
    task_list = response.log_transfers
    print("#### get {} obs transfer task ####".format(obs_transfer_num))
except exceptions.ClientRequestException as e:
    print(e.status_code)
    print(e.request_id)
    print(e.error_code)
    print(e.error_msg)

# 2.set obs transfer task obs_time_zone to UTC+08:00
CNT = 1
while len(task_list):
    transfer_task = task_list.pop()
    print("There are still {} progress: \n".format(len(task_list)), transfer_task)
    try:
        if transfer_task.log_transfer_info.log_transfer_detail.obs_time_zone == OBS_TIME_ZONE:
            CNT += 1
            continue
        request = UpdateTransferRequest()
        transfer_task.log_transfer_info.log_transfer_detail.obs_time_zone = OBS_TIME_ZONE
        transfer_task.log_transfer_info.log_transfer_detail.obs_time_zone_id = OBS_TIME_ZONE_ID
        request.body = UpdateTransferRequestBody(
            log_transfer_info=transfer_task.log_transfer_info,
            log_transfer_id=transfer_task.log_transfer_id
        )
        response = client.update_transfer(request)
        CNT += 1
```



```
except exceptions.ClientRequestException as e:
    print(e.status_code)
    print(e.request_id)
    print(e.error_code)
    print(e.error_msg)
    task_list.append(transfer_task)
except exceptions.ServerResponseException as e:
    print({
        "target": transfer_task.log_streams,
        "reason": e
    })
    task_list.append(transfer_task)
```

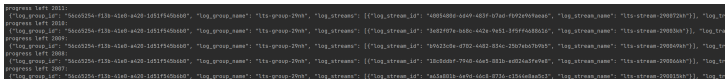
Step 4 Run the Python script on the host to batch change the time zones of files to be transferred to OBS.

```
nohup python lts_python.py > lts_python.log &
```

Step 5 View execution logs to check whether the Python script has been executed and whether the files' time zones have been changed.

```
tail -f lts_python.log
```

Figure 4-2 Viewing execution logs



----End

5 Log Alarms

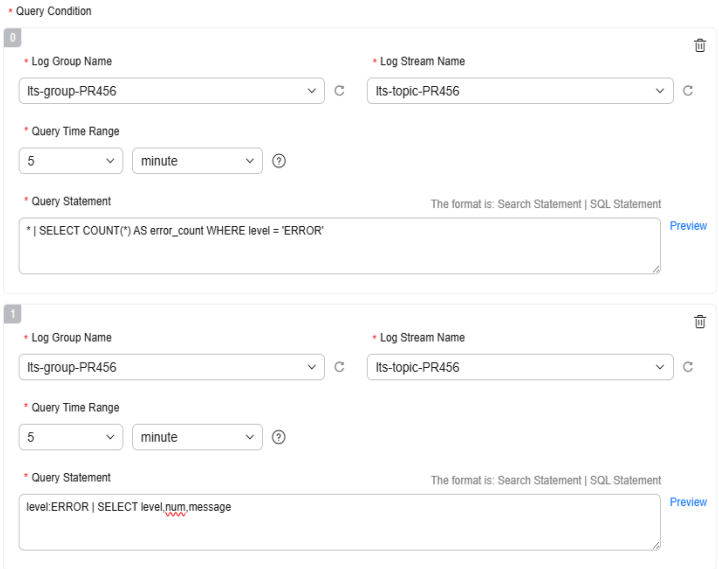
5.1 Using Multi-Chart Query Results for Alarm Detection and Notification

When configuring alarm rules, you may need to use the query results of multiple charts. You can **use the query result of the first chart to detect alarms and include the query results of other charts in alarm notifications**.

For example, you want to monitor error logs and trigger an alarm if 10 logs whose level is **ERROR** are generated within 5 minutes. The alarm notification email will then include the query result of error logs, including parameters **level** (log severity), **num** (log number), and **message** (error information).

To do this, you would add two charts to your alarm rule.

