Cloudera Runtime 7.3.2

Managing Apache Kafka

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Contents

Management basics

Broker log management

Learn more about the configuration properties related to broker log management, as well as the ways you can monitor log directory space.

Kafka brokers save their data as log segments in a directory. The logs are rotated depending on the size and time settings.

The most common log retention settings to adjust for your cluster are shown below. These are accessible in Cloudera Manager via the Kafka Configuration tab.

- log.dirs: The location for the Kafka data (that is, topic directories and log segments).
- log.retention.{ms|minutes|hours}: The retention period for the entire log. Any older log segments are removed.
- log.retention.bytes: The retention size for the entire log.

In addition, there are many more configuration properties available for fine-tuning broker log management. For more information look for the following properties in theBroker Configs section in the upstream Apache Kafka documentation.

- log.dirs
- log.flush.*
- log.retention.*
- log.roll.*
- log.segment.*

You can monitor the log directory space of the Kafka Brokers on the Log Directory Free Capacity chart on the Kafka service Status page.

This chart relies on the Broker Log Directory Free Capacity Check trigger. The check is triggered if the capacity of any log directory falls below 10%. The trigger is automatically created for all newly deployed Kafka services. For existing services, you need to create the trigger using the Create Kafka Log Directory Free Capacity Check action on the Kafka service Actions page following an upgrade.

Related Information

Broker Configs

Record management

Learn how you can manage records.

There are two pieces to record management, log segments and log cleaner.

As part of the general data storage, Kafka rolls logs periodically based on size or time limits. Once either limit is reached, a new log segment is created with the all new data being placed there, while older log segments should generally no longer change. This helps limit the risk of data loss or corruption to a single segment instead of the entire log.

- log.roll.{ms|hours}: The time period for each log segment. Once the current segment is older than this value, it goes through log segment rotation.
- log.segment.bytes: The maximum size for a single log segment.

There is an alternative to simply removing log segments for a partition. There is another feature based on the log cleaner. When the log cleaner is enabled, individual records in older log segments can be managed differently:

- log.cleaner.enable: This is a global setting in Kafka to enable the log cleaner.

- cleanup.policy: This is a per-topic property that is usually set at topic creation time. There are two valid values for this property, delete and compact.
- log.cleaner.min.compaction.lag.ms: This is the retention period for the “head” of the log. Only records outside of this retention period will be compacted by the log cleaner.

The compact policy, also called log compaction, assumes that the "most recent Kafka record is important." Some examples include tracking a current email address or tracking a current mailing address. With log compaction, older records with the same key are removed from a log segment and the latest one is kept. This effectively removes some offsets from the partition.

Broker garbage collection log configuration

Learn more about broker garbage collection and how garbage collection log rotation can be configured.

About this task

Both broker JVM garbage collection log and JVM garbage collection log rotation is enabled by default in Cloudera Kafka delivered with Cloudera Runtime. Garbage collection logs are written in the agent process directory by default.

Example path:

```
/run/cloudera-scm-agent/process/99-kafka-KAFKA_BROKER/kafkaServer-gc.log
```

Changing the default directory of garbage collection logs is currently not supported. However, you can configure properties related garbage collection log rotation.

Kafka garbage collection log rotation properties can be configured with the Kafka Broker Environment Advanced Configuration Snippet (Safety Valve) property.

Procedure

1. In Cloudera Manager, go to the Kafka service and click Configuration.
2. Find the Kafka Broker Environment Advanced Configuration Snippet (Safety Valve) property.
3. Add the following line to the property:

   Modify the values of as required.

   ```
   KAFKA_GC_LOG_OPTS="-XX:+UseGCLogFileRotation -XX:NumberOfGCLogFiles=10 -XX
   :GCLogFileSize=100M"
   ```

   The flags used are as follows:

   - +UseGCLogFileRotation: Enables garbage collection log rotation.
   - -XX:NumberOfGCLogFiles: Specifies the number of files to use when rotating logs.
   - -XX:GCLogFileSize: Specifies the size when the log will be rotated.
4. Click on Save Changes.
5. Restart the Kafka service to apply the changes.

Results

Kafka garbage collection log rotation is configured.

Collecting Kafka diagnostic data using Cloudera Manager actions

Learn how to collect Kafka diagnostic data using Kafka actions in Cloudera Manager. These actions provide quick access to diagnostic data for troubleshooting and support.

Use the Collect Kafka Cluster Diagnostics and Describe Kafka Topics actions in Cloudera Manager to collect Kafka diagnostic data. These actions are available in the Actions dropdown on the **Kafka service** and **Kafka Broker role instance** pages. Running these Kafka-specific actions is a more lightweight process compared to full diagnostic bundle collection, allowing you to quickly gather targeted data for analysis.

The actions do the following:

- Collect Kafka Cluster Diagnostics – Collects detailed diagnostic information about the entire Kafka cluster, including topics, configurations, consumer groups, log directories, and offsets. The action uses the following command-line tools to gather data:
  - kafka-topics
  - kafka-configs
  - kafka-consumer-groups
  - kafka-log-dirs
  - kafka-get-offsets
  - kafka-transactions
  - kafka-broker-api-versions

  By default, data collected by the Collect Kafka Cluster Diagnostics action is included in the cluster-wide diagnostic bundles that Cloudera Manager collects automatically as well as the diagnostic bundles you capture manually with the Support Send Diagnostic Data modal.
- Describe Kafka Topics – Collects detailed information about all Kafka topics in the cluster. This action runs the kafka-topics command-line tool with the --describe option to gather data.

  This action provides more fine-grained data for detailed analysis of individual topics compared to cluster-wide diagnostic bundles.

Diagnostic data is printed to stdout, making it immediately available in the command modal after an action finishes. In addition, data is saved as a compressed archive on the cluster host where the action runs. The host where the action runs depends on which page you start the action.

- **Kafka service page** – Cloudera Manager chooses one of the Kafka Broker hosts to run the action. The name of the host is visible in the command modal. Start actions from this page if the host where data is saved is not important.
- **Kafka Broker role instance page** – The action runs on the host of the Kafka Broker role instance. Start actions from this page if you want to save diagnostic data on a specific host.

The archive is saved to a subdirectory under /var/run/cloudera-scm-agent/process. The exact location is printed to stdout. Look for a log entry similar to the following to find the exact location of the archive.

```
Successfully created archive: /var/run/cloudera-scm-agent/process/1546339774
-kafka-KAFKA_BROKER-CollectKafkaClusterInfoCmdBroker/info_collection/kafka_i
nfo_collection_2025_11_05__22_11_25.tar.gz
```

Extracting KRaft metadata

Learn how to extract Kafka metadata from the __cluster_metadata topic. Metadata extracted from this topic can be used for debugging and troubleshooting issues with a Kafka deployment running in KRaft mode.

About this task

When Kafka is running in KRaft mode, metadata describing the state of the Kafka cluster is stored in the __cluste
r_metadata topic. This topic can be found in the /var/local/kraft/data directory on each KRaft Controller service role host.

In case you encounter any issues when running your deployment in KRaft mode, generally the first step is to print the contents of the __cluster_metadata topic. Reviewing the contents of the topic can help in identifying the issues with the cluster.

The contents of the __cluster_metadata topic can be printed using the kafka-dump-log command with the --cluster-metadata-decoder option.

Procedure

1. Log in to one of your cluster hosts that has a KRaft service role (KRaft Controller) deployed on it.
2. Run the kafka-dump-log command with the --cluster-metadata-decoder option. For example:

```
kafka-dump-log --cluster-metadata-decoder --files /var/local/kraft/data/
__cluster_metadata-0/00000000000000000000.log
```

Client and broker compatibility across Kafka versions

An overview on client and broker version compatibility.

Maintaining compatibility across different Kafka clients and brokers is a common issue. Mismatches among client and broker versions can occur as part of any of the following scenarios:

- Upgrading your Kafka cluster without upgrading your Kafka clients.
- Using a third-party application that produces to or consumes from your Kafka cluster.
- Having a client program communicating with two or more Kafka clusters (such as consuming from one cluster and producing to a different cluster).
- Using Spark as a Kafka consumer.

In these cases, it is important to understand client/broker compatibility across Kafka versions. Here are general rules that apply:

- Changes in either the major part or the minor part of the Kafka version *MAJOR.MINOR* determines whether the client and broker are fully compatible. If there are differences, some features might not be available.
- Differences among the maintenance versions are not considered when determining compatibility.
- All clients and brokers later than version 1.0.0 are considered compatible. Additionally, all client and broker versions shipped with Cloudera Runtime are also considered compatible. If you are using an older client version with a newer broker version, some limitations on the available features may apply, but the client and broker will be able to communicate with each other.

