

Ultra Cloud Core Common Data Layer Configuration and Administration Guide, Release 1.12

First Published: 2025-08-12

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About this Guide

Note The documentation set for this product strives to use bias-free language. For purposes of this documentation set, bias-free is defined as language that does not imply discrimination based on age, disability, gender, racial identity, ethnic identity, sexual orientation, socioeconomic status, and intersectionality. While any existing biased terms are being substituted, exceptions may be present in the documentation due to language that is hardcoded in the user interfaces of the product software, language used based on RFP documentation, or language that is used by a referenced third-party product.

This preface describes the *Common Data Layer*, how it is organized and its document conventions.

This guide describes the Cisco Common Data Layer (CDL) and includes infrastructure and interfaces, feature descriptions, specification compliance, session flows, configuration instructions, and CLI commands for monitoring and troubleshooting the system.

• Conventions Used, on page ix

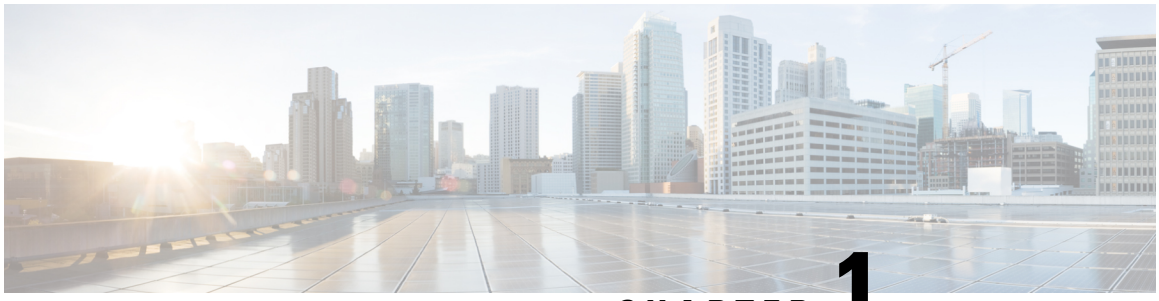
Conventions Used

The following tables describe the conventions used throughout this documentation.

Notice Type	Description
Information Note	Provides information about important features or instructions.
Caution	Alerts you of potential damage to a program, device, or system.
Warning	Alerts you of potential personal injury or fatality. May also alert you of potential electrical hazards.

Typeface Conventions	Description
Text represented as a `screen display`	This typeface represents displays that appear on your terminal screen, for example: `Login:`

Typeface Conventions	Description
Text represented as **commands**	This typeface represents commands that you enter, for example: **show ip access-list** This document always gives the full form of a command in lowercase letters. Commands are not case sensitive.
Text represented as a **command** *variable*	This typeface represents a variable that is part of a command, for example: **show card** *slot_number* *slot_number* is a variable representing the desired chassis slot number.
Text represented as menu or sub-menu names	This typeface represents menus and sub-menus that you access within a software application, for example: Click the **File** menu, then click **New**



CHAPTER 1

Cisco Common Data Layer

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Overview

The Cisco Common Data Layer (CDL) is a high-performance next generation Key-value (KV) data store layer for all the Cloud Native applications. These applications use the CDL as a state management with High Availability (HA) and Geo HA functions. The CDL provides:

- A Common Data Store Layer across different Network Functions (NFs) - such as AMF, SMF and PCF - Microservices.
- Multi-primary support to achieve low latency read and write.
- Pure in-memory storage.
- Runs session related timers to notify NF on timer expiry.
- High Availability and Geo Redundancy with fast failover

Revision History

Table 1: Revision History

Revision Details	Release
• CDL supports identifying and taking necessary action on stale index records. • Allows the peer site to process GR failover notifications of the isolated site. • CDL provides a utility to sync the indexes with its remote peers. • The Grafana dashboard is enhanced to show the GR Connection status.	2020.02.3

Architecture

You can deploy CDL in the following modes:

- **HA Only**
- **Geo HA**

Note For HA Only deployments, redundancy is provided for blade failures at the local site. However, session redundancy is not provided for HA Only deployments, when the complete site or K8s cluster is unreachable.

The following figures depict the high-level architecture of the CDL deployment models.

Figure 1: CDL Deployment Model

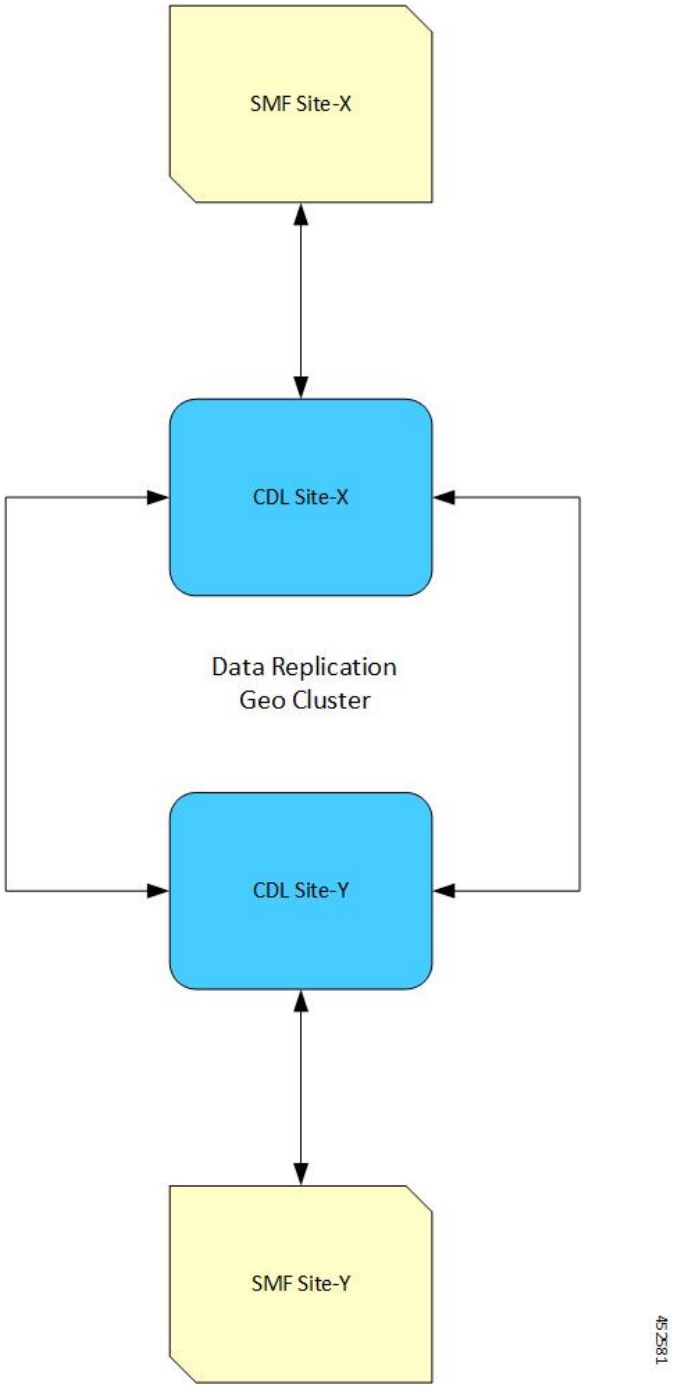
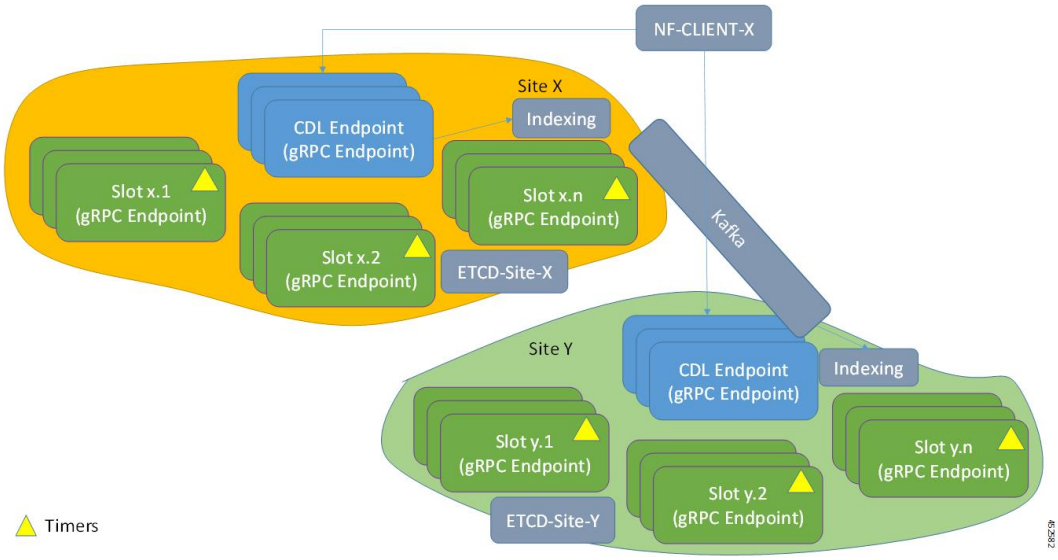
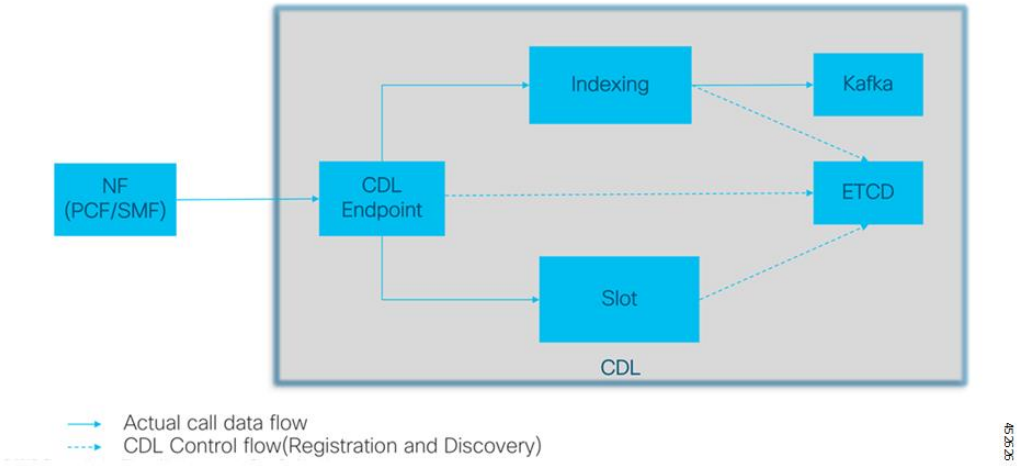


Figure 2: CDL Microservices



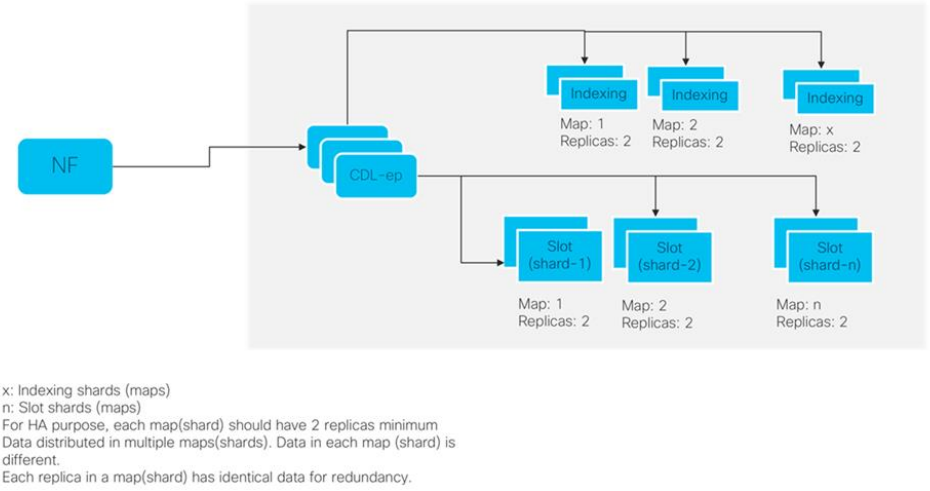
The following figures depict the CDL high-level architecture:

Figure 3: CDL Architecture



The following figures depict the CDL high-level architecture with primary components:

Figure 4: CDL Architecture with Primary Components



CDL Endpoint

The CDL endpoint pod is the front-end for receiving requests from NF application towards CDL. The CDL endpoint exposes gRPC over HTTP2 interface towards the NF client's for processing database service requests. Each pod starts with the following attributes:

- **systemID:** This parameter specifies the site ID (For instance: Site).
- **clusterID:** This parameter specifies the unique datastore ID within a site (For instance: X, Y).

The CDL endpoint receives the Create, Read, Update, Delete (CRUD) requests from the NF applications. It communicates with the CDL Index and Slot pods over GRPC to perform these operations.

The CDL endpoint learns about the other pods within a site automatically using the *etcd*. Also, the Cisco Data Store K8s pod is stateless in nature and does not maintain any session stickiness. The CDL endpoint receives the request from NF application and communicates with Slot and Index pods internally through GRPC to handle the request accordingly. It returns the response after the processing is complete.

When the CDL endpoint receives a Create, Delete, or Update session, the receiving container replicates it to the Slot and Index pods and sends a response only when 'n' number of writes are acknowledged (ACKed) by the Index and Slot microservices.

Note A maximum of four virtual CPUs (vCPUs) is required for deploying the CDL endpoint pod in production environment.

Single Compute or Node Failure

When a single compute or node fails, one of the *cdl-ep* pods goes down and tries to schedule on the other session nodes. If all the other session nodes already have a *cdl-ep*, pod scheduling will not take place since there is node anti-affinity defined for *cdl-ep* pods. So, with single node failure, the remaining *cdl-ep* pods handle the traffic and might get loaded with the many requests. After recovering from the node failure, the

cdl-ep pod, which was in the pending state earlier, starts scheduling on the recovered node to process the requests.

Multiple Compute or Node Failures

If all the session nodes fails, it brings down all the *cdl-ep* pods along with it. When Geo High Availability (GeoHA) is configured, the NF application talks to the remote site to continue processing the sessions on the local site. But, in High Availability (HA) scenario, this leads to a complete downtime.

Slot

The CDL Slot pod stores the actual session data. The CDL endpoint connects to all the Slot pods within the cluster to replicate the session data to all the pods. These microservices are K8s pod deployed for exposing internal gRPC interface towards the Cisco Data Store. Each pod starts with the following attributes:

- **systemID:** This parameter specifies the site ID (For instance: Site-1).
- **clusterID:** This parameter specifies the unique datastore ID within a site (For instance: Session).
- **mapID:** This parameter specifies the replica set ID within the cluster. (For instance: map-1, map-2,..map-n).
- **instanceID:**This parameter specifies the instance ID within the replica set. (For instance: map-1.instance-1,map-1.instance-2)

Each Slot pod holds a finite number of sessions and pre-allocated memory for the storing session data. Also, each replica within the replica set (mapID) has a defined anti affinity rule, which prevents the same blade form hosting multiple member or instances of the same replica set (for high availability in case of a blade or node failure). Each Slot pod maintains a timer and last updated ts. The Slot pod generates the notification callback to the client NF for taking action when the timer expires of if a conflict is detected.



Note A maximum of two vCPUs is required for deploying the Slot pod in production environment.

In the event of pod failover and recovery, the Slot pod recovers from:

- **Local Replica Member:** The Slot directly reads from the gRPC stream in bulk directly to recover data.
- **Remote Replica Member:** When there is no local replica available for synchronization, the Slot reads the data from the remote site instances for the same map.

  The following figures depict the Slot recovery process from local and remote peers:

Figure 5: Slot Recovery from Local Peer

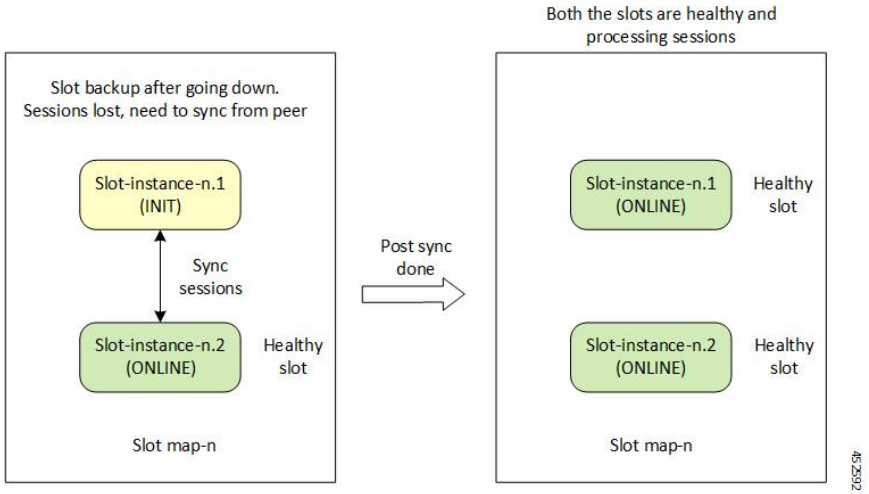
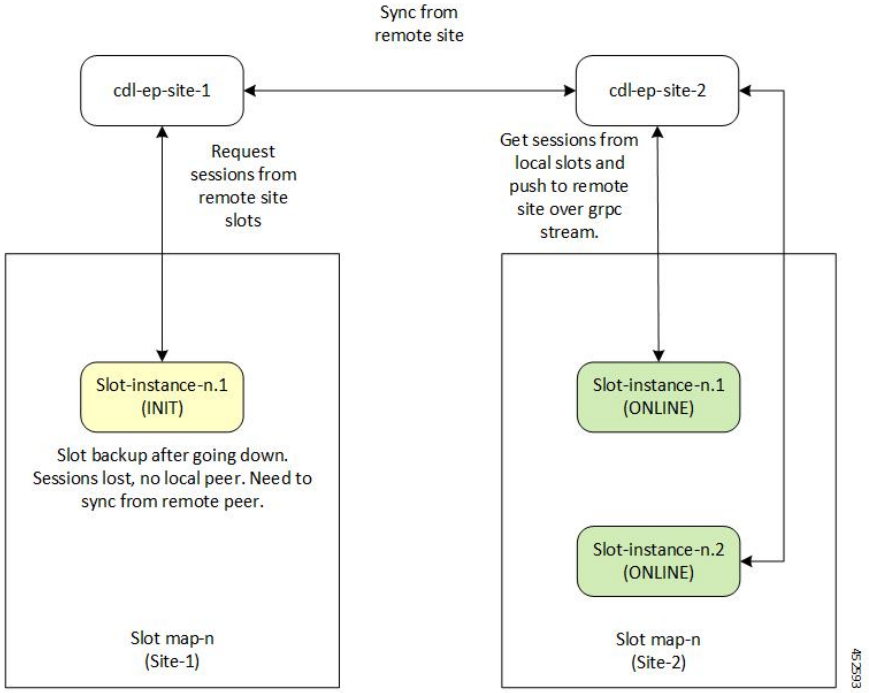


Figure 6: Slot Recovery from Remote Peer



Data Slicing

Data slicing logically separates CDL as slices and stores the session data based on the slice name received from the Network Functions (NF).

With data slicing, one or more NFs can store different types of session data in dedicated slices of CDL.

A default slice name called **session** is used if the slice names are not configured.

The configuration is as follows:

```
cdl datastore <datastore name> slice-names [ <sliceName 1> <sliceName 2> ... <sliceName n>
 ]
```

The sample configuration is as follows:

```
cdl datastore session slice-names [ session1 session2 ]
```



Note

- If the slice names are configured at the NF's ops-center or CDL's ops-center, every request from the NF must have a valid slice name. If the slice name is different from what is configured or empty, then the request is rejected with an error code.
- If the slice names are not configured, then the NF requests are routed to the default **session**.
- The slice names cannot be updated in a running system post deployment.

Deleting CDL Slot Data

In certain scenarios, the CDL records are found on Slot but not in the index pods. The notifications from Slot towards the application for such records do not receive the values correctly. The record in the slot is not deleted, if the index data is not deleted.

Ensure the following before deleting the CDL Slot Data:

- If the number of notifications to an application crosses a threshold value (default value of 3), a record is suspected to be stale.
- This triggers a validation check to find the corresponding record in any of the index pods (local or on any geo remote sites).
- If there is a mismatch in map ID from index, or if the map ID is not found in all index pods, then a clean-up is invoked to delete the record on local as well as remote sites.

The following parameters are introduced to delete stale records:

disable-auto-deletion:When set to true, the stale CDL records are not deleted. Auto deletion of stale records is enabled by default.

notification-retry-count:Specifies the minimum number of timer expiry notification retries sent to application without receiving an update from application. If there are no updates received even after notification-retry-count times, cdl proceeds to check if slot record is stale. The default number is 3.

The sample CDL configurations are as follows:

To disable the stale slot record auto deletion feature:

```
cdl datastore session
features slot-stale-session-detection disable-auto-deletion true
exit
```

You can change the notification-retry-count to a new value, for example 5. This indicates that the timer expiry notification tries 5 times, after which it proceeds for checking whether the data is stale.

```
cdl datastore session
```

```
features slot-stale-session-detection notification-retry-count 5
exit
```

Troubleshooting

To enable troubleshooting logs for Stale CDL Slot Data on endpoint and slot pods, use the following configuration:

```
cdl logging logger ep.staleRecord.session
level info
exit

cdl logging logger slot.staleRecord.session
level info
exit
```

Single Compute or Node Failure

When there is a single compute failure, the CDL continues to function with one less *cdl-ep* pod and replica for some Slots and Index pods. With a single replica, the CDL Slot map continues to process all the requests. When the out of service node is brought back to service, the Slot pods on the node syncs with its respective peer, as depicted in the figure Slot Recovery from Local Peer.

Multiple Compute or Node Failures

In case of multiple compute failures, all the replicas for a Slot map goes down. For instance, If two nodes are down, both the replicas of a Slot map goes down (the default value of Slot replica count is two). This leads to an entire local replica-set failure and triggers a shutdown of all the *cdl-ep* pods. Also, a CDL Geo Replication (GR) is triggered, if GeoHA is configured. The NF application talks to the remote site *cdl-ep* to process the requests when GeoHA is configured. When there is no GeoHA configuration, it ultimately leads to a service downtime.

When the failed nodes recover, the Slot pods and Slot replica set recovers and synchronizes from the remote site (if both the replicas were down during the failure). This will happen only if GeoHA is configured. The Slot Recovery from Remote Peer figure depicts the initial synchronization from the remote peer when the entire local replica set was down.

Indexing

The Indexing containers contain indexing data. There are two key pieces of information stored in the Index pod:

- Primary key to Slot Map ID.
- Unique secondary key to primary key mapping.

The index entries are created (an example use case) at the time of session connect and removed at the time of disconnect. Using the in-memory KV store, Indexing stores the keys in memory and provides a multi-primary write. The indexing write log (set and delete operations) are also written to Kafka pods for remote site replication. One of the Index pods writes the logs in Kafka, which are then received at the remote site. The corresponding operations are also performed at the remote site.

Note A maximum of two vCPUs is required for deploying the Index pod in production environment.

In the event of pod failover and recovery, the Index pod recovers from:

- **Local Replica Member** - The Index directly reads from the gRPC stream in bulk directly to recover data.
- **Remote Replica Member** - If there is no local replica available for synchronization, the Index reads the data from the remote site instances for the same map.

  The following figures depict the Index recovery process from local and remote peers:

Figure 7: Index Recovery from Local Peer

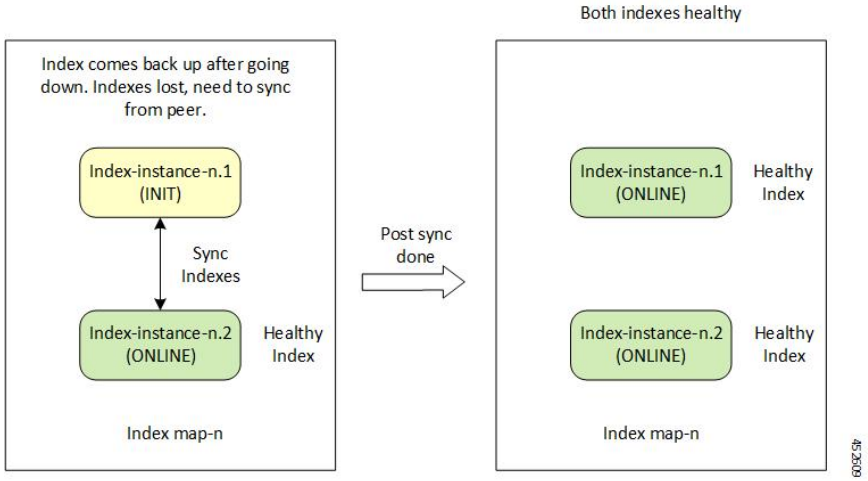
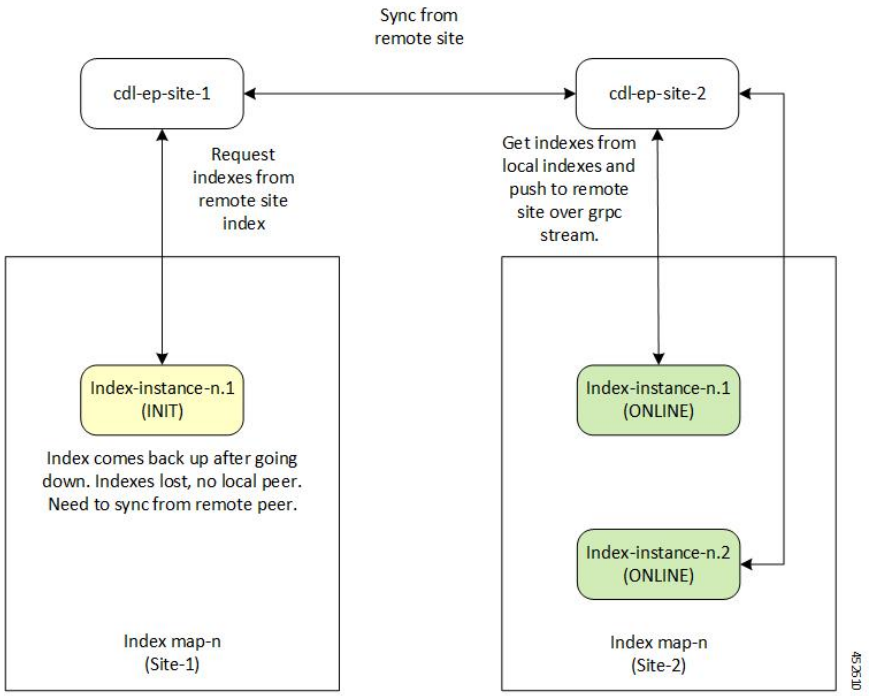


Figure 8: Index Recovery from Remote Peer



Single Compute or Node Failure

When there is a single compute failure, the CDL continues to function with one less *cdl-ep* pod and replica for some Slots and Index pods. With a single replica, the CDL Slot map continues to process all the requests. When the out of service node is brought back to service, the Index pods on the node syncs with its respective peer, as depicted in the figure Index Recovery from Local Peer.

Multiple Compute Failures

In case of multiple compute failures, all the replicas for a Slot map goes down. For instance, If two nodes are down, both the replicas of a Slot map goes down (the default value of Slot replica count is two). This leads to an entire local replica-set failure and triggers a shutdown of all the *cdl-ep* pods. Also, a CDL Geo Replication (GR) is triggered, if GeoHA is configured. The NF application talks to the remote site *cdl-ep* to process the requests when GeoHA is configured. When there is no GeoHA configuration, it ultimately leads to a service downtime.

When the failed nodes recover, the Index pods and Index replica set recovers and synchronizes from the remote site (if both the replicas were down during the failure). This will happen only if GeoHA is configured. The *Index Recovery from Remote Peer* figure depicts the initial synchronization from the remote peer when the entire local replica set was down.

ETCD

The CDL uses the *etcd* (an open-source key-value store) as the DB service discovery. When the CDL pods (Endpoint, Slot or Index) is started, killed or shutdown, it results in updating the event to *etcd* by publishing the state.

The CDL endpoint is interested in knowing when a Slot or Index pod comes up or goes down. Therefore, it subscribes to the notifications for Slot and Index pod events in *etcd*.

Similarly, the CDL Slot or Index pod is interested in knowing when its peer replica pod (with the same map-id) comes up or goes down. Therefore, it subscribes to the notifications for corresponding Slot or Index (with same map-id) pod events in *etcd*.

Thus, the notifications are sent to each of the pods subscribed to these events. In addition, when a key event is added or removed, it refreshes the local map. The *etcd* cache is only applicable for local site events.

Kafka

The Kafka pod replicates data between the local replicas and across sites for Indexing. For replication across sites, Kafak uses MirrorMaker. The Kafka pods are deployed on the session *vms* with the replica count set to a minimum of two for high availability.

Zookeeper

Kafka uses the Zookeeper pod for managing Kafka clusters and coordinating with Kafka brokers.