Figure 5-1 Chart details



- First chart (numbered **0**): queries the number of logs whose level is **ERROR**. The query result is used to define the detection rule's condition.

- Second chart (numbered **1**): queries error log details, including **level**, **num**, and **message**. These results will be included in the alarm notification email body.

You can follow the following steps to configure an alarm rule for this scenario.

Creating a Message Template

A message template provides a fixed format for your alarm notifications. When an alarm is triggered, the system automatically populates the template's variables with content from your alarm rules. For example, to include the query result of error logs in your email notifications, add the following statement to **Body** of your message template:

```
Query log: $event.annotations.results[1].raw_results
```

Step 1 Log in to the **LTS console**.

Step 2 Choose **Log Alarms** in the navigation pane.

Step 3 Click **Alarm Notification Rules**.

Step 4 Click the **Message Templates** tab and click **Create**. The **Create Message Template** right pane is displayed.

Step 5 Set parameters by referring to **Table 5-1**.

Figure 5-2 Message template

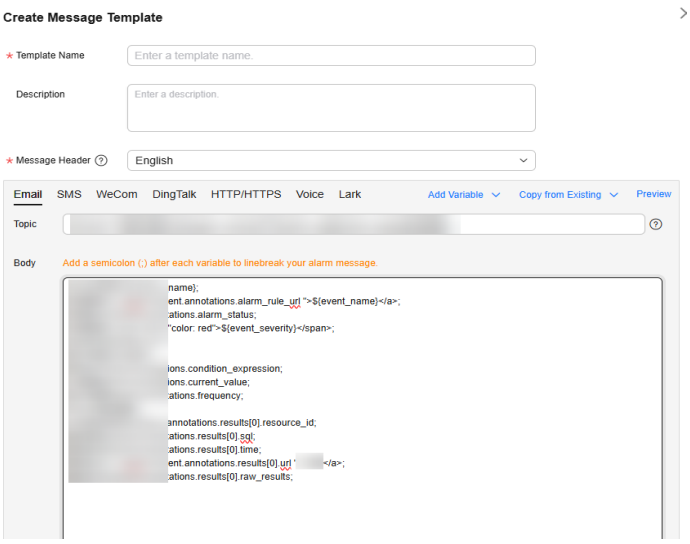


Table 5-1 Parameters for creating a message template

Parameter	Example Value	Description
Template Name	**multi_table_query**	Message template name. Use only digits, letters, underscores (_), and hyphens (-). Do not start or end with an underscore or hyphen. Enter up to 100 characters.
Description	-	Description of a message template. Use only digits, letters, and underscores (_). Do not start or end with an underscore. Enter up to 1,024 characters.
Message Header	**Chinese (Simplified)**	A header (for example, "Dear customer") will be added to each message by default.
Notification method	**Email**	Notification method.
Topic	**Huawei Cloud LTS Notification: [${region_name}] and ${starts_at} O&M Notification**	Email subject. You can specify a subject or use variables. A subject can contain a maximum of 512 characters. Variables: • Occurrence region: **${region_name}** • Occurrence time: **${starts_at}**

Parameter	Example Value	Description
Body	Huawei Cloud account: **${domain_name};** Alarm rule: **${event_name};** Alarm status: **$event.annotations.alarm_status;** Alarm severity: **${event_severity};** Occurrence time: **${starts_at};** Expression: **$event.annotations.condition_expression;** Current value: **$event.annotations.current_value;** Statistical period: **$event.annotations.frequency;** Log group/stream name: **$event.annotations.results[1].resource_id;** Query statement: **$event.annotations.results[1].sql;** Query URL: **Details;** Query log: **$event.annotations.results[1].raw_results;**	You can insert variables into your email body. Variables: ● Huawei Cloud account: **${domain_name}** ● Alarm rule details link: **$event.annotations.alarm_rule_url** ● Original alarm rule name: **${event_name}** ● Alarm severity: **${event_severity}** ● Occurrence time: **${starts_at}** ● Alarm rule triggering condition expression: **$event.annotations.condition_expression** ● Current value of the condition expression: **$event.annotations.current_value** ● Statistical period: **$event.annotations.frequency** ● To include the log group/stream name from the second chart (chart **1**) for querying detailed error logs: **$event.annotations.results[1].resource_id** ● To include the query URL from the second chart (chart **1**) for querying detailed error logs, use this variable. Clicking the link will redirect you to the specific log stream details page: **$event.annotations.results[1].url** ● To include the query log result from the second chart (chart **1**) for querying detailed error logs: **$event.annotations.results[1].raw_results**

Step 6 Click **OK**.