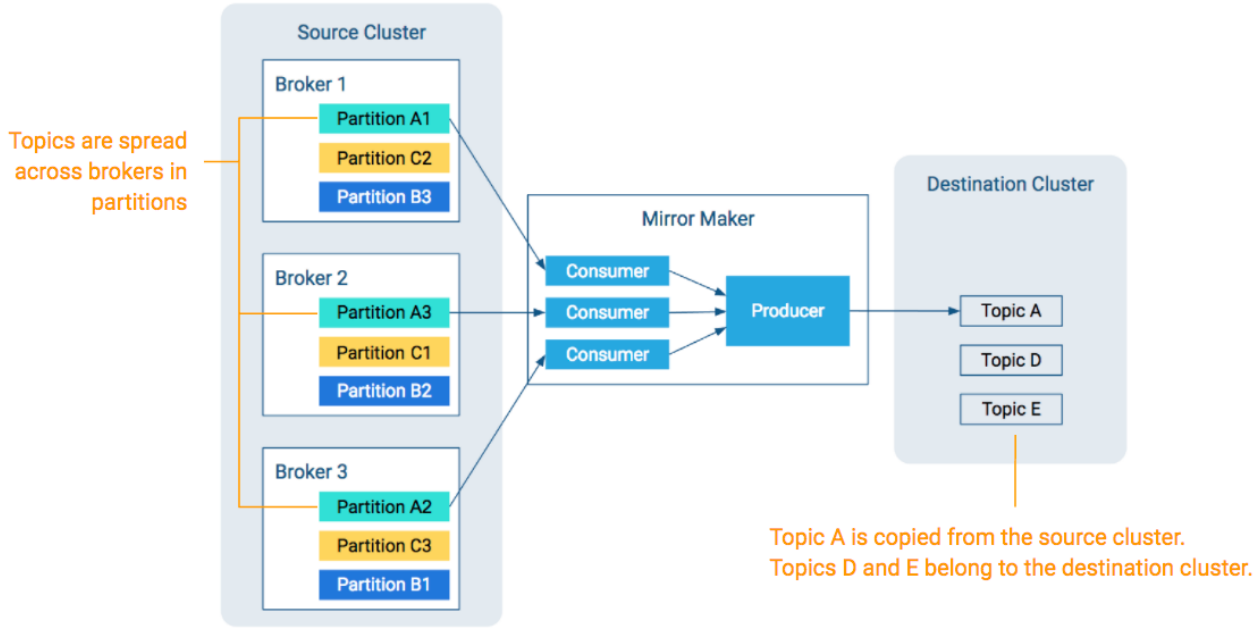
Managing topics across multiple Kafka clusters

You may have more than one Kafka cluster to support:

- Geographic distribution
- Disaster recovery
- Organizational requirements

You can distribute messages across multiple clusters. It can be handy to have a copy of one or more topics from other Kafka clusters available to a client on one cluster. Mirror Maker is a tool that comes bundled with Kafka to help automate the process of mirroring or publishing messages from one cluster to another. "Mirroring" occurs between clusters where "replication" distributes message within a cluster.

Figure 1: Mirror Maker Makes Topics Available on Multiple Clusters



While the diagram shows copying to one topic, Mirror Maker's main mode of operation is running continuously, copying one or more topics from the source cluster to the destination cluster.

Keep in mind the following design notes when configuring Mirror Maker:

- Mirror Maker runs as a single process.
- Mirror Maker can run with multiple consumers that read from multiple partitions in the source cluster.
- Mirror Maker uses a single producer to copy messages to the matching topic in the destination cluster.

Set up MirrorMaker in Cloudera Manager

Learn how to set up MirrorMaker in Cloudera Manager

Before you begin

Consider the following before setting up MirrorMaker for Kafka:

Consumer/Producer Compatibility

The Mirror Maker consumer needs to be client compatible with the source cluster. The Mirror Maker producer needs to be client compatible with the destination cluster. See Client and Broker Compatibility Across Kafka Versions for further details on compatibility.

Topic Differences between Clusters

Because messages are copied from the source cluster to the destination cluster—potentially through many consumers funneling into a single producer—there is no guarantee of having identical offsets or timestamps between the two clusters. In addition, as these copies occur over the network, there can be some mismatching due to retries or dropped messages.

Optimize Mirror Maker Producer Location

Because Mirror Maker uses a single producer and since producers typically have more difficulty with high latency and/or unreliable connections, it is better to have the producer run "closer" to the destination cluster, meaning in the same data center or on the same rack.

Destination Cluster Configuration

Before starting Mirror Maker, make sure that the destination cluster is configured correctly:

- Make sure there is sufficient disk space to copy the topic from the source cluster to the destination cluster.
- Make sure the topic exists in the destination cluster or enable topic auto creation by setting the auto.create.topics.enable property to true. The latter can be done in Cloudera Manager by going to KafkaConfiguration.

Kerberos and Mirror Maker

As mentioned earlier, Mirror Maker runs as a single process. The resulting consumers and producers rely on a single configuration setup. Mirror Maker requires that the source cluster and the destination cluster belong to the same Kerberos realm.

Procedure

1. In Cloudera Manager, select the Kafka service.
2. Choose Action Add Role Instances.
3. Under Kafka Mirror Maker, click Select hosts.
4. Select the host where Mirror Maker will run and click Continue.
5. Fill in the Destination Broker List and Source Broker List with your source and destination Kafka clusters.

   Use host name, IP address, or fully qualified domain name.
6. Fill out the Topic Whitelist.

   The allowlist (whitelist) is required.
7. Fill out the TLS/SSL sections if security needs to be enabled.
8. Start the Mirror Maker instance.

Results

MirrorMaker is configured and started.

Related Information

Client and broker compatibility across Kafka versions

Settings to avoid data loss

An overview of default configuration properties to avoid data loss.

If for some reason the producer cannot deliver messages that have been consumed and committed by the consumer, it is possible for a MirrorMaker process to lose data. The following collection of properties are set by default and help with preventing data loss when replicating data. In addition, note that MirrorMaker starts correctly if you enter the numeric values in the configuration snippet (rather than using "max integer" for retries and "max long" for max.block.ms).

Producer settings

- acks=all
- retries=2147483647
- max.block.ms=9223372036854775807

Consumer setting

- auto.commit.enable=false

MirrorMaker setting

- abort.on.send.failure=true

Scaling Kafka brokers

Learn how to scale the number of Kafka brokers in a Cloudera Base on premises cluster.

The number of Kafka brokers provisioned in a Cloudera Base on premises cluster can be scaled. Scaling is done by first configuring the Kafka and Cruise Control services and then adding or removing (decommission and delete) Kafka Broker role instances in the cluster. After broker roles are added or removed, Cruise Control automatically detects the change and rebalances partitions between brokers.

Note:

When recommissioning a previously decommissioned broker, Cruise Control only reassigns partitions to the broker if the broker was removed for a longer time than the value of removal.history.retention.time.ms configured in the Cruise Control Advanced Configuration Snippet. The default value is equivalent to fourteen days. You can configure a shorter time period.

Alternatively, you can set self.healing.exclude.recently.removed.brokers in the Cruise Control Advanced Configuration Snippet to false.

Configuring Kafka and Cruise Control for scaling

Learn how to configure Kafka and Cruise Control to be able to scale a Kafka cluster.

About this task

Before you can scale a Kafka cluster, configuring both the Kafka and Cruise Control service is required:

- For the Kafka service, you must ensure that Enable Kafka Decommission is selected.
- For the Cruise Control service, you must enable self healing and configure Cruise Control to use specific anomaly notifier and anomaly finder classes.

Procedure

1. Configure Kafka.
   a) In Cloudera Manager, select the Kafka service.
   b) Go to Configuration.
   c) Find and select the Enable Kafka Decommission property.
2. Configure Cruise Control.
   a) In Cloudera Manager, select the Cruise Control service.
   b) Go to Configuration.
   c) Find and select the Self Healing Enabled property.
   d) Find the Anomaly Notifier Class property.
   e) Replace the currently configured class with the following:

   ```
   com.linkedin.kafka.cruisecontrol.detector.notifier.SelfHealingNotifier
   ```

   f) Find the Metric Anomaly Finder Class property.
   g) Add the following class to the configuration:

   ```
   com.cloudera.kafka.cruisecontrol.detector.EmptyBrokerAnomalyFinder
   ```

3. Restart both the Kafka and Cruise Control service.

What to do next

After configuring Kafka and Cruise Control, you can upscale or downscale the Kafka clusters.

Scaling up Kafka brokers

Learn how you can upscale Kafka brokers in a Streams Messaging cluster.

About this task

The Kafka brokers in a Streams Messaging cluster can be upscaled by adding new Kafka broker instances to your cluster. The newly added Kafka broker is automatically detected by Cruise Control, a rebalance is triggered once they become available, and partitions are moved to the new broker.

Before you begin

- Ensure that the cluster, its hosts, and all its services are healthy.
- Ensure that the Kafka brokers are commissioned and running.
- Ensure that the Cruise Control service is running.
- Ensure that Kafka and Cruise Control is configured for scaling. For more information, see Configuring Kafka and Cruise Control for scaling.
- Ensure that one or more hosts are available that do not have a Kafka Broker role deployed on them. For more information on how to add a new host, see Adding a Host to a Cluster.

Procedure

1. In Cloudera Manager, select the Kafka service.
2. Go to Instances.
3. Click Add Role Instances.
4. Click Select hosts>Custom… found under Kafka broker.

   Note: You can also select Select hosts>All Hosts if you want to add role instances to all available hosts.
5. Select one or more hosts and click OK.
6. Click Continue.
7. Optional: Review and configure the properties available on the **Review Changes** page based on your cluster and requirements.
8. Click Finish.
9. Select the newly added role instances.
10. Click Actions for Selected>Start .
11. Review the list of instances that will be started and click Start.
12. Restart the Kafka service.

Results

After the Kafka broker is added to your cluster, Cruise Control automatically detects it and starts the partition reassignment process.

Scaling down Kafka brokers

Learn how you can downscale Kafka brokers in a Streams Messaging cluster.

About this task

The Kafka brokers in a Streams Messaging cluster can be downscaled by decommissioning one or more Kafka broker role instances. Data and partitions of the decommissioned broker are automatically moved to other Kafka brokers. The decommissioned broker instances can be deleted after the downscale process is finished.

Before you begin

- Ensure that the cluster, its hosts, and all its services are healthy.
- Ensure that the Kafka brokers are commissioned and running.
- Ensure that the Cruise Control service is running.
- Ensure that Kafka and Cruise Control is configured for scaling. For more information, see Configuring Kafka and Cruise Control for scaling.
- Do not restart Kafka or Cruise Control during a downscale operation.
- Do not create new partitions during a downscale operation.

Procedure

1. In Cloudera Manager, select the Kafka service.
2. Go to Instances.
3. Select the Kafka broker roles you want to decommission.
4. Click Actions for Selected>Decommission.
5. Review the list of brokers that will be decommissioned and click Decommission.
6. Wait until the decommission process is finished and click Close.
7. Restart the Kafka service.

Results

Cruise Control automatically decommissions the Kafka broker and reassigns the partitions to the other brokers.