Mirror Maker

The Mirror Maker pod geo-replicates the indexing data to the remote CDL sites. It takes data from the remote sites and publishes it to the local Kafka site for the appropriate Indexing instances to pick up.

Remote Site Monitoring

Feature Description

CDL endpoint monitors the remote site connection (replication connection and internal operational connection) using the CDL Ping RPC every 30 seconds. If ping fails three times for any of the connections, then recreate that connection and close the old connection.

Remote site monitoring is configurable and it is enabled by default. Use the **cdl datastore session features remote-site-connection-monitoring enable** CLI command to enable or disable remote site connections.

Configuring Remote Site Connection

To enable or disable remote site connection, use the following CLI command:

```
config
  cdl datastore session features remote-site-connection-monitoring enable
 [ true | false ]
  exit
```

Troubleshooting Information

To view the logs for remote site connection on an endpoint, use the following configuration:

```
cdl logging logger ep.remoteConnection.session
level trace
exit
```

CDL Deployment Models

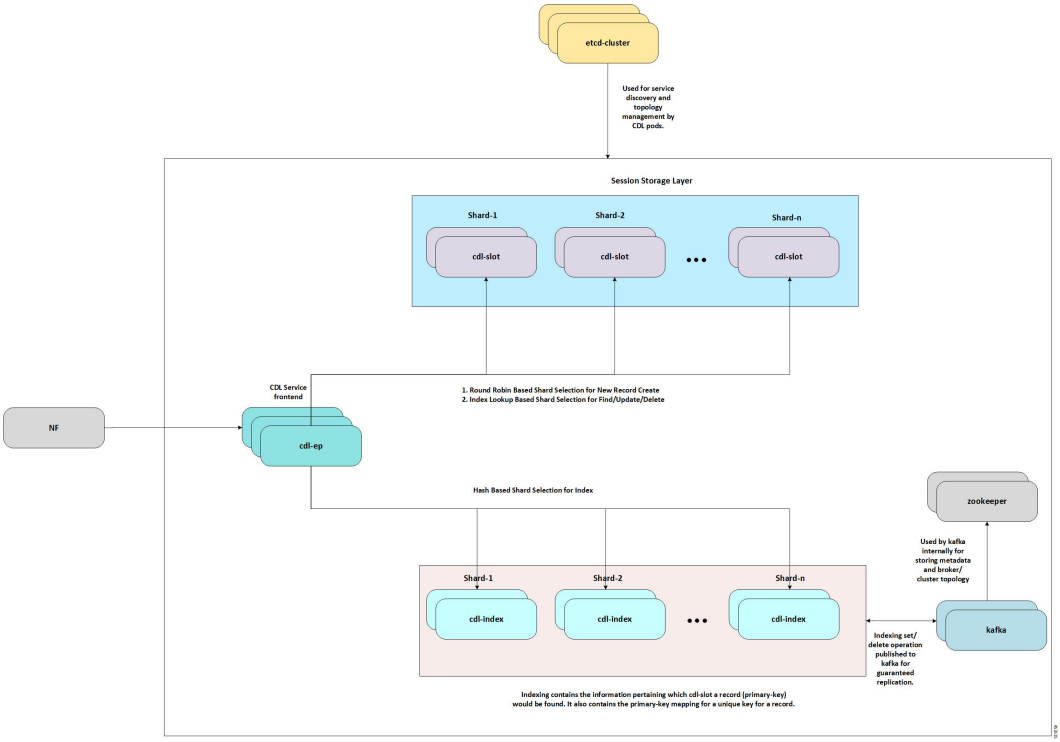
This section describes the different CDL deployment models, namely:

- CDL HA.
- Geo HA deployment.

The CDL HA deployment involves the following:

1. Each CDL pod consists of a minimum of two replicas for high availability.
2. The CDL endpoint pod discovers the local Slots and Indexes using *etcd* for service discovery.
3. 3. The Index and Slot pod data is distributed across maps (or shards) for write scalability and each maps have at least one replica for high availability. The default and recommended number of replicas for Slot and Index replica is two.
4. The CDL endpoint on receiving request selects the Slot shard to which the data is written to or read from. For new record creation, it selects the Slot map in a round robin manner. For existing sessions, the slot map is selected after looking up the primary key in indexing.
5. If new keys (primary or unique) are added or removed for a session, the CDL endpoint sends the key to the Indexing pods. The Index map selection takes place by hashing of the key and sending it to the appropriate Index map for updating the key in the Index. For primary key, the Indexing pod stores the Slot map-id where the session is stored. For unique-key, the Indexing pod stores the primary-key where the session is stored.
6. The CDL endpoint forwards the Create, Update, Delete, or Find request to the selected Slot(s) for writing or reading the data from the Slot memory. The slot generates an appropriate response towards the endpoint on successful processing of the request.
7. Each Indexing shard contains a leader which publishes the indexing operations to Kafka bus for guaranteed local and remote replication.
8. Each Indexing pod instance listens to the Kafka bus for Indexing events. On receipt of a set or delete event, it compares the time stamp of the event with the time stamp of the Index already present. If the Kafka event time stamp is greater than the current Index time stamp, it applies the operation to the Indexing pod, else the event from Kafka is ignored.

Figure 9: CDL HA Deployment

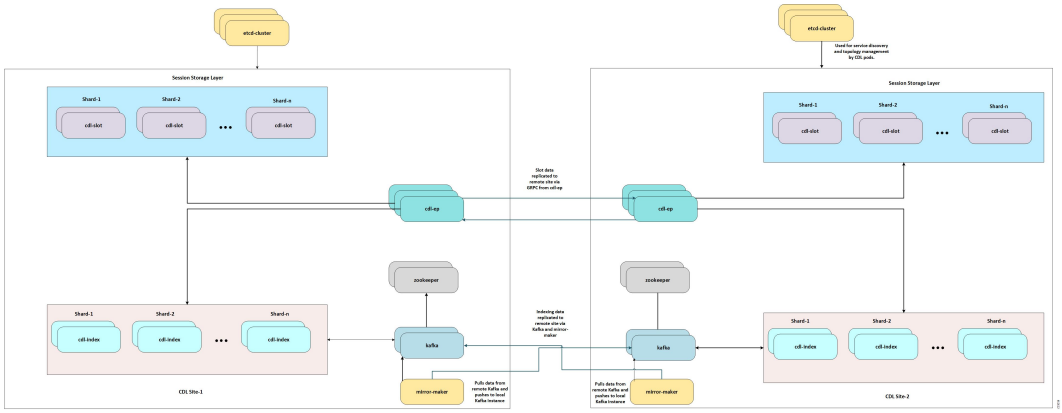


The CDL Geo HA deployment involves the following:

1. For CDL Geo HA deployment, each site is configured with a remote site for achieving geo redundancy.
2. In addition to sending the data to local Slots and Indexes, the CDL endpoint also sends the request to remote site *cdl-endpoint* over GRPC to replicate Slot data on the remote sites.
3. On receiving the Create,Update, or Delete request on the remote site, the CDL endpoint forwards the request to Slots with the same map-id as selected in the original site.
4. The Indexing data replication is achieved through the Mirror-maker. The Mirror-maker on the remote site consumes the data from the Kafka of other site and pushes the data to its local Kafka bus for replicating it to the local Index pods.

Note For Geo HA deployments, the round-trip time (RTT) recommended between two geo sites is 50ms.

Figure 10: CDL Geo HA Deployment



Call Flows

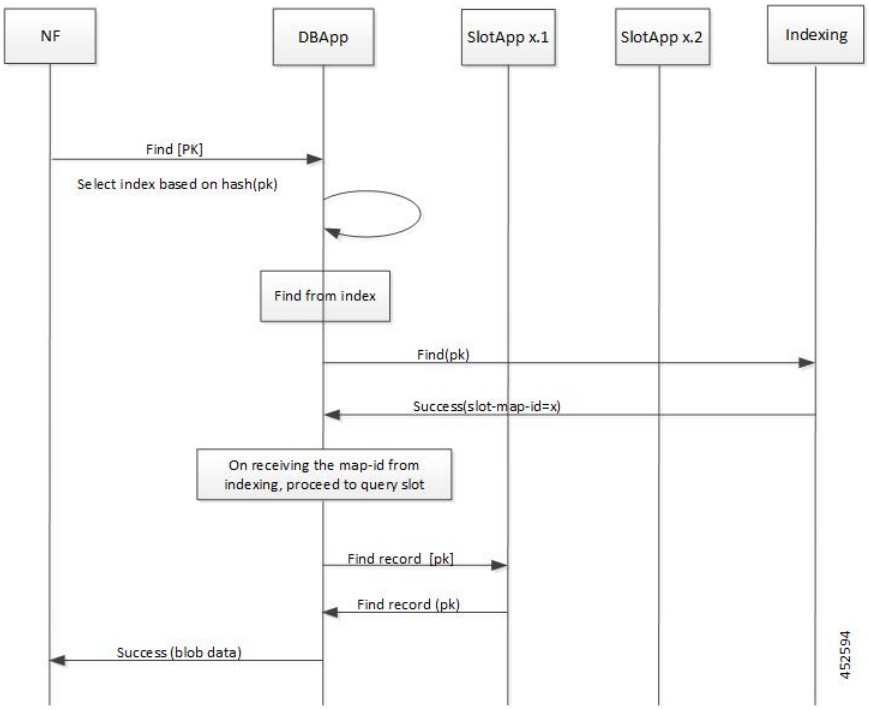
This section describes the following call flows:

- Finding Record by Primary Key
- Finding Record by Unique Key
- Creating a Record
- Updating a Record
- Deleting a Record
- Notification to NF on Timer Expiry
- Geo Replication - Create (GEO)
- Geo Replication - Update (GEO)
- Geo Replication - Delete (GEO)

Finding Record by Primary Key

This section describes the call flow of finding a record by primary key.

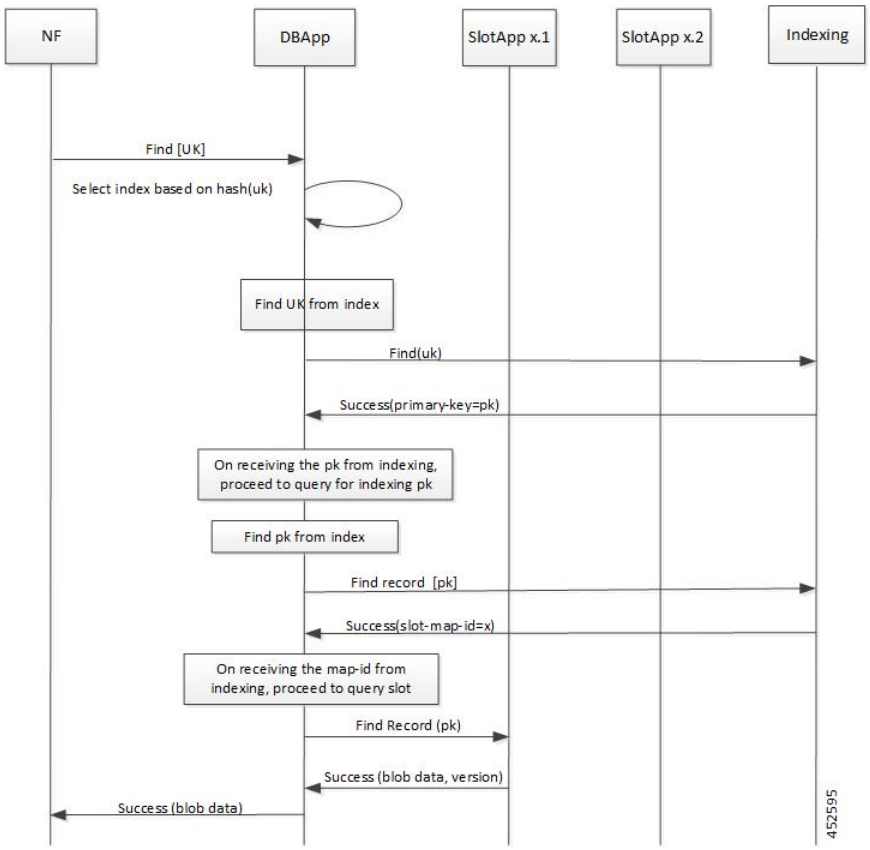
Figure 11: Finding Record by Primary Key - Call Flow



Finding Record by Unique Key

This section describes the call flow of finding a record by unique key.

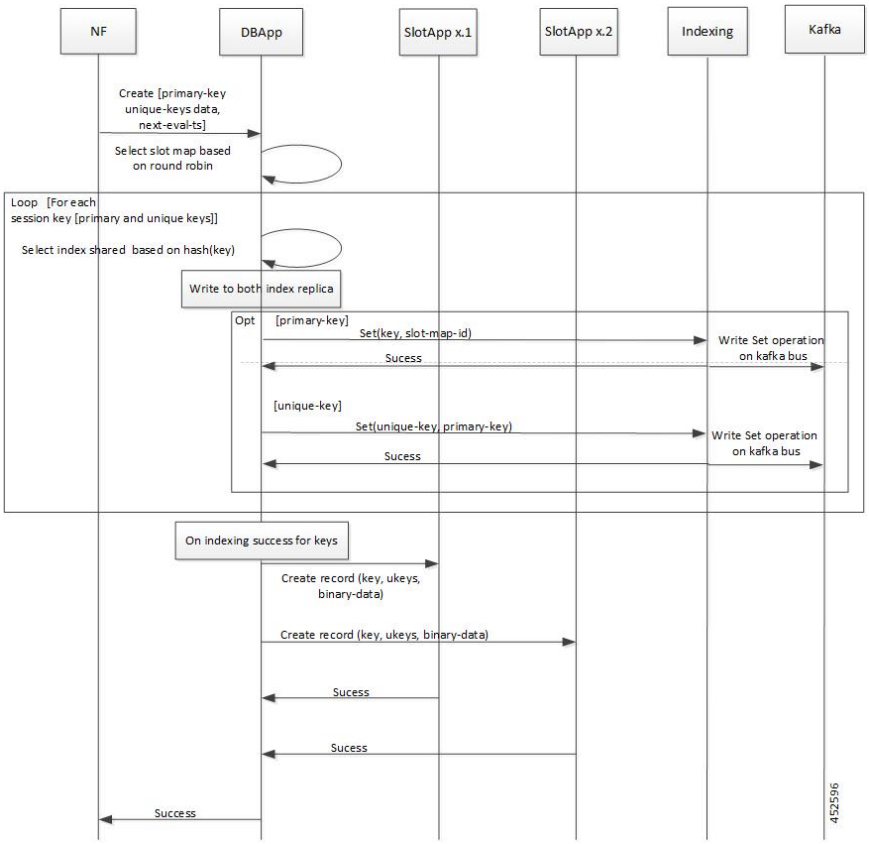
Figure 12: Finding Record by Unique Key - Call Flow



Creating a Record

This section describes the call flow of creating a record.

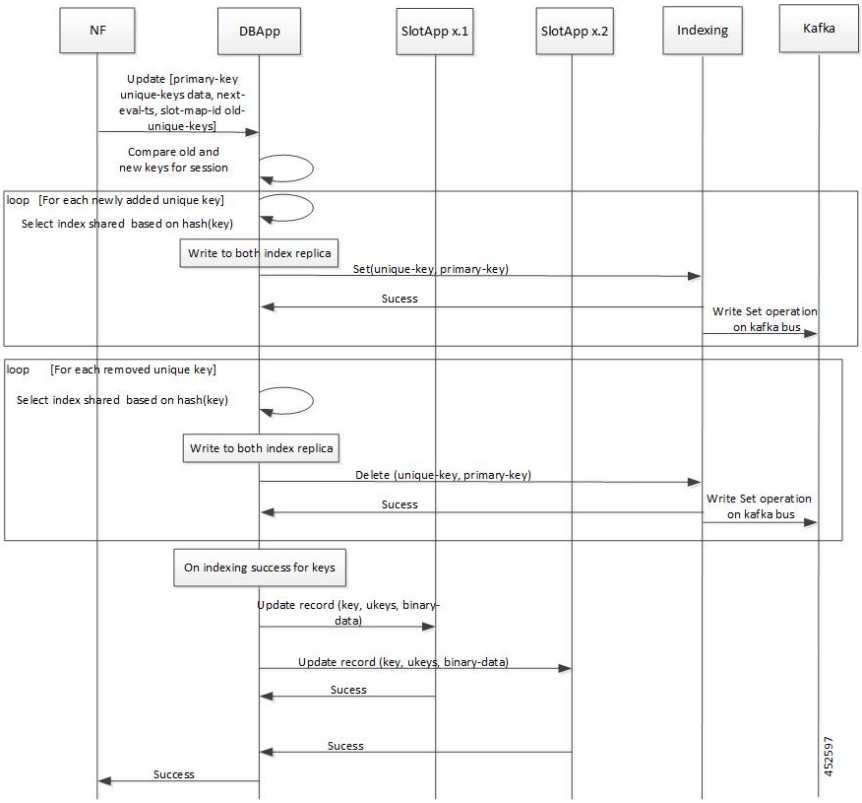
Figure 13: Creating a Record - Call Flow



Updating a Record

This section describes the call flow of updating a record.

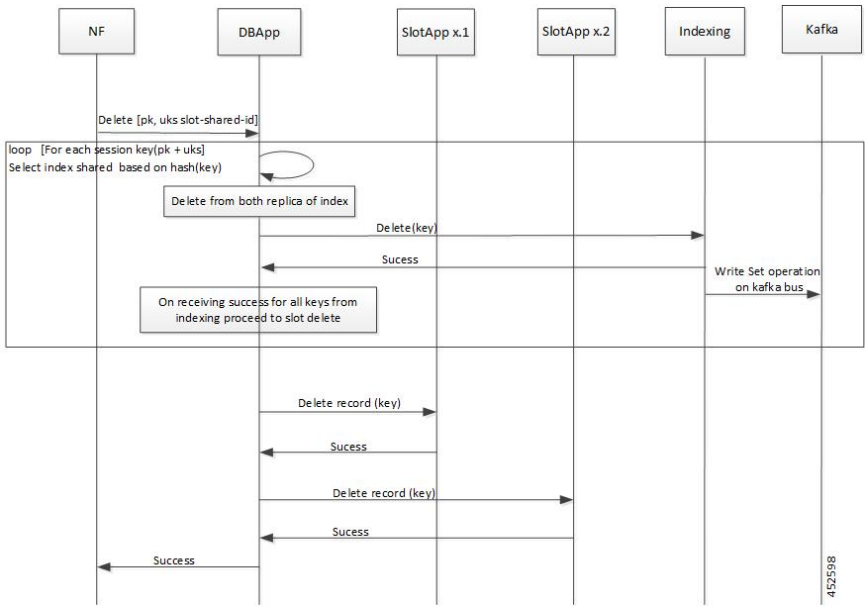
Figure 14: Updating a Record - Call Flow



Deleting a Record

This section describes the call flow of deleting a record.

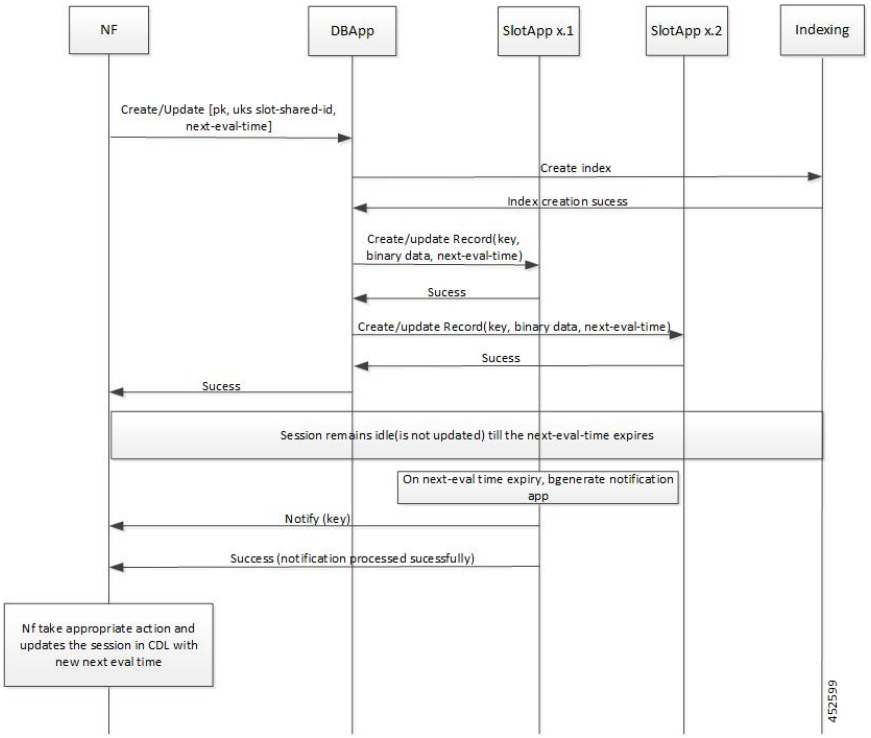
Figure 15: Deleting a Record - Call Flow



Notification to NF on Timer Expiry

This section describes the call flow of session notification to NF on timer expiry.

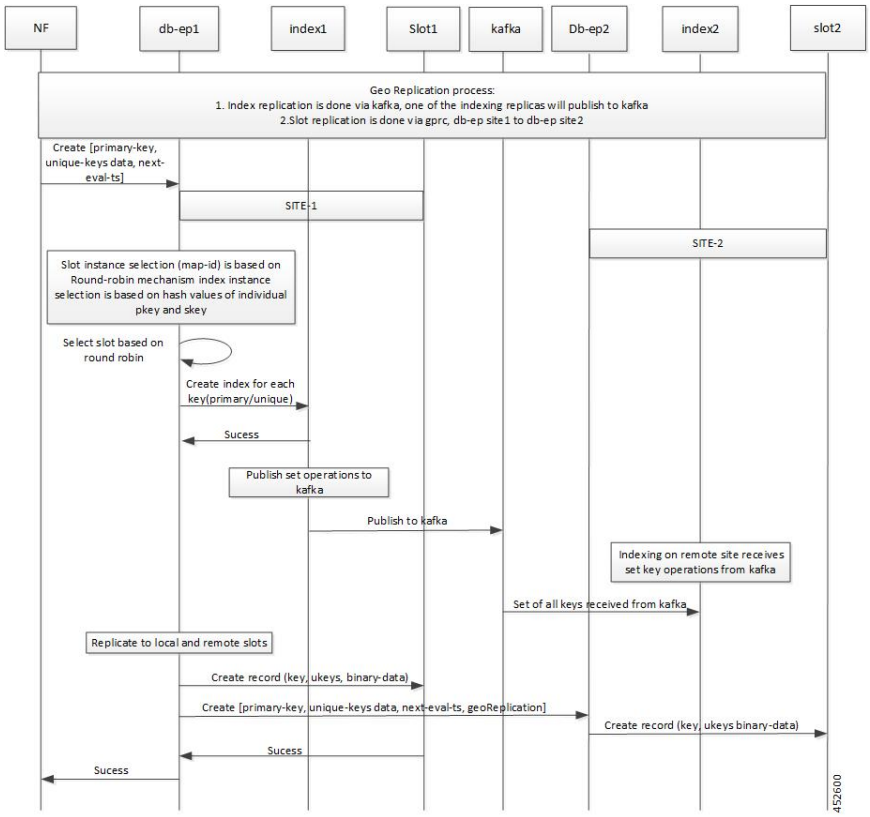
Figure 16: Session Notification to NF - Call Flow



Geo Replication - Create

This section describes the call flow of creating primary and unique keys for Geo Replication.

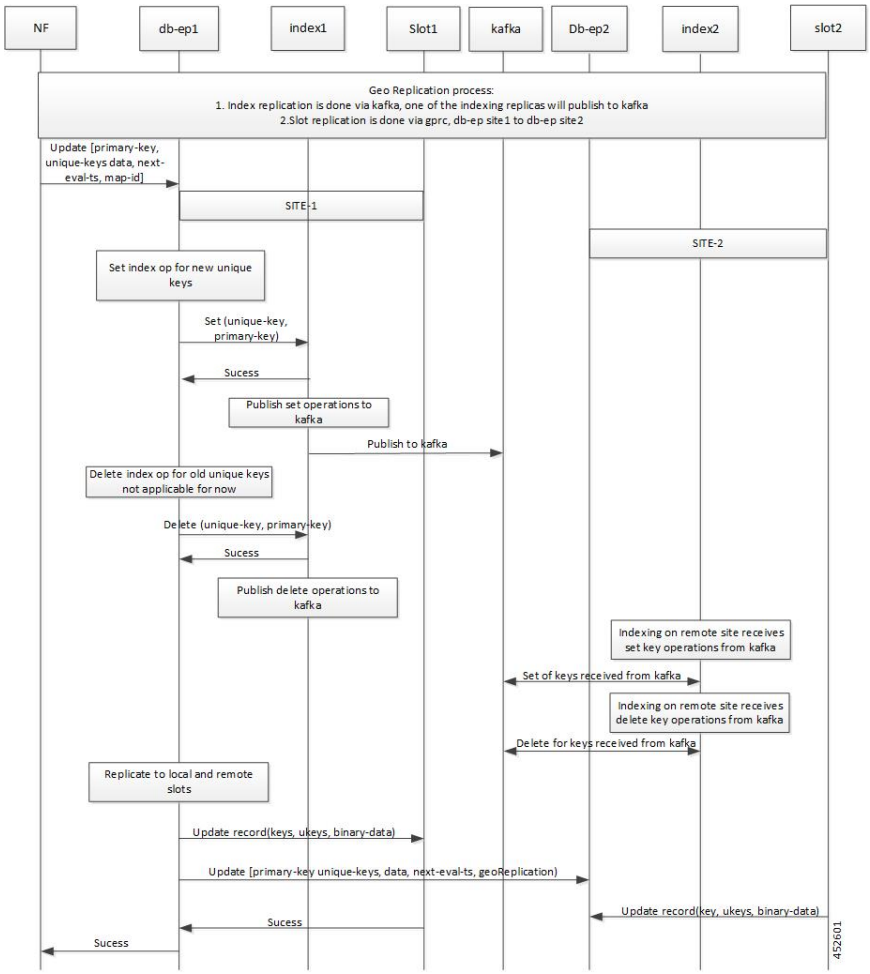
Figure 17: Geo Replication Call Flow - Creating Geo



Geo Replication - Update

This section describes the call flow of updating primary and unique keys for Geo Replication.

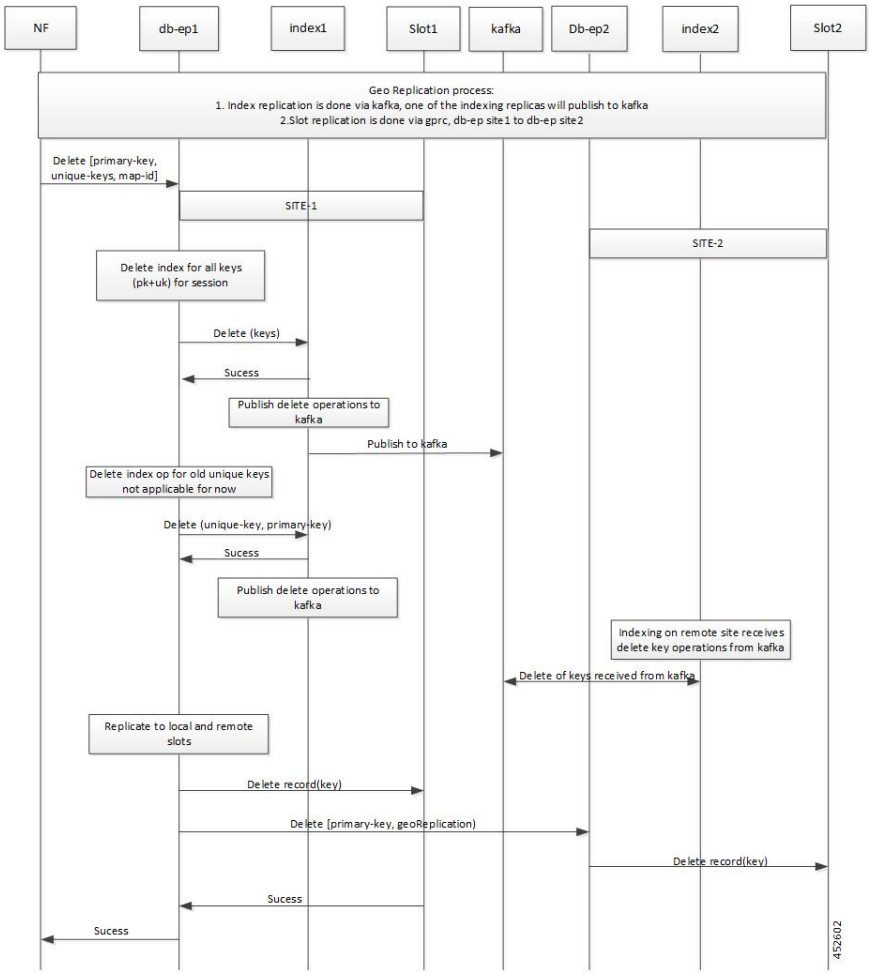
Figure 18: Geo Replication Call Flow - Updating Geo



Geo Replication - Delete

This section describes the call flow of deleting primary and unique keys for Geo Replication.