----End

Creating an Alarm Notification Rule

Alarm notification rules link SMN topics with message templates. When an alarm is triggered, the system automatically sends an email notification using the specified message template.

Step 1 Log in to the **LTS console**.

Step 2 Choose **Log Alarms** in the navigation pane.

Step 3 Click **Alarm Notification Rules**.

Step 4 On the **Alarm Notification Rules** tab page, click **Create**. Set parameters by referring to **Table 5-2**.

Figure 5-3 Alarm notification rule

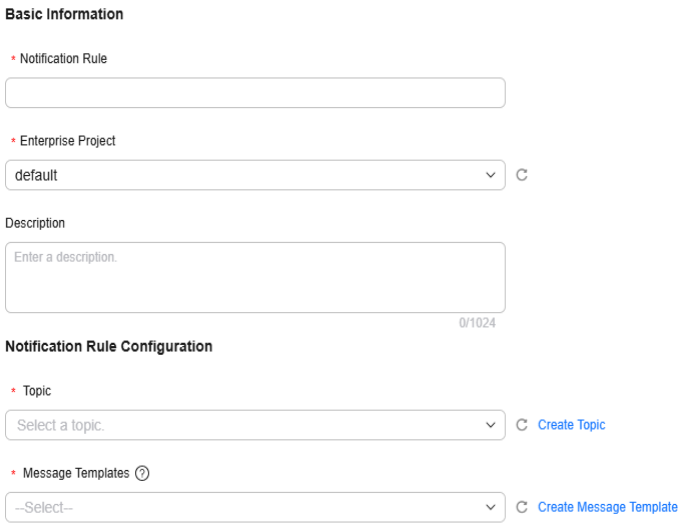


Table 5-2 Alarm notification rule parameters

Parameter	Example Value	Description
Notification Rule	**error_log_email_notification**	Notification rule name, which cannot be changed after the rule is created. Naming rules: Enter 1 to 64 characters. Only digits, letters, underscores (_), and hyphens (-) are allowed. Do not start or end with an underscore or hyphen.
Enterprise Project	**default**	Select an enterprise project. This parameter is displayed only when the enterprise project function is enabled for the current account.

Parameter	Example Value	Description
Description	-	Enter a description for the rule. Up to 1,024 characters are allowed.
Topic	**LTS**	Select an SMN topic. You can click **Create Topic** to access the SMN console, create a topic named **LTS**, and add a subscription (recipient email addresses) for it. For details about how to create a topic, see **Creating a Topic**. For details about how to subscribe to a topic, see **Adding a Subscription to a Topic**.
Message Templates	**multi_table_query**	Select a message template from the drop-down list.

Step 5 Click **OK**.

----End

Creating an Alarm Rule

An alarm rule defines the conditions that trigger alarms, including the query condition, detection rule, statistical period, notification frequency, and notification channel.

Step 1 Log in to the **LTS console**.

Step 2 Choose **Log Alarms** in the navigation pane.

Step 3 Click the **Alarm Rules** tab.

Step 4 Click **Create**.