What to do next

After the broker is decommissioned, you can fully remove the role instance from the cluster by deleting it.

1. Go to Kafka>Instances .
2. Select the instances that you want to delete.
3. Click Actions for Selected>Delete .

Important: Do not delete broker role instances if you plan on recommissioning them later on.

Scaling KRaft controllers

Scale the number of KRaft controllers in a Cloudera Base on premises cluster by adding or removing KRaft Controller role instances.

The number of KRaft controllers provisioned in a Cloudera Base on premises cluster can be scaled. Scaling is done by adding or deleting KRaft Controller role instances in the cluster and then executing the Add KRaft Controller to Quorum or Remove KRaft Controller from Quorum actions. Kafka in Cloudera Base on premises deployments use Dynamic KRaft Quorums.

Scaling up KRaft controllers

Scale KRaft controllers up by adding new KRaft Controller role instances to your Kafka service and adding the controllers to the KRaft Quorum using the Add KRaft Controller to Quorum action.

Before you begin

- Ensure that the cluster, its hosts, and all its services are healthy.
- Ensure that the majority of the KRaft Quorum is healthy and operational.

- Cloudera recommends deploying KRaft Controller roles on hosts that do not have Kafka Broker roles. This avoids both controllers and brokers going down during a host failure. Controllers and brokers also have different system requirements. For more information on how to add a new host, see Adding a Host to a Cluster.
- To withstand N concurrent failures, you must scale to a total of 2N + 1 controllers to ensure the KRaft quorum remains functional. For example, a cluster of five controllers (2x2 + 1) can tolerate up to two concurrent failures without impacting availability.
- If you are scaling from a single controller, you can scale to three or more, but will not be able to scale down to a single controller.

Important: Do not restart KRaft Controller roles during the add process as this can impact quorum availability.

Procedure

1. In Cloudera Manager, select the Kafka service.
2. Go to Instances.
3. Click Add Role Instances.
4. Click Select hosts found under KRaft Controller.
5. In the host selection dialog, select one or more hosts and click OK.

   You can select the checkbox next to the Hostname column header to select all available hosts.
6. Click Continue.
7. Review and configure the properties available on the **Review Changes** page based on your cluster and requirements.
8. Click Finish.
9. Select the newly added role instances.
10. Click Actions for Selected Start .
11. Review the list of instances that will be started and click Start.
12. For each newly added KRaft Controller role, run the Add KRaft Controller to Quorum role level action.

    Note: The command can only be executed on running instances.

    a) Select a newly added KRaft Controller role instance.
    b) Click Actions Add KRaft Controller to Quorum .
    c) Wait until the command completes and click Close.
    d) Repeat these steps for each newly added KRaft Controller role.
13. Restart the Kafka service to clear configuration staleness warnings.

    Tip: While the newly added controllers function correctly without this restart, Cloudera Manager displays configuration staleness warnings until the Kafka service is restarted.

Results

The newly added KRaft Controller roles are part of the KRaft Quorum and the Kafka service reflects the updated configuration.

Scaling down KRaft controllers

Scale KRaft controllers down by removing KRaft Controller role instances from your Kafka service and then removing them from the KRaft Quorum using the Remove KRaft Controller from Quorum action. The role instances can be deleted after the downscale process is finished.

Before you begin

- Ensure that the cluster, its hosts, and all its services are healthy.
- Ensure that the majority of the KRaft Quorum is healthy and operational.
- When scaling down, you can remove a maximum of N controllers if you have a total of 2N + 1 roles to ensure you preserve a majority of the quorum. For example, you can reduce a cluster from five controllers to three by removing two roles, but you cannot reduce a three controller cluster further as it would violate the minimum supported count.
- You must always scale to an odd number of controllers and maintain a minimum of three roles, as scaling to fewer than three controllers is not supported.

Important: Do not restart KRaft Controller roles during the remove process as this can impact quorum availability.

Procedure

1. In Cloudera Manager, select the Kafka service.
2. Go to Instances.
3. Select the KRaft Controller roles you want to remove.
4. Click Actions for Selected Stop .
5. Review the list of instances that will be stopped and click Stop.
6. Wait until the stop process is finished and click Close.
7. For each stopped KRaft Controller role, execute the Remove KRaft Controller from Quorum role level action.

   Note: The command can only be executed on stopped instances.

   a) Select a stopped KRaft Controller role instance.
   b) Click Actions for Selected Remove KRaft Controller from Quorum .
   c) Wait until the command completes and click Close.
   d) Repeat these steps for each KRaft Controller role you want to remove.
8. Restart the Kafka service to clear configuration staleness warnings.

   While the remaining controllers function correctly without this restart, Cloudera Manager displays configuration staleness warnings until the service is restarted. Restarting the service clears these warnings and completes the scaling operation.

Results

The KRaft Controller roles are no longer part of the KRaft Quorum and the Kafka service reflects the updated configuration.

What to do next

After the controller is removed from the quorum, you can fully remove the role instances from the cluster by deleting them.

Important: Do not delete KRaft Controller role instances if you plan on adding them back to the quorum later on. Controllers can be re-added to the quorum at any time without any time-based limitations or special considerations.

1. Go to Kafka Instances .
2. Select the instances that you want to delete.
3. Click Actions for Selected Delete .

Troubleshooting KRaft controller scaling

Troubleshoot issues when scaling KRaft controllers by checking quorum state and verifying that controllers have joined the quorum.

Checking KRaft Quorum state

If any of the add or remove commands are failing, the KRaft Quorum state can be checked to start the investigation using the following command:

```
kafka-metadata-quorum --bootstrap-controller example.com:9192 describe --sta
tus
```

Note: You can also generate a Diagnostic Bundle using Support Send Diagnostic Data . Diagnostic Bundles contain Quorum state information.

Verifying that a controller joined the quorum

There are two ways to verify that a KRaft Controller successfully joined the quorum:

- **Command success**: If the Add KRaft Controller to Quorum command completes successfully, the controller has been added to the quorum.
- **Health test**: Cloudera Manager provides a health test that displays Concerning Health status if a KRaft Controller role is not part of the quorum. If the controller role shows healthy status, it is part of the quorum.

Handling dangling KRaft Controller roles

In some cases it is possible that a given KRaft Controller role is not actually a member of the KRaft Quorum despite never explicitly leaving it. For example, this can be the case when the metadata log directory was corrupted, removed, or recreated.

If there are dangling KRaft Controller roles present, meaning that a KRaft Controller role is active but not part of the Quorum, Cloudera Manager will change the health status of the role to Concerning Health.

To resolve the issue, the KRaft Controller role must be readded to the Quorum by completing a Remove KRaft Controller from Quorum # Add KRaft Controller to Quorum cycle.

Broker migration

Learn more about the options you have when migrating brokers and copying data between brokers.

In case of catastrophic hardware failure brokers can be moved to a new host in a Kafka cluster. There multiple methods with which you can move brokers between clusters:

Using kafka-reassign-partitions tool

This method involves more manual work to modify JSON, but does not require manual edits to configuration files.

Modify the broker IDs in meta.properties

This method involves less manual work, but requires modifying an internal configuration file.

Using rsync

You can use rsync to copy over all data from an old broker to a new broker, preserving modification times and permissions.

Continue reading for instructions on how to move brokers by modifying broker IDs or using rsync. For instructions on how to migrate brokers with kafka-reassign-partitions, see the kafka-reassign-partitions tool description. For specific instructions on how to migrate existing Kafka partitions to JBOD configured disks, see JBOD disk migration.

Related Information

kafka-reassign-partitions
JBOD disk migration

Migrate brokers by modifying broker IDs in meta.properties

Learn how to migrate brokers between hosts in a Kafka cluster by modifying broker IDs in meta.properties.

About this task

In case of catastrophic hardware failure brokers can be moved to a new host in a Kafka cluster. The following steps walk you through broker migration by modifying broker IDs in meta.properties. Compared to migration with the help of the kafka-reassign-partitions tool, this method involves less manual work, but requires modifying an internal configuration file.

Important: Data intensive administration operations such as rebalancing partitions, adding a broker, removing a broker, or bootstrapping a new machine can cause significant additional load on the cluster. Therefore, Cloudera highly recommends that you migrate one broker at a time and migrate brokers when there is minimal load on the cluster

Before you begin

- Verify that the cluster is healthy.
- Verify that all replicas are in sync.

Procedure

1. Start up the new broker as a member of the old cluster.

   This creates files in the data directory.
2. Stop both the new broker and the old broker that it is replacing.
3. Change broker.id of the new broker to the broker.id of the old one both in Cloudera Manager and in *DATA DIRECTORY*/meta.properties.
4. Optional: Run rsync to copy files from one broker to another.
5. Start up the new broker.

   When started the new broker re-replicates data from the other nodes.

Results

The Kafka broker is migrated to a new host.

Use rsync to copy files from one broker to another

Learn how to use rsync to copy over all data from an old broker to a new broker.

About this task

You can run rsync command to copy over all data from an old broker to a new broker, preserving modification times and permissions. Using rsync allows you to avoid having to re-replicate the data from the leader.

Before you begin

- Ensure that the disk structures match between the two brokers, or verify the meta.properties file between the source and destination brokers (because there is one meta.properties file for each data directory).

Procedure

Run the following command on destination broker:

```
rsync -avz
        SRC_BROKER:SRC_DATA_DIR
        DEST_DATA_DIR
```

If you plan to change the broker ID, edit *DEST_DATA_DIR*/meta.properties.

Results

Data from the source broker is copied over to the destination broker.

Disk management

Monitoring

Recommendations on what to monitor on clusters.

Cloudera recommends that administrators continuously monitor the following on a cluster:

Replication Status

Monitor replication status using Cloudera Manager Health Tests. Cloudera Manager automatically and continuously monitors both the OfflineLogDirectoryCount and OfflineReplicaCount metrics. Alters are raised when failures are detected.