Figure 19: Geo Replication Call Flow - Deleting Geo



Identifying Stale Index Records

In certain scenarios, the unique keys in index pods of the CDL are stale (presumed to be deleted). The NFs may try to use these unique keys for another record, as the CDL does not show the stale record details to the NFs.

The CDL allows the operator to enable a parameter to detect the stale records and perform the necessary action on such stale records.

To detect the stale records and perform actions:

1. Identify the stale records. When a new record is created, the unique key is overwritten. To identify such records, enable the **index-overwrite-detection** parameter, and ensure that the *unique-keys-prefix* matches the prefix pattern.
2. Perform the necessary **action** (notify, delete or log) on the identified stale records.

   The CDL detects any unique key that is overwritten and performs one of the following actions:

- Deletes the stale record or the entire record. The delete action is triggered only if the **PurgeOnEval** flag is set to false for the stale record.
- Notifies the NF about the stale record. The notify action sends the **STALE_INDEX_NOTIFICATION** to the NF.
- Logs the overwritten unique key. For the log action, the stale record is logged with the WARN log level.



Note If there are two different unique keys pointing to the same primary key; one with notify action and the other with delete action, then the notify action is performed.

Use the following configuration:

```
features index-overwrite-detection max-tps variable
features index-overwrite-detection queue-size variable
features index-overwrite-detection unique-keys-prefix uk
  action [delete-record, notify-record, log-record]
```

where,

- **max-tps**: Controls the rate of notification for stale records. The default is 200.
- **queue-size**: Controls the processing queue size of the stale records. The default is 1000.



Note The **queue-size** parameter is for both delete and notify actions. The **max-tps** parameter is only for the notify action.

- **unique-keys-prefix**: Specifies the unique-key prefix pattern along with the action that needs to be performed.

Example:

```
cdl datastore session
features index-overwrite-detection max-tps 250
 features index-overwrite-detection queue-size 2000
 features index-overwrite-detection unique-keys-prefix uk
 action notify-record
 exit
  exit
```

Troubleshooting

To troubleshoot the stale index records, set the **index.overwrite.session** logger to INFO level. The logs from the endpoint pods as well as the index pods help in troubleshooting.

CDL configuration:

```
cdl logging logger index.overwrite.session
 level info
exit
```

The following metrics are introduced:

- **overwritten_index_records_deleted**–maintains the total number of records deleted due to stale records identified at index.
- **overwritten_index_records_skipped**–maintains the total number of records detected as stale, but dropped when the queue is full while processing the records for notify or delete.

Deploying CDL through Network Functions (NFs)

You can deploy CDL through the Network Functions (NFs) – Session Management Function (SMF) and Policy Control Function (PCF) – Ops Center.

For deploying CDL through SMF Ops Center, see *Cisco Common Data Layer in SMF* chapter in *Ultra Cloud Core 5G Session Management Function - Configuration and Administration Guide*

For deploying CDL through PCF Ops Center, see *Cisco Common Data Layer in PCF* chapter in *Ultra Cloud Core 5G Policy Control Function -Configuration and Administration Guide*

CDL Geo Replication (GR) Deployment

This section describes how to deploy CDL for Geo Replication (GR).

Prerequisites for CDL GR

Before deploying CDL GR, configure the following:

- CDL Session Database and define the base configuration.
- Kafka for CDL.
- Zookeeper for CDL.

Configuring the CDL Session Database and Defining the Base Configuration

This section describes how to configure the CDL session database and define the base configuration through the NF (SMF or PCF) Ops Center.

1. Open the NF Ops Center console and navigate to the datastore CLI.
2. To configure the session database and define the base configurations for the failover of the CDL operations, use the following configuration.

```
configure
   cdl system-id system_id
   cdl node-type node_type
   cdl enable-geo-replication boolean_value
   cdl remote-site remote_system_id db-endpoint host host_ip_address
      db-endpoint port port
      kafka-server remote_kafka_host remote_port
      end exit
```

```
cdl datastore session
       endpoint replica num_replica
       endpoint external-ip ip_address
       endpoint external-ip port
       slot replica num_replica
       slot map num_map/shards
       slot write-factor write_factor
       slot notification host host
       slot notification port port
       slot notification limit tps
       index replica num_replica
       index map num_map/shards
       index write-factor write_factor
       end exit
```

Notes:

- **cdl system-id** *system_id*: Specifies the system or Kubernetes cluster identity. The default value is 1.
- **cdl node-type** *node_type*: Indicates the Kubernetes node label to configure the node affinity. The default value is session. *node_type* must be a string of length 0-64 characters.
- **cdl enable-geo-replication** *boolean_value*: This is an optional CLI. Specifies the geo replication status as enable or disable. The default value is *false*.
- **cdl remote-site** *remote_system_id*: Specifies the endpoint's IP address for the remote site endpoint. Configure this command only when you have set the **cdl enable-geo-replication** to *true*.
- **db-endpoint host** *host_ip_address*: Specifies the endpoint IP address for the remote site. Configure this command only when you have set the **cdl enable-geo-replication** to *true*.
- **db-endpoint port** *port_number*: Denotes the endpoint port for the remote site endpoint. The default port number is 8882. Configure this command only when you have set the **cdl enable-geo-replication** to *true*.
- **kafka-server** *remote_kafka_host remote_port*: Indicates the Kafka server's external ip and port of the remote site, which the remote-system-id identifies. You can configure multiple host and ports per Kafka instance at the remote site. Configure this command only when you have set the **cdl enable-geo-replication** to *true*.
- **endpoint replica** *num_replica*: Indicates the number of replicas to be created. The default value is 1. *num_replica* must be in the range of 1 to 16.
- **endpoint external-ip** *ip_address*: This is an optional CLI. Specifies the external ip address to expose the database endpoint. Configure this command only when you have set the **cdl enable-geo-replication** to *true*.
- **endpoint external-port** *port*: Specifies the external Port to expose the database endpoint. Configure this command only when you have set the **cdl enable-geo-replication** to *true*. The default value is 8882.
- **slot replica** *num_replica*: Specifies the number of replicas to be created. The default value is 1. *num_replica* must be in the range of 1 to 16.
- **slot map** *num_map/shards*: Specifies the number of partitions in a slot. The default value is 1. *num_map/shards* must be in the range of 1 to 1024.

- **slot write-factor** *write_factor*: Specifies the number of copies to be written before a successful response. The default value is 1. *write_factor* must be in the range of 0 to 16. Make sure that the value is less than or equal to the number of replicas.
- **slot notification host** *host*: Specifies the notification server hostname or IP address. The default value is *datastore-notification-ep.*
- **slot notification port** *port*: Specifies the notification server port number. The default value is 8890.
- **slot notification limit** *tps*: Specifies the notification limit per second. The default value is 2000.
- **index replica** *num_replica*: Specifies the number of replicas to be created. The default value is 2. *num_replica* must be in the range of 1 to 16.
- **index map** *num_map/shards*: Specifies the number of partitions in a Slot. The default value is 1. The accepted range is 1–1024. Avoid modifying this value after deploying the CDL.
- **index write-factor** *write_factor*: Specifies the number of copies to be written before a successful response. The default value is 1. *write_factor* must be in the range of 0 to 16.

Configuring Kafka for CDL

This section describes how to configure Kafaka for the CDL.

1. Open the NF Ops Center console and navigate to the datastore CLI.
2. Use the following configuration.

```
configure
   cdl kafka replica num_replicas
      enable-JMX-metrics boolean_value
      external-ip ip_address port_number
      retention-time retention_period
      retention-size retention_size
      end
      exit
```

Note

- **cdl kafka replica** *num_replicas*: Specifies the number of replicas to be created. The default value is 3. *num_replicas* must be in the range of 1 to 16.
- **enable-JMX-metrics** *boolean_value*: Specifies the status of the JMX metrics. The default value is true.
- **external-ip** *ip_address port_number*: Specifies the external IPs to expose to the Kafka service. Configure this command when you have set the **enable-geo-replication** parameter to *true*. You are required to define an external ip address and port number for each instance of the Kafka replica. For example, if the **cdl kafka replica** parameter is set to 3, then you must define three external ip addresses and port numbers.
- **retention-time** *retention_period*: Specifies the duration (in hours) for which the data must be retained. The default value is 3. *retention_period* must be in the range of 1 to 168.
- **retention-size** *retention_size*: Specifies the data retention size in MB. The default value is 5120 MB.

Configuring Zookeeper for CDL

This section describes how to configure the Zookeeper for CDL.

To configure Zookeeper for CDL, use the following configuration:

1. Open the NF Ops Center console and navigate to the datastore CLI.
2. Execute the following commands

```
configure
 cdl zookeeper data_storage_size_in_gb
  log-storage-size size_in_gb
  replica num_replicas
  enable-JMX-metrics boolean_value
  enable-persistence boolean_value
  end
          exit
```



Note

- **cdl zookeeper** *data_storage_size_in_gb*: Specifies the size of the Zookeeper data storage in GB. The default value is 20 GB. *data_storage_size_in_gb* must be in the range of 1 to 64.
- **log-storage-size** *size_in_gb*: Indicates the size of the Zookeeper data log's storage in GB. The default value is 20 GB. *size_in_gb* must be in the range of 1to 64.
- **replica** *num_replicas*: Indicates the number of replicas that must be created. The default value is 3. *num_replicas* must be in the range of 1 to 16.
- **enable-JMX-metrics** *boolean_value*: Indicates the status of the JMX metrics. The default value is set to true.
- **enable-persistence** *boolean_value*: Specifies the status of the persistent storage for Zookeeper data. The default value is false.

Deploying CDL for Geo Replication (GR)

For Geo Replication (GR), you have to create two separate HA systems independently and configure the Geo HA for communications with the remote sites. By default, CDL is deployed with two replicas for *db-ep*, one *slot* map (with two replicas per map) and one *index* map (with two replicas per map).



Important

- It is recommended to configure CDL containers in YANG model.
- It is recommended to configure the Geo HA only after the two HA systems become active.

To deploy the CDL GR, use the following configuration:

Procedure

Step 1 Deploy HA on site-1.

Deploy site-1 HA system without any Geo HA related configuration parameters and set the **system-id** parameter to *1* in the configuration.

```
configure
    cdl system-id system_id
    cdl node-type node_label
    cdl datastore datastore_name
    endpoint replica number_of_HA_instances
    index map number_of_index_partitions
    index replica number_of_HA_instances
    slot map number_of_slot_partitions
    slot replica number_of_HA_instances
    exit
```

Example:

```
cdl# configure terminal
cdl(config)# cdl system-id 2
cdl(config)# cdl node-type session
cdl(config)# cdl datastore session
cdl(config-datastore-session)# endpoint replica 2
cdl(config-datastore-session)# slot map 4
cdl(config-datastore-session)# slot replica 2
cdl(config-datastore-session)# index map 3
cdl(config-datastore-session)# index replica 2
cdl(config-datastore-session)# exit
cdl(config)#
```

Step 2 Apply the HA configuration on site-1.

Commit the configurations and deploy the pods on site-1.

Step 3 Deploy HA on site-2.

Deploy site-2 HA system (in parallel) without any Geo HA related configuration parameters and set the **system-id** parameter to *2* in the configuration.

```
configure
    cdl system-id system_id
    cdl node-type node_label
    cdl datastore datastore_name
    endpoint replica number_of_HA_instances
    index map number_of_index_partitions
    index replica number_of_HA_instances
    slot map number_of_slot_partitions
    slot replica number_of_HA_instances
    exit
```

Example:

```
cdl# configure terminal
cdl(config)# cdl system-id 2
```

```
cdl(config)# cdl node-type session
cdl(config)# cdl datastore session
cdl(config-datastore-session)# endpoint replica 2
cdl(config-datastore-session)# slot map 4
cdl(config-datastore-session)# slot replica 2
cdl(config-datastore-session)# index map 3
cdl(config-datastore-session)# index replica 2
cdl(config-datastore-session)# exit
cdl(config)#
```

Step 4 Apply HA configuration on site-2.

Commit the configuration and deploy the pods on site-2.

Step 5 Verify whether site-1 and site-2 are active.

Verify whether the CDL, Kafka, and Zookeeper pods are active before proceeding to Geo HA configuration.

Step 6 Configure external IP address on site-1 for site-2 communication.

a) Enable Geo Replication on site-1 and configure the remote site as 2 for site-1.

```
configure
    cdl enable-geo-replication true/false
    cdl datastore session geo-remote-site list_of_geo_replication_sites
```

Example:

```
cdl# configure terminal
cdl(config)# cdl enable-geo-replication true
cdl(config)# cdl datastore session geo-remote-site 2
```

b) Configure the external IP address for CDL endpoints so that site-2 can access it.

```
configure
   cdl datastore session endpoint external-ip site_1_external_ip_address
```

c) Configure the external IP address and port for all Kafka replicas.

For instance, if two replicas (default) are configured for Kafka, provide two different pairs of IP address and port numbers.

```
configure
   cdl kafka external-ip site_1_external_ip_address port1
   cdl kafka external-ip site_1_external_ip_address port2
```

d) (Optional) Configure the SSL/TLS certificate to enable TLS support for the local site.

Configuring TLS certificates enable the local site to accept both secure and non-secure connections. Similarly, configuring SSL certificates enable the local site to establish a secure connection with the remote sites.

Note
All the certificates are in multi-line raw text format. If the certificates are invalid, the server continues with the non-secure connection.

```
configure
  cdl ssl-config enable true
  cdl ssl-config ip site_1_external_ip_address
  cdl ssl-config certs site_1_external_ip_address ssl-key ssl_key
  cdl ssl-config certs site_1_external_ip_address ssl-crt ssl_crt
```

Step 7 Configure external IP address on site-2 for site-1 communication.

a) Enable Geo Replication on site-2 and configure the remote site as 1 for site-2.

```
configure
   cdl enable-geo-replication true/false
   cdl datastore session geo-remote-site list_of_geo_replication_sites
```

Example:

```
cdl# configure terminal
cdl(config)# cdl enable-geo-replication true
cdl(config)# cdl datastore session geo-remote-site 1
```

b) Configure the external IP address for CDL endpoints so that site-1 can access it.

```
configure
  cdl datastore session endpoint external-ip site_2_external_ip_address
```

c) Configure the external IP address and port for all Kafka replicas.

For instance, if two replicas (default) are configured for Kafka, provide two different pairs IP addresses and port numbers.

```
configure
   cdl kafka external-ip site_2_external_ip_address port1
   cdl kafka external-ip site_2_external_ip_address port2
```

d) (Optional) Configure the SSL/TLS certificate to enable TLS support for the local site.

Configuring TLS certificates enable the local site to accept both secure and non-secure connections. Similarly, configuring SSL certificates enable the local site to establish a secure connection with the remote sites.

Note
All the certificates are in multi-line raw text format. If the certificates are invalid, the server continues with the non-secure connection.

```
configure
  cdl ssl-config enable true
  cdl ssl-config ip site_1_external_ip_address
  cdl ssl-config certs site_1_external_ip_address ssl-key ssl_key
  cdl ssl-config certs site_1_external_ip_address ssl-crt ssl_crt
```

Step 8 Add the remote site information in each of the sites.

a) Configure remote site *cdl-ep* (CDL endpoint) configuration on site-1.

```
configure
   cdl remote-site 2 db-endpoint host site_2_cdl_ep_ip
```

b) Configure remote site Kafka configuration on site-1.

```
configure
   cdl remote-site 2 kafka-server site_2_kafka1_ip_address site_2_kafka1_port
   cdl remote-site 2 kafka-server site_2_kafka2_ip_address site_2_kafka2_port
```

c) (Optional) Configure the SSL certificates to establish a secure connection with remote site on site-1.

Note
All the certificates are in multi-line raw text format. If the certificates are invalid, the server continues with the non-secure connection.

```
configure
  cdl ssl-config certs site_2_external_ip_address ssl-key ssl_key
  cdl ssl-config certs site_2_external_ip_address ssl-crt ssl_crt
```

Commit the configuration on site-1.

d) Configure remote site *cdl-ep* configuration on site-2.

```
configure
   remote-site 1 db-endpoint host site_1_cdl_ep_ip_address
```

e) Configure remote site Kafka configuration on site-2.

```
configure
   cdl remote-site 1 kafka-server site_1_kafka1_ip_address site_1_kafka1_port
   cdl remote-site 1 kafka-server site_1_kafka2_ip_address site_1_kafka2_port
```

f) (Optional) Configure the SSL certificates to establish a secure connection with remote site on site-2.

Note
All the certificates are in multi-line raw text format. If the certificates are invalid, the server continues with the non-secure connection.

```
configure
  cdl ssl-config certs site_1_external_ip_address ssl-key ssl_key
  cdl ssl-config certs site_1_external_ip_address ssl-crt ssl_crt
```

Commit the configuration on site-2.

Step 9 Verify whether Mirror Maker pod is deployed and all the other pods are active.

NOTES:

- **cdl kafka external-ip** - Specifies the external IP address and port for all Kafka replicas.
  - *site_external_ip_address* - Specifies the external IP address of the remote site.
  - *port_number* - Specifies the port number of the remote site.
- **cdl ssl-config certs** - Specifies the SSL certificates to establish a secure connection with remote site.
  - *site_external_ip_address* - Specifies the external IP address of the remote site.
  - **ssl-key***ssl_key* - Specifies the generated SSL key.

Geo Replication (GR) Failover Notification

The CDL is equipped with Geo Replication (GR) failover notifications, which can notify the timer expiry of session data and bulk notifications to the currently active site. The CDL uses Border Gateway Protocol (BGP) through App-Infra for the GR failover notifications.

The CDL subscribes to the key value on both the GR sites. The App-Infra sends notifications to the CDL when there is any change in these key values. A key value indicates the state of the CDL System ID or the GR instance. The GR instance is mapped to the CDL slices using the CDL system ID or the GR instance ID in the key.

The following parameters are introduced for CDL GR failover notification:

- **instance-aware-notification enable *true or false*** - Set this to true to enable GR failover notification.
- **instance-aware-notification system-id** - The system-id maps to the sliceName, that is, the primary system-id maps to the primary site ID of that particular sliceName. This information must be configured on all the geo sites. The *FindAllNotify* and *TimerExpiry* notifications use the system ID details for bulk processing tasks.

The system ID is mandatory on both the sites. The GR instance ID in the NF configuration must match the CDL system ID.

In the following example, the GR failover notification is set to true. The system-id 1 is the primary site ID for sliceNames *sgw1* and *smf1*while system-id 2 is the primary site for slicesNames *sgw2* and *smf1*.

```
cdl datastore session
 features instance-aware-notification enable true
 features instance-aware-notification system-id 1
  slice-names [ sgw1 smf1 ]
 exit
 features instance-aware-notification system-id 2
  slice-names [ sgw2 smf2 ]
 exit
exit
```

GR Failover Notification Records of Peer Site

The CDL sends notification about records only to its local application. The notification is based on the system-id and Timer Expiry parameters of the records. In a GR setup, when a site is isolated for maintenance, the records of that site are not sent to its peer site.

With the **remote-system-id** parameter, CDL allows the peer site to process notifications of the isolated site. The **remote-system-id** of the peer site is configured with the site ID of the isolated site. The CDL processes records when the system-id of any record matches the remote-system-id. The notifications are sent based on the Timer Expiry, or for the records that have the **notifyOnPurge** enabled.



Note The remote-system-id must be removed from the CDL configuration after the isolated site resumes its function.

The following procedure explains the configuration of remote-system-id with an example:

In the example below, the GR setup has 2 sites: site-1 and site-2. The site-1 is disconnected for an upgrade, and the remote-system-id of site-2 is configured with the site ID of site-1.

1. Shutdown or disconnect the site-1.
2. To configure the **remote-system-id** of site-2 with site ID of site-1, run the following command:

   ```
   cdl datastore session
       slot notification remote-system-id [ 1 ]
   exit
   ```

   Note that the value [1] for **remote-system-id** in the above command is the site ID of site-1, which is isolated.
3. The site-2 starts notifying records of site-1 to the local application.

4. Before bringing up site-1, remove the site ID of site-1 from the remote-system-id list of site-2.

The **remote-system-id** is mutually exclusive with the **instance-aware-notification-system-id**. For more information, refer to the *Geo Replication (GR) Failover Notification* topic.

Triggering Remote Index Sync

The CDL provides a utility to sync the indexes with its remote peers. The utility can be used in the scenarios such as post site isolation, where there is a huge difference in the number of index records between the sites. The CDL also supports a command to check the status of the remote index sync.



Note

- It is recommended to use the remote sync only if there is a huge difference in the index records between the sites as this might impact the performance.
- The geo-remote-site should be configured to view the commands.

Trigger remote index sync for,

- a list of index mapIDs or all mapIDs from the cli.
- a list of sliceNames or all the sliceNames.

Note the following:

- Ensure the conditions below are met to avoid errors while triggering a remote sync for index with its peers.
  - The custom map-ids and slice-names should be unique.
  - Only valid index map-ids and slice-names are allowed.
  - Remote site is reachable.
- Internally, CDL retries a maximum of 3 times to sync with its remote peer.
- The remote index sync skips the index instance if the sync is already ongoing for that instance.

Command	Output Parameter
cdl actions remote-index-sync start *[options]* **Options** • **map-id** Index map-id for which the remote index sync should start. The map-id is optional. If included, triggers remote index sync for all the instances of that index map-id. A maximum of 5 map-ids can be given using this option. • **slice-name** The slice-name for which the remote index sync starts. The slice-name is optional. If included, triggers remote index sync for all the slice-names. There is no limit for the number of slice-names.	**triggered-instances** Shows the list of index instances for which the remote index sync has been started.
Example	**Output**
cdl actions remote-index-sync start map-id { 1 } map-id { 2 } slice-name { session-1 } slice-name { session-2 }	**triggered-instances 'index-mapID-1-instanceID-1, index-mapID-1-instanceID-2, index-mapID-2-instanceID-1, index-m**

Check the Remote Sync Status

The remote sync status shows the index instances for which the remote index sync is in progress.

Note The remote sync status does not show the sync status per sliceName. If the sync status shows that a particular index instance is syncing with the remote site, it means all the sliceNames or the listed sliceNames are syncing one after the other.

Command	Output parameter
cdl actions remote-index-sync status	**syncing-instances** List of index instances for which the remote index sync is in progress.
Example	**Output**
cdl actions remote-index-sync status	**syncing-instances 'index-mapID-1-instanceID-1, index-mapID-1-instanceID-2, index-mapID-2-instanceID-1, index-mapID-2-instanceID-2'**

Troubleshooting

The following warning or error logs in Index pods show the status of the remote index sync.

- The sync is successful with the following:

  Log:

  `Bulk Sync done from Remote Indexes(s) for isInitSync = false`

  Example:

  ```
  [datastore.index.session] Bulk Sync done from Remote Indexes(s) for isInitSync = false
   sliceName = session via DBApp
  ```

  Log:

  `Sync finished successfully with Remote MemoryMap App isInitSync: false`

  Example:

  ```
  [datastore.index.session] Sync finished successfully with Remote MemoryMap App isInitSync:
   false count: 100 Time taken: 16.699031ms sliceName: session
  ```

- The sync fails with the following error log:

  Example:

  ```
  Error! Remote Bulk Read failed 3 times for isInitSync = false
  ```

Feature Summary and Revision History

Summary Data

Applicable Product (s) or Functional Area	PCF 2021.04.0 and later
Applicable Platforms	Bare Metal, OpenStack, VMware
Feature Default Setting	Disabled – Configuration Required
Related Changes in this Release	Not Applicable
Related Documentation	Not Applicable

Revision History

Revision Details	Release
First introduced.	CDL 1.6

Feature Description

In this release, the CDL supports IPv6, thus enabling the dual stack support for its endpoints in a GR enabled setup. Dual stack enables networking devices to be configured with both IPv4 and IPv6 addresses.

This feature provides the following functionality:

- IPv6 support for the CDL endpoints.

- IPv6 support for communicating between Mirror Maker and Kafka brokers.
- TLS support for CDL and Kafka IPv6 endpoints.



Note To get IPv6 support in CDL, the K8s cluster must support dual stack and it must be enabled in the cluster.

Configuring the IPv6 Support

To configure IPv6 support for CDL in a GR enabled setup, use the CLI commands or configuration in the following steps:

1. Expose the CDL IPv6 endpoint and connect to remote site IPv6 endpoint.
   a. Enable CDL geo replication.

      ```
      config
        cdl enable-geo-replication true
      ```

   b. Configure the external IP address for CDL endpoints. In addition to the **endpoint external-ip**, configure the **endpoint external-ipv6** parameter too.

      ```
      config
        cdl datastore session endpoint external-ipv6 IPv6_address
      ```

   c. Configure the CDL endpoints for remote site.

      ```
      config
        cdl remote-site system_id
          db-endpoint host IPv6_address
          db-endpoint port 8882
        exit
      ```



Note The IPv4 and IPv6 endpoints can be accessed over the same port (default value is 8882).



Note Currently, the CDL can connect to remote site endpoints using either IPv4 or IPv6, but not both. However, it can simultaneously expose both the IPv4 and IPv6 endpoints for the remote site to connect to either one of them.

2. Expose the CDL Kafka and connect to remote site Kafka over IPv6.
   a. Configure the external IP address and port for all Kafka replicas.

      ```
      config
        cdl kafka external-ipv6 IPv6_address port_address
        exit
      ```

Note You must configure IPv6 for each broker separately. It is possible to simultaneously expose the Kafka brokers over IPv4 and IPv6, but the ports used must be different. Currently, the Kafka listeners do not support using the same port for different IP addresses.

b. Configure the remote site Kafka configuration.

Mirror Maker can connect to both local site and remote site Kafka brokers either over IPv4 and IPv6 or only one of them.

Configure the remote kafka-server separately using the following CLI command:

```
config
   cdl remote-site system_id
      kafka-server IPv6_address port_address
   exit
```

3. (Optional step) Configure the SSL/TLS certificates to enable TLS support for both local and remote sites. These certificates help to establish a secure connection between the local and remote sites.

Use the same configuration to configure the certificates on each site.

a. Enable SSL for CDL endpoint.

```
config
   cdl ssl-config enable true
```

b. Configure the certificates.

```
config
   cdl ssl-config certs external_ipv6_address
      ssl-key ssl_key
      ssl-crt ssl_crt
      ssl-ca ssl_ca
   exit
```

NOTES:

- **ssl-key** *ssl_key* - Specify the Private key of server.
- **ssl-crt** *ssl_crt* - Specify the CA signed server certificate.
- **ssl-ca** *ssl_ca* - Specify the Public CA certificate.