Step 5 On the displayed **Create Alarm Rule** right panel, set parameters as follows:

1. Configure the **Basic Info** parameters.

Figure 5-4 Basic Info

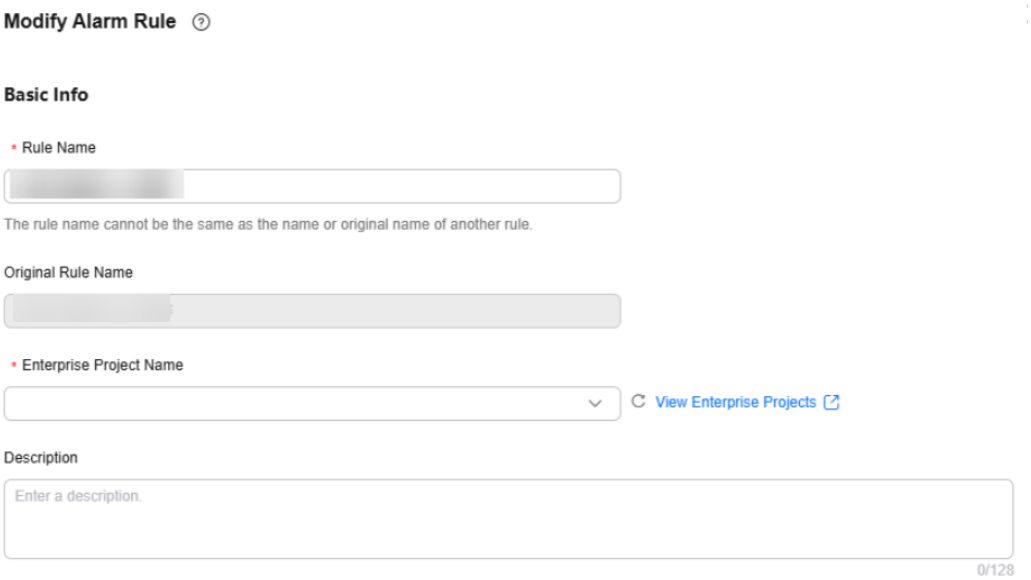


Table 5-3 Basic information about search analysis alarms

Parameter	Example Value	Description
Rule Name	**error_log_alarm**	Define a name for your alarm rule based on service requirements. After the rule is created, move the cursor to the rule name in the rule list to view both the rule name and the original rule name. You can modify the rule name, but cannot modify the original rule name (defined during rule creation). **Naming rules:** Use only letters, digits, hyphens (-), and underscores (_). Do not start or end with a hyphen or underscore. Enter 1 to 128 characters.
Enterprise Project Name	**default**	Select the required enterprise project. The default value is **default**.
Description	**More than 10 ERROR-level logs were reported within 5 minutes. Log details are included.**	Brief description of the rule. Enter up to 128 characters.

2. Configure the **Statistical Analysis** parameters.

Figure 5-5 Statistical Analysis

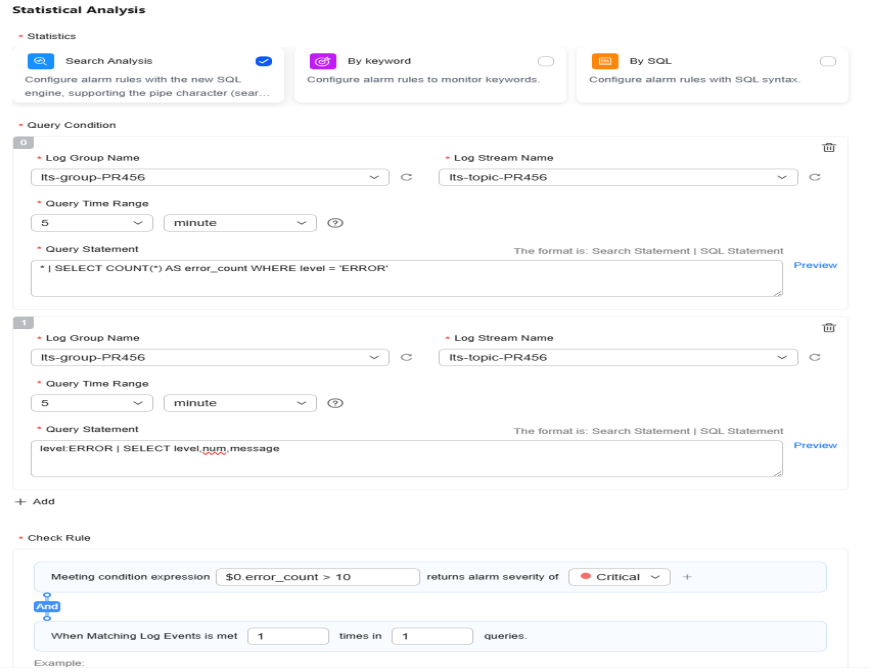


Table 5-4 Alarm rules based on Search | Analysis statistics

Parameter	Example Value	Description
Query Condition (query charts)	Add the first chart (chart 0), which is used for alarm detection rules.	