Disk Capacity

Monitor free space on mounted disks and open file descriptors. Reassign partitions or move log files around if necessary. For more information, see the kafka-reassign-partitions tool description.

Related Information

Cloudera Manager Health Tests

kafka-reassign-partitions

Handling disk failures

An overview on how to handle disk failures.

Cloudera Manager has built in monitoring functionalities that automatically trigger alerts when disk failures are detected. When a log directory fails, Kafka also detects the failure and takes the partitions stored in that directory offline.

Important: If there are no healthy log directories present in the system, the broker stops working.

The cause of disk failures can be analyzed with the help of the kafka-log-dirs tool, or by reviewing the error messages of KafkaStorageException entries in the Kafka broker log file. To access the log file go to InstancesLog FilesRole Log File.

In case of a disk failure, a Kafka administrator can carry out either of the following actions. The action taken depends on the failure type and system environment:

- Replace the faulty disk with a new one.
- Remove the disk and redistribute data across remaining disks to restore the desired replication factor.

Note: Disk replacement and disk removal both require stopping the broker. Therefore, Cloudera recommends that you perform these actions during a maintenance window.

Related Information

kafka-log-dirs

Disk Replacement

Learn how to replace a disk.

About this task

In case of a disk failure, a Kafka administrator can replace the faulty disk with a new one.

Procedure

1. Stop the broker that has a faulty disk:
   a) In Cloudera Manager, go to the Kafka service, select Instances and select the broker.
   b) Go to ActionsGracefully stop this Kafka Broker.
2. Replace the disk.
3. Mount the disk.
4. Set up the directory structure on the new disk the same way as it was set up on the previous disk.

   Note: You can find the directory paths for the old disk in the Data Directories property of the broker.

5. Start the broker:
   a) In Cloudera Manager go to the Kafka service, selectInstances and select the broker.
   b) Go to ActionsStart this Kafka Broker.

Results

The disk is replaced. The Kafka broker re-creates topic partitions in the same directory by replicating data from other brokers.

Disk Removal

Learn how to remove a disk from the configuration.

About this task

In case of a disk failure, a Kafka administrator can remove the disk and redistribute data across remaining disks to restore the desired replication factor.

Procedure

1. Stop the broker that has a faulty disk:
   a) In Cloudera Manager, go to the Kafka service, select Instances and select the broker.
   b) Go to ActionsGracefully stop this Kafka Broker.
2. Remove the log directories on the faulty disk from the broker:
   a) Go to Configuration and find the Data Directories property.
   b) Remove the affected log directories with the Remove button.
   c) Enter a Reason for change, and then click Save Changes to commit the changes.
3. Start the broker:
   a) In Cloudera Manager, go to the Kafka service, select Instances and select the broker.

b) Go to ActionsStart this Kafka Broker.

Results
The disk is removed from the configuration. The Kafka broker redistributes data across the cluster.

Reassigning replicas between log directories

Learn about replica reassignment between log directories.

Reassigning replicas between log directories can prove useful when you have multiple disks available, but one or more of them is nearing capacity. Moving a replica from one disk to another ensures that the service will not go down due to disks reaching capacity. To balance storage loads, the Kafka administrator has to continuously monitor the system and reassign replicas between log directories on the same broker or across different brokers. These actions can be carried out with the kafka-reassign-partitions tool.

For more information on tool usage, see the kafka-reassign-paritions tool description.

Related Information
kafka-reassign-partitions

Retrieving log directory replica assignment information

Learn how log directory replica assignment information can be retrieved.

To optimize replica assignment across log directories, the list of partitions per log directory and the size of each partition is required. This information can be exposed with the kafka-log-dirs tool.

For more information on tool usage, see the kafka-log-dirs tool description.

Related Information
kafka-log-dirs

Metrics

Learn about Kafka metrics and how to view them.

Kafka uses Yammer metrics to record internal performance measurements. The metrics are exposed via Java Management Extensions (JMX) and can be read with a JMX console.

Metrics Categories

There are metrics available in the various components of Kafka. In addition, there are some metrics specific to how Cloudera Manager and Kafka interact. This table has pointers to both the Apache Kafka metrics names and the Cloudera Manager metric names.

Table 1: Metrics by Category

Category	Cloudera Manager Metrics Doc	Apache Kafka Metrics Doc
Cloudera Manager Kafka Service	Base Metrics	
Broker	Broker Metrics, Broker Topic Metrics, Replica Metrics, Broker Topic Partition Metrics	Broker

Category	Cloudera Manager Metrics Doc	Apache Kafka Metrics Doc
Common Producer/Consumer		Client Client-to-Broker
Producer	Producer Metrics	Producer Producer Sender
Consumer	Consumer Group Metrics	Consumer Group Consumer Fetch
Mirror Maker	Mirror Maker Metrics	Same as Producer or Consumer tables

Note the following about Cloudera Manager metrics:

Broker Topic Partitions Metrics:

Required for Streams Messaging Manager. These metrics have to be specifically enabled within the host's configuration.

Producer Metrics:

Required for Streams Messaging Manager. These metrics have to be specifically enabled within Kafka's configuration and are different from the metrics available on client instances.

Consumer Groups Metrics

Generated by and required for Streams Messaging Manager. These metrics are different from the metrics available on client instances.

Viewing Metrics

Cloudera Manager records most of these metrics and makes them available via Chart Builder.

Because Cloudera Manager cannot track metrics on any clients (that is, producer or consumer), you may wish to use an alternative JMX console program to check metrics. There are several JMX console options, for example:

- JConsole, which comes bundled with the JDK.
- VisualVM, with the MBeans plugin.

Related Information

JConsole Documentation

VisualVM Homepage

Building Cloudera Manager charts with Kafka metrics

A collection query examples to build Kafka metrics charts within Cloudera Manager.

Cloudera Manager enables you to build charts based on Kafka specific metrics. To access the chart builder go to ChartsChart Builderin Cloudera Manager. The following are a few specific examples of queries for cloudera metrics:

Controllers across all brokers

This chart shows the active controller across all brokers. It is useful for checking active controller status (should be one at any given time, transitions should be fast).

```
SELECT
    kafka_active_controller
WHERE
    roleType=KAFKA_BROKER
```

Network idle rate

>Chart showing the network processor idle rate across all brokers. If idle time is always zero, then probably the num.network.threads property may need to be increased.

```
SELECT
    kafka_network_processor_avg_idle_rate
WHERE
    roleType=KAFKA_BROKER
```

Partitions per broker

Chart showing the number of partitions per broker. It is useful for detecting partition imbalances early.

```
SELECT
    kafka_partitions
WHERE
    roleType=KAFKA_BROKER
```

Partition activity

Chart tracking partition activity on a single broker.

```
SELECT
    kafka_partitions, kafka_under_replicated_partitions
WHERE
    hostname=host1.domain.com
```

Mirror Maker activity

Chart for tracking Mirror Maker behavior. Since Mirror Maker has one or more consumers and a single producer, most consumer or metrics should be usable with this query.

```
SELECT
    PRODUCER OR CONSUMER METRIC
WHERE
    roleType=KAFKA_MIRROR_MAKER
```

Related Information

Charting Time-Series Data

Essential metrics to monitor

Cloudera Manager collects a high number of performance metrics for the Kafka services running on your clusters. Certain metrics should be monitored in any Kafka deployment as they can help you to improve the stability and performance of your Kafka deployment.

The following tables collect the Kafka broker metrics that Cloudera recommends you to monitor in any Kafka deployment. For more information on metrics, including a full list of Kafka metrics, see Cloudera Manager Metrics.

Table 2: ZooKeeper connectivity metrics

Metric Name	Description	Unit	Importance	Parents	Version Availability
kafka_zookeeper_expires_rate	Measures the session expires per second.	Expires per second	High	cluster, kafka, rack	CDH 5, CDH 6, Cloudera 7

Metric Name	Description	Unit	Importance	Parents	Version Availability
kafka_zookeeper_request_latency_avg	Request latency between the broker and Zookeeper.	ms	High	cluster, kafka, rack	CDH 5, CDH 6, Cloudera 7

Table 3: KRaft controller metrics

Metric Name	Description	Unit	Importance	Parents	Version Availability
kafka_active_controller	Will be 1 if this instance is the active controller, 0 otherwise.	Number of controllers	High	cluster, kafka, rack	Cloudera 7
kafka_preferred_replica_imbalance	Number of partitions where the lead replica is not the preferred replica.	Partition count	Medium	cluster, kafka, rack	Cloudera 7
kafka_offline_partitions	Number of unavailable partitions.	Partition count	High	cluster, kafka, rack	Cloudera 7
kafka_global_partition_count	Total number of partitions in the cluster.	Partition count	Low	cluster, kafka, rack	Cloudera 7
kafka_global_topic_count	Total number of topics in the cluster.	Topic count	Low	cluster, kafka, rack	Cloudera 7
kafka_active_broker_count	Number of active brokers in the cluster.	Broker count	High	cluster, kafka, rack	Cloudera 7
kafka_fenced_broker_count	Number of fenced brokers in the cluster.	Broker count	High	cluster, kafka, rack	Cloudera 7
kafka_zk_migration_state	An enumeration of the possible migration states the cluster can be in. 0 = NONE, cluster created in KRaft mode; 4 = ZK, Migration has not started, controller is a ZK controller; 2 = PRE_MIGRATION, the KRaft Controller is waiting for all ZK brokers to register in migration mode; 1 = MIGRATION, ZK metadata has been migrated, but some broker is still running in ZK mode; 3 = POST_MIGRATION, the cluster migration is complete.	Discrete states	Medium	cluster, kafka, rack	Cloudera 7
kafka_metadata_log_end_offset	The current raft log end offset.	Offset count	Low	cluster, kafka, rack	Cloudera 7
kafka_metadata_high_watermark	The metadata high watermark maintained on this member; -1 if it is unknown.	Offset count	Medium	cluster, kafka, rack	Cloudera 7
kafka_metadata_fetch_records_avg_count	The average number of records fetched from the leader of the raft quorum.	Message count	Low	cluster, kafka, rack	Cloudera 7

Metric Name	Description	Unit	Importance	Parents	Version Availability
kafka_quorum_member_state	The state of the quorum member. 0 = leader; 1 = candidate; 2 = voted; 3 = follower; 4 = unattached; 5 = observer.	Discrete states	High	cluster, kafka, rack	Cloudera 7

Note: While the disk utilization metrics do not measure disk performance directly, they can point to problems with the disks.