4. (Optional step) Configure the SSL/TLS certificates to enable TLS support for Kafka endpoints.

a. Enable SSL for CDL endpoint.

```
config
   cdl ssl-config enable true
```

b. Enable SSL for Kafka endpoint.

```
config
   cdl kafka ssl-settings enable-ssl true
   cdl kafka ssl-settings disable-host-name-verification true
```

c. Configure the certificates for Kafka endpoints on both local and remote sites.

```
config
   cdl ssl-config certs external_ipv6_address
      ssl-key ssl_key
      ssl-crt ssl_crt
      ssl-ca ssl_ca
   exit
```

The following sample configuration is used to connect to remote site IPv6 TLS endpoints and IPv6/IPv4 TLS Kafka:

Site-1 Configuration

```
cdl remote-site 2
 db-endpoint host 2001:DB8:54ff:a4::139:250
 db-endpoint port 8882
 kafka-server 10.106.139:250 10092
 ssl-port 10094
 exit
 kafka-server 10.106.139:250 10093
 ssl-port 10095
 exit
 kafka-server 2001:DB8:54ff:a4::139:250 10096
 ssl-port 10098
 exit
 kafka-server 2001:DB8:54ff:a4::139:250 10097
 ssl-port 10099
 exit
exit
cdl ssl-config enable true
cdl ssl-config certs 2001:DB8:54ff:a4::139:250
    ssl-key  "<server-key>"
    ssl-crt  "<signed-certificate>"
    ssl-ca  "<ca-certificate>"
exit
cdl ssl-config certs 192.0.2.2
    ssl-key  "<server-key>"
    ssl-crt  "<signed-certificate>"
    ssl-ca  "<ca-certificate>"
exit
cdl ssl-config certs 192.0.2.1
    ssl-key  "<server-key>"
    ssl-crt  "<signed-certificate>"
    ssl-ca  "<ca-certificate>"
exit
cdl ssl-config certs 2001:DB8:54ff:a4::139:249
    ssl-key  "<server-key>"
    ssl-crt  "<signed-certificate>"
    ssl-ca  "<ca-certificate>"
exit
cdl datastore session
 geo-remote-site [ 2 ]
 endpoint external-ip 192.0.2.1 endpoint external-ipv6 2001:DB8:54ff:a4::139:249
exit
cdl kafka ssl-settings enable-ssl true
cdl kafka ssl-settings disable-host-name-verification true
cdl kafka external-ipv6 2001:DB8:54ff:a4::139:249 10096
 ssl-port 10098
exit
cdl kafka external-ipv6 2001:DB8:54ff:a4::139:249 10097
 ssl-port 10099
exit
```

```
cdl kafka external-ip 10.106.139.249 10092
 ssl-port 10094
exit
cdl kafka external-ip 10.106.139.249 10093
 ssl-port 10095
exit
```

Site-2 Configuration

```
cdl remote-site 1
 db-endpoint host 2001:DB8:54ff:a4::139:249
 db-endpoint port 8882
 kafka-server 10.106.139:249 10092
 ssl-port 10094
 exit
 kafka-server 10.106.139:249 10093
 ssl-port 10095
 exit
 kafka-server 2001:DB8:54ff:a4::139:249 10096
 ssl-port 10098
 exit
 kafka-server 2001:DB8:54ff:a4::139:249 10097
 ssl-port 10099
 exit
exit
cdl ssl-config enable true
cdl ssl-config certs 2001:DB8:54ff:a4::139:249
    ssl-key  "<server-key>"
    ssl-crt  "<signed-certificate>"
    ssl-ca  "<ca-certificate>"
exit
cdl ssl-config certs 192.0.2.1
    ssl-key  "<server-key>"
    ssl-crt  "<signed-certificate>"
    ssl-ca  "<ca-certificate>"
exit
cdl ssl-config certs 192.0.2.1
    ssl-key  "<server-key>"
    ssl-crt  "<signed-certificate>"
    ssl-ca  "<ca-certificate>"
exit
cdl ssl-config certs 2001:DB8:54ff:a4::139:250
    ssl-key  "<server-key>"
    ssl-crt  "<signed-certificate>"
    ssl-ca  "<ca-certificate>"
exit
cdl datastore session
 geo-remote-site [ 1 ]
 endpoint external-ip 192.0.2.1
 endpoint external-ipv6 2001:DB8:54ff:a4::139:250
exit
cdl kafka ssl-settings enable-ssl true
cdl kafka ssl-settings disable-host-name-verification true
cdl kafka external-ipv6 2001:DB8:54ff:a4::139:250 10096
 ssl-port 10098
exit
cdl kafka external-ipv6 2001:DB8:54ff:a4::139:250 10097
 ssl-port 10099
exit
cdl kafka external-ip 192.0.2.1 10092
 ssl-port 10094
exit
cdl kafka external-ip 192.0.2.1 10093
 ssl-port 10095
exit
```

CDL Alarms

This section describes the alarms in the CDL deployment.

The following alarms are introduced to detect failure:

Table 2: Alarms

Alarm	Severity	Description
cdlLocalRequestFailure	critical	This alarm is triggered if the local request success rate is less than 90%, for more than 5 minutes.
cdlRemoteConnectionFailure	critical	This alarm is triggered if the active connections from the endpoint pod to the remote site reaches 0, for longer than 5 minutes. This alarm is for GR deployment only.
cdlRemoteRequestFailure	critical	This alarm is triggered if the incoming remote request success rate is less than 90%, for more than 5 minutes. This alarm is for GR deployment only.
cdlReplicationError	critical	If the ratio of outgoing replication requests to the local requests in cdl-global namespace is below 90%, for more than 5 minutes. This alarm is for GR deployment only.
cdlKafkaRemoteReplicationDelay	critical	This alarm is triggered if the kafka replication delay to the remote site crosses 10 seconds, for longer than 5 minutes. This alarm is for GR deployment only.

CDL Zone Upgrade

Feature Description

CNDP supports zone-based upgrades where all the nodes in an upgrade zone are upgraded in parallel. This avoids the time that is taken to upgrade large clusters. CDL utilizes the K8s Topology Spread Constraints feature to spread the pods across upgrade zones.

To support this in-service for CDL, the pods must be aware of upgrade zones and ensure that all replicas for a slot, index, or Kafka do not get scheduled in the same upgrade zone. For example, if both slot replicas of the same map are in the same upgrade zone, both replicas go down at the same time and cause session loss in a non-GR scenario. The CDL endpoint stops serving requests until one replica is back.

Ensure that at least three upgrade zones are present. Any node failure can result in Pending state for pods even if another zone has space to schedule the pod.

There is no explicit configuration that is required in CDL or NF Ops Center to enable this feature. The cluster deployer itself passes the configuration.

Topology Spread Constraint

CDL uses the K8s topology spread constraints feature to spread pods across upgrade zones so that if an upgrade zone is down, all the redundant pods are not lost at the same time.

The following fields are defined for the topology spread constraint:

- **maxSkew**—Defines the maximum permitted difference between the number of matching pods in the target topology and the global minimum (the minimum number of pods that match the label selector in a topology domain). For example, if you have 3 zones with 2, 4, and 5 matching pods respectively, then the global minimum is 2 and maxSkew is compared relative to that number.
- **whenUnsatisfiable**—Indicates how to deal with a pod if it does not satisfy the spread constraint:
  - **DoNotSchedule** (default) indicates the scheduler not to schedule the pod.
  - **ScheduleAnyway** indicates the scheduler to schedule the pod while prioritizing nodes that minimize the skew.
- **topologyKey** is the key of node labels. If two nodes are labelled with this key and have identical values for that label, the scheduler treats both nodes as being in the same topology. The scheduler tries to place a balanced number of pods into each topology domain.
- **labelSelector** is used to find matching pods. Pods that match this label selector are counted to determine the number of pods in their corresponding topology domain.

For CDL pods, the following is an example of the fields defined for topology spread constraint:

- **topologyKey: smi.cisco.com/upgrade-zone**
- **maxSkew: 1**
- **whenUnsatisfiable: DoNotSchedule**
- **labelSelector:** Selects all pods matching the deployment or stateful set

Based on this constraint, the K8s scheduler attempts to distribute the pods evenly in a deployment or stateful set across zones with maxSkew of 1.

- For slot or index pods that have two replicas, then the two replicas are always in separate upgrade zones.
- For cdl-ep or Kafka pods, the pods will be distributed almost evenly with a maxSkew of 1.
- If the pod is unable to satisfy the **maxSkew: 1** constraint, the pod will remain in Pending state as the **whenUnsatisfiable** field is set to **DoNotSchedule**. This constraint does not allow the maxSkew to be violated.



Note The topology spread constraints are only added for cdl-ep, cdl-slot, index, Kafka, or stateful sets deployment. There is no change for etcd and zookeeper as they are scheduled on primary or OAM nodes which will be upgraded one by one.

Limitations and Restrictions

This section describes the known limitations and restrictions for CDL zone upgrade:

- CDL supports NF deployments with Kafka replica 2 or Kafka replica 3. For deployments with Kafka replica 3, CDL defines at least three upgrade zones. If there are three replicas and two upgrade zones, then one upgrade zone will have two replicas and the other will have one replica. In this scenario where the upgrade zone having two replicas goes down, only one replica will be available to serve traffic.
- If the nodes in an upgrade zone are fully utilized and if one or more nodes in that zone go down, the pods on one or more nodes that went down may be in Pending state.

  The following conditions apply for same zone nodes and different zone nodes:

  - Same zone nodes—Nodes in the same zone do not have the requested CPU or memory resources for the pod to be scheduled on it.
  - Different zone nodes—One of the following conditions applies for different zone nodes:
    - Nodes in another zone do not have the requested CPU or memory resources for the pod to be scheduled on it.
    - Nodes in another zone have the requested CPU or memory resources for the pod to be scheduled. With scheduling, the pod will violate the maxSkew:1 constraint.

CDL Overload Protection

The CDL offers overload protection at endpoints whenever the system reaches its full capacity. With overload protection at endpoints, the CDL can:

- Reject *create* requests if maximum soft limit is reached.
- Reject *update* requests if maximum hard limit is reached.
- Trigger alarms when the system reaches 80% and 90% of its maximum capacity.
- Configure overload protection (enable or disable) at endpoints.

CDL Maximum Capacity

You can define the maximum capacity per shard in CDL using the following parameters:

- *slotRecordCapacity* (Default value: 1M/shard)
- *indexRecordCapacity* (Default value: 10M/shard)
- *slotRecordsSizeCapacityInBytes* (Default value: 5GB/shard)

Note You cannot change the default capacity per shard.

Based on the following calculations, the CDL determines the maximum capacity:

Soft Limit

1. `cdl_slot_record_capacity = No of shards * slotRecordCapacity`

2. `cdl_index_record_capacity = No of shards * indexRecordCapacity`
3. `cdl_slot_size_capacity    = No of shards * slotRecordsSizeCapacityInBytes`

Hard Limit

1. `cdl_slot_record_capacity = No of shards * slotRecordCapacity * 105%`
2. `cdl_index_record_capacity = No of shards * indexRecordCapacity * 105%`
3. `cdl_slot_size_capacity = No of shards * slotRecordsSizeCapacityInBytes * 105%`

Triggering Alerts for Overloading in CDL

The CDL is overloaded whenever the system reaches its maximum capacity. Also, the CDL triggers the following alerts to protect the system from overloading:

- *cdlOverloaded - major* - This alert is triggered when the CDL system reaches 80% of its capacity.
- *cdlOverloaded – critical* - This alert is triggered when the CDL system reaches 90% of its capacity.

In addition to the alerts, the CDL endpoint rejects all the *create* requests with the following error:

```
error code 507: Datastore reached its full capacity
```

However, the CDL processes all the *update* requests till the hard limit capacity is reached. When the hard limit capacity is exceeded, the CDL rejects all the *update* requests.

Configuring Overload Protection

The the existing CDL overload protection configuration is replaced with a new configuration.

Note Earlier, the overload protection was enabled by default with hard coded limits of 1 million records per slot, 10 million records per index and 5 gb record size per slot. However, in this release, the feature is disabled by default and requires configuration to enable this feature and to configure the appropriate overload limits (optional) for each parameter.

Table 3: CDL Overload Data Protection

Command	Changes
Old command: **`cdl datastore session overload-protection disable`** *`true`*	The old CDL overload protection command is deprecated. **Note** The command is not functional but is available only for backward compatibility.

Command	Changes
New command: **cdl datastore session features overload-protection enable** *<true/false>*	The overload protection configuration is moved under **cdl datastore session features** configuration to configure overload-protection and alerts. CDL is now equipped to configure: • record-capacity per slot/index • record-capacity in bytes per slot • configure major and critical alarm %

If the overload protection is enabled then the alerts are also enabled. The prometheus-rules-cdl pod is spawned. If overload-protection is disabled then the alerts are disabled. The prometheus-rules-cdl pod is removed.

Configuring Overload Protection Parameter

The following parameters are configured to set limits for overload-protection:

- **cdl datastore session features overload-protection index-max-record-count** *<value>*
- **cdl datastore session features overload-protection slot-max-record-count** *<value>*
- **cdl datastore session features overload-protection slot-max-size** *<value>*
- **cdl datastore session features overload-protection hard-limit-percentage** *<value>*

The table below lists the configuration details:

Table 4: Overload Protection Parameter Configuration

CLI Command	Description
cdl datastore session features overload-protection enable *<true/false>*	(Optional) CDL overload-protection is disabled by default. The default value is false.
cdl datastore session features overload-protection index-max-record-count *<value>*	(Optional) Maximum number of records that can be stored in the Index shard. The default value is 60000000 (60M). The range is 100k to 100M. **Note** The range from 100 to 1000 is applicable only for testing in the lab environment. It is not recommended for production environment.

CLI Command	Description
cdl datastore session features overload-protection slot-max-record-count *<value>*	(Optional) Maximum number of records that can be stored in Slot shard. The default value is 2500000 (2.5M). The range is either 100 or 100k to 10M. **Note** The value 100 is applicable only for testing in the lab environment. It is not recommended for production environment.
cdl datastore session features overload-protection slot-max-size *<value>*	(Optional) Maximum size of Slot shard in mega bytes. The default value is 16384 (16GB). The range is 1GB to 96GB.
cdl datastore session features overload-protection hard-limit-percentage *<value>*	(Optional) Additional capacity (percentage) in addition to the soft limit. This is used to determine when to reject the update requests at CDL endpoint. For eg: if index shard = 1, index-record-capacity = 100 and hard-limit-percentage = 5, then the create requests are rejected when number of index records = 100 and update requests are rejected only when it reaches 105. The default value is 5. The range is 0-10.
cdl datastore session features overload-protection major-alert-threshold *<value>*	(Optional) Threshold (percentage) at which CDL triggers an alert cdlOverloaded-major. The default value is 80. The range is 40-100.
cdl datastore session features overload-protection critical-alert-threshold *<value>*	(Optional) Threshold (percentage) at which CDL triggers an alert *cdlOverloaded-critical*. The default value is 90. The range is 40-100.

To configure the alert percentage, run the following command:

cdl datastore session features overload-protection critical-alert-threshold *<percentage>*

cdl datastore session features overload-protection major-alert-threshold *<percentage>*

Verifying the Alerts

You can verify the alerts using the following command in CEE Ops Center CLI:

show alerts active { **detail** | **summary** }

Also, you can filter the alerts in CEE Ops Center CLI using the following command:

show alerts active detail sumary *"CDL is overloaded."*

In the following example, the *cdlOverloaded - major* alert is triggered when the system capacity is greater than or equal to 80%

```
alerts active detail cdlOverloaded-major 5446095ab264
 severity    major
 type        "Processing Error Alarm"
 startsAt    2020-10-15T15:09:00.425Z
 source      System
 summary     "CDL is overloaded."
```

In the following example, the *cdlOverloaded - critical* alert is triggered when the system capacity is greater than or equal to 90%

```
alerts active detail cdlOverloaded-critical 5446095ab264
 severity    critical
 type        "Processing Error Alarm"
 startsAt    2020-10-15T15:09:16.425Z
 source      System
 summary     "CDL is overloaded."
```

CDL Rack Conversion

Feature Description

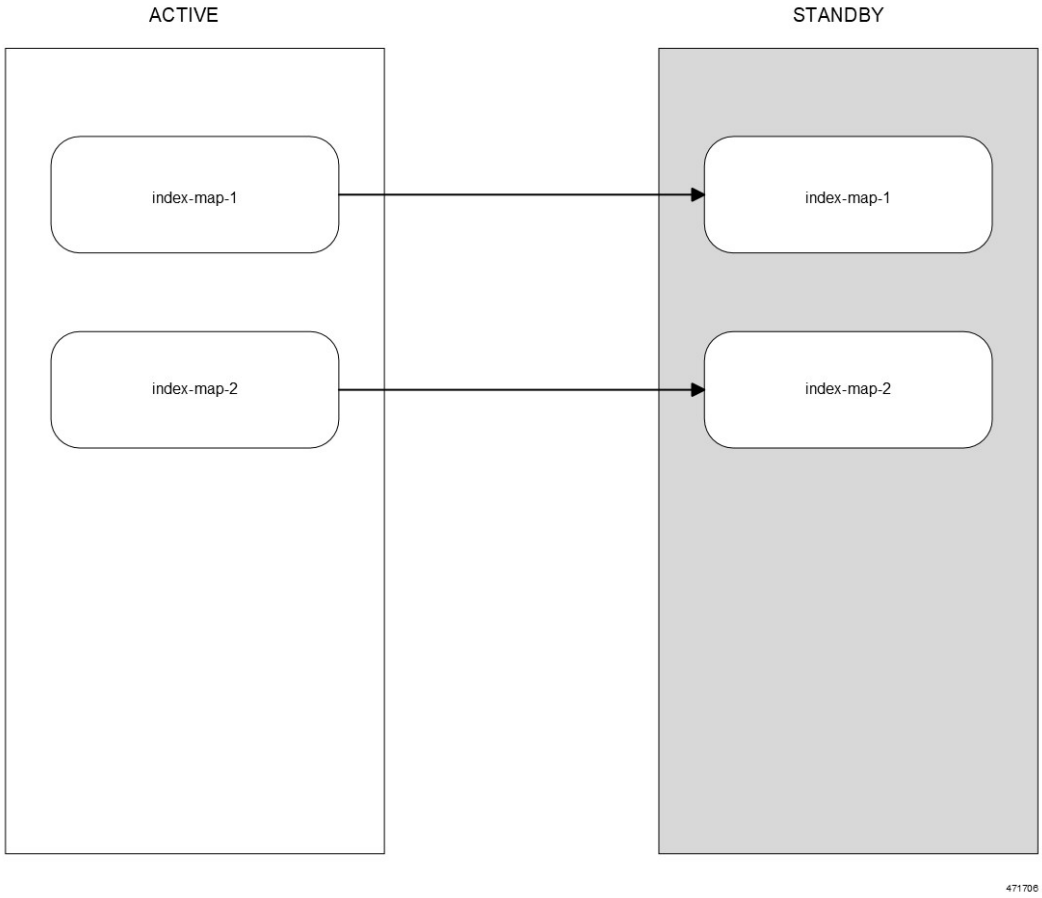
CDL supports rack conversion from half height to full height without draining traffic using the rebalancing method.

This rebalancing method doesn't affect the existing and new calls during migration. This feature addresses index map rebalancing for CDL.

MOP for CDL Conversion

Use the following procedure to migrate CDL half-rack configuration to full-rack configuration.

1. Set rack-1 as Active and rack-2 as Standby.

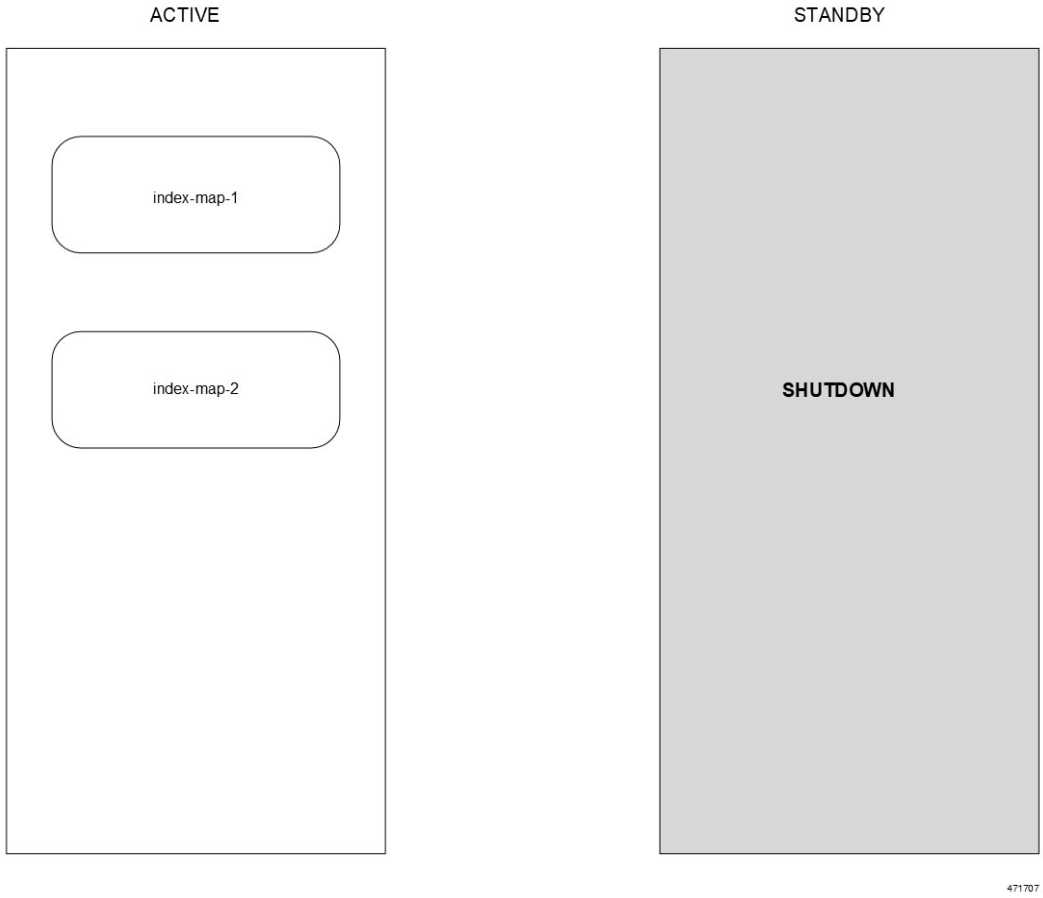


Prerequisite: *Both sites must have full-rack resources though CDL is running using half-rack configuration.*

Action: *Make rack-1 as Active and rack-2 as Standby. No configuration change in CDL.*

Post-validation: *Traffic lands only on rack-1.*

2. Set the system mode shutdown in rack-2.



Prerequisite: *Rack-1 must be on active mode and rack-2 must be on standby mode.*

Action: *Do system mode shutdown in rack-2.*

Post-validation: *The mirror-maker on site-1 is not in running state.*

3. Configure rack-2 as Standby. Configure full-rack CDL along with new configuration to enable the scale-up mode with prev-map-count configured.

   The following is a sample configuration:

```
configure
  cdl datastore session mode scale-up
  cdl datastore session index prev-map-count 2
```

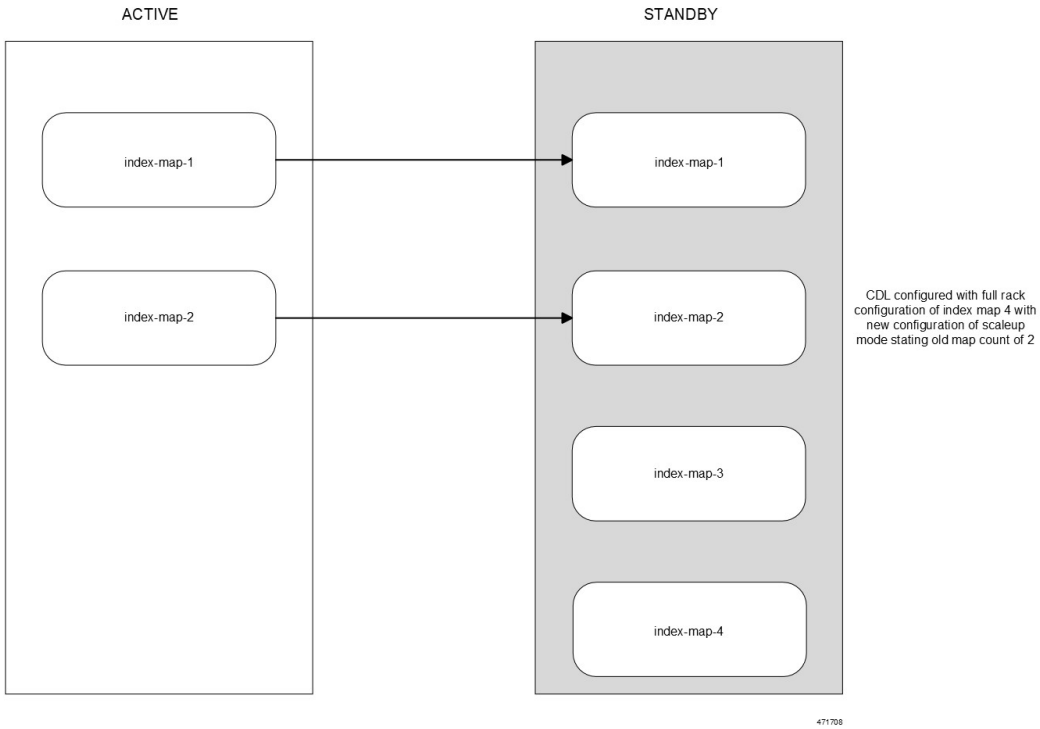
   Half-rack configuration without scaleup mode:

```
cdl datastore session
label-config session
  index map 2
  slot map 4
  exit
```

   Full-rack configuration with scaleup mode:

```
cdl datastore session
label-config session
mode scale-up
   index map 4
   index prev-map-count 2
   slot map 8
   exit
```

4. Enable system mode running of rack-2.

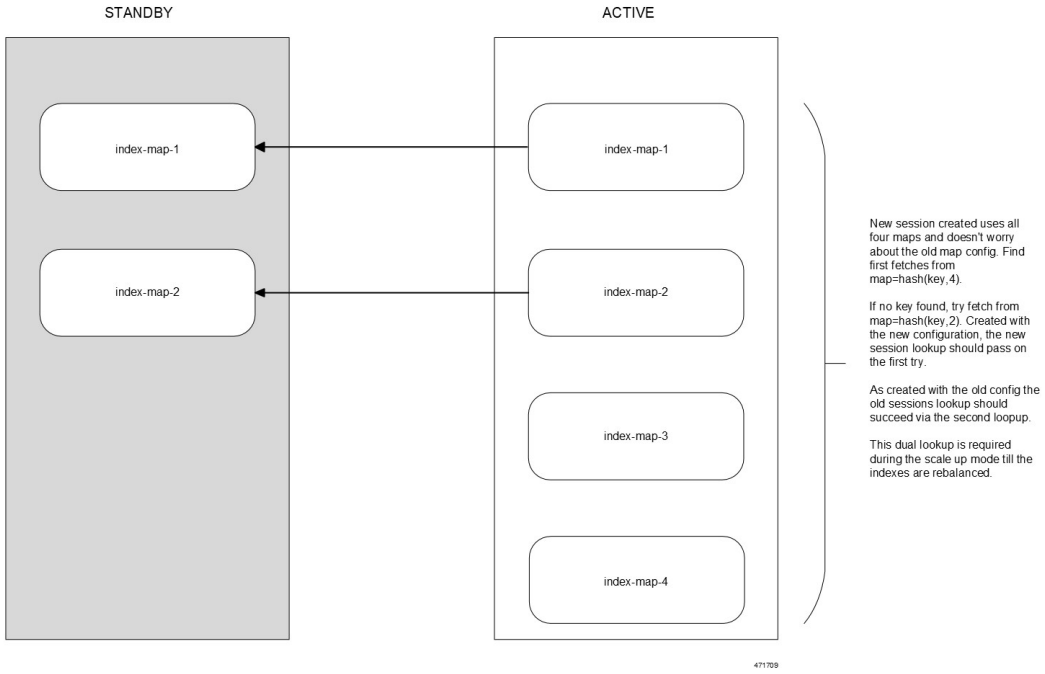


Prerequisite: *Rack-1 must be active and rack-2 must be on standby with full-rack CDL configuration.*

Action: *Execute the system mode running in rack-2.*

Post-validation: *The mirror-maker in both sites must be in running state. The old indexes or slots in site-2 must be able to do initial sync with remote peers.*

5. Switch the traffic to rack-2.



Prerequisite: *Rack-1 must be active and have full-rack resources with CDL running on half-rack configuration. Rack-2 must be on standby and have full-rack resources with CDL running on full -ack configuration.*

Action: *Make rack-1 as standby and rack-2 as active. No configuration change is required in CDL.*

Post-validation: *The traffic lands on rack-2 only.*

6. Enable system mode shutdown of rack-1.



Prerequisite: *Rack-2 must be on active and rack-1 must be on standby.*

Action:*Do system mode shutdown in rack-1.*

Post-validation: *The mirror-maker on site-2 is not in running state.*

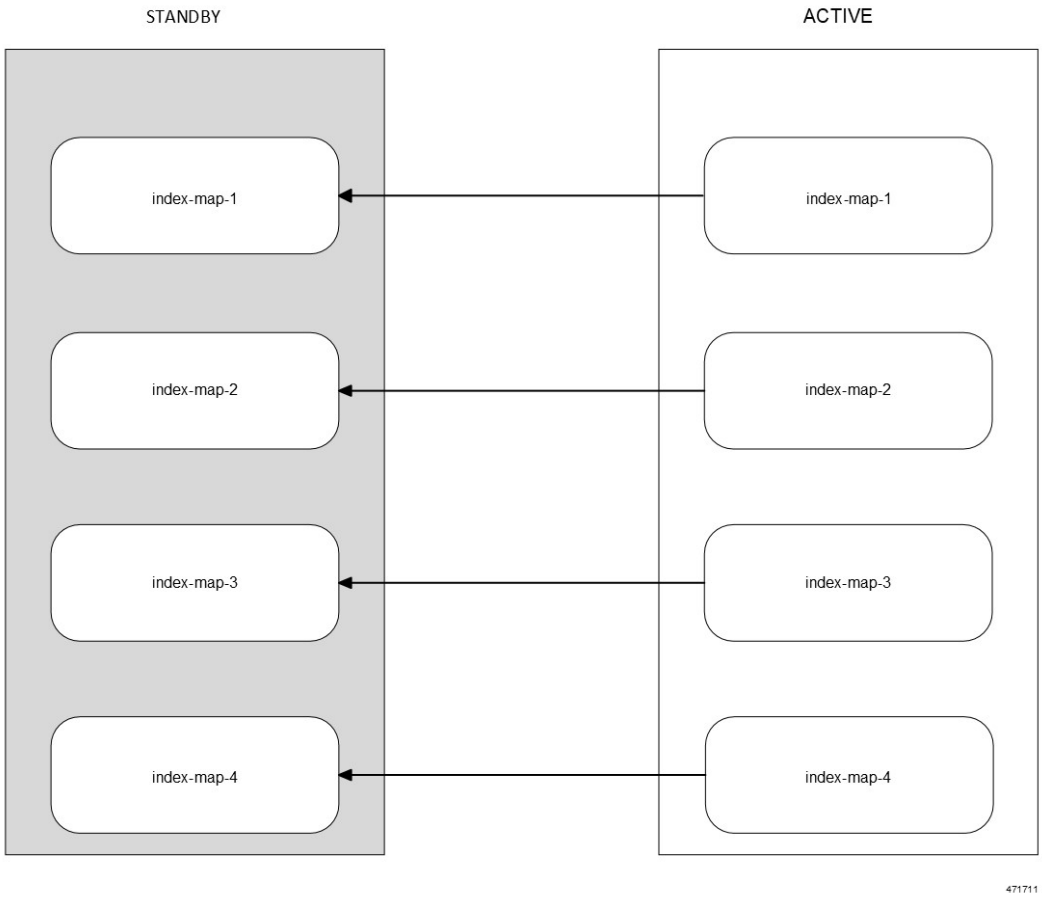
7. Configure rack-1 as Standby. Configure full-rack CDL with the new configuration to enable scale-up mode with premap-count configured.