	lts-group-PR456	**Log Group**: Select the created log group **lts-group-PR456**.
	lts-topic-PR456	**Log Stream**: Select the created log stream **lts-topic-PR456**.
	5 minutes	**Query Time Range**: Specify the query period of the statement. It is one period earlier than the current time. For example, if **Query Time Range** is set to 5 minutes and the current time is 9:00, the query statement period is 8:55–9:00.
	*** | SELECT COUNT(*) AS error_count WHERE level = 'ERROR'**	**Query Statement**: Enter a statement in the following format. `Search statement | SQL analysis statement` LTS monitors logs in the log stream based on the configured statement. Enter a query statement and click **Preview** to see the query result.

Parameter	Example Value	Description
	Click **Add** to add a chart (chart 1), which is used to display log content. The log group, log stream, and query time range should be the same as the previous chart. Set the query statement to: **level:ERROR | SELECT level,num,message**	
Check Rule	**$0.error_count > 10**	Enter a specific condition expression. When the expression execution result is **true**, an alarm is generated. When a condition expression is associated with multiple charts, the following format must be used to reference fields in the condition expression: ${*Query condition No.*}.{*Query statement field*} **$0.error_count** indicates the **error_count** field in the query statement *** | SELECT COUNT(*) AS error_count WHERE level = 'ERROR'** of the first chart (chart 0). The second chart (chart **1**) is used to query the **level**, **num**, and **message** fields of error logs. It is not used for the alarm verification rule. The corresponding variables have been added to the body as instructed in **Creating a Message Template**. **CAUTION** When multiple charts are used, the condition expression must contain the first chart (chart 0), that is, **$0**. Therefore, the sequence of the two charts in this example cannot be changed.

3. Configure the **Advanced Settings** parameters.

Figure 5-6 Advanced Settings

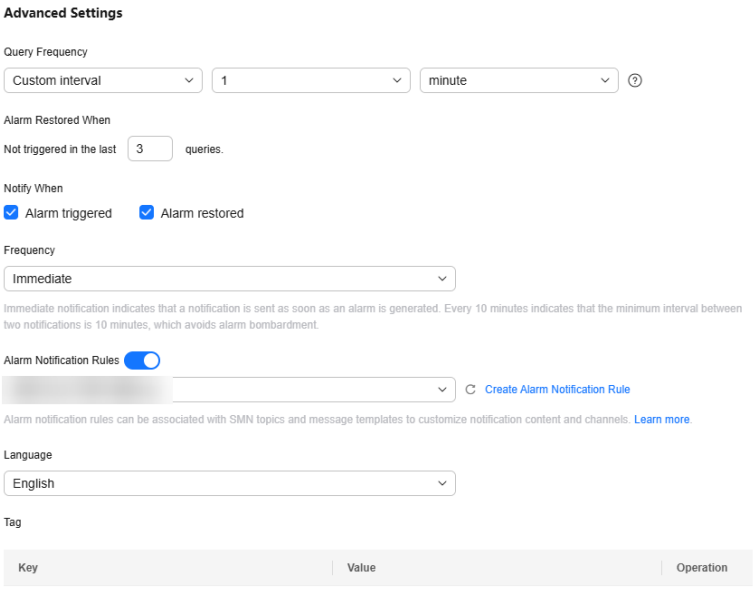


Table 5-5 Parameters of a search analysis alarm rule

Parameter	Example Value	Description
Query Frequency	**Custom interval: 1 minute**	If you set the query frequency of a condition expression to **Custom interval**, you can specify the interval from 1 minute to 60 minutes or from 1 hour to 24 hours. For example, if the current time is 9:00 and the **Custom interval** is set to 5 minutes, the first query is at 9:00, the second query is at 9:05, the third query is at 9:10, and so on.