Table 4: Network metrics

Metric Name	Description	Unit	Importance	Parents	Version Availability
kafka_network_processor_avg_idle	The average free capacity of the network processors. Should be > 0.3.	Percentage of free capacity	High	cluster, kafka, rack	CDH 5, CDH 6, Cloudera 7
kafka_request_queue_size	Size of the request queue in Kafka.	Message count	Medium	cluster, kafka, rack	CDH 5, CDH 6, Cloudera 7
kafka_response_queue_size	Size of the response queue in Kafka.	Message count	Medium	cluster, kafka, rack	CDH 5, CDH 6, Cloudera 7
kafka_messages_received_rate	Number of messages written to topic on this broker.	Messages per second	Medium	cluster, kafka, rack	CDH 5, CDH 6, Cloudera 7

Table 5: Disk utilization metrics

Metric Name	Description	Unit	Importance	Parents	Version Availability
kafka_produce_local_time_rate	Local Time spent in responding to Produce requests.	Requests per second	Low	cluster, kafka, rack	CDH 5, CDH 6, Cloudera 7
kafka_log_flush_rate	Rate of flushing Kafka logs to disk.	Flushes per second	Low	cluster, kafka, rack	CDH 5, CDH 6, Cloudera 7
kafka_request_handler_avg_idle_rate	The average free capacity of the request handler. Should be > 0.3.	Percentage of free capacity	High	cluster, kafka, rack	CDH 5, CDH 6, Cloudera 7

Note: While the disk utilization metrics do not measure disk performance directly, they can point to problems with the disks.

Table 6: Kafka metrics

Metric Name	Description	Unit	Importance	Parents	Version Availability
kafka_broker_state	The state the broker is in. 0 = NotRunning, 1 = Starting, 2 = RecoveringFromUncleanShutdown, 3 = RunningAsBroker, 4 = RunningAsController, 6 = PendingControlledShutdown, 7 = BrokerShuttingDown	Discrete states	Medium	cluster, kafka, rack	CDH 5, CDH 6, Cloudera 7
kafka_jvm_gc_runs_rate	Number of garbage collector runs performed on this broker.	Events per second	Medium	cluster, kafka, rack	CDH 5, CDH 6, Cloudera 7
kafka_isr_expands_rate	ISR expands per second.	Events per second	Medium	cluster, kafka, rack	CDH 5, CDH 6, Cloudera 7
kafka_isr_shrinks_rate	ISR shrinks per second.	Events per second	Medium	cluster, kafka, rack	CDH 5, CDH 6, Cloudera 7
kafka_max_replication_lag	Maximum replication lag on the broker, across all fetchers, topics, and partitions.	Messages	Medium	cluster, kafka, rack	CDH 5, CDH 6, Cloudera 7
kafka_offline_partitions	Number of offline partitions.	Partition count	High	cluster, kafka, rack	CDH 5, CDH 6, Cloudera 7
kafka_under_min_isr_partition_count	Count of partitions with less than the configured minimum in-sync replicas available.	Partition count	High	cluster, kafka, rack	CDH 5, CDH 6, Cloudera 7
kafka_under_replicated_partitions	Count of partitions with unavailable replicas.	Partition count	Low	cluster, kafka, rack	CDH 5, CDH 6, Cloudera 7
kafka_active_controller	Shows the number of active controllers at a given time. Ideally it should be 1.	Number of controllers	High	cluster, kafka, rack	CDH 5, CDH 6, Cloudera 7

Note: The kafka_active_controller metric appears in both the Kafka metrics table and the KRaft controller metrics table. In ZooKeeper-based deployments, this metric is collected from the Broker role. In KRaft mode deployments, this metric is collected from the KRaft Controller role. Both measure whether the instance is the active controller.

Related Information

Cloudera Manager Metrics

Command Line Tools

Kafka command line tools overview.

In some situations, it is convenient to use the command line tools available in Kafka to administer your cluster. However, it is important to note that not all tools available for Kafka are supported by Cloudera. Moreover, certain administration tasks can be carried out more easily and conveniently using Cloudera Manager.

When administering Kafka with command line tools, be aware of the following:

- Use Cloudera Manager to start and stop Kafka and Zookeeper services. Do not use the kafka-server-start, kafka-server-stop, zookeeper-server-start, or zookeeper-server-stop commands.
- For a parcel installation, all Kafka command line tools are located in /opt/cloudera/parcels/KAFKA/lib/kafka/bin/. For a package installation, all such tools can be found in /usr/bin/.
- Ensure that the JAVA_HOME environment variable is set to your JDK installation directory before using the command-line tools. For example:

```
export JAVA_HOME=/usr/java/jdk1.8.0_144-cloudera
```

- Using any Zookeeper command manually can be very difficult to get right when it comes to interaction with Kafka. Cloudera recommends that you avoid doing any write operations or ACL modifications in Zookeeper.
- In a FIPS-enabled cluster that is running JDK 17, you must set various JVM arguments in your shell environment before running any of the Kafka CLI tools. For more information, see *Configuring Kafka command line tools in FIPS clusters*.

Note: Output examples in the command line tool descriptions are cleaned and formatted for easier readability.

Unsupported command line tools

Kafka command line tools not supported by Cloudera.

The following tools can be found as part of the Kafka distribution, but their use is generally discouraged for various reasons as documented here.

Tool	Notes
connect-mirror-maker	Use Streams Replication Manager instead.
connect-distributed connect-standalone	Use Cloudera Manager to deploy and manage Kafka Connect workers. In Cloudera, Kafka Connect workers are represented by Kafka Connect roles, which can be deployed under a Kafka service.
kafka-acls	Cloudera recommends using Ranger for authorization instead.
kafka-broker-api-versions	Primarily useful for Client-to-Broker protocol related development.
kafka-configs	Use Cloudera Manager to adjust any broker or security properties instead of the kafka#configs tool. This tool should only be used to modify topic properties.
kafka-delete-records	Cloudera does not recommend using this tool in.
kafka-features	Used to describe and modify currently active features in the cluster. Limited support is provided. Only use this tool to describe currently active features.
kafka-mirror-maker	Use Cloudera Manager to deploy Mirror Maker instances.
kafka-replay-log-producer	Can be used to “rename” a topic.
kafka-replica-verification	Validates that all replicas for a set of topics have the same data. This tool is a “heavy duty” version of the ISR column of kafka-topics tool.
kafka-server-start kafka-server-stop	Use Cloudera Manager to manage any Kafka host.

Tool	Notes
kafka-storage	Used to generate a universally unique identifier (UUID) for the cluster and to format log directories when Kafka is running in KRaft mode. Both UUID generation and log directory formatting are done automatically by Cloudera Manager when you deploy the Kafka service for the first time as well as when you add new Kafka role instances to the cluster. The generated UUID is stored internally by Cloudera Manager and cannot be replaced. Additionally, adding and manually formatting new log directories in KRaft not supported.
kafka-verifiable-consumer kafka-verifiable-producer	These scripts are intended for system testing.
zookeeper-server-start zookeeper-server-stop	Use Cloudera Manager to manage any Zookeeper host.
zookeeper-shell	Limit usage of this script to reading information from Zookeeper.

kafka-topics

Learn more about the kafka-topics tool.

Use the kafka-topics tool to generate a snapshot of topics in the Kafka cluster.

```
kafka-topics --bootstrap-server [BROKER_HOST]:[PORT] --describe
```

```
Topic: topic-a1      PartitionCount:3      ReplicationFactor:3      Configs:
         Topic: topic-a1      Partition: 0      Leader: 64      Replicas: 6
4,62,63      Isr: 64,62,63
         Topic: topic-a1      Partition: 1      Leader: 62      Replicas:
 62,63,64      Isr: 62,63,64
         Topic: topic-a1      Partition: 2      Leader: 63      Replicas: 6
3,64,62      Isr: 63,64,62
Topic: topic-a2      PartitionCount:1      ReplicationFactor:3      Configs:
         Topic: topic-a2      Partition: 0      Leader: 64      Replicas: 64
,62,63      Isr: 64,62,63
```

The output lists each topic and basic partition information. Note the following about the output:

- Partition count: The more partitions, the higher the possible parallelism among consumers and producers.
- Replication factor: Shows 1 for no redundancy and higher for more redundancy.
- Replicas and in-sync replicas (ISR): Shows which broker ID's have the partitions and which replicas are current.

There are situations where this tool shows an invalid value for the leader broker ID or the number of ISRs is fewer than the number of replicas. In those cases, there may be something wrong with those specific topics.

It is possible to change topic configuration properties using this tool. Increasing the partition count, the replication factor or both is not recommended.

kafka-cluster

Learn about the kafka-cluster CLI tool, which you can use to print the ID of a Kafka cluster.

Use the kafka-cluster tool to retrieve the ID of the Kafka cluster. The ID of a Kafka cluster is automatically generated by Cloudera Manager when you first start your Kafka service. The ID you retrieve is used when carrying out management actions for your Kafka service using other CLI tools.

```
kafka-cluster cluster-id --bootstrap-server [***HOST***]:[***PORT***] --c
onfig [***PROPERTY FILE***]
```

- Replace *[***HOST***]:[***PORT***]* with the host and port of a broker.
- Replace *[***PROPERTY FILE***]* with the location of a configuration file that contains all necessary security properties that are required to establish a connection with the Kafka service. This option is only required if your Kafka service is secured.