   The following is a sample configuration:

   ```
   configure
     cdl datastore session mode scale-up
     cdl datastore session index prev-map-count 2
   ```

   The full configuration updates the slot maps count and index maps count. The label configuration is added for newly added slots and indexes.

8. Enable system mode running of rack-1.

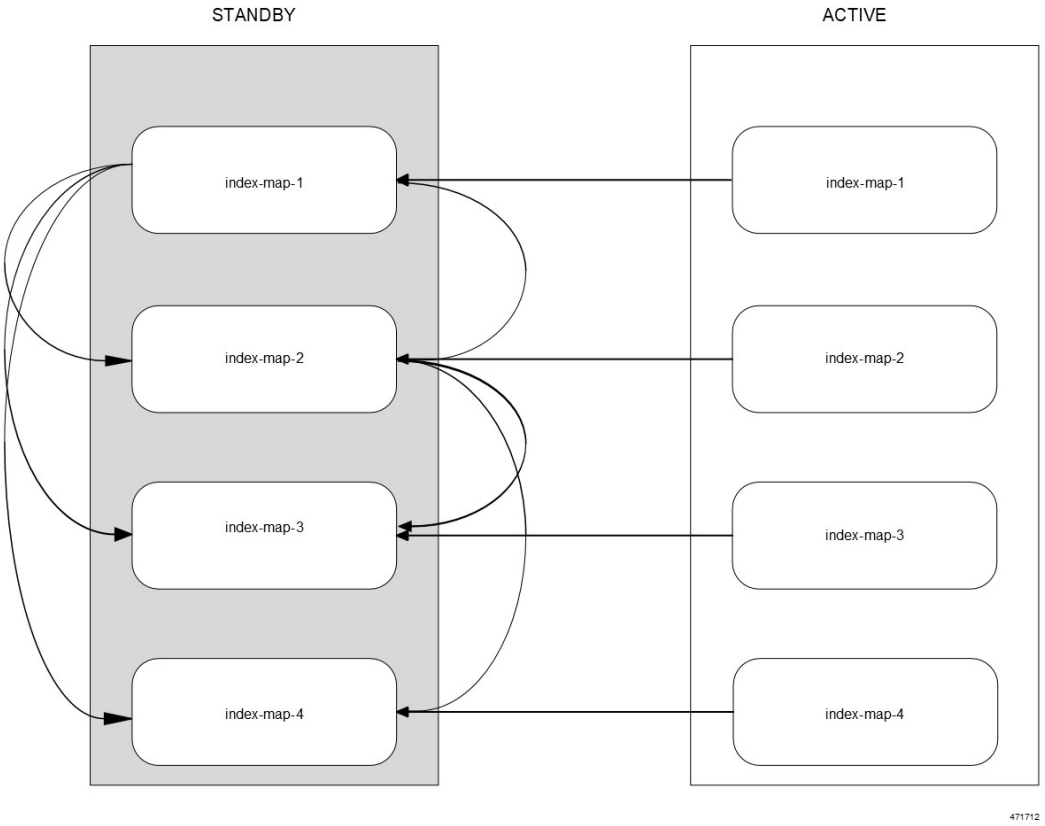


Prerequisite: *Rack-2 must be active and rack-1 must be on standby with full-rack CDL configuration.*

Action: *Do system mode running in rack-1.*

Post-validation: *The mirror-maker in both sites must be in a running state. All indexes and slots in site-1 must be able to do initial sync with remote peers. Check in CEE alerts for CDL replication errors if any.*

9. Trigger index rebalances using the CLI on rack-1 (Standby).



Prerequisite: *The CDL must be in a healthy state at both sites. Rack-1 must be on standby and rack-2 must be on active. Both sites must have scale-up mode configured with index prev-map-count.*

Index rebalancing through the CLI on rack-1 triggers copying the index from the old calculated map (as per the old map count) to the newly calculated map (as per the new map count). This is done after deleting index from the old calculated map once the copying is complete.

Action: *Trigger the rebalance-index run using the following command in standby site(rack1):*

`cdl rebalance-index run tps` *`tps_value`*

Post-validation: *To track the rebalancing status, use the following steps:*

- Monitor the rebalance status using the following CLI command:

  `cdl rebalance-index status`

- Validate the rebalance run using the following CLI command:

  `cdl rebalance-index validate`

10. Switch the instances to Active-Active.



Prerequisite: *The rebalancing must be done successfully.*

Action: *Enable rack-1 and rack-2 as active.*

Post-validation: *The traffic must land on both sites.*

11. Remove the CDL scale-up mode configuration from both sites.

    Prerequisite: *Both rack-1 and rack-2 must be active.*

    Action: *Configure the following command on both sites:*

    ```
    no cdl datastore session mode
    ```

    Post-validation: *CDL must be running in a healthy state. The mirror-maker restarts after scale-up mode is disabled.*

Troubleshooting

To view the rebalancing logs, configure the following logger in CLI:

```
cdl logging logger datastore.idx-rebalance.session
level warn
exit
```

The following metric is introduced in the index pod to know the total number of index keys that are rebalanced.

Metric	Label
index_rebalanced_keys_total	cdl_slice, shardId

FindAll and FindAllNotify Query Enhancements for CDL

Feature Description

In this release, the CDL supports enhancements for the FindAll and FindAllNotify queries.

New query filters are introduced to support the following operations:

- A maximum of 20 IN filters in the FindAllNotify query. The CDL retreives all sessions from a slot and then matches each session with the passed filters. If the session keys match with any one of the passed filters, then notify the same to the NF with the matched IN filter condition.
- A NOT-MATCH operation with more than one condition.
- The IN and NOT operations in the CDL CLI.
- IPC streaming for the notifications.

  In the previous releases, the CDL used a unary RPC for sending notifications to the application. With this release, the CDL supports the bidirectional streaming RPC for optimizing IPCs between it and the application.

How it Works

This section describes the sequence of operations for CDL to support the different filter conditions in FindAll and FindAllNotify queries.

Support IN Filters

1. The system checks for all the AND and IN conditions inside the query parameter.
   - If both the AND and IN query filters are in the query, then it's processed in the following manner:
     - The CDL first checks all the AND filters. If any of the AND filter fails, then it skips the other AND filters and IN filters because the key did not match the filter.
     - After all the AND filters are matched, then check the IN filters. If any of the IN filters is matched, then the CDL skips the other IN filters because the key already matched the filter.
   - If only the IN filters are in the query and any of the IN filter is matched, then the CDL skips processing the other IN conditions.
2. If there are more than 20 IN filters in the query request, then respond back with a 400 Bad Request message.
3. The CDL sends the matched IN filter condition along with the notification only when it is enabled in the FindAllNotify query request.

Note If more IN filters are passed in the request, the query performance is impacted.

Support NOT-MATCH Operation with More than One Condition

The CDL supports the additional conditions for this query filtering:

- not-match
- not-starts-with
- not-ends-with
- not-contains

Note If any key (pk/uk/nuk) in a session satisfies the **match**, **contains**, **starts-with**, or **ends-with** condition, then that session will not be for selected for the filter corresponding to the **not-match**, **not-contains**, **not-starts-with**, or **not-ends-with** condition respectively.

Support the IN and NOT Operations in the CDL CLI

- Support the following additional conditions for filtering the sessions in CLI:
  - contains
  - not-contains
  - not-ends-with
  - not-starts-with
  - not-match
- Support the **in-filter** filter in addition to the AND filter **filter** for the IN operations in CLI

  The following code snippet is a sample CLI command:

```
cdl show sessions summary filter { condition ends-with key 6 } in-filter { in-condition
 starts-with key key-1 } in-filter { in-condition starts-with key key-2 }
```

Note The **filter** and **in-filter** filters are a list of conditions. The query supports a maximum of 20 **in-filters** filters. The order of the filters, **filter** and **in-filter** does not matter as the filters mentioned with **filter** are grouped together. Likewise, the filters mentioned with **in-filter** are also grouped together.

- The following CDL operations are supported for filtering with **filter** and **in-filter**:
  - **cdl show sessions count summary**
  - **cdl show sessions count detailed**

- **cdl show sessions detailed**
- **cdl show sessions summary**
- **cdl clear sessions**

Support Streaming Notifications

- The CDL uses bi-directional streaming RPC to send the notifications over a stream with a transaction ID to the application. The response is sent in a different stream from the application to the datastore with the transaction ID for correlation.
- By default, the CDL uses unary RPC and the streaming functionality is disabled. Streaming is enabled only when the feature flag **use-stream** is configured in the CDL CLI. If the streaming is enabled, then all the CDL notifications are sent using the streaming.

  To enable the streaming for notification functionality, use the following CLI command:

  ```
  cdl datastore session slot notification use-stream true
  ```
- If the streaming is enabled, then by default there are four stream connections from the CDL to a notification endpoint. The connection count can be configured by using the CDL CLI. The stream connections are used in the round robin manner.
- Support metrics to check the number of active stream connections from the slot or endpoint to the notification endpoint. Use these metrics to generate alerts when there is no active stream connection.

Network Policy Configuration

Feature Summary and Revision History

Summary Data

Applicable Product (s) or Functional Area	Cloud Native Broadband Network Gateway (cnBNG) 2022.02 and later
Applicable Platforms	Bare Metal, OpenStack, VMware
Feature Default Setting	Disabled – Configuration Required
Related Changes in this Release	Not Applicable
Related Documentation	*UCC CDL Configuration and Administration Guide, Release 1.8*

Revision History

Revision Details	**Release**
First introduced.	CDL 1.8.0

Feature Description

In this release, the CDL enables you to configure its network policy to override the global network policy configuration. If the configuration is enabled, then the network policy for CDL endpoint, index, slot, Kafka, and Zookeeper are applied.

You can also configure the network policy for etcd to override the global network policy configuration. If the configuration is enabled, then the network policy for etcd is applied.

Configuring the CDL Network Policy

To configure the CDL network policy, use the following CLI commands:

```
config
  cdl network-policy enable <true/false>
```

To configure the etcd network policy, use the following CLI commands:

```
config
  etcd network-policy enable <true/false>
```

Troubleshooting Information

This section describes how to resolve some of the known issues in CDL configuration. Before proceeding with troubleshooting CDL configurations, consider the following:

- **system-id** is unique across the site.
- **cluster-id** (**datastore id**) is unique within the site.
- You cannot change the replica of Index after deploying the CDL. To change the replica:
  1. Set the system mode to "shutdown".
  2. Change the replica.
  3. Set the system mode to "running".
- The replica of Endpoint, Index, Slot and Kafka pods must be less than or equal to the number of k8 nodes with the following label and value:
  - **Label**: *smi.cisco.com/node-type*.
  - **Value**: Value of *cdl/node-type*. In a multi-node setup, the default value is *session*.
- The replica of Zookeeper and ETCD pods must be less than or equal to the number of k8 nodes with the following label and value:
  - **Label**: *smi.cisco.com/node-type*.
  - **Value**: *oam*.
- In a Geo-replication setup (across the sites cluster-id), the replicas, and maps of the Index and Slot pods must be identical. Otherwise data replication may fail.

CDL Index are not Replicated Accurately

This section describes how to replicate the CDL Index pods accurately.

Issue Description

The session data is not replicated properly to the remote site.

Identifying the Issue

The data added at one site is inaccessible at the other site.

Possible Causes

The incorrect Geo-replication configuration may cause this issue.

Resolution

To resolve this issue:

- Verify the local system-id and remote site configuration.
- Verify whether CDL endpoints and Kafka between each site are reachable.
- Verify the map, replica of index and slot at each site. They must be identical across all the sites.

CDL Operations are Failing but the Connection is Successful

This section describes how to resolve the CDL operation failure issue.

Issue Description

The NF connects to the CDL, but the session operations such as find, create, update, and delete fail.

Identifying the Issue

You can view the NF log files to identify the call failure.

Possible Causes

You might encounter this issue when the CDL Index and Slot pods are not ready.

Resolution

To resolve this issue:

- Verify whether all the pods are in ready and running state.
- The Index pods move to the ready state only if the synchronization is complete with peer replica (local or remote if available).
- The Slot pods move to the ready state only if the synchronization is complete with peer replica (local or remote if available).

- At least one slot and index pod must be available for the Endpoint to move to ready state. Even when it isn't ready, the client accepts the GRPC connection.

CDL Pods are Down

This section describes how to bring up the CDL pods when they are down.

Issue Description

The CDL pods are not in the "*running*" state because of incorrect CDL configuration.

Identifying the Issue

Verify the "describe pods" output (Containers, Member, State, Reason, or Events) to identify whether the pods are down with the following command:

kubectl describe pods -n *<namespace> <failed pod name>*

Possible Causes

The possible causes are:

- Pods are in "*pending*" state.
- Pods are in "*CrashLoopBackOff*" failure state.
- Pods are in "*ImagePullBack*" failure state.

Resolution

- When the pods are in "*pending*" state:
  - Verify whether the k8s nodes with the label value *cdl/node-type* are present. Also, ensure that the number of replicas are less than or equal to the number of k8s nodes with the label value *cdl/node-type*.

    ```
    kubectl get nodes -l smi.cisco.com/node-type=<value of cdl/node-type, default value
     is 'session' in multi node setup)
    ```

- When the pods are in "*CrashLoopBackOff*" failure state:
  - Verify the status of the ETCD pods.

    ```
    kubectl describe pods -n <namespace> <etcd pod name>
    ```

    If the ETCD pods are not running, resolve the ETCD issues to bring up the pods.

- When the pods are in "*ImagePullBack*" failure state:
  - Verify whether the helm repository and image registry are accessible.
  - Verify whether the required proxy and DNS servers are configured.

Mirror Maker Pod is in Not Ready State

This section describes how to move the Mirror Maker pods that remain in the "*Not Ready*" state.

Issue Description

The Mirror Maker pods are not in running state because of connectivity issues on the remote site.

Identifying the Issue

Verify the Describe pod's output and pod logs with the following command:

```
kubectl describe pods -n <namespace> <failed pod name>
kubectl logs -n <namespace> <failed pod name> [-c <container name>]
```

Possible Causes

Connectivity issues with remote site Kafka brokers may cause this issue.

Resolution

To resolve this issue:

- Verify whether the external IPs configured for Kafka are accurate.
- Verify whether the remote sites of Kafka are reachable through the external IPs.

Early or Delayed Notification for Purging Record from CDL

This section describes how to resolve the early or delayed notification sent for purging record from CDL.

Issue Description

The notification sent for purging record from CDL is either early or delayed.

Identifying the Issue

While purging record from CDL, the notification comes either early or delayed.

Possible Causes

The nodes in the Kubernetes cluster are not time synchronized.

Resolution

To resolve this issue:

- Verify whether all the nodes in the k8s cluster are time synchronized.
- Verify the synchronization status on all the k8s nodes.

```
chronyc tracking
chronyc sources -v
chronyc sourcestats -v
```

Sessions Piling Up or Overloading on CDL

This section describes how to resolve the sessions pile up on CDL.

Issue Description

The number of sessions pile up because of some network issues or an unexpected number of sessions on CDL, which does not match with the peer session count.

Identifying the Issue

The session count from the CLI or Grafana dashboard displays a higher session count than expected or the sessions are rising constantly.

Possible Causes

The *Create* request received at CDL are more than the *Delete* request. Consequently, the session count keeps on growing.

Resolution

To resolve this issue, the respective NF must take appropriate action for triggering clear for the subscribers.

User-Defined Scheduling and Pod Placement

This section describes how to resolve unschedulable pods issue that may arise by using single node label for scheduling, node affinity, and pod placement in CDL pods.

Issue Description

The *nodeType* parameter controls scheduling, node affinity, and pod placement in CDL. Currently, this parameter is configured with a single node label value *smi.cisco.com/node-type*. When CDL is configured to its full node capacity, the pods are marked as unschedulable (sometimes) because of the single node label usage.

Identifying the Issue

The CDL pods are marked as unschedulable.

Possible Causes

The usage of single node label for scheduling, node affinity, and pod placement.

Resolution

You can control different CDL pod types using separate node labels. To create separate node labels:

1. (Mandatory) Create *smi.cisco.com/node-type* label on all the nodes used for CDL through SMI Cluster Manager Ops Center CLI.
2. Create labels for CDL pods as specified in the following table:

Pods	Label	Value
CDL Endpoint pods	*smi.cisco.com/cdl-ep*	*true*
CDL Slot pods	*smi.cisco.com/cdl-slot-<MAP Id 1..n>*	*true*
CDL Index pods	*smi.cisco.com/cdl-index-<MAP Id 1..n>*	*true*



Note This configuration is required only for user-defined scheduling.

Example

The following example shows how to create separate node labels for CDL which uses four different nodes with two endpoint replicas, four Slot maps (with two replicas each) and two Index maps (with two replicas each).

Node 1	Node-2	Node-3	Node-4
Pod: slot-1-0	Pod: slot-1-1	Pod: slot-2-0	Pod: slot-2-1
Label: cdl-slot-1	Label: cdl-slot-1	Label: cdl-slot-2	Label: cdl-slot-2
Pod: slot-3-0	Pod: slot-3-1	Pod: slot-4-0	Pod: slot-4-1
Label: cdl-slot-3	Label: cdl-slot-3	Label: cdl-slot-4	Label: cdl-slot-4
Pod: index-1-0	Pod: index-1-1	Pod: index-2-0	Pod: index-2-1
Label: cdl-index-1	Label: cdl-index-1	Label: cdl-index-2	Label: cdl-index-2
Pod: ep-0			Pod: ep-2
Label: cdl-ep	Label: cdl-ep	Label: cdl-ep	Label: cdl-ep

Sample Configuration: SMI Cluster Manager

```
clusters user-k8s
  nodes session1
   k8s node-labels smi.cisco.com/cdl-ep true
   exit
   k8s node-labels smi.cisco.com/cdl-index-1 true
   exit
   k8s node-labels smi.cisco.com/cdl-slot-1 true
   exit
   k8s node-labels smi.cisco.com/cdl-slot-3 true
   exit
   k8s node-labels smi.cisco.com/node-type session
   exit
  exit
exit
clusters user-k8s
  nodes session2
   k8s node-labels smi.cisco.com/cdl-ep true
   exit
```

```
    k8s node-labels smi.cisco.com/cdl-index-1 true
    exit
    k8s node-labels smi.cisco.com/cdl-slot-1 true
    exit
    k8s node-labels smi.cisco.com/cdl-slot-3 true
    exit
    k8s node-labels smi.cisco.com/node-type session
    exit
  exit
exit
clusters user-k8s
  nodes session3
    k8s node-labels smi.cisco.com/cdl-ep true
    exit
    k8s node-labels smi.cisco.com/cdl-index-2 true
    exit
    k8s node-labels smi.cisco.com/cdl-slot-2 true
    exit
    k8s node-labels smi.cisco.com/cdl-slot-4 true
    exit
    k8s node-labels smi.cisco.com/node-type session
    exit
  exit
exit
clusters user-k8s
  nodes session3
    k8s node-labels smi.cisco.com/cdl-ep true
    exit
    k8s node-labels smi.cisco.com/cdl-index-2 true
    exit
    k8s node-labels smi.cisco.com/cdl-slot-2 true
    exit
    k8s node-labels smi.cisco.com/cdl-slot-4 true
    exit
    k8s node-labels smi.cisco.com/node-type session
    exit
  exit
exit
```

Sample Configuration: CDL

```
cdl label-config session
  endpoint key smi.cisco.com/cdl-ep
  endpoint value true
  slot map 1
    key smi.cisco.com/cdl-slot-1
    value true
  slot map 2
    key smi.cisco.com/cdl-slot-2
    value true
  slot map 3
    key smi.cisco.com/cdl-slot-3
    value true
  slot map 4
    key smi.cisco.com/cdl-slot-4
    value true
  index map 1
    key smi.cisco.com/cdl-index-1
    value true
  index map 2
    key smi.cisco.com/cdl-index-2
    value true
cdl datastore session
  label-config session
  endpoint replica 2
```

```
  index replica 2
  index map 2
  slot replica 2
  slot map 4
exit
```

Monitoring

This section describes how to monitor the status and records in CDL. You can also monitor CDL through Grafana dashboards.

Monitoring CDL through Grafana Dashboards

You can monitor various activities in CDL through the Grafana dashboard called CDL Dashboard, which is bundled by default. The CDL Dashboard displays the TPS towards CDL for various pods like *cdl-endpoint*, *Slot*, *Index* and the response time taken for each operation.

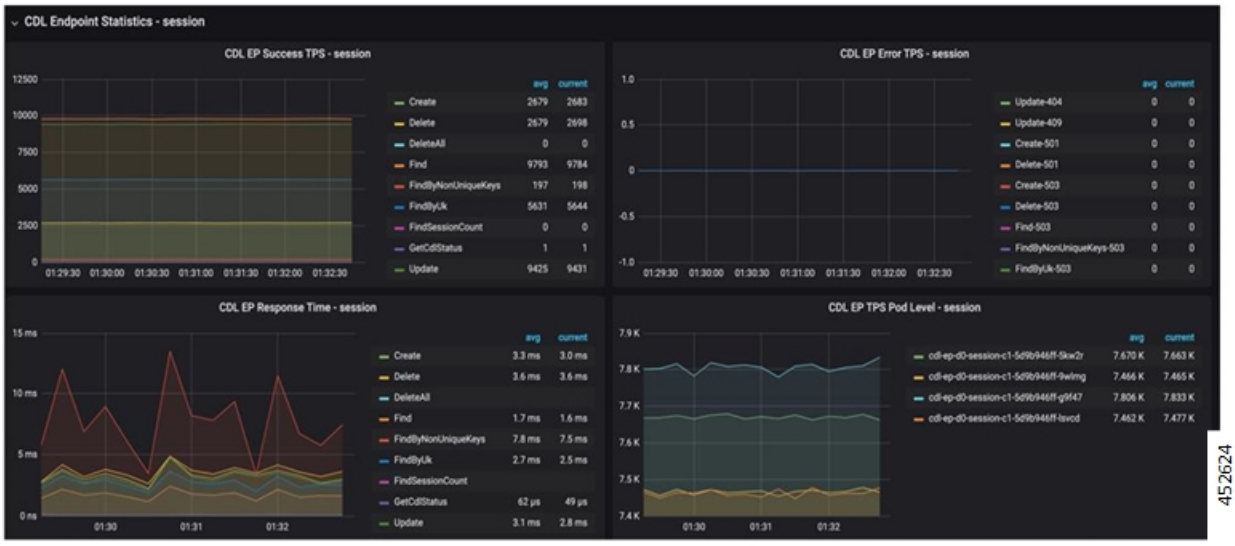
A sample Grafana CDL Summary dashboard displaying the total records by Type, SliceName, SystemID and so on is shown below:

Figure 20: Grafana CDL Dashboard - Summary



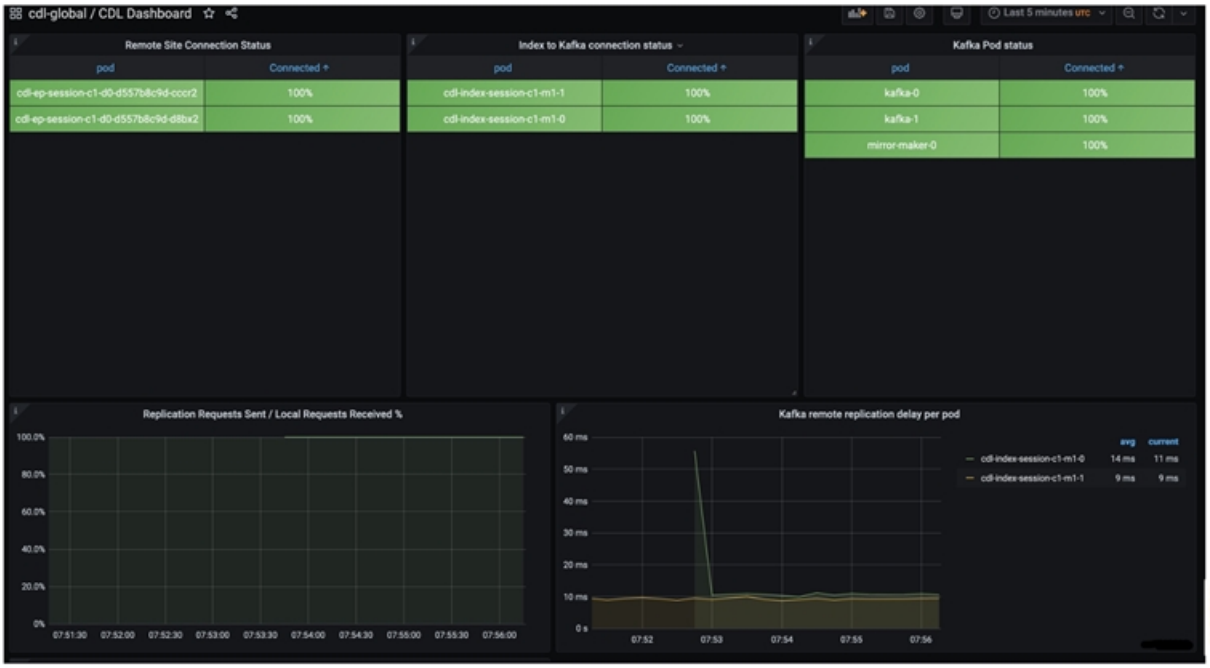
A sample Grafana CDL dashboard displaying the CDL TPS and response time graphs is shown below:

Figure 21: Grafana CDL Dashboard - CDL TPS and Response Time



The Grafana CDL dashboard is enhanced to show the Geo Replication status. A sample Grafana dashboard displaying the Geo Replication status and other details is shown below.

Figure 22: Grafana CDL Dashboard - GR Connection



The GR connection, Index replication and slot replication panels, and their descriptions are listed in the table below:

Table 5: GR Connection Status

Panel	Description
Remote Site connection status	The remote site connections active per endpoint pod (in percentage). If it reaches 0 for more than 5 minutes, an alert is triggered.
Index to Kafka connection status	The average kafka connections currently active from each index pod.
Kafka Pod status	The readiness status of Kafka pod and mirrorMaker pods.
Replication Requests Sent/Local Requests Received %	The ratio of replication requests sent to the remote site vs the local requests received by the NF. If the ratio goes below 90% for more than 5 minutes, an alert is triggered.

Panel	Description
Kafka Remote Replication delay per pod	The total delay for replicating records to the partner site via Kafka. If the delay is more than 10 seconds in replicating the records for more than 5 minutes, then an alert is triggered.
Total Remote requests dropped	The total number of remote requests that have been dropped due to the queue being full.

Table 6: Index Replication

Panel	Description
Kafka Publish TPS per pod	The per index pod total rate of kafka write requests (publish).
Kafka Remote Replication TPS per pod	The per index pod total rate of incoming kafka requests (consume) from the partner site.

Table 7: Slot Replication

Panel	Description
Slot Geo Replication Requests Sent	The total rate of replication requests from `cdl-ep` to remote site per operation.
Slot Geo Replication Requests Received	The total rate of replication requests received by the slot pods per operation type.
Slot Checksum Mismatch	The total rate of slot checksum mismatch.
Slot Reconciliation	The total rate of slot reconciliation due to slot data checksum mismatch.