Alarm Restored When	**3**	If alarm restoration notification is enabled and the trigger condition has not been met for the specified number of last queries, an alarm restoration notification is sent. Number of last queries: 1–10

Parameter	Example Value	Description
Notify When	Select **Alarm triggered** and **Alarm restored**.	– **Alarm triggered**: Specify whether to send a notification when an alarm is triggered. If this option is enabled, a notification will be sent when the trigger condition is met. If disabled, no notifications will be sent, even if the trigger condition is met. – **Alarm restored**: Specify whether to send a notification when an alarm is restored. If this option is enabled, a notification will be sent when the restoration policy is met. If disabled, no notifications will be sent, even if the restoration policy is met.
Frequency	**Immediate**	Notification is sent as soon as an alarm is generated.
Alarm Notification Rules	**error_log_email_notification**	Select the created alarm notification rule **error_log_email_notification** from the drop-down list.
Language	**Chinese (Simplified)**	Specify the language (**Chinese (simplified)** or **English**) in which alarms are sent.
Tag	-	Tag alarm rules as required. Click **Add** and enter a tag key and value.

Step 6 Click **OK**.

----End

Viewing Alarm Notifications

Logs are reported to LTS. When 10 error logs are generated within 5 minutes, you will receive an email notification. The email body contains the error log statistics of the first chart (chart 0) and the error log details of the second chart (chart 1).

6 Billing

6.1 Collecting Statistics on LTS Expenses of Different Departments Based on Log Stream Tags

To collect statistics on the LTS expenses of different departments in an enterprise, you can add tags to LTS log streams to distinguish business departments. LTS will add these tags to CDRs sent to the Billing Center. You can download LTS billing details by navigating to **Billing Center** > **Billing** > **Expenditure Details**. Then, you can use resource tags to aggregate and analyze expenses of different departments, providing a basis for enterprise expense allocation.

Prerequisites

The function of reporting CDRs by log stream is available only to whitelisted users. To use log stream tags to aggregate and analyze departmental expenses in LTS, **submit a service ticket**.

Solution

Log streams are managed in log groups. When you add a tag to a log group, **Apply to Log Stream** is enabled by default to automatically add the tag to streams in this group. This feature allows you to differentiate LTS expenses by department.

This practice uses departments aa and bb as examples. First, add the **group=groupaa** tag to department aa's log group and the **group=groupbb** tag to department bb's log group. Then, export bills from the Billing Center and perform statistical analysis with Excel.

The prices mentioned in the following are only for reference. The actual prices are subject to those in **Price Calculator**.

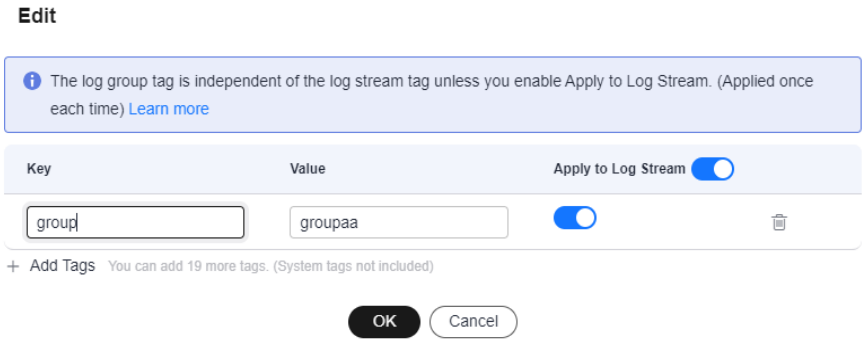
Collecting Statistics on LTS Expenses of Different Departments Based on Log Stream Tags

Step 1 Log in to the LTS console.