Output example:

```
Cluster ID: 8TMmf99zQR-KIy5bF1lmZQ
```

kafka-configs

In an environment managed by Cloudera Manager the kafka-configs tool can be used to set, describe, or delete topic properties.

Important: Cloudera does not recommend that you use the kafka-configs tool to configure broker properties. This is because the tool bypasses Cloudera Manager safety checks. Use Cloudera Manager instead if you want to configure your brokers. Only use this tool to configure topic properties.

Setting topic properties

You can set a topic property using the --alter option together with the --add-config option. For example:

```
kafka-configs --bootstrap-server [HOST:PORT] --entity-type
 topics --entity-name [TOPIC] --alter --add-config [PROPERTY
 NAME]=[VALUE]
```

Describing topic properties

You can list the configuration properties of a topic with the --describe option. For example:

```
kafka-configs --bootstrap-server [HOST:PORT] --entity-type topics
 --entity-name [TOPIC] --describe
```

Deleting topic properties

You can delete a topic property using the --alter option together with the --delete-config option. For example:

```
kafka-configs --bootstrap-server [HOST:PORT] --entity-type topics
 --entity-name [TOPIC] --alter --delete-config [PROPERTY_NAME]
```

Related Information

Topic-Level Configs

kafka-console-producer

Learn how you can use the kafka-console-producer tool to produce messages to a topic.

This tool is used to write messages to a topic in a text based format.

The following examples demonstrate the basic usage of the tool. In addition to reviewing these examples, you can also use the --help option to see a list of all available options.

Produce messages to a topic

To start producing message to a topic, you need to run the tool and specify a server as well as a topic.

```
kafka-console-producer --bootstrap-server [HOST1:PORT1] --topic [TOPIC]
```

Start typing messages once the tool is running.

```
>MY FIRST MESSAGE
>MY SECOND MESSAGE
```

Alternatively, you can also produce the contents of a file to a topic.

```
cat [FILE] | kafka-console-producer --bootstrap-server [HOST1:PORT1] --t
opic [TOPIC]
```

Produce messages to a topic in a secure cluster

In order to use the tool on a secure cluster, additional client configuration is required. You do this by creating a .properties file that contains the necessary configurations to run the tool on a secure cluster. Which properties are configured in this file depends on the security configuration of your cluster. See Securing Apache Kafka to learn more about which exact properties you need to use for your security configuration. Once the file is created, you can use --producer.config to pass the file to the tool.

Example .properties file:

```
security.protocol = SASL_SSL
sasl.mechanism=GSSAPI
sasl.kerberos.service.name = kafka
ssl.truststore.location = /var/private/ssl/kafka.client.truststore.jks
ssl.truststore.password = test1234
sasl.jaas.config=com.sun.security.auth.module.Krb5LoginModule required useTi
cketCache=true;
```

This example shows what properties you have to set when both Kerberos and TLS/SSL are configured.

Do the following to run the tool in a secure cluster:

1. Create a .properties file.

   Use the example above. Make changes as necessary.
2. Run the tool with the --producer.config option.

   ```
   kafka-console-producer --bootstrap-server [HOST1:PORT1] --topic [TOPIC] --
   producer.config client.properties
   ```

Define a key-value delimiter

It is possible to define a key-value delimiter for the given producer instance. The delimiter can vary each time you run the tool. For example, if you run the tool with the delimiter set to - and then a second time using :, Kafka will know how to store the data. The first term is always stored as the key, the second as the value. As a result, when the data written this way is consumed, the keys and values are consumed irrespective of what delimiter was used when the records were written to the topic.

To produce messages with key-value delimiters, you need to set two properties, parse.key and key.seperator. Both properties can be set with the --properties option.

```
kafka-console-producer --bootstrap-server [HOST1:PORT1] --topic [TOPIC] --p
roperty parse.key=true --property key.separator=":"
```

Configure retry backoff

Before each retry, the producer refreshes the metadata of the relevant topics. You can configure the amount of time the producer waits before refreshing the metadata with the --retry-backoff-ms option.

```
kafka-console-producer --bootstrap-server [HOST1:PORT1] --topic [TOPIC] --r
etry-backoff-ms 1000
```

Related Information

Configure Kafka clients for TLS/SSL encryption
Enable Kerberos authentication
Client authentication using delegation tokens
Configure Kafka clients for LDAP authentication
Configure Kafka clients for PAM authentication

kafka-console-consumer

Learn how to use the kafka-console-consumer tool.

The kafka-console-consumer tool can be useful in a couple of ways:

- Acting as an independent consumer of particular topics. This can be useful to compare results against a consumer program that you've written.
- To test general topic consumption without the need to write any consumer code.

Examples of usage:

```
kafka-console-consumer --bootstrap-server [BROKER1],[BROKER2]... --to
pic [TOPIC] --from-beginning
[RECORD-EARLIEST-OFFSET]
[RECORD-EARLIEST-OFFSET+1]
```

Note the following about the tool:

- This tool prints all records and keeps outputting as more records are written to the topic.
- If the kafka-console-consumer tool is given no flags, it displays the full help message.
- In older versions of Kafka, it may have been necessary to use the --new-consumer flag. As of Apache Kafka version 0.10.2, this is no longer necessary.

kafka-consumer-groups

Learn how to use the kafka-consumer-groups tool.

The kafka-consumer-groups tool can be used to list all consumer groups, describe a consumer group, delete consumer group info, or reset consumer group offsets. The following topic gives an overview on how to describe or reset consumer group offsets.

Describe Offsets

This tool is primarily used for describing consumer groups and debugging any consumer offset issues, like consumer lag. The output from the tool shows the log and consumer offsets for each partition connected to the consumer group that is being described. You can see at a glance which consumers are current with their partition and which ones are lagging. From there, you can determine which partitions (and likely the corresponding brokers) are slow.

Using the tool on secure and unsecure clusters differs slightly. On secure clusters, you have to use the command-config option together with an appropriate property file.

Describing offsets on an unsecure cluster

Use the following command to describe offsets committed to Kafka:

```
kafka-consumer-groups --bootstrap-server [HOST]:9092 --describe
 --group [CONSUMER GROUP]
```

Output Example:

```
GROUP   TOPIC  PARTITION  CURRENT-OFFSET  LOG-END-OFFSET  LAG
 OWNER
group1   topic1     0          1               3               2
      test-consumer-group_postamac.local-1456198719410-29ccd54f-0
```

Describing offsets on a secure cluster

In order to describe offsets on a secure Kafka cluster, the consumer-groups tool has to be run with the command-config option. The command-config option specifies the property file that contains the necessary configurations to run the tool on a secure cluster. Which properties are configured in this file depends on the security configuration of your cluster.

Example client.properties file:

```
exclude.internal.topics=false
security.protocol = SASL_SSL
sasl.kerberos.service.name = kafka
ssl.truststore.location = /var/private/ssl/kafka.client.trusts
tore.jks
ssl.truststore.password = test1234
```

This example shows what properties you have to set when both Kerberos and TLS/SSL are configured.

To describe offsets do the following:

1. Pass the jaas.conf file location as a JVM parameter.

   ```
   export KAFKA_OPTS='-Djava.security.auth.login.config=[PATH TO
    JAAS.CONF]
   ```

2. Create a client.properties file.

   Use the example above. Make changes as necessary.

3. Run the tool with the command-config option.

   ```
   kafka-consumer-groups --bootstrap-server [HOST]:9093 --desc
   ribe --command-config CLIENT.PROPERTIES --group [CONSUMER
    GROUP]
   ```

Resetting Offsets

You can use the --reset-offset option to reset the offsets of a consumer group to a particular value. The tool can be used to reset all offsets on all topics. However, this is something you probably won't ever want to do. Therefore, it is highly recommended that you exercise caution when resetting offsets.

To reset offsets you need to define a scope, an execution option, and a scenario.

Scope

There are two supported scopes:

- --topic: Restricts the change to a specific topic or a specific set of partitions within a topic.
- --all-topics: Executes the change for all topics.

Note: Choosing a scope is mandatory for all scenarios except for the --from-file scenario where specifying a scope is not required.

Execution option

There are three execution options:

- --dry-run --reset-offsets: Default option. Displays which offsets will be reset if the process is executed.
- --execute --reset-offsets : Executes the process.
- --export --reset-offsets : Exports results in CSV format.

Scenarios

There are a number of supported scenarios. Scenarios control what value the offsets are reset to. Specifying a scenario is mandatory.

- --to-datetime
- --by-period
- --to-earliest
- --to-latest
- --shift-by
- --from-file
- --to-current

Example:

```
kafka-consumer-groups --dry-run --reset-offsets --bootstrap-serv
er [HOST]:9092 --group [CONSUMER GROUP] --topic [TOPIC] --to-current
```

kafka-features

Learn about the kafka-features CLI tool, which you can use to describe currently active features.

Important: Support for this tool is limited in this version of Cloudera Runtime. Do not use the upgrade, downgrade, or disable, options to manage Kafka features in your cluster. Only use this tool to describe currently active features.

Describing currently active features

The kafka-features describe command returns the current features active in the cluster. The command returns a list of feature flags with their supported minimum and maximum versions as well as the finalized version, which is the version currently configured.

```
kafka-features --bootstrap-server [***HOST***]:[***PORT**] --command-config
 describe
```

- Replace *[***HOST***]:[***PORT**]* with the host and port of a broker.
- Replace *[***PROPERTY FILE***]* with the location of a configuration file that contains all necessary security properties that are required to establish a connection with the Kafka service. This option is only required if your Kafka service is secured.

kafka-reassign-partitions

Learn about the kafka-reassign-partitions tool, which is used to reassign partitions between brokers in a cluster.