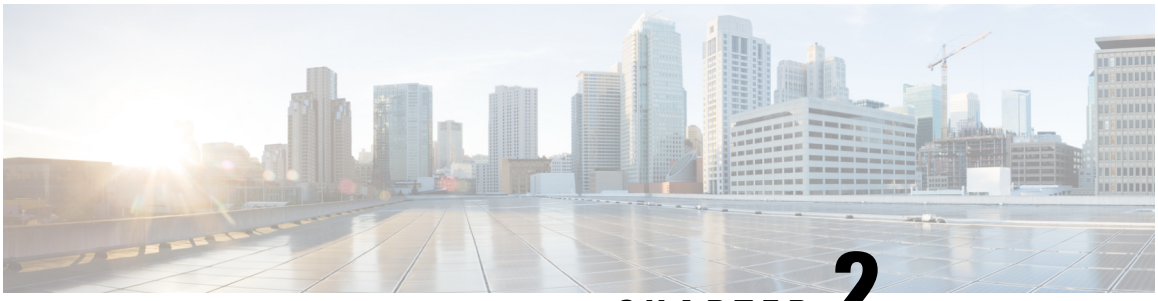
Verifying the Status and Records in CDL

You can verify the status of the CDL and inspect the data inserted by the client using the **cdl show status** command in the CDL Ops Center. For more information on **cdl show status** command, see the *UCC CDL Command Reference Guide.*

The following example displays the status of all the CDL components and client's data.

```
[unknown] cdl# cdl show status
message params: {cmd:status mode:cli dbName:session sessionIn:{mapId:0 limit:10000
filters:[]}}
site {
    system-id 1
    cluster-id 1
    db-endpoint {
        state STARTED
    }
    slot {
        map-id 1
```

```
            instance-id 2
            records 100
            capacity 1000000
            state STARTED
        }
        slot {
            map-id 1
            instance-id 1
            records 100
            capacity 1000000
            state STARTED
        }
        index {
            map-id 1
            instance-id 2
            records 500
            capacity 2500000
            state ONLINE
        }
        index {
            map-id 1
            instance-id 1
            records 500
            capacity 2500000
            state ONLINE
        }
    }
    [unknown] cdl#
```



CHAPTER 2

CDL Backup and Restoration

This chapter describes the operational procedures for CDL backup and restoration.

- Access CDL Ops-Center Configuration, on page 71
- Backup and Restore, on page 72

Access CDL Ops-Center Configuration

Use this procedure to access the CDL API configuration.

Before you begin

Ensure that the CDL datastore is configured to configure CDL API.

Procedure

Step 1 Enable the CDL API pod deployment using the **cdl api deploy true** command.

By default, the pod deployment is disabled.

Step 2 Scale the CDL API pod vertically using the following commands.

a) Configure the maximum CPU limit using the **cdl api cpu-limit** *cpu_limit* command.

Example:

```
cdl api cpu-limit 2000
```

cpu_limit must be an integer in the range of 1000 to 8000. Default: 4000.

b) Configure the maximum number of CPU cores using the **cdl api go-max-procs** *cpu_cores* command.

Example:

```
cdl api go-max-procs 4
```

cpu_cores must be an integer in the range of 1 to 32. Default: 4.

c) Configure the maximum memory allowed in Gi using the **cdl api memory-limit** *memory_limit* command.

Example:

```
cdl api memory-limit 6
```

memory_limit must be an integer in the range of 1 to 8. Default: 4.

d) Configure the backup storage in GB using the **cdl api storage** *storage_size* command.

Example:

```
cdl api storage 90
```

storage_size must be an integer in the range of 1 to 200. Default: 90.

Backup and Restore

Use this procedure to trigger and restore the backup process.

Before you begin

Ensure that you configure **cdl api deploy true** to access the **cdl actions backup** and **cdl actions restore** commands.

Procedure

Step 1 Trigger the backup process using the **cdl actions backup start [concurrency-factor** *concurrency_factor* **| created-before** *timestamp* **| slice-name** *slice_name* **]** command.

This command triggers the backup process and will not wait for the process to be completed. It returns a successful or failure message with the dump file name that gets created. Once the backup process is completed, the dump file in the output can be collected or referred for the restore process. This file can be located at */data/<namespace>/data-cdl-api-0/<file-name.dump>* on the node where the cdl-api-0 pod is running.

This command will prompt the warning *This triggers CDL backup process. Are you sure?*. Type *yes* to proceed with triggering the CDL backup process.

The following parameters are optional to be configured with the **backup start** command:

- **concurrency-factor** *concurrency_factor*—Take the backup by fetching data from the slots concurrently. By, default only 1 slot will be queried at a time.

  concurrency_factor must be an integer in the range 1 to 8.

- **created-before** *timestamp*—Take the backup of records created before this timestamp. The timestamp must be in the `CCYY-MM-DDTHH:MM:SS` format.

  By default, all available data will be queried for backup.

- **slice-name** *slice_name*—Take the backup of the given slice names. Only the configured slice name will be allowed to pass here.

  By default, the backup of all slice names will be taken.

Step 2 Run the **cdl actions backup status** command to know the status of the backup process.

This command returns one of the following status:

- **idle | completed**—CDL backup process is completed or not going on
- **in-progress**—CDL backup process is in-progress

Step 3 Trigger the restore process using the **cdl actions restore start file** *filename* command.

This command triggers the restore process and will not wait for the process to be completed. It returns a successful or failure message. It is mandatory to configure the **`file`** parameter with this command.

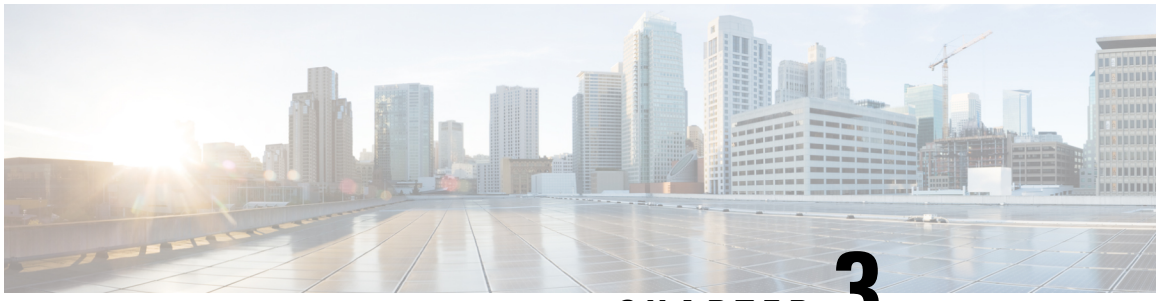
This command will prompt the warning *This triggers CDL restore process and will overwrite the existing data. Are you sure?*. Type *yes* to proceed with triggering the CDL restore process.

The file name must have the `.dump` extension. The file must be present in the host path */data/<namespace>/data-cdl-api-0/<file-name.dump>* on the node where the cdl-api-0 pod is running.

Step 4 Run the **cdl actions restore status** command to know the status of the restore process.

This command returns one of the following status:

- **idle | completed**—CDL restore process is completed or not going on
- **in-progress**—CDL restore process is in-progress



CHAPTER 3

CDL Metrics

- Overview, on page 75
- CDL Category, on page 76

Overview

This chapter describes the Key Performance Indicators (KPIs) available to monitor and analyze the performance of the CDL.

The label name and description of the metrics used in CDL are defined in the following table:

Table 8: Metrics Label Description

Metric Label Name	Label Description
db	The name of the datastore.
operation	The name of operation performed on the CDL pods.
errorCode	The error code sent in response.
errorMessage	The error message sent in response.
slot_shard_id	The Slot map or Shard id where the operation is performed.
slot_instance_id	The Slot instance id where the operation is performed.
shardId	The Slot or Index map or Shard id where the metric is pegged.
instanceId	The Slot or Index map or Instance id where the metric is pegged.
session_type	The type of session data present in the record.
bucket	The bucket represents the bucket under which the session lies. The current buckets are <=1kb, <=2kb, <=4kb,<=8kb, <=16kb, <=32kb, >32kb
notification_type	The type of notification sent from CDL. Values: TIMER_EXPIRED, RECORD_CONFLICT, BULK_TASK_NOTIFICATION
topic	The topic while publishing to kafka
not_found_in	The pod from where the data was not found. Values: Index/Slot

CDL Category

bulk_task_ongoing

Description: Gauge metric to indicate number of bulk tasks that is being processed at any given point in time

Sample Query: `bulk_task_ongoing`

Labels:

- Label: `db`

  Label Description: DB name

  Example: session

- Label: `slot_shard_id`

  Label Description: The slot shard id

  Example: 1, 2

- Label: `slot_instance_id`

  Label Description: The slot instance id

  Example: 1, 2

- Label: `cdl_slice`

  Label Description: The name of the logical cdl slice

  Example: session

bulk_task_total

Description: Total number of bulk tasks with processing status

Sample Query: `bulk_task_total`

Labels:

- Label: `db`

  Label Description: DB name

  Example: session

- Label: `slot_shard_id`

  Label Description: The slot shard id

  Example: 1, 2

- Label: `slot_instance_id`

  Label Description: The slot instance id

  Example: 1, 2

- Label: `cdl_slice`

Label Description: The name of the logical cdl slice

Example: session

- Label: `status`

  Label Description: Processing status of bulk task

  Example: timeout, skipped, aborted, completed_last_record, completed

cdl_ep_to_slot_request_tps

Description: Recording rule for endpoint to slot request TPS measurement

Sample Query: `cdl_ep_to_slot_request_tps`

Labels:

- Label: `namespace`

  Label Description: Kubernetes namespace from which the metric is generated

  Example: cdl-global

Labels:

- Label: `pod`

  Label Description: Endpoint pod name from which the metric is generated

- Label: `operation`

  Label Description: The type of DB operation

  Example: Create, Update, Delete, UpdateFlags

- Label: `errorCode`

  Label Description: The errorCode in the DB response for deletion

  Example: 0, 502

cdl_ep_to_slot_response_time

Description: Recording rule for endpoint to slot response time measurement

Sample Query: `cdl_ep_to_slot_response_time`

Labels:

- Label: `namespace`

  Label Description: Kubernetes namespace from which the metric is generated

  Example: cdl-global

Labels:

- Label: `operation`

  Label Description: The type of DB operation

  Example: Create, Update, Delete, UpdateFlags

Labels:

- Label: `errorCode`

  Label Description: The errorCode in the DB response for deletion

  Example: 0, 502

cdl_geo_replication_enabled

Description: Gauge metric to indicate geo replication status. If Geo replication is enabled then value is 1 else 0

Sample Query: `cdl_geo_replication_enabled`

cdl_index_record_capacity

Description: Total index record capacity of CDL

Sample Query: `cdl_index_record_capacity{db=\"session\"}`

Labels:

- Label: `db`

  Label Description: DB name

  Example: session

cdl_slice_state

Description: CDL slice active state information in GR instance-awareness. If value is 1 then slice is active

Sample Query: `cdl_slice_state`

Labels:

- Label: `cdl_slice`

  Label Description: The name of the logical cdl slice

  Example: session

Labels:

- Label: `shardId`

  Label Description: The slot shard id

  Example: 1, 2

cdl_slot_record_capacity

Description: Total slot record capacity of CDL

Sample Query: `cdl_slot_record_capacity{db=\"session\"}`

Labels:

- Label: `db`

Label Description: DB name

Example: session

cdl_slot_size_capacity

Description: Total slot size capacity of CDL

Sample Query: `cdl_slot_size_capacity{db=\"session\"}`

Labels:

- Label: `db`

  Label Description: DB name

  Example: session

consumer_kafka_nonprocessed_records_total

Description: Total count of unprocessed kafka records since originated from same pod

Sample Query: `sum(consumer_kafka_nonprocessed_records_total)by(shardId,instanceId)`

Labels:

- Label: `db`

  Label Description: DB name

  Example: session

Labels:

- Label: `operation`

  Label Description: The type of DB operation

  Example: Get, Multi

Labels:

- Label: `shardId`

  Label Description: The shard id

  Example: 1, 2

Labels:

- Label: `instanceId`

  Label Description: The instance id

  Example: 1, 2

Labels:

- Label: `reason`

  Label Description: The reason for skipping the consumed kafka record

Example: old_timestamp

consumer_kafka_records_duration_seconds

Description: Time taken to process consumed kafka records

Sample Query: `sum(irate(consumer_kafka_records_duration_seconds[5m]))by(shardId,instance_id)`

Labels:

- Label: `db`

  Label Description: DB name

  Example: session

Labels:

- Label: `shardId`

  Label Description: The shard id

  Example: 1, 2

Labels:

- Label: `origin_instance_id`

  Label Description: The index instance id from which the kafka request originated

  Example: 1.1, 1.2

Labels:

- Label: `systemId`

  Label Description: The id of the system

  Example: 1, 2

consumer_kafka_records_total

Description: Total count of records consumed from kafka

Sample Query: `sum(irate(consumer_kafka_records_total[5m]))by(shardId,instance_id)`

Labels:

- Label: `db`

  Label Description: DB name

  Example: session

Labels:

- Label: `shardId`

  Label Description: The shard id

  Example: 1, 2

Labels:

- Label: `origin_instance_id`

  Label Description: The index instance id from which the kafka request originated

  Example: 1.1, 1.2

Labels:

- Label: `systemId`

  Label Description: The id of the system

  Example: 1, 2

Labels:

- Label: `cdl_slice`

  Label Description: The name of the logical cdl slice

  Example: session

datastore_internal_requests_duration_seconds

Description: Time taken for processing of internal datastore requests

Sample Query: `sum(datastore_internal_requests_duration_seconds)by(operation)`

Labels:

- Label: `db`

  Label Description: DB name

  Example: session

Labels:

- Label: `operation`

  Label Description: The type of DB operation

  Example: RemoteBulkRead, RemoteBulkReadIndexing, GetChecksumRemoteSlot

Labels:

- Label: `errorCode`

  Label Description: The errorCode in the DB response

  Example: 0, 1401

Labels:

- Label: `cdl_slice`

  Label Description: The name of the logical cdl slice

  Example: session

datastore_requests_duration_seconds

Description: Total time taken for processing requests at cdl-ep

Sample Query:
`sum(irate(datastore_requests_duration_seconds{errorCode=\"0\",local_request=\"1\"}[5m])) by (operation)`

Labels:

- Label: `db`

  Label Description: DB name

  Example: session

Labels:

- Label: `operation`

  Label Description: The type of DB operation

  Example: Create, Update, Delete, Find, FindByUK, GetCdlStatus, UpdateFlags

Labels:

- Label: `errorCode`

  Label Description: The errorCode in the DB response

  Example: 0, 400, 403, 404, 409, 413, 501, 502, 503, 507, 508

Labels:

- Label: `local_request`

  Label Description: Whether the DB requests is Local or GR. If local_request = 1 then it is Local otherwise it is GR.

  Example: 1, 0

Labels:

- Label: `cdl_slice`

  Label Description: The name of the logical cdl slice

  Example: session

datastore_requests_total

Description: Total count of requests received at cdl-ep

Sample Query: `sum(irate(datastore_requests_total{errorCode=\"0\",local_request=\"1\"}[5m])) by (operation)`

Labels:

- Label: `db`

  Label Description: DB name

  Example: session

Labels:

- Label: `operation`

  Label Description: The type of DB operation

  Example: Create, Update, Delete, Find, FindByUK, GetCdlStatus, UpdateFlags

Labels:

- Label: `errorCode`

  Label Description: The errorCode in the DB response

  Example: 0, 400, 403, 404, 409, 413, 501, 502, 503, 507, 508

Labels:

- Label: `local_request`

  Label Description: Whether the DB requests is Local or GR. If local_request = 1 then it is Local otherwise it is GR.

  Example: 1, 0

Labels:

- Label: `cdl_slice`

  Label Description: The name of the logical cdl slice

  Example: session

db_records_softdelete_total

Description: Total count of records for the db which are in soft delete/purge state due to purgeOnEval set

Sample Query: `sum(avg(db_records_softdelete_total{notify=\"1\"})by(notify))`

Labels:

- Label: `db`

  Label Description: DB name

  Example: session

Labels:

- Label: `cdl_slice`

  Label Description: The name of the logical cdl slice

  Example: session

Labels:

- Label: `notify`

  Label Description: Whether purgeOnNotify is set. 1 indicates purgeOnNotify=true, 0 otherwise.

  Example: 1

db_records_total

Description: Total count of records for the db. The following metrics can be achieved: 1. Total record count - Query:
sum(avg(db_records_total{namespace=\"$namespace\",session_type=\"total\",appInstanceId=\"0\"})by(systemId,cdl_slice))
2. Slice wise record count - Query:
sum(avg(db_records_total{namespace=\"$namespace\",session_type=\"total\",appInstanceId=\"0\"})by(systemId,cdl_slice))by(cdl_slice)
3. System ID based count:
sum(avg(db_records_total{namespace=\"$namespace\",session_type=\"total\",appInstanceId=\"0\"})by(systemId,cdl_slice))by(systemId)
4. Sessions grouped by session type - Query:
avg(db_records_total{namespace=\"$namespace\",session_type!=\"total\"}) by (session_type)

Sample Query:
`sum(avg(db_records_total{namespace=\"$namespace\",session_type=\"total\",appInstanceId=\"0\"})by(systemId,cdl_slice))`

Labels:

- Label: `db`

  Label Description: DB name

  Example: session

Labels:

- Label: `session_type`

  Label Description: The session type stored in the data

  Example: GX, RX, total

Labels:

- Label: `systemId`

  Label Description: The id of the system

  Example: 1, 2

Labels:

- Label: `cdl_slice`

  Label Description: The name of the logical cdl slice

  Example: session

Labels:

- Label: `appInstanceId`

  Label Description: The app instance id populated by app in the record.

  Example: 1

dpapp_internal_requests_total

Description: Total count of internal dp app requests

Sample Query: `sum(dpapp_internal_requests_total)by(operation)`

Labels:

- Label: `db`

  Label Description: DB name

  Example: session

Labels:

- Label: `operation`

  Label Description: The type of DB operation

  Example: RemoteBulkRead, RemoteBulkReadIndexing, GetChecksumRemoteSlot

Labels:

- Label: `errorCode`

  Label Description: The errorCode in the DB response

  Example: 0, 1401

Labels:

- Label: `cdl_slice`

  Label Description: The name of the logical cdl slice

  Example: session

duplicate_slot_records_deleted

Description: Total slot records deleted due to duplicate slot data found

Sample Query: `duplicate_slot_records_deleted`

Labels:

- Label: `errorCode`

  Label Description: The errorCode in the DB response

  Example: 0, 502

Labels:

- Label: `cdl_slice`

  Label Description: The name of the logical cdl slice

  Example: session

find_no_record_total

Description: Total count of find requests for which no records are sent back

Sample Query: `sum(find_no_record_total)by(not_found_in,operation)`

Labels:

- Label: `db`

  Label Description: DB name

  Example: session

Labels:

- Label: `operation`

  Label Description: The type of DB operation

  Example: FindByUk, FindTagsByUk, Find

Labels:

- Label: `not_found_in`

  Label Description: Whether the data not found in index or slot

  Example: index, slot

Labels:

- Label: `cdl_slice`

  Label Description: The name of the logical cdl slice

  Example: session

findall_records_bucket

Description: The total number of findAll requests received which can be grouped into the number of records sent in response

Sample Query: `sum(irate(findall_records_bucket[5m]))by(bucket)`

Labels:

- Label: `bucket`

  Label Description: Buckets grouped by no of records

  Example: =0, <=10, <=20, <=50, <=100, >100

Labels:

- Label: `cdl_slice`

  Label Description: The name of the logical cdl slice

  Example: session

index_init_sync_duration_seconds

Description: Time taken by the index to sync with local and remote peers during startup

Sample Query: `sum(index_init_sync_duration_seconds)by(shardId,instance_id)`

Labels:

- Label: `db`

Label Description: DB name

Example: session

Labels:

- Label: `shardId`

  Label Description: The shard id

  Example: 1, 2

Labels:

- Label: `systemId`

  Label Description: The id of the system

  Example: 1, 2

index_rebalanced_keys_total

Description: Total no of index keys that have been rebalanced

Sample Query: `index_rebalanced_keys_total`

Labels:

- Label: `cdl_slice`

  Label Description: The name of the logical cdl slice

  Example: session

Labels:

- Label: `shardId`

  Label Description: The shard id

  Example: 1, 2

indexing_audit_deleted_keys_total

Description: Total number of unique keys and primary keys deleted during index auditing

Sample Query:
`sum(irate(indexing_audit_deleted_keys_total{errorCode=\"0\",key_type=\"unique\"}[5m]))by(shardId,instance_id)`

Labels:

- Label: `db`

  Label Description: DB name

  Example: session

Labels:

- Label: `shardId`

  Label Description: The shard id

Example: 1, 2

Labels:

- Label: `key_type`

  Label Description: The type of key

  Example: primary, unique

Labels:

- Label: `errorCode`

  Label Description: The errorCode in the DB response

  Example: 302, 403

indexing_audit_duration_seconds

Description: Total time taken for performing the indexing audit

Sample Query: `indexing_audit_duration_seconds{pod=~\".*\"}`

indexing_audit_total

Description: Total times the indexing audit was run

Sample Query: `indexing_audit_total{pod=~\".*\"}`

indexing_is_leader

Description: Indexing is leader or follower

Sample Query: `indexing_is_leader`

Labels:

- Label: `db`

  Label Description: DB name

  Example: session

Labels:

- Label: `shardId`

  Label Description: The shard id

indexing_kafka_replication_delay_seconds

Description: Total delay in replicating indexes from kafka in index

Sample Query: `sum(irate(indexing_kafka_replication_delay_seconds[5m]))by(shardId,instance_id)`

Labels:

- Label: `db`

  Label Description: DB name

Example: session

Labels:

- Label: `shardId`

  Label Description: The shard id

  Example: 1, 2

Labels:

- Label: `origin_instance_id`

  Label Description: The index instance id from which the kafka request originated

  Example: 1.1, 1.2

Labels:

- Label: `systemId`

  Label Description: The id of the system

  Example: 1, 2

indexing_operation_duration_seconds

Description: Time taken for response of indexing operations sent from cdl ep to index app

Sample Query: `sum(irate(indexing_operation_duration_seconds{errorCode=\"0\"}[5m])) by (operation)`

Labels:

- Label: `db`

  Label Description: DB name

  Example: session

Labels:

- Label: `operation`

  Label Description: The type of DB operation

  Example: Create, Update, Delete, GetByPk, GetByUk

Labels:

- Label: `errorCode`

  Label Description: The errorCode in the DB response

  Example: 0, 404, 500, 503

Labels:

- Label: `cdl_slice`

  Label Description: The name of the logical cdl slice

Example: session

indexing_operation_total

Description: Total count of indexing operations sent from cdl ep to index app

Sample Query: `sum(irate(indexing_operation_total{errorCode=\"0\"}[5m])) by (operation)`

Labels:

- Label: `db`

  Label Description: DB name

  Example: session

Labels:

- Label: `operation`

  Label Description: The type of DB operation

  Example: Create, Update, Delete, GetByPk, GetByUk

Labels:

- Label: `errorCode`

  Label Description: The errorCode in the DB response

  Example: 0, 404, 500, 503

Labels:

- Label: `cdl_slice`

  Label Description: The name of the logical cdl slice

  Example: session

indexing_overwrites_total

Description: Total number of indexing set operations for which index record is overwriting

Sample Query: `sum(indexing_overwrites_total)by(key_type,shardId)`

Labels:

- Label: `db`

  Label Description: DB name

  Example: session

Labels:

- Label: `shardId`

  Label Description: The shard id

  Example: 1, 2

Labels:

- Label: `key_type`

  Label Description: The type of key

  Example: primary, unique

Labels:

- Label: `cdl_slice`

  Label Description: The name of the logical cdl slice

  Example: session

indexing_records_total

Description: Total count of records in the indexing

Sample Query: `indexing_records_total{pod=~\".*\"}`

Labels:

- Label: `db`

  Label Description: DB name

  Example: session

Labels:

- Label: `shardId`

  Label Description: The shard id

  Example: 1, 2

Labels:

- Label: `cdl_slice`

  Label Description: The name of the logical cdl slice

  Example: session

indexing_requests_duration_seconds

Description: Time taken for response of indexing requests received

Sample Query: `sum(irate(indexing_requests_duration_seconds{errorCode=\"0\",isKafka=\"1\"}[5m])) by (operation)`

Labels:

- Label: `db`

  Label Description: DB name

  Example: session

Labels:

- Label: `operation`

  Label Description: The type of DB operation

  Example: Set, Delete

Labels:

- Label: `shardId`

  Label Description: The shard id

  Example: 1, 2

Labels:

- Label: `errorCode`

  Label Description: The errorCode in the DB response

  Example: 0, 404, 1408

Labels:

- Label: `cdl_slice`

  Label Description: The name of the logical cdl slice

  Example: session

Labels:

- Label: `isKafka`

  Label Description: Whether the request is from kafka or GRPC. If isKafka = 1 then the request is from kafka

  Example: 1, 0

indexing_requests_total

Description: Total number of requests received at index pod

Sample Query: `sum(irate(indexing_requests_total{errorCode=\"0\",isKafka=\"1\"}[5m])) by (operation)`

Labels:

- Label: `db`

  Label Description: DB name

  Example: session

Labels:

- Label: `operation`

  Label Description: The type of DB operation

  Example: Set, Delete

Labels:

- Label: `shardId`

  Label Description: The shard id

  Example: 1, 2

Labels:

- Label: `errorCode`

  Label Description: The errorCode in the DB response

  Example: 0, 404, 1408

Labels:

- Label: `cdl_slice`

  Label Description: The name of the logical cdl slice

  Example: session

Labels:

- Label: `isKafka`

  Label Description: Whether the request is from kafka or GRPC. If isKafka = 1 then the request is from kafka

  Example: 1, 0

inmemory_indexing_operation_duration_seconds

Description: Total time taken for responses to requests from cdl-ep to cdl-index pod

Sample Query: `sum(inmemory_indexing_operation_duration_seconds{errorCode=\"0\"})by(operation)`

Labels:

- Label: `db`

  Label Description: DB name

  Example: session

Labels:

- Label: `operation`

  Label Description: The type of DB operation

  Example: Get, Multi

Labels:

- Label: `shardId`

  Label Description: The shard id

  Example: 1, 2

Labels:

- Label: `instanceId`

  Label Description: The instance id

  Example: 1, 2

Labels:

- Label: `errorCode`

  Label Description: The errorCode in the DB response

  Example: 0, 404

Labels:

- Label: `cdl_slice`

  Label Description: The name of the logical cdl slice

  Example: session

inmemory_indexing_operation_total

Description: Total count of operations from cdl-ep to cdl-index pod

Sample Query: `sum(inmemory_indexing_operation_total)by(operation,shardId)`

Labels:

- Label: `db`

  Label Description: DB name

  Example: session

Labels:

- Label: `operation`

  Label Description: The type of DB operation

  Example: Get, Multi

Labels:

- Label: `shardId`

  Label Description: The shard id

  Example: 1, 2

Labels:

- Label: `instanceId`

  Label Description: The instance id

  Example: 1, 2

Labels:

- Label: `errorCode`

  Label Description: The errorCode in the DB response

  Example: 0, 404

Labels:

- Label: `cdl_slice`

  Label Description: The name of the logical cdl slice

  Example: session

kafka_connection_status

Description: Kafka connection status

Sample Query: `kafka_connection_status`

Labels:

- Label: `topic`

  Label Description: Kafka topic name

  Example: kv.kafka.shard.1.1.1

Labels:

- Label: `shardId`

  Label Description: The shard id

  Example: 1, 2

kafka_producer_downtime_op_total

Description: Total numbers of operations when kafka producer is not available and added to downtime cache

Sample Query: `sum(kafka_producer_downtime_op_total) by (pod,reason)`

Labels:

- Label: `operation`

  Label Description: The operation which failed

  Example: Set, Delete

Labels:

- Label: `reason`

  Label Description: The reason why the operation failed

  Example: error, queue_full

Labels:

- Label: `success`

Label Description: Whether addition to downtime cache is success or failed

Example: 0, 1

kafka_producer_pending_publish_total

Description: Total count of messages pending to be published to kafka

Sample Query: `kafka_producer_pending_publish_total{pod=~\".*\"}`

kafka_producer_republished_total

Description: Total count of requests republished by kafka producer

Sample Query: `kafka_producer_republished_total`

Labels:

- Label: `operation`

  Label Description: CDL Kafka operation

  Example: Delete, Set

Labels:

- Label: `shardId`

  Label Description: The shard id

  Example: 1, 2

Labels:

- Label: `topic`

  Label Description: Kafka topic name

  Example: kv.kafka.shard.1.1.1

kafka_producer_requests_duration_seconds

Description: Total time taken by kafka producer to process requests

Sample Query: `sum(irate(kafka_producer_requests_duration_seconds[5m])) by (topic)`

Labels:

- Label: `topic`

  Label Description: Kafka topic name

  Example: kv.kafka.shard.1.1.1

kafka_producer_requests_total

Description: Total count of requests sent towards kafka

Sample Query: `kafka_producer_requests_total`

Labels:

- Label: `topic`

  Label Description: Kafka topic name

  Example: kv.kafka.shard.1.1.1

kafka_records_replayed_total

Description: Total number of records published to kafka due to leader-switchover or kafka-reconnection

Sample Query:
`sum(kafka_records_replayed_total{reason=\"leader_switchover\"})by(shardId,instance_id)`