Step 2 Move the cursor to the **Tags** column of the log group created for department aa and click  .

Step 3 In the displayed dialog box, click **Add Tags**, enter key **group** and value **groupaa**, retain the default setting (enabled) of **Apply to Log Stream**, and click **OK**.

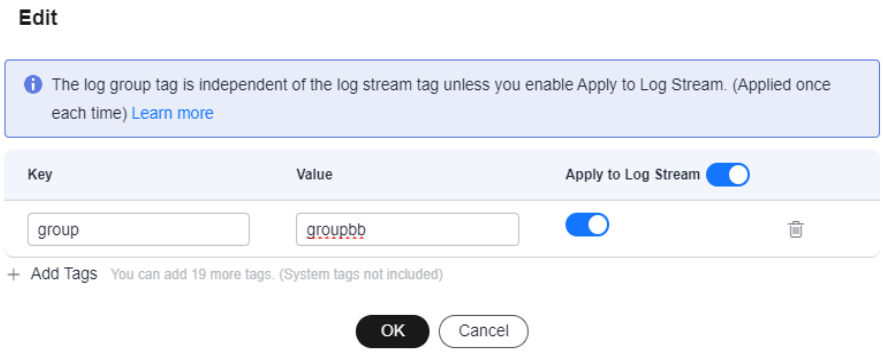
Figure 6-1 Adding a tag for department aa



Step 4 Move the cursor to the **Tags** column of the log group created for department bb and click  .

Step 5 In the displayed dialog box, click **Add Tags**, enter key **group** and value **groupbb**, retain the default setting (enabled) of **Apply to Log Stream**, and click **OK**.

Figure 6-2 Adding a tag for department bb



Step 6 After the tags are added, wait for about one hour for CDRs to be generated.

Step 7 On the top menu bar, choose **More** > **Billing** > **Bills**. The **Dashboard** page is displayed.

Step 8 Choose **Expenditure Details** in the navigation pane, select **Usage**, set **Data Period** to **Details**, and select **Service Type: Log Tank Service LTS** in the filter box. For details, see **Bill Details**.

Step 9 Click **Export**. On the displayed page, set a custom export scope and export the expenditure details to the local PC. For details, see **Exporting Bills**.

Step 10 In the exported Excel file, filter tags in the **Resource Tag** column to view the expenditure details of departments aa and bb.

The actual prices are subject to those in **Price Calculator**.

----End

7 Suggestions on LTS Security Configuration

Security is a shared responsibility between Huawei Cloud and yourself. Huawei Cloud is responsible for the security of cloud services to provide a secure cloud. As a tenant, you should properly use the security capabilities provided by cloud services to protect data, and securely use the cloud. For details, see **Shared Responsibilities**.

This section provides actionable guidance for enhancing the overall security of LTS. You can continuously evaluate the security of your LTS resources and enhance their overall defensive capabilities by combining different security capabilities provided by LTS. By doing this, data stored in LTS can be protected from leakage and tampering both at rest and in transit.

Consider the following aspects for your security configurations:

- **Properly Managing Your Identity Authentication Information to Prevent Data Leaks**
- **Enhancing Permissions Management and Improving Access Control**
- **Enabling CTS to Record LTS Operations**
- **Building Data Backup and Restoration Capabilities for Higher Data Security and Reliability**
- **Keeping Data in Transit Safe**
- **Using the Latest SDKs for Better Experience and Security**
- **Protecting Sensitive Data to Reduce Leakage**

Properly Managing Your Identity Authentication Information to Prevent Data Leaks

No matter whether you access LTS through the console, APIs, or SDKs, you are required to provide identity credentials and undergo identity authentication. In addition, login protection and login authentication policies are provided to harden identity authentication security. LTS supports three identity authentication modes based on IAM: username and password, access key (AK/SK), and temporary access key. It also provides **login protection** and **login authentication policies**.