This tool provides substantial control over partitions in a Kafka cluster. It is mainly used to balance storage loads across brokers through the following reassignment actions:

- Change the ordering of the partition assignment list. Used to control leader imbalances between brokers.
- Reassign partitions from one broker to another. Used to expand existing clusters.
- Increase the replication factor of partitions. Used to expand existing clusters.
- Reassign partitions between log directories on the same broker. Used to resolve storage load imbalance among available disks in the broker.
- Reassign partitions between log directories across multiple brokers. Used to resolve storage load imbalance across multiple brokers.

The tool uses two JSON files for input. Both of these are created by the user. The two files are the following:

- Topics-to-Move JSON
- Reassignment Configuration JSON

Topics-to-Move JSON

This JSON file specifies the topics that you want to reassign. This a simple file that tells the kafka-reassign-partitions tool which partitions it should look at when generating a proposal for the reassignment configuration. The user has to create the topics-to-move JSON file from scratch.

The format of the file is the following:

```
{"topics":  [{"topic": "mytopic1"},
             {"topic": "mytopic2"}],
 "version":1
}
```

Reassignment Configuration JSON

This JSON file is a configuration file that contains the parameters used in the reassignment process. This file is created by the user, however, a proposal for its contents is generated by the tool. When the kafka-reasssign-partitions tool is executed with the --generate option, it generates a proposed configuration which can be fine-tuned and saved as a JSON file. The file created this way is the reassignment configuration JSON. To generate a proposal, the tool requires a topics-to-move file as input.

The format of the file is the following:

```
{"version":1,
 "partitions":
   [{"topic":"mytopic1","partition":3,"replicas":[4,5],"log_dir
s":["any","any"]},
    {"topic":"mytopic1","partition":1,"replicas":[5,4],"log_dirs"
:["any","any"]},
    {"topic":"mytopic2","partition":2,"replicas":[6,5],"log_dir
s":["any","any"]}]
}
```

The reassignment configuration contains multiple properties that each control and specify an aspect of the configuration. The Reassignment Configuration Properties table lists each property and its description.

Table 7: Reassignment Configuration Properties

Property	Description
topic	Specifies the topic.
partition	Specifies the partition.
replicas	Specifies the brokers that the selected partition is assigned to. The brokers are listed in order, which means that the first broker in the list is always the leader for that partition. Change the order of brokers to resolve any leader balancing issues among brokers. Change the broker IDs to reassign partitions to different brokers.

Property	Description
log_dirs	Specifies the log directory of the brokers. The log directories are listed in the same order as the brokers. By default any is specified as the log directory, which means that the broker is free to choose where it places the replica. By default, the current broker implementation selects the log directory using a round-robin algorithm. An absolute path beginning with a / can be used to explicitly set where to store the partition replica.

Notes and Recommendations:

- Cloudera recommends that you minimize the volume of replica changes per command instance. Instead of moving 10 replicas with a single command, move two at a time in order to save cluster resources.
- This tool cannot be used to make an out-of-sync replica into the leader partition.
- Use this tool only when all brokers and topics are healthy.
- Anticipate system growth. Redistribute the load when the system is at 70% capacity. Waiting until redistribution becomes necessary due to reaching resource limits can make the redistribution process extremely time consuming.

Tool usage

Learn how to reassign partitions with the kafka-reassign-partitions-tool.

Procedure

1. Create a topics-to-move JSON file that specifies the topics you want to reassign.

   Use the following format:

```
{"topics":  [{"topic": "MYTOPIC1"},
             {"topic": "MYTOPIC2"}],
 "version":1
}
```

2. Generate the content for the reassignment configuration JSON with the following command:

```
kafka-reassign-partitions --bootstrap-server [***HOSTNAME***]:[***PORT***]
 --topics-to-move-json-file [***TOPICS TO MOVE.JSON***] --broker-li
st [***BROKER 1***], [***BROKER 2***] --generate
```

   Running the command lists the distribution of partition replicas on your current brokers followed by a proposed partition reassignment configuration.

```
Current partition replica assignment
{"version":1,
 "partitions":
   [{"topic":"mytopic2","partition":1,"replicas":[2,3],"log_dirs":["any","
any"]},
    {"topic":"mytopic1","partition":0,"replicas":[1,2],"log_dirs":["any"
,"any"]},
    {"topic":"mytopic2","partition":0,"replicas":[1,2],"log_dirs":["any","
any"]},
    {"topic":"mytopic1","partition":2,"replicas":[3,1],"log_dirs":["any"
,"any"]},
    {"topic":"mytopic1","partition":1,"replicas":[2,3],"log_dirs":["any","
any"]}]
}

Proposed partition reassignment configuration

{"version":1,
 "partitions":
```

```
   [{"topic":"mytopic1","partition":0,"replicas":[4,5],"log_dirs":["any",
"any"]},
    {"topic":"mytopic1","partition":2,"replicas":[4,5],"log_dirs":["any
","any"]},
    {"topic":"mytopic2","partition":1,"replicas":[4,5],"log_dirs":["any",
"any"]},
    {"topic":"mytopic1","partition":1,"replicas":[5,4],"log_dirs":["any
","any"]},
    {"topic":"mytopic2","partition":0,"replicas":[5,4],"log_dirs":["any",
"any"]}]
}
```

In this example, the tool proposed a configuration which reassigns existing partitions on broker 1, 2, and 3 to brokers 4 and 5.

3. Copy and paste the proposed partition reassignment configuration into an empty JSON file.
4. Review, and if required, modify the suggested reassignment configuration.
5. Save the file.
6. Start the redistribution process with the following command:

```
kafka-reassign-partitions --bootstrap-server [***HOSTNAME***]:[***PORT***]
 --reassignment-json-file [***REASSIGNMENT CONFIGURATION.JSON***] --execu
te
```

The tool prints a list containing the original replica assignment and a message that reassignment has started. Example output:

```
Current partition replica assignment

{"version":1,
 "partitions":
   [{"topic":"mytopic2","partition":1,"replicas":[2,3],"log_dirs":["any",
"any"]},
    {"topic":"mytopic1","partition":0,"replicas":[1,2],"log_dirs":["any
","any"]},
    {"topic":"mytopic2","partition":0,"replicas":[1,2],"log_dirs":["any",
"any"]},
    {"topic":"mytopic1","partition":2,"replicas":[3,1],"log_dirs":["any
","any"]},
    {"topic":"mytopic1","partition":1,"replicas":[2,3],"log_dirs":["any",
"any"]}]
}

Save this to use as the --reassignment-json-file option during rollback
Successfully started reassignment of partitions.
```

7. Verify the status of the reassignment with the following command:

```
kafka-reassign-partitions --bootstrap-server [***HOSTNAME***]:[***PORT***]
 --reassignment-json-file [***REASSIGNMENT CONFIGURATION.JSON***] --verify
```

The tool prints the reassignment status of all partitions.

```
Status of partition reassignment:
Reassignment of partition mytopic2-1 completed successfully
Reassignment of partition mytopic1-0 completed successfully
Reassignment of partition mytopic2-0 completed successfully
Reassignment of partition mytopic1-2 completed successfully
Reassignment of partition mytopic1-1 completed successfully
```

Results
Partitions are reassigned.

Reassignment examples
A collection of examples that demonstrate how users can modify the proposed configuration file generated by the kafka-reassign-partitions.

There are multiple ways to modify the configuration file. The following list of examples shows how a user can modify a proposed configuration and what these changes do.

Suppose that the kafka-reassign-partitions tool generated the following proposed reassignment configuration:

```
{"version":1,
 "partitions":
   [{"topic":"mytopic1","partition":0,"replicas":[1,2],"log_dirs":["any","a
ny"]}]}
```

Now let's look at how this reassignment configuration has to be changed in different reassignment scenarios.

Reassign partitions between brokers

To reassign partitions from one broker to another, change the broker ID specified in replicas. For example:

```
{"topic":"mytopic1","partition":0,"replicas":[5,2],"log_dirs":[
"any","any"]}
```

This reassignment configuration moves partition mytopic1-0 from broker 1 to broker 5.

Reassign partitions to another log directory on the same broker

To reassign partitions between log directories on the same broker, change the appropriate any entry to an absolute path. For example:

```
{"topic":"mytopic1","partition":0,"replicas":[1,2],"log_dirs":["/
log/directory1","any"]}
```

This reassignment configuration moves partition mytopic1-0 to the /log/directory1 log directory.

Reassign partitions between log directories across multiple brokers

To reassign partitions between log directories across multiple brokers, change the broker ID specified in replicas and the appropriate any entry to an absolute path. For example:

```
{"topic":"mytopic1","partition":0,"replicas":[5,2],"log_dirs":["/
log/directory1","any"]}
```

This reassignment configuration moves partition mytopic1-0 to /log/directory1 on broker 5.

Change partition assignment order (elect a new leader)

To change the ordering of the partition assignment list, change the order of the brokers in replicas. For example:

```
{"topic":"mytopic1","partition":0,"replicas":[2,1],"log_dirs":["a
ny","any"]}
```

This reassignment configuration elects broker 2 as the new leader.

Increase the replication factor of a topic

To increase the replication factor of a topic, add one or more new brokers to replicas. For example:

```
{"topic":"mytopic1","partition":0,"replicas":[1,2,3],"log_dirs":
["any","any","any"]}
```

kafka-log-dirs

Learn how to use the kafka-log-dirs tool.

The kafka-log-dirs tool allows user to query a list of replicas per log directory on a broker. The tool provides information that is required for optimizing replica assignment across brokers.

To retrieve replica assignment information, run the following command:

```
kafka-log-dirs --describe --bootstrap-server HOSTNAME:PORT --broker-li
st BROKER 1, BROKER 2 --topic-list TOPIC 1, TOPIC 2
```

Important: On secure clusters the admin client config property file has to be specified with the --command-config option. Otherwise, the tool fails to execute.