Labels:

- Label: `db`

  Label Description: DB name

  Example: session

Labels:

- Label: `shardId`

  Label Description: The shard id

  Example: 1, 2

Labels:

- Label: `reason`

  Label Description: The reason for replaying kafka records

  Example: leader_switchover, kafka_reconnection

notification_ep_connection_total

Description: Total numbers of connections from CDL to notification endpoint

Sample Query: `notification_ep_connection_total`

Labels:

- Label: `cdl_slice`

  Label Description: The name of the logical cdl slice

  Example: session

Labels:

- Label: `appInstanceId`

  Label Description: The app instance id

  Example: 1

notification_streaming_enabled

Description: CDL to Notification endpoint streaming connection status. If streaming is enabled then value is 1

Sample Query: `notification_streaming_enabled`

overwritten_index_records_deleted

Description: Total number of records deleted due to overwritten/duplicate unique keys at index

Sample Query: `overwritten_index_records_deleted`

Labels:

- Label: `errorCode`

  Label Description: The errorCode in the DB response for deletion

  Example: 0, 502

Labels:

- Label: `cdl_slice`

  Label Description: The name of the logical cdl slice

  Example: session

Labels:

- Label: `prefix`

  Label Description: The unique key prefix pattern that detected the stale record

  Example: uk1

overwritten_index_records_skipped

Description: Total number of unprocessed stale records due to queue being full

Sample Query: `overwritten_index_records_skipped`

Labels:

- Label: `action`

  Label Description: action that was supposed to be performed for the stale record

  Example: delete, notify

Labels:

- Label: `cdl_slice`

  Label Description: The name of the logical cdl slice

  Example: session

Labels:

- Label: `prefix`

Label Description: The unique key prefix pattern that detected the stale record

Example: uk1

records_notification_duration_seconds

Description: Time taken for notification sent towards notification endpoint

Sample Query: `sum(irate(records_notification_duration_seconds[5m])) by (shardId,instance_id,notification_type)`

Labels:

- Label: `db`

  Label Description: DB name

  Example: session

Labels:

- Label: `notification_type`

  Label Description: Type of the notification

  Example: TIMER_EXPIRED, RECORD_CONFLICT, BULK_TASK_NOTIFICATION

Labels:

- Label: `shardId`

  Label Description: The shard id

  Example: 1, 2

Labels:

- Label: `errorCode`

  Label Description: The errorCode in the DB response

  Example: 0, 1406

Labels:

- Label: `cdl_slice`

  Label Description: The name of the logical cdl slice

  Example: session

records_notification_retry_count

Description: Total notification retries by the slot app

Sample Query: `sum(irate(records_notification_retry_count[5m])) by (shardId,instance_id)`

Labels:

- Label: `db`

  Label Description: DB name

Example: session

Labels:

- Label: `shardId`

  Label Description: The shard id

  Example: 1, 2

Labels:

- Label: `cdl_slice`

  Label Description: The name of the logical cdl slice

  Example: session

records_notification_total

Description: Total count of notifications sent towards notification endpoint

Sample Query: `sum(irate(records_notification_total[5m])) by (shardId,instance_id,notification_type)`

Labels:

- Label: `db`

  Label Description: DB name

  Example: session

Labels:

- Label: `notification_type`

  Label Description: Type of the notification

  Example: TIMER_EXPIRED, RECORD_CONFLICT, BULK_TASK_NOTIFICATION

Labels:

- Label: `shardId`

  Label Description: The shard id

  Example: 1, 2

Labels:

- Label: `errorCode`

  Label Description: The errorCode in the DB response

  Example: 0, 1406

Labels:

- Label: `cdl_slice`

  Label Description: The name of the logical cdl slice

Example: session

remote_requests_dropped_total

Description: Total number of remote requests that have been dropped

Sample Query: `remote_requests_dropped_total`

Labels:

- Label: `operation`

  Label Description: The type of DB operation

  Example: Create, Update, Delete, UpdateFlags

Labels:

- Label: `reason`

  Label Description: The reason for dropping the remote requests

  Example: queue_full

remote_site_connection_status

Description: CDL endpoint to remote site cdl-ep connection count

Sample Query: `sum(remote_site_connection_status)by(pod,systemId)`

Labels:

- Label: `systemId`

  Label Description: The id of the system

  Example: 1, 2

remote_site_connections_total

Description: Total number of remote site connections configured per endpoint pod

Sample Query: `remote_site_connections_total`

Labels:

- Label: `systemId`

  Label Description: The systemId id of the remote site

  Example: 1, 2

slot_checksum_mismatch_total

Description: Total number of checksum mismatch

Sample Query: `sum(irate(slot_checksum_mismatch_total[5m]))by(slot_shard_id)`

Labels:

- Label: `db`

Label Description: DB name

Example: session

Labels:

- Label: `slot_shard_id`

  Label Description: The slot shard id

  Example: 1, 2

slot_geo_replication_requests_duration_seconds

Description: Time taken to send the response of slot geo replication

Sample Query:
`sum(irate(slot_geo_replication_requests_duration_seconds[5m]))by(systemId,operation)`

Labels:

- Label: `systemId`

  Label Description: The id of the system

  Example: 1, 2

Labels:

- Label: `operation`

  Label Description: The type of DB operation

  Example: CREATE, DELETE, UPDATE, UPDATEFLAGS

Labels:

- Label: `errorCode`

  Label Description: The errorCode in the DB response

  Example: 0, 503

slot_geo_replication_requests_total

Description: Total number of requests for slot geo replication

Sample Query: `sum(irate(slot_geo_replication_requests_total[5m]))by(systemId,operation)`

Labels:

- Label: `systemId`

  Label Description: The id of the system

  Example: 1, 2

Labels:

- Label: `operation`

  Label Description: The type of DB operation

Example: CREATE, DELETE, UPDATE, UPDATEFLAGS

Labels:

- Label: `errorCode`

  Label Description: The errorCode in the DB response

  Example: 0, 503

slot_init_sync_duration_seconds

Description: Time taken by the slot to sync with local and remote peers during startup

Sample Query: `sum(slot_init_sync_duration_seconds)by(shardId,instance_id)`

Labels:

- Label: `db`

  Label Description: DB name

  Example: session

Labels:

- Label: `shardId`

  Label Description: The shard id

  Example: 1, 2

Labels:

- Label: `systemId`

  Label Description: The id of the system

  Example: 1, 2

slot_operation_duration_seconds

Description: Time taken for response of operations sent from cdl ep to slot app

Sample Query:
`sum(irate(slot_operation_duration_seconds{errorCode=\"0\",local_request=\"1\"}[5m])) by (operation)`

Labels:

- Label: `db`

  Label Description: DB name

  Example: session

Labels:

- Label: `operation`

  Label Description: The type of DB operation

Example: Create, Update, Delete, Find, UpdateFlags

Labels:

- Label: `slot_shard_id`

  Label Description: The slot shard id. Kept empty string if metric verbosity is production

  Example: 1, 2

Labels:

- Label: `slot_instance_id`

  Label Description: The slot instance id. Kept empty string if metric verbosity is production

  Example: 1, 2

Labels:

- Label: `errorCode`

  Label Description: The errorCode in the DB response

  Example: 0, 104, 105

Labels:

- Label: `local_request`

  Label Description: Whether the DB requests is Local or GR. If local_request = 1 then it is Local otherwise it is GR.

  Example: 1, 0

Labels:

- Label: `cdl_slice`

  Label Description: The name of the logical cdl slice

  Example: session

slot_operation_total

Description: Total count of operations sent from cdl ep to slot app

Sample Query: `sum(irate(slot_operation_total{errorCode=\"0\",local_request=\"1\"}[5m])) by (operation)`

Labels:

- Label: `db`

  Label Description: DB name

  Example: session

Labels:

- Label: `operation`

Label Description: The type of DB operation

Example: Create, Update, Delete, Find, UpdateFlags

Labels:

- Label: `slot_shard_id`

  Label Description: The slot shard id. Empty string if metric verbosity is production

  Example: 1, 2

Labels:

- Label: `slot_instance_id`

  Label Description: The slot instance id. Empty string if metric verbosity is production

  Example: 1, 2

Labels:

- Label: `errorCode`

  Label Description: The errorCode in the DB response

  Example: 0, 104, 105

Labels:

- Label: `local_request`

  Label Description: Whether the DB requests is Local or GR. If local_request = 1 then it is Local otherwise it is GR.

  Example: 1, 0

Labels:

- Label: `cdl_slice`

  Label Description: The name of the logical cdl slice

  Example: session

slot_purged_sessions_duration_seconds

Description: Time taken for purging sessions at slot due to next eval timer expiry and purge=true

Sample Query:

```
sum(irate(slot_purged_sessions_duration_seconds{errorCode=\"0\"}[5m]))by(shardId,instance_id)
```

Labels:

- Label: `db`

  Label Description: DB name

  Example: session

Labels:

- Label: `shardId`

  Label Description: The shard id

  Example: 1, 2

Labels:

- Label: `errorCode`

  Label Description: The errorCode in the DB response

  Example: 0, 501, 508

Example: Get index record failure, Invalid Slice Name received

Labels:

- Label: `notify`

  Label Description: Whether purgeOnNotify is set. 1 indicates purgeOnNotify=true, 0 otherwise.

  Example: 1

slot_purged_sessions_total

Description: Total number of sessions purged at slot due to next eval timer expiry and purge=true

Sample Query:

```
sum(irate(slot_purged_sessions_total{errorCode=\"0\"}[5m]))by(shardId,instance_id)
```

Labels:

- Label: `db`

  Label Description: DB name

  Example: session

Labels:

- Label: `shardId`

  Label Description: The shard id

  Example: 1, 2

Labels:

- Label: `errorCode`

  Label Description: The errorCode in the DB response

  Example: 0, 501, 508

Labels:

- Label: `notify`

  Label Description: Whether purgeOnNotify is set. 1 indicates purgeOnNotify=true, 0 otherwise.

  Example: 1

slot_reconciled_records_total

Description: Total number of reconciled records

Sample Query: `sum(slot_reconciled_records_total)by(systemId,slot_shard_id,slot_instance_id)`

Labels:

- Label: `db`

  Label Description: DB name

  Example: session

Labels:

- Label: `slot_shard_id`

  Label Description: The slot shard id

  Example: 1, 2

Labels:

- Label: `slot_instance_id`

  Label Description: The slot instance id

  Example: 1, 2

Labels:

- Label: `systemId`

  Label Description: The id of the system

  Example: 1, 2

Labels:

- Label: `operation`

  Label Description: The type of DB operation

  Example: Create, Delete

slot_reconciliation_duration_seconds

Description: Total time taken to execute reconciliation

Sample Query: `sum(slot_reconciliation_duration_seconds{isError=\"0\"})by(slot_shard_id)`

Labels:

- Label: `db`

  Label Description: DB name

  Example: session

Labels:

- Label: `slot_shard_id`

Label Description: The slot shard id

Example: 1, 2

Labels:

- Label: `isError`

  Label Description: Whether any error occurred while reconciling. If isError = 1, then error happened

  Example: 0, 1

slot_reconciliation_total

Description: Total number of reconciliation triggered by checksum mismatch

Sample Query: `sum(slot_reconciliation_total{isError=\"0\"})by(slot_shard_id)`

Labels:

- Label: `db`

  Label Description: DB name

  Example: session

Labels:

- Label: `slot_shard_id`

  Label Description: The slot shard id

  Example: 1, 2

Labels:

- Label: `isError`

  Label Description: Whether any error occurred while reconciling. If isError = 1, then error happened

  Example: 0, 1

slot_records_size_total

Description: Total size of records in bytes in the slot

Sample Query: `sum(slot_records_size_total)`

Labels:

- Label: `db`

  Label Description: DB name

  Example: session

Labels:

- Label: `shardId`

  Label Description: The shard id

Example: 1, 2

Labels:

- Label: `cdl_slice`

  Label Description: The name of the logical cdl slice

  Example: session

slot_records_total

Description: Total count of records in the slot

Sample Query: `sum(slot_records_total{session_type\"total\"}) by(pod)`

Labels:

- Label: `db`

  Label Description: DB name

  Example: session

Labels:

- Label: `shardId`

  Label Description: The shard id

  Example: 1, 2

Labels:

- Label: `cdl_slice`

  Label Description: The name of the logical cdl slice

  Example: session

Labels:

- Label: `session_type`

  Label Description: The session type stored in the data

  Example: GX, RX, total

Labels:

- Label: `systemId`

  Label Description: The id of the system

  Example: 1, 2

Labels:

- Label: `bucket`

  Label Description: The bucket grouped by size

  Example: <=1kb, 2kb, 4kb, 8kb

Labels:

- Label: `appInstanceId`

  Label Description: The app instance id populated by app in the record.

  Example: 1

slot_requests_duration_second

Description: Time taken for response of requests received at slot app

Sample Query: `sum(irate(slot_requests_duration_seconds{errorCode\"0\"}[5m])) by (errorCode)`

Labels:

- Label: `db`

  Label Description: DB name

  Example: session

Labels:

- Label: `operation`

  Label Description: The type of DB operation

  Example: Get, Create, Delete

Labels:

- Label: `shardId`

  Label Description: The shard id

  Example: 1, 2

Labels:

- Label: `errorCode`

  Label Description: The errorCode in the DB response

  Example: 0, 1406

Labels:

- Label: `cdl_slice`

  Label Description: The name of the logical cdl slice

  Example: session

slot_requests_total

Description: Total count of requests received at slot app

Sample Query: `sum(irate(slot_requests_total{errorCode=\"0\"}[5m])) by (operation)`

Labels:

- Label: `db`

  Label Description: DB name

  Example: session

Labels:

- Label: `operation`

  Label Description: The type of DB operation

  Example: Get, Create, Delete

Labels:

- Label: `shardId`

  Label Description: The shard id

  Example: 1, 2

Labels:

- Label: `errorCode`

  Label Description: The errorCode in the DB response

  Example: 0, 1406

Labels:

- Label: `cdl_slice`

  Label Description: The name of the logical cdl slice

  Example: session

slot_stale_record_duration_seconds

Description: Time taken by the slot to process the stale slot records

Sample Query: `slot_stale_record_duration_seconds`

Labels:

- Label: `db`

  Label Description: DB name

  Example: session

Labels:

- Label: `delete`

  Label Description: To check if the stale record has been send to delete or skipped. If delete = 1 , then it has been send to delete, otherwise it has been skipped

  Example: 1, 0

Labels:

- Label: `shardId`

  Label Description: The shard id

  Example: 1, 2

Labels:

- Label: `errorCode`

  Label Description: The errorCode in the DB response

  Example: 0, 502

Labels:

- Label: `cdl_slice`

  Label Description: The name of the logical cdl slice

  Example: session

Labels:

- Label: `reason`

  Label Description: The reason for stale record deletion

  Example: find_all_notify, stale_check_enabled

slot_stale_record_total

Description: Total count of stale slot record deletions processed

Sample Query: `slot_stale_record_total`

Labels:

- Label: `db`

  Label Description: DB name

  Example: session

Labels:

- Label: `delete`

  Label Description: To check if the stale record has been send to delete or skipped. If delete = 1 , then it has been send to delete, otherwise it has been skipped

  Example: 1, 0

Labels:

- Label: `shardId`

  Label Description: The shard id

  Example: 1, 2

Labels:

- Label: `errorCode`

  Label Description: The errorCode in the DB response

  Example: 0, 502

Labels:

- Label: `cdl_slice`

  Label Description: The name of the logical cdl slice

  Example: session

Labels:

- Label: `reason`

  Label Description: The reason for stale record deletion

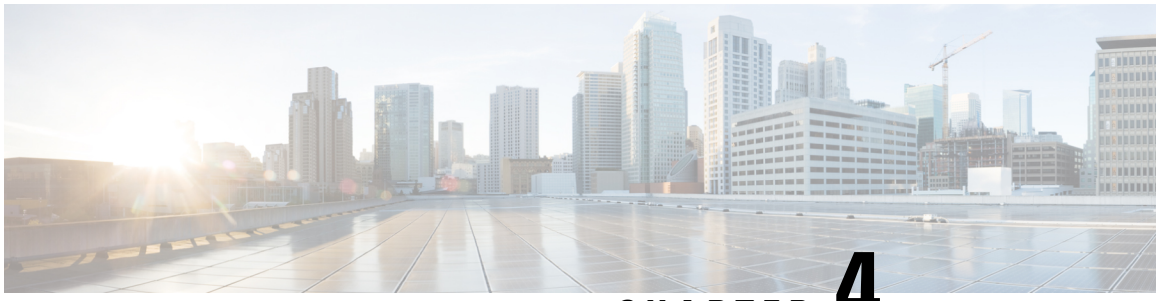
  Example: find_all_notify, stale_check_enabled



PART I

CDL Config Mode Command Reference

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CDL Config Mode Command Reference

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cdl

Configures the next generation Cisco Data Layer (CDL).

Command Modes

Exec > Global Configuration

Syntax Description

cdl { datastore *datastore_name* **{ cluster-id** *cluster_id* **| { { endpoint { external-ip** *ipv4_address* **| external-port** *port_number* **} | index { map** *index_partitions* **| write-factor** *write_factor* **} | slot { map** *slot_partitions* **| notification { host** *host_name* **| limit** *notification_tps* **| port** *notification_server_port*

} | write-factor *write_factor* **} } { go-debug** *go_debug* **| patch-url** *patch_url* **| replica** *ha_instances* **} | geo-remote-site** *list* **} } | deployment-model { large | small } | enable-geo-replication { false | true } | kafka { enable-JMX-metrics { false | true } | enable-persistence { false | true } | external-ip {** *ipv4_address port_number*} **| replica** *ha_instances* **| retention-size** *data_retention_size* **| retention-time** *data_retention_time* **| storage** *data_storage_size* **} | logging { { default-log-level | logger** *cdl_module_name* **level** *default_log_level* **} | node-type** *k8s_node_label_value* **| remote-site** *system_id* **{ db-endpoint { host** *db_endpoint_hostname* **| port** *db_endpoint_port_number* **} | kafka-server {** *host port* **} } | system-id** *system_id* **| zookeeper { data-storage-size** *data_storage_size* **| { enable-JMX-metrics | enable-persistence } { false | true } | log-storage-size** *log_storage_size* **| replica** *ha_instances* **} } }**

deployment-model *deployment_model*

Specify the k8s deployment resource requirement. The default value is large. NOTE: In a production environment, you must always use the large deployment model.

Must be one of the following:

- **large**
- **small**

enable-geo-replication { false | true }

Specify to enable or disable geo-replication.

Must be one of the following:

- **false**
- **true**

Default Value: false.

node-type *k8s_node_label_value*

Specify the K8s node label value for affinity.

Must be a string of 0-64 characters.

Default Value: .

system-id *system_id*

Specify the deployment system ID.

Must be an integer.

Default Value: 1.

Usage Guidelines

Use this command to configure CDL parameters for deployment. If CDL container is not configured, the CDL chart will not be deployed.

cdl actions backup

Trigger the backup process.

Command Modes Exec > Global Configuration

Syntax Description **cdl actions backup start [concurrency-factor** *concurrency_factor* **| created-before** *timestamp* **| slice-name** *slice_name* **]**

concurrency-factor *concurrency_factor*

Take the backup by fetching data from the slots concurrently. By, default only 1 slot will be queried at a time.

concurrency_factor must be an integer in the range 1 to 8.

created-before *timestamp*

Take the backup of records created before this timestamp. The timestamp must be in the *CCYY-MM-DDTHH:MM:SS* format.

By default, all available data will be queried for backup.

slice-name *slice_name*

Take the backup of the given slice names. Only the configured slice name will be allowed to pass here.

By default, the backup of all slice names will be taken.

Usage Guidelines Use this command to trigger the backup process and will not wait for the process to be completed. It returns a successful or failure message with the dump file name that gets created. Once the backup process is completed, the dump file in the output can be collected or referred for the restore process. This file can be located at */data/<namespace>/data-cdl-api-0/<file-name.dump>* on the node where the cdl-api-0 pod is running.

This command will prompt the warning *This triggers CDL backup process. Are you sure?*. Type *yes* to proceed with triggering the CDL backup process.

cdl actions restore

Trigger the restore process.

Command Modes Exec > Global Configuration

Syntax Description **cdl actions restore { start file** *filename* **| status }**

start file *filename*

This keyword is mandatory to be configured.

The file name must have the *.dump* extension. The file must be present in the host path */data/<namespace>/data-cdl-api-0/<file-name.dump>* on the node where the cdl-api-0 pod is running.

status

Display the status of the restore process as one of the following options:

Must be one of the following:

- **idle | completed**—CDL restore process is completed or not going on
- **in-progress**—CDL restore process is in-progress

Usage Guidelines

Use this command to trigger the restore process and will not wait for the process to be completed. It returns a successful or failure message. It is mandatory to configure the file parameter with this command

This command will prompt the warning *This triggers CDL restore process and will overwrite the existing data. Are you sure?.* Type *yes* to proceed with triggering the CDL restore process.

cdl api

Enable the CDL API configuration.

Command Modes

Exec > Global Configuration

Syntax Description

cdl api [deploy { false | true } | cpu-limit *cpu_limit* **| go-max-procs** *cpu_cores* **| memory-limit** *memory_limit* **| storage** *storage_size* **]**

deploy { false | true }

Enable or disable the API pod deployment.

Default: **false**

cpu-limit *cpu_limit*

Specify the maximum CPU limit. *cpu_limit* must be an integer in the range of 1000 to 8000.

Default: 4000

go-max-procs *cpu_cores*

Specify the maximum number of CPU cores. *cpu_cores* must be an integer in the range of 1 to 32.

Default: 4

memory-limit *memory_limit*

Specify the maximum memory allowed in Gi. *memory_limit* must be an integer in the range of 1 to 8.

Default: 4

storage *storage_size*

Specify the backup storage in GB. *storage_size* must be an integer in the range of 1 to 200.

Default: 90

Usage Guidelines Use this command to access the CDL API configuration. Ensure that the CDL datastore is configured to configure CDL API.

cdl datastore

Configures the list of datastores to be deployed.

Command Modes Exec > Global Configuration

Syntax Description **cdl datastore** *datastore_name* **{ advanced-config-profile** *profile_name* **| cluster-id** *cluster_id* **| copies-per-node** *copies_per_node* **| label-config** *label_config* **| { { endpoint { external-ip** *ipv4_address* **| external-port** *port_number* **} | index { map** *index_partitions* **| write-factor** *write_factor* **} | slot { map** *slot_partitions* **| notification { host** *host_name* **| limit** *notification_tps* **| port** *notification_server_port* **} | write-factor** *write_factor* **} } { go-debug** *go_debug* **| patch-url** *patch_url* **| replica** *ha_instances* **} } | geo-remote-site** *list* **}**

advanced-config-profile *profile_name*

Specify the advanced configuration parameters profile name.

cluster-id *cluster_id*

Specify the K8s cluster ID.

Must be an integer in the range of 1-10.

Default Value: 1.

find-by-nuk-prefixes *key_prefix*

Specify the list of pre-configured non unique key prefix to support findbyNonUniqueKey API

Must be a string of 1-20 characters.

geo-remote-site *list*

Specify the list of geo replication sites.

label-config *label_config*

Specify the label configuration name.

slice-names *slice_names_list*

Specify the list of slice names.

Must be a string of 1-16 characters.

Default Value: session.

datastore_name

Specify the name of the datastore.

Must be a string of 1-16 characters.

Usage Guidelines Use this command to configure the list of datastores to be deployed.

You can configure a maximum of 10 elements with this command.

cdl datastore actions remote-index-sync start

Initiates syncing index with its remote peers.

Command Modes Exec

Syntax Description **`actions remote-index-sync start`**

Usage Guidelines Reconciles indexes with the remote peer. Use this command to start syncing index with its remote peers.

cdl datastore actions remote-index-sync start map-id

Triggers remote sync for the list of index map IDs.

Command Modes Exec

Syntax Description **`actions remote-index-sync map-id map`** *`index_name`*

map *index_map*

Specify the trigger remote index sync for the index map.

Must be an integer.

Usage Guidelines Use this command to trigger remote sync for the list of index map IDs. By default, it will trigger all index maps.

You can configure a maximum of five elements with this command.

cdl datastore actions remote-index-sync start slice-name

Triggers remote sync for the list of slice names.

Command Modes Exec

Syntax Description **`actions remote-index-sync slice-name slice`** *`slice_name`*

slice *slice_name*

Specify to trigger remote index sync for the slice name.

Must be a string.

Usage Guidelines Use this command to trigger remote sync for the list of slice names. By default, it will trigger all slice names.

cdl datastore actions remote-index-sync status

Displays the index instances that are still syncing with the remote peers.

Command Modes Exec

Syntax Description **cdl show status**

Usage Guidelines Use this command to view the comma-separaeted list of index instances that are still syncing with the remote peers.

cdl datastore clear sessions

Clears all datastore sessions data.

Command Modes Exec

Syntax Description **cdl clear sessions [db-name** *db_name* **| filter { condition** *query_expression* **key** *query_string* **} | map-id** *map_id* **]**

db-name *db_name*

Specify the name of the DB to query.

Must be a string of 1-16 characters.

Default Value: session.

map-id *map_id*

Specify the map ID to query data from a map.

Must be an integer in the range of 0-1024.

Default Value: 0.

slice-name *slice_name*

Specify the slice name to query.

Must be a string of 1-16 characters.

Default Value: session.

Usage Guidelines Use this command to clear all datastore session data. Note that this may result in the permanent deletion of some or all records.

cdl datastore clear sessions filter

Configures the AND filter parameter used for queries.

Command Modes

Exec

Syntax Description

filter { condition *query_expression* **key** *query_string* **} | map-id** *map_id* **| limit** *number_of_records* **| purge-on-eval { false | true } | next-eval-start-time** *next_eval_start_time* **| next-eval-end-time** *next_eval_end_time*

condition *query_expression*

Specify the query expression in the AND filter.

Must be one of the following:

- **contains**
- **ends-with**
- **match**
- **not-contains**
- **not-ends-with**
- **not-match**
- **not-starts-with**
- **starts-with**

key *query_string*

Specify the query string.

Must be a string of 0-512 characters.

Usage Guidelines

Use this command to configure the filter parameters used for queries.

cdl datastore clear sessions in-filter

Configures the OR filter parameter used for queries.

Command Modes

Exec

Syntax Description

filter { condition *query_expression* **key** *query_string* **} | map-id** *map_id* **| limit** *number_of_records* **| purge-on-eval { false | true } | next-eval-start-time** *next_eval_start_time* **| next-eval-end-time** *next_eval_end_time*

condition *query_expression*

Specify the query expression in the OR filter.

Must be one of the following:

- **contains**
- **ends-with**
- **match**
- **not-contains**
- **not-ends-with**
- **not-match**
- **not-starts-with**
- **starts-with**

key *query_string*

Specify the query string.

Must be a string of 0-512 characters.

Usage Guidelines Use this command to configure the filter parameters used for queries.

cdl datastore endpoint

Configures endpoint pod parameters.

Command Modes Exec > Global Configuration

Syntax Description **cdl datastore** *datastore_name* **endpoint { go-debug** *go_debug_variables* **| patch-url** *patch_url* **| replica** *ha_instances* **}**

copies-per-node *copies_per_node*

Specify copies of cdl-endpoint pods per node.

Must be an integer in the range of 1-4.

Default Value: 1.

cpu-limit *max_cpu*

Specify the maximum CPU allowed in milli CPU.

Must be an integer in the range of 200-32000.

Default Value: 4000.

cpu-request *min_cpu*

Specify the minimum CPU required in milli CPU.

Must be an integer in the range of 100-16000.

Default Value: 2000.

external-ip *ipv4_address*

Specify the list of IPv4 addresses to expose the service externally.

external-ip *ipv6_address*

Specify the list of IPv6 addresses to expose the service externally.

external-port *port_number*

Specify the port number to be exposed for external traffic.

Default Value: 8882.

go-debug *go_debug_variables*

Specify the comma-separated list of GO Debug variables.

Must be a string.

go-max-procs *max_cpu*

Specify the maximum number CPU cores used simultaneously.

Must be an integer in the range of 1-32.

Default Value: 4.

memory-limit *max_memory*

Specify the maximum memory allowed in megabytes.

Must be an integer in the range of 512-131072.

Default Value: 131072.

memory-request *min_memory*

Specify the minimum memory required in megabytes.

Must be an integer in the range of 256-65536.

Default Value: 256.

patch-url *patch_url*

Specify the URL to download the datastore application patch.

Must be a string.

replica *ha_instances*

Specify the number of HA instances to be created.

Must be an integer in the range of 1-16.

Default Value: 2.

Usage Guidelines Use this command to configure endpoint pod parameters.

cdl datastore endpoint settings

This command is deprecated. Configures the CD endpoint parameters.

Command Modes Exec > Global Configuration

Syntax Description **settings index-timeout-ms** *index_timeout* **slot-timeout-ms** *slot_timeout* **remote-ep-connection-count** *remote_ep_connection_count*

index-timeout-ms *index_timeout*

This keyword is deprecated. Specify the timeout period for index operations in milliseconds.