1. **Using a temporary AK/SK (recommended)**

   Reporting logs or managing LTS resources via LTS APIs or SDKs requires identity credentials to ensure request confidentiality and integrity, and to verify the requester identity. You are advised to configure an IAM agency to obtain temporary AKs/SKs, or directly configure temporary AKs/SKs for your applications or cloud services. Temporary AK/SKs will expire after a short period, which reduces data leakage risks. For details, see **Temporary Access Key** and **Obtaining Temporary Access Keys and Security Tokens of an Agency**.

2. **Regularly changing a permanent AK/SK**

   If you use a permanent AK/SK, change it regularly and encrypt it for storage to prevent data leakage. For details, see **Access Keys**.

3. **Regularly changing your password and avoiding weak passwords**

   Regularly resetting passwords is a key measure to enhance system and application security. This practice lowers the chances of password exposure and helps you meet compliance requirements, mitigate internal risks, and boost security awareness. Also, use complex passwords to reduce risks. For details, see **Password Policy**.

Enhancing Permissions Management and Improving Access Control

To assign different permissions to employees in your enterprise to access your LTS resources, IAM is a good choice for fine-grained permissions management. IAM provides identity authentication, permissions management, and access control, helping you secure access to your LTS resources. You can set LTS system permissions or fine-grained permissions for least privilege access. For details, see **Permissions**.

Enabling CTS to Record LTS Operations

Cloud Trace Service (CTS) is a professional log audit service for Huawei Cloud security solutions. It enables you to collect, store, and query resource operation records (traces). You can use these traces to perform security analysis, track resource changes, audit compliance, backtrack problems, and locate faults.

After you enable CTS and configure a tracker, CTS records traces of LTS for auditing. For details, see section "LTS Traces".

Building Data Backup and Restoration Capabilities for Higher Data Security and Reliability

Build restoration and disaster recovery (DR) capabilities in advance to prevent data from being deleted or damaged by mistake in abnormal data processing scenarios.

1. **Log redundancy**

   By default, LTS stores log data in multiple copies for data reliability.

2. **LTS DR solution**

   LTS uses intra-AZ instance DR and multi-AZ DR to enhance service durability and reliability. Within the same AZ, LTS uses multiple instances to implement DR and quickly removes faulty nodes to ensure continuous service availability.

In multi-AZ scenarios, LTS supports cross-AZ DR, maintaining service availability even if an AZ is abnormal.

3. **Properly setting the log retention period**

   To prevent adverse impact caused by log aging, you are advised to set the log retention duration as needed. LTS allows you to flexibly configure log retention periods for log groups and log streams. If you disable **Log Retention (Days)** for a log stream, logs are retained for the period set for the log group to which the log stream belongs.

4. **Transferring logs to OBS**

   You can transfer logs to OBS for long-term storage. OBS supports encrypted data storage, allowing you to select an encrypted OBS bucket for storing sensitive data. For details, see **Transferring Logs to OBS**.

Keeping Data in Transit Safe

You are advised to use HTTPS to access LTS. This protects the integrity and confidentiality of data transmitted between clients and servers, preventing data theft or damage during transmission.

Using the Latest SDKs for Better Experience and Security

Use the latest LTS SDKs to better protect your data. For details, see **LTS SDK Reference**.

Protecting Sensitive Data to Reduce Leakage

Data anonymization effectively reduces exposure and leakage risks during processing, transmission, and use, protecting user rights and interests. You are advised to anonymize sensitive data before reporting logs to avoid unexpected data leakage.