If no topic is specified with the --topic-list option, then all topics are queried. If no broker is specified with the --broker-list option, then all brokers are queried. If a log directory is offline, the log directory will be marked offline in the script output. Error example:

```
"error":"org.apache.kafka.common.errors.KafkaStorageException"
```

On successful execution, the tool prints a list of partitions per log directory for the specified topics and brokers. The list contains information on topic partition, size, offset lag, and reassignment state. Example output:

```
{
    "brokers": [
        {
            "broker": 86,
            "logDirs": [
                {
                    "error": null,
                    "logDir": "/var/local/kafka/data",
                    "partitions": [
                        {
                            "isFuture": false,
                            "offsetLag": 0,
                            "partition": "mytopic1-2",
                            "size": 0
                        }
                    ]
                }
            ]
        },
        ...
    ],
    "version": 1
}
```

The following table gives an overview of the information provided by the output of the kafka-log-dirs tool.

Table 8: Contents of the kafka-log-dirs Output

Property	Description
broker	Displays the ID of the broker.

Property	Description
error	Indicates if there is a problem with the disk that hosts the topic partition. If an error is detected, org.apache.kafka.common.errors.KafkaStorageException is displayed. If no error is detected, the value is null.
logDir	Specifies the location of the log directory. Returns an absolute path.
isfuture	The reassignment state of the partition. This property shows whether there is currently replica movement underway between the log directories.
offsetLag	Displays the offset lag of the partition.
partition	Displays the name of the partition.
size	Displays the size of the partition in bytes.

zookeeper-security-migration

Learn how to use the zookeeper-security-migration tool.

The zookeeper-security-migration tool is used in the process of restricting or unrestricting access to metadata stored in Zookeeper. When executed, the tool updates the ACLs of znodes based on the configuration specified by the user.

Important: Running the zookeeper-security-migration tool is only one of the steps required when restricting or unrestricting access. For full instructions, see Restricting Access to Kafka Metadata in Zookeeper.

Set the ACLs on all existing Zookeeper znodes to secure with the following command:

```
zookeeper-security-migration --zookeeper.connect HOSTNAME:PORT --zookeeper
.acl secure
```

Set the ACLs on all existing Zookeeper znodes to unsecure with the following command:

```
zookeeper-security-migration --zookeeper.connect HOSTNAME:PORT --zookeeper
.acl unsecure
```

Related Information

Restricting Access to Kafka Metadata in Zookeeper

kafka-delegation-tokens

Learn how to use the kafka-delegation-tokens tool.

The kafka-delegation-tokens provides the user with the functionality required for using and managing delegation tokens.

The tool can be used to issue, renew, expire, or describe delegation tokens.

Issue, and store for verification

The owner of the token is the currently authenticated principal. A renewer can be specified when requesting the token.

```
kafka-delegation-tokens --bootstrap-server HOSTNAME:PORT  --crea
te   --max-life-time-period -1 --command-config CLIENT.PROPERTIES
 --renewer-principal USER:USER1
```

Renew

Only the owner and the principals that are renewers of the delegation token can extend its validity by renewing it before it expires. A successful renewal extends the Delegation Token's expiration time for another renew-interval, until it reaches its max lifetime. Expired delegation tokens cannot be renewed. The brokers remove expired delegation tokens from the broker's cache and from the metadata service.

Important: A delegation token cannot be used to renew a delegation token. The delegation token owner must authenticate using a different method to renew a token.

```
kafka-delegation-tokens --bootstrap-server HOSTNAME:PORT --renew
    --renew-time-period -1 --command-config CLIENT.PROPERTIES --h
mac LAYYSFMLS4BTJF+LTZ1LCHR/ZZFNA==
```

Remove

Delegation tokens are removed when they are canceled by the client or when they expire.

```
kafka-delegation-tokens --bootstrap-server HOSTNAME:PORT --expir
e   --expiry-time-period -1   --command-config CLIENT.PROPERTIES
 --hmac LAYYSFMLS4BTJF+LTZ1LCHR/ZZFNA==
```

Describe

Tokens can be described by owners, renewers or the Kafka super user.

```
kafka-delegation-tokens --bootstrap-server HOSTNAME:PORT --
describe --command-config CLIENT.PROPERTIES  --owner-princi
pal USER:USER1
```

Note: In Apache Kafka, principals that have the describe permission on the token resource can also describe the token.

kafka-*-perf-test

The kafka-*-perf-test tools can be used in several ways. In general, it is expected that these tools should be used on a test or development cluster.

The kafka-*-perf-test tools allow you to:

- Measure, read, and write throughput.
- Stress test the cluster based on specific parameters (such as message size).
- Load test for the purpose of evaluating specific metrics or determining the impact of cluster configuration changes.

The kafka-producer-perf-test script can either create a randomly generated byte record:

```
kafka-producer-perf-test --topic TOPIC --record-size SIZE_IN_BYTES
```

or randomly read from a set of provided records:

```
kafka-producer-perf-test --topic TOPIC --payload-delimiter DELIMITER --paylo
ad-file INPUT_FILE
```

where the *INPUT_FILE* is a concatenated set of pre-generated messages separated by *DELIMITER*. This script keeps producing messages or limited based on the --num-records flag.

The kafka-consumer-perf-test is:

```
kafka-consumer-perf-test --broker-list HOST1:PORT1,HOST2:PORT2,... --zooke
eper ZK1:PORT1,ZK2:PORT2,... --topic TOPIC
```

The flags of most interest for this command are:

- --group *GID*: If you run more than one instance of this test, you will want to set different ids for each instance.
- --num-fetch-threads: Defaults to 1. Increase if higher throughput testing is needed.
- --from-latest: To start consuming from the latest offset. May be needed for certain types of testing.

Configuring Kafka command line tools in FIPS clusters

Before running Kafka CLI tools in FIPS clusters that use JDK 17, you must set the KAFKA_OPTS environment variable in your shell environment to include various JVM arguments. Otherwise, Kafka CLI tools will not run. Learn what JVM arguments you must set and how you can set them.

Before you begin

- The following configuration is not required if your cluster uses JDK 8.
- Ensure that you know the location of the following SafeLogic Java modules (JAR files):
  - SafeLogic CC Java module – ccj-*[***VERSION***]*.jar
  - SafeLogic BCTLS Java module – bctls-safelogic.jar

  These JAR files are deployed on all cluster hosts at a location of your choosing. You can choose the location during cluster installation. Both JARs are located in the same directory.

Procedure

1. In Cloudera Manager, go to Administration Settings .
2. Find the Extra JVM arguments for Java-based services property and take note of its contents.

   The property contains various JVM arguments. The content of the property is similar to the following example:

   ```
   -Dcom.safelogic.cryptocomply.fips.approved_only=true \
   -Djdk.tls.ephemeralDHKeySize=2048 -Dorg.bouncycastle.jsse.client.assumeOr
   iginalHostName=true \
   -Djdk.tls.trustNameService=true
   ```
3. Using ssh, log in to the cluster host where you want to run the tool.
4. Set the KAFKA_OPTS environment variable in your shell environment.

   KAFKA_OPTS must contain the JVM arguments present in Extra JVM arguments for Java-based services as well as the following additional options:

   ```
   --add-modules=com.safelogic.cryptocomply.fips.core,bctls \
   --add-exports=java.base/sun.security.provider=com.safelogic.cryptocomply.
   fips.core \
   --add-exports=java.base/sun.security.provider=bctls \
   --module-path=/[***LOCATION***]\
   ```

   Where *[***LOCATION***]* is the absolute path to the location where the SafeLogic CC (ccj-*[***VERSION***]*.jar) and SafeLogic BCTLS (bctls-safelogic.jar) Java module JARs are located.

   The command you run to set KAFKA_OPTS will be similar to the following:

   ```
   export KAFKA_OPTS="-Dcom.safelogic.cryptocomply.fips.approved_only=true \
   -Djdk.tls.ephemeralDHKeySize=2048 \
   -Dorg.bouncycastle.jsse.client.assumeOriginalHostName=true \
   ```

```
-Djdk.tls.trustNameService=true --add-modules=com.safelogic.cryptocomply.
fips.core,bctls \
--add-exports=java.base/sun.security.provider=com.safelogic.cryptocomply.f
ips.core \
--add-exports=java.base/sun.security.provider=bctls \
--module-path=/[***LOCATION***]"
```

5. Run the tool.

Configuring log levels for command line tools

Learn how to change the logging level of command line tools.

About this task

In some cases it can prove useful to change the default logging level of the command line tools. This can be done by setting the required logging level in the log4j2 properties file that the tools use.

Procedure

1. Create a copy of the log4j2.properties file that the tools use.

   You are free to change the location where the copy gets created.

   ```
   cp /etc/kafka/conf/tools-log4j2.properties /VAR/TMP
   ```

2. Open the copied file and change the value of the root.logger property as required.

   For example:

   ```
   root.logger=TRACE,console
   ```

3. Pass the location of the newly created properties file as a JVM parameter.

   You can do this by adding -Dlog4j2.configurationFile=file:*[PATH_TO_FILE]* to the KAFKA_OPTS variable. For example:

   ```
   export KAFKA_OPTS="-Dlog4j2.configurationFile=file:/VAR/TMP/TOOLS-
   LOG4J2.PROPERTIES"
   ```

Results

The specified logging level is configured.

Understanding the kafka-run-class Bash Script

Almost all the provided Kafka tools eventually call the kafka-run-class script. This script is generally not called directly. However, if you are proficient with bash and want to understand certain features available in all Kafka scripts as well as some potential debugging scenarios, familiarity with the kafka-run-class script can prove highly beneficial.

For example, there are some useful environment variables that affect all the command line scripts:

- KAFKA_DEBUG allows a Java debugger to attach to the JVM launched by the particular script. Setting KAFKA_DEBUG also allows some further debugging customization:
  - JAVA_DEBUG_PORT sets the JVM debugging port.
  - JAVA_DEBUG_OPTS can be used to override the default debugging arguments being passed to the JVM.
- KAFKA_HEAP_OPTS can be used to pass memory setting arguments to the JVM.
- KAFKA_JVM_PERFORMANCE_OPTS can be used to pass garbage collection flags to the JVM.