Must be an integer in the range of 25-5000.

Default Value: 200.

remote-ep-connection-count *remote_ep_connection_count*

This keyword is deprecated. Specify the number of connections to remote site CDL endpoint for GRPC replication.

Must be an integer in the range of 1-20.

Default Value: 4.

slot-timeout-ms *slot_timeout*

This keyword is deprecated. Specify the timeout period for slot operations in milliseconds.

Must be an integer in the range of 25-5000.

Default Value: 375.

Usage Guidelines This command is deprecated. Use this command to configure CDL endpoint parameters.

cdl datastore features index-overwrite-detection unique-keys-prefix

Configures CDL Overload Protection configuration.

Command Modes Exec > Global Configuration

Syntax Description **index-overwrite-detection unique-keys-prefix { action** *index_overwrite_action* **| key-prefix** *key_prefix* **| max-tps** *max_tps* **| queue-size** *queue_size* **}**

action *index_overwrite_action*

Specify the action to be performed on index overwrite detection.

Must be one of the following:

- **delete-record**
- **log-record**
- **notify-record**

key-prefix *key_prefix*

Specify the prefix pattern for unique keys for overwrite detection.

Must be a string.

Usage Guidelines Index keys overwrite detection configuration. Use this command to configure the list of uniqueKey prefixes for index overwrite detection, and the action to be performed on detection.

cdl datastore features instance-aware-notification

Configures Geo Replication instance awareness configuration.

Command Modes Exec > Global Configuration

Syntax Description **`features instance-aware-notification enable { false | true }`**

enable { false | true }

Specify whether to enable the instance state check for slices.

Must be one of the following:

- **false**
- **true**

Default Value: false.

Usage Guidelines Use this command to configure Geo Replication instance awareness configuration.

cdl datastore features instance-aware-notification system-id

Configures the mapping of systemID to sliceNames.

Command Modes Exec > Global Configuration

Syntax Description **`system-id is`** *`system_id`* **`slice-names`** *`slice_names`*

id *system_id*

Specify the system/site ID.

Must be an integer.

slice-names *slice_names*

Specify the list of slice names associated with the systemID.

Usage Guidelines Use this command to configure the mapping of systemID to sliceNames.

cdl datastore features overload-protection

Configures CDL Overload Protection configuration.

Command Modes Exec > Global Configuration

Syntax Description **cdl datastore overload-protection disable { false | true } | critical-alert-threshold** *critical_alert_threshold* **| hard-limit-percentage** *hard_limit_percentage* **| index-record-capacity-count** *index_record_capacity_count* **| major-alert-threshold** *major_alert_threshold* **| slot-record-capacity-bytes** *slot_record_capacity* **| slot-record-capacity-count** *slot_record_capacity_count*

enable { false | true }

Specify to disable or enable Overload Protection.

Must be one of the following:

- **false**
- **true**

Default Value: false.

index-max-record-count *index_max_record_count*

Specify the maximum number of records that can be stored in the Index shard.

Must be an integer.

Must be an integer in the range of either 100-1000 or 100000-100000000

Default Value: 60000000.

enable { false | true }

Specify to disable or enable Overload Protection.

Must be one of the following:

- **false**
- **true**

Default Value: false.

index-max-record-count *index_max_record_count*

Specify the maximum number of records that can be stored in the Index shard.

Must be an integer.

slot-max-record-count *slot_max_record_count*

Specify the maximum number of records that can be stored in the Slot shard.

Must be an integer.

Must be an integer in the range of either 100-1000 or 100000-100000000

Default Value: 2500000.

critical-alert-threshold *critical_alert_threshold*

Specify the threshold in percentage at which CDL must trigger an alert cdlOverloaded-critical. major-alert-threshold must be less than critical-alert-threshold.

Must be an integer in the range of 40-100.

Default Value: 90.

enable { false | true }

Specify to disable or enable Overload Protection.

Must be one of the following:

- **false**
- **true**

Default Value: false.

hard-limit-percentage *hard_limit_percentage*

Specify the extra percentage of capacity in addition to the soft limit.

Must be an integer in the range of 0-10.

Default Value: 5.

index-max-record-count *index_max_record_count*

Specify the maximum number of records that can be stored in the Index shard.

Must be an integer.

major-alert-threshold *major_alert_threshold*

Specify the threshold in percentage at which CDL must trigger an alert cdlOverloaded-major. major-alert-threshold must be less than critical-alert-threshold.

Must be an integer in the range of 40-100.

Default Value: 80.

slot-max-record-count *slot_max_record_count*

Specify the maximum number of records that can be stored in the Slot shard.

Must be an integer.

slot-max-size *slot_max_size*

Specify the maximum size of the Slot shard in megabytes.

Must be an integer in the range of 1024-98304.

Default Value: 16384.

Usage Guidelines Use this command to configure CDL Overload Protection configuration.

cdl datastore features slot-stale-session-detection

Configures the stale slot records detection parameters.

Command Modes Exec > Global Configuration

Syntax Description **`slot-stale-session-detection disable-auto-deletion { false | true }`**

disable-auto-deletion { false | true }

Specify to disable or enable stale slot record auto deletion.

Must be one of the following:

- **false**
- **true**

Default Value: false.

notification-retry-count *notification_retry_count*

Specify the minimum number of timer expiry notification retries sent to an application without receiving an update from the application. If no update is received even after "notification-retry-count" number of times, CDL proceeds to check if slot record is stale.

Must be an integer in the range of 3-10.

Default Value: 3.

Usage Guidelines Use this command to configure the stale slot records detection parameters.

cdl datastore index

Configures index pod parameters.

Command Modes Exec > Global Configuration

Syntax Description **`cdl datastore`** *`datastore_name`* **`index { map`** *`index_partitions`* **`| write-factor`** *`write_factor`* **`| go-debug`** *`go_debug`* **`| patch-url`** *`patch_url`* **`| replica`** *`ha_instances`* **`}`**

cpu-limit *max_cpu*

Specify the maximum CPU allowed in milli CPU.

Must be an integer in the range of 200-32000.

Default Value: 4000.

cpu-request *min_cpu*

Specify the minimum CPU required in milli CPU.

Must be an integer in the range of 100-16000.

Default Value: 2000.

go-debug *go_debug_variables*

Specify the comma-separated list of GO Debug variables.

Must be a string.

go-max-procs *max_cpu*

Specify the maximum number CPU cores used simultaneously.

Must be an integer in the range of 1-32.

Default Value: 4.

map *index_partitions*

Specify the number of partitions to be created for index.

Must be an integer in the range of 1-1024.

Default Value: 1.

memory-limit *max_memory*

Specify the maximum memory allowed in megabytes.

Must be an integer in the range of 512-131072.

Default Value: 131072.

memory-request *min_memory*

Specify the minimum memory required in megabytes.

Must be an integer in the range of 256-65536.

Default Value: 256.

patch-url *patch_url*

Specify the URL to download the datastore application patch.

Must be a string.

replica *replicas*

Specify the number of HA instances to be created.

Must be an integer in the range of 1-2.

Default Value: 2.

write-factor *write_factor*

This keyword has been deprecated. Specify the number of copies to be written into the index before a successful response.

Must be an integer in the range of 0-2.

Default Value: 2.

Usage Guidelines Use this command to configure the index pod parameters.

cdl datastore kafka

Configures the Kafka for Geo Replication.

Command Modes Exec > Global Configuration

Syntax Description **cdl kafka { enable-JMX-metrics { false | true } | enable-persistence { false | true } | external-ip {** *ipv4_address port_number* **} | replica** *ha_instances* **| retention-size** *retention_size* **| retention** *data_retention_period* **| storage** *data_storage_size* **| log-level { debug | error | fatal | info | trace | warn } }**

enable-JMX-metrics { false | true }

Specify to enable or disable JMX metrics.

Must be one of the following:

- **false**
- **true**

Default Value: true.

enable-persistence { false | true }

Specify to enable or disable persistence for the Kafka data.

Must be one of the following:

- **false**
- **true**

Default Value: false.

log-level

Specify the Kafka logging level. The logging levels include debug, error, fatal, info, trace, and warn. The changes specified here will trigger rolling restart of Zookeeper pods.

Must be one of the following:

- **debug**
- **error**
- **fatal**
- **info**
- **trace**
- **warn**

partition *number_of_partitions*

Specify the number of partitions per topic.

Must be an integer in the range of 1-1024.

Default Value: 1.

replica *ha_instances*

Specify the number of HA instances to be created.

Must be an integer in the range of 1-16.

Default Value: 2.

Default Value: 2.

retention-size *retention_size*

This keyword is deprecated. Specify the data retention size in MB.

Must be an integer in the range of 1024-1048576.

Default Value: 5120.

retention-time *data_retention_period*

Specify the data retention period in hours.

Must be an integer in the range of 1-168.

Default Value: 12.

storage *data_storage_size*

Specify the Kafaka data storage size in GB.

Must be an integer in the range of 1-64.

Default Value: 20.

to-earliest

Specify to enable parallel pod management policy.

Must be one of the following:

- **false**
- **true**

Default Value: false.

total-retention-size *total_retention_size*

Specify the data total retention size in MB.

Must be an integer in the range of 10240-1048576.

Default Value: 65536.

Usage Guidelines Use this command to configure Kafka for Geo replication.

cdl datastore kafka describe

Describes the Kafka consumer groups. By default, it describes all the Kafka consumer groups.

Command Modes Exec

Syntax Description **`cdl kafka describe { consumer-groups name`** *`group_name`* **`| topics { include-internal-topics | name`** *`kafka-topic_name`* **`} }`**

Usage Guidelines Use this command to describe the kafka consumer groups.

cdl datastore kafka describe consumer-groups

Describes the Kafka consumer groups.

Command Modes Exec

Syntax Description **`cdl kafka describe consumer-groups name`** *`group_name`*

group name *group_name*

Specify the Kafka consumer group name.

Must be a string in the pattern [a-zA-Z0-9._-]+.

Usage Guidelines Use this command to list all the Kafka consumer groups. The default behaviour is to describe all the consumer groups.

cdl datastore kafka describe topics

Describes the Kafka topics. By default, it describes all the topics that are not internal.

Command Modes Exec

Syntax Description **cdl kafka describe topics { include-internal-topics | name** *kafka_topic_name* **}**

include-internal-topics

Specify whether to include internal Kafka topics.

topic *kafka-topic_name*

Specify the Kafka topic name.

Must be a string in the pattern [a-zA-Z0-9._-]+.

Usage Guidelines Use this command to describe the Kafka topics.

cdl datastore kafka external-ip

Configures the IPs that are exposed to the external servers.

Command Modes Exec > Global Configuration

Syntax Description **cdl kafka external-ip** *ipv4_address* **port** *port_number* **ssl-port** *ssl_port_number*

ip *IPv4_address*

Specify the IPv4 address for the kafka server to listen for client traffic.

port *port_number*

Specify the port address to expose for external traffic.

ssl-port *ssl-port_address*

Specify the ssl-port address to expose for external traffic.

Usage Guidelines Use this command to configure the IPs that are exposed to the external servers.

cdl datastore kafka label-config

Configures label configuration for Kafka pods.

Command Modes Exec > Global Configuration

Syntax Description `cdl kafka label-config key label_key value label_value`

key *label_key*

Specify the label key.

Must be a string.

value *label_value*

Specify the label value.

Must be a string.

Usage Guidelines Use this command to configure label configuration for Kafka pods.

cdl datastore kafka list

Shows all the kafka topics. By default, the list does not contain the internal topics.

Command Modes Exec

Syntax Description `cdl kafka list { consumer-groups name group_name | topics { include-internal-topics | name kafka-topic_name } }`

Usage Guidelines Use this command to show all the Kafka topics.

cdl datastore kafka list consumer-groups

Shows all the Kafka consumer groups.

Command Modes Exec

Syntax Description `cdl kafka list consumer-groups name group_name`

Usage Guidelines Use this command to show all the Kafka consumer groups.

cdl datastore kafka list topics

Shows all the Kafka topics.

Command Modes Exec

Syntax Description `cdl kafka list topics include-internal-topics`

include-internal-topics

Specify whether to include internal Kafka topics.

Usage Guidelines Use this command to show all the Kafka topics.

cdl datastore kafka log-compaction

Configures Kafka log compaction parameters.

Command Modes Exec > Global Configuration

Syntax Description **`cdl kafka log-compaction disable { false | true } delete-retention-ms`** *`delete_retention_period`*

delete-retention-ms *delete_retention_period*

Specify the period of time in miliseconds to retain deletes for log compacted topics.

Must be an integer in the range of 60000-172800000.

Default Value: 43200000.

disable { false | true }

Specify to disable or enable Kafka log compaction.

Must be one of the following:

- **false**
- **true**

Default Value: false.

Usage Guidelines Use this command to configure Kafka log compaction parameters.

cdl datastore kafka reset-offsets

Resets the offsets of all the topics of the Kafka consumer groups. The offset of a consumer group can be set only if the group is inactive.

Command Modes Exec

Syntax Description **`cdl kafka reset-offsets { consumer-group name`** *`group_name`* **`| to-earliest name`** *`group_name`* **`| to-latest name`** *`group_name`* **`}`**

Usage Guidelines Use this command to reset the offsets of all the topics of the Kafka consumer groups.

cdl datastore kafka reset-offsets consumer-group

Resets Kafka consumer group offset of all the topics.

Command Modes Exec

Syntax Description `cdl kafka reset-offsets consumer-group name group_name`

consumer-group name *group_name*

Specify the Kafka consumer group.

Must be a string in the pattern [a-zA-Z0-9._-]+.

to-earliest

Specify to reset offsets to earliest.

to-earliest

Specify to reset offsets to latest.

Usage Guidelines Use this command to reset Kafka consumer group offset of all the topics.

cdl datastore kafka ssl-settings

Configures Kafka SSL settings.

Command Modes Exec > Global Configuration

Syntax Description
```
cdl kafka ssl-settings enable-ssl { false | true }
disable-host-name-verification { false | true }
```

disable-host-name-verification { false | true }

Specify to disable or enable host name verification during SSL communication between Kafka brokers.

Must be one of the following:

- **false**
- **true**

Default Value: false.

enable-ssl { false | true }

Specify to disable or enable SSL communication between Kafka brokers.

Must be one of the following:

- **false**
- **true**

Default Value: false.

Usage Guidelines Use this command to configure Kafka SSL settings.

cdl datastore metrics

Configures the verbosity level of metrics.

Command Modes Exec > Global Configuration

Syntax Description

```
cdl datastore datastore_name { metrics { verbosity { debug | production } }
 }
```

Usage Guidelines Use this command to configure the verbosity level of metrics.

cdl datastore mirror-maker

Configures the Kafka MirrorMaker.

Command Modes Exec > Global Configuration

Syntax Description

```
cdl mirror-maker { enable-JMX-metrics { false | true } | log-level { debug
 | error | fatal | info | trace | warn } }
```

enable-JMX-metrics { false | true }

Specify to enable or disable JMX metrics

Must be one of the following:

- **false**
- **true**

Default Value: true.

log-level { debug | error | fatal | info | trace | warn }

Specify the Kafka MirrorMaker logging level. NOTE: The changes trigger restart of the MirrorMaker pod

Must be one of the following:

- **debug**
- **error**
- **fatal**
- **info**
- **trace**
- **warn**

Usage Guidelines Use this command to configure the Kafka MirrorMaker.

cdl datastore overload-protection

This command is deprecated. Configures CDL Overload Protection configuration.

Command Modes Exec > Global Configuration

Syntax Description **cdl datastore overload-protection disable { false | true } | critical-alert-threshold** *critical_alert_threshold* **| hard-limit-percentage** *hard_limit_percentage* **| index-record-capacity-count** *index_record_capacity_count* **| major-alert-threshold** *major_alert_threshold* **| slot-record-capacity-bytes** *slot_record_capacity* **| slot-record-capacity-count** *slot_record_capacity_count*

disable { false | true }

This keyword is deprecated. Specify to disable or enable Overload Protection.

Must be one of the following:

- **false**
- **true**

Default Value: false.

Usage Guidelines This command is deprecated. Use this command to configure CDL Overload Protection configuration.

cdl datastore reset-offsets-dry-run

Shows results of reset-offsets without executing changes on consumer groups.

Command Modes Exec

Syntax Description **cdl kafka reset-offsets-dry-run { consumer-group name** *group_name* **| to-earliest name** *group_name* **| to-latest name** *group_name* **}**

Usage Guidelines Use this command to show results of reset-offsets without executing changes on consumer groups.

cdl datastore reset-offsets-dry-run consumer-group

Resets Kafka consumer group offset of all the topics.

Command Modes Exec

Syntax Description **cdl kafka reset-offsets-dry-run consumer-group name** *group_name*

consumer-group name *group_name*

Specify the Kafka consumer group.

Must be a string in the pattern [a-zA-Z0-9._-]+.

to-earliest

Specify to reset offsets to earliest.

to-earliest

Specify to reset offsets to latest.

Usage Guidelines Use this command to reset Kafka consumer group offset of all the topics.

cdl datastore session features remote-site-connection-monitoring

Configures the remote site connection (replication connection and internal operational connection) for CDL endpoint.

Command Modes Exec > Global Configuration

Syntax Description **`features remote-site-connection-monitoring enable { false | true }`**

enable { false | true }

Specify whether to enable or disable remote site monitoring. This feature is enabled by default.

Must be one of the following:

- **false**
- **true**

Default value: **true**

Usage Guidelines Use this command to configure the remote site connection for CDL endpoint.

cdl datastore show indexes

Displays session index information.

Command Modes Exec

Syntax Description **`show indexes all-replicas { false | true } | db-name`** *`db_name`* **`| key`** *`key`* **`| limit`** *`max_indexes`* **`| map-id`** *`map_id`* **`]`**

all-replicas { false | true }

Specify whether to fetch index from all the replicas.

Must be one of the following:

- **false**
- **true**

Default Value: false.

db-name *db_name*

Specify the name of the DB to query.

Must be a string of 1-16 characters.

Default Value: session.

key *key*

Specify the key - query value (uk/pk).

Must be a string of 0-512 characters.

limit *max_indexes*

Specify the maximum number of indexes to display.

Must be an integer in the range of 1-1000.

map-id *map_id*

Specify the map ID to query data from a map where the index is stored.

Must be an integer in the range of 0-1024.

slice-name *slice_name*

Specify the slice name to query.

Must be a string of 1-16 characters.

Default Value: session.

Usage Guidelines Use this command to view session index information.

cdl datastore show sessions count detailed

Displays detailed session count information.

Command Modes Exec

Syntax Description **cdl show sessions count detailed [db-name** *db_name* **| filter { condition** *query_expression* **key** *query_string* **} | limit** *number_of_records* **| map-id** *map_id* **]**

db-name *db_name*

Specify the name of the DB to query.

Must be a string of 1-16 characters.

Default Value: session.

map-id *map_id*

Specify the map ID to query data from a map.

Must be an integer in the range of 0-1024.

Default Value: 0.

slice-name *slice_name*

Specify the slice name to query.

Must be a string of 1-16 characters.

Default Value: session.

Usage Guidelines Use this command to view detailed session count information.

cdl datastore show sessions count detailed filter

Configures the AND filter parameter used for queries.

Command Modes Exec

Syntax Description **filter { condition** *query_expression* **key** *query_string* **} | map-id** *map_id* **| limit** *number_of_records* **| purge-on-eval { false | true } | next-eval-start-time** *next_eval_start_time* **| next-eval-end-time** *next_eval_end_time*

condition *query_expression*

Specify the query expression in the AND filter.

Must be one of the following:

- **contains**
- **ends-with**
- **match**
- **not-contains**
- **not-ends-with**
- **not-match**
- **not-starts-with**
- **starts-with**

key *query_string*

Specify the query string.

Must be a string of 0-512 characters.

Usage Guidelines Use this command to configure the filter parameters used for queries.

cdl datastore show sessions count detailed in-filter

Configures the OR filter parameter used for queries.

Command Modes Exec

Syntax Description **filter { condition** *query_expression* **key** *query_string* **} | map-id** *map_id* **| limit** *number_of_records* **| purge-on-eval { false | true } | next-eval-start-time** *next_eval_start_time* **| next-eval-end-time** *next_eval_end_time*

condition *query_expression*

Specify the query expression in the OR filter.

Must be one of the following:

- **contains**
- **ends-with**
- **match**
- **not-contains**
- **not-ends-with**
- **not-match**
- **not-starts-with**
- **starts-with**

key *query_string*

Specify the query string.

Must be a string of 0-512 characters.

Usage Guidelines Use this command to configure the filter parameters used for queries.

cdl datastore show sessions count summary

Displays summary session count information.

Command Modes Exec

Syntax Description **cdl show sessions count summary [db-name** *db_name* **| filter { condition** *query_expression* **key** *query_string* **} | limit** *number_of_records* **| map-id** *map_id* **]**

db-name *db_name*

Specify the name of the DB to query.

Must be a string of 1-16 characters.

Default Value: session.

map-id *map_id*

Specify the map ID to query data from a map.

Must be an integer in the range of 0-1024.

Default Value: 0.

slice-name *slice_name*

Specify the slice name to query.

Must be a string of 1-16 characters.

Default Value: session.

Usage Guidelines Use this command to view summary session count information.

cdl datastore show sessions count summary filter

Configures the AND filter parameter used for queries.

Command Modes Exec

Syntax Description **filter { condition** *query_expression* **key** *query_string* **} | map-id** *map_id* **| limit** *number_of_records* **| purge-on-eval { false | true } | next-eval-start-time** *next_eval_start_time* **| next-eval-end-time** *next_eval_end_time*

condition *query_expression*

Specify the query expression in the AND filter.

Must be one of the following:

- **contains**
- **ends-with**
- **match**
- **not-contains**
- **not-ends-with**
- **not-match**
- **not-starts-with**
- **starts-with**

key *query_string*

Specify the query string.

Must be a string of 0-512 characters.

Usage Guidelines Use this command to configure the filter parameters used for queries.

cdl datastore show sessions count summary in-filter

Configures the OR filter parameter used for queries.

Command Modes Exec

Syntax Description **filter { condition** *query_expression* **key** *query_string* **} | map-id** *map_id* **| limit** *number_of_records* **| purge-on-eval { false | true } | next-eval-start-time** *next_eval_start_time* **| next-eval-end-time** *next_eval_end_time*

condition *query_expression*

Specify the query expression in the OR filter.

Must be one of the following:

- **contains**
- **ends-with**
- **match**
- **not-contains**
- **not-ends-with**
- **not-match**
- **not-starts-with**
- **starts-with**

key *query_string*

Specify the query string.

Must be a string of 0-512 characters.

Usage Guidelines Use this command to configure the filter parameters used for queries.

cdl datastore show sessions detailed

Displays session details with data.

Syntax Description

cdl show detailed [db-name *db_name* **| filter { condition** *query_expression* **key** *query_string* **} | limit** *number_of_records* **| map-id** *map_id* **]**

Command Modes

Exec

db-name *db_name*

Specify the name of the DB to query.

Must be a string of 1-16 characters.

Default Value: session.

limit *number_of_records*

Specify the maximum number of records to display.

Must be an integer in the range of 1-500.

Default Value: 100.

map-id *map_id*

Specify the map ID to query data from a map.

Must be an integer in the range of 0-1024.

Default Value: 0.

max-data-size-kb *max_data_size*

Specify the maximum data size to display per record. If the data size is greater than this parameter, the output is truncated.

Must be an integer in the range of 1-32.

Default Value: 4.

next-eval-end-time *next_eval_end_time*

Sessions that have next-eval-time less than this time.

next-eval-start-time *next_eval_start_time*

Sessions that have next-eval-time greater than this time.

purge-on-eval { false | true }

Sessions that have purge-on-eval flag set to false or true.

Must be one of the following:

- **false**
- **true**

slice-name *slice_name*

Specify the slice name to query.

Must be a string of 1-16 characters.

Default Value: session.

Usage Guidelines Use this command to view session details with data.

cdl datastore show sessions detailed filter

Configures the AND filter parameter used for queries.

Command Modes Exec

Syntax Description **filter { condition** *query_expression* **key** *query_string* **} | map-id** *map_id* **| limit** *number_of_records* **| purge-on-eval { false | true } | next-eval-start-time** *next_eval_start_time* **| next-eval-end-time** *next_eval_end_time*

condition *query_expression*

Specify the query expression in the AND filter.

Must be one of the following:

- **contains**
- **ends-with**
- **match**
- **not-contains**
- **not-ends-with**
- **not-match**
- **not-starts-with**
- **starts-with**

key *query_string*

Specify the query string.

Must be a string of 0-512 characters.

Usage Guidelines Use this command to configure the filter parameters used for queries.

cdl datastore show sessions detailed in-filter

Configures the OR filter parameter used for queries.

Command Modes Exec

Syntax Description **filter { condition** *query_expression* **key** *query_string* **} | map-id** *map_id* **| limit** *number_of_records* **| purge-on-eval { false | true } | next-eval-start-time** *next_eval_start_time* **| next-eval-end-time** *next_eval_end_time*

condition *query_expression*

Specify the query expression in the OR filter.

Must be one of the following:

- **contains**
- **ends-with**
- **match**
- **not-contains**
- **not-ends-with**
- **not-match**
- **not-starts-with**
- **starts-with**

key *query_string*

Specify the query string.

Must be a string of 0-512 characters.

Usage Guidelines Use this command to configure the filter parameters used for queries.

cdl datastore show sessions summary

Displays session details without data.

Syntax Description **cdl show sessions summary [db-name** *db_name* **| filter { condition** *query_expression* **key** *query_string* **} | limit** *number_of_records* **| map-id** *map_id* **]**

Command Modes Exec

db-name *db_name*

Specify the name of the DB to query.

Must be a string of 1-16 characters.

Default Value: session.

limit *number_of_records*

Specify the maximum number of records to display.

Must be an integer in the range of 1-500.

Default Value: 100.

map-id *map_id*

Specify the map ID to query data from a map.

Must be an integer in the range of 0-1024.

Default Value: 0.

max-data-size-kb *max_data_size*

Specify the maximum data size to display per record. If the data size is greater than this parameter, the output is truncated.

Must be an integer in the range of 1-32.

Default Value: 4.

next-eval-end-time *next_eval_end_time*

Sessions that have next-eval-time less than this time.

next-eval-start-time *next_eval_start_time*

Sessions that have next-eval-time greater than this time.

purge-on-eval { false | true }

Sessions that have purge-on-eval flag set to false or true.

Must be one of the following:

- **false**
- **true**

slice-name *slice_name*

Specify the slice name to query.

Must be a string of 1-16 characters.

Default Value: session.

Usage Guidelines Use this command to view session details without data.

cdl datastore show sessions summary filter

Configures the AND filter parameter used for queries.

Command Modes Exec

Syntax Description **filter { condition** *query_expression* **key** *query_string* **} | map-id** *map_id* **| limit** *number_of_records* **| purge-on-eval { false | true } | next-eval-start-time** *next_eval_start_time* **| next-eval-end-time** *next_eval_end_time*

condition *query_expression*

Specify the query expression in the AND filter.

Must be one of the following:

- **contains**
- **ends-with**
- **match**
- **not-contains**
- **not-ends-with**
- **not-match**
- **not-starts-with**
- **starts-with**

key *query_string*

Specify the query string.

Must be a string of 0-512 characters.

Usage Guidelines Use this command to configure the filter parameters used for queries.

cdl datastore show sessions summary in-filter

Configures the OR filter parameter used for queries.

Command Modes Exec

Syntax Description **filter { condition** *query_expression* **key** *query_string* **} | map-id** *map_id* **| limit** *number_of_records* **| purge-on-eval { false | true } | next-eval-start-time** *next_eval_start_time* **| next-eval-end-time** *next_eval_end_time*

condition *query_expression*

Specify the query expression in the OR filter.

Must be one of the following:

- **contains**
- **ends-with**

- **match**
- **not-contains**
- **not-ends-with**
- **not-match**
- **not-starts-with**
- **starts-with**

key *query_string*

Specify the query string.

Must be a string of 0-512 characters.

Usage Guidelines Use this command to configure the filter parameters used for queries.

cdl datastore show status

Displays CDL status information.

Command Modes Exec

Syntax Description **cdl show status [db-name** *db_name* **]**

db-name *db_name*

Specify the name of the database.

Must be a string.

Default Value: session.

Usage Guidelines Use this command to view CDL status information.

cdl datastore slot

Configures slot pod parameters.

Command Modes Exec > Global Configuration

Syntax Description **cdl datastore** *datastore_name* **slot { map** *slot_partitions* **| notification { host** *host_name* **| limit** *notification_tps* **| port** *notification_server_port* **} | write-factor** *write_factor* **}**

cpu-limit *max_cpu*

Specify the maximum CPU allowed in milli CPU.

Must be an integer in the range of 200-32000.

Default Value: 4000.

cpu-request *min_cpu*

Specify the minimum CPU required in milli CPU.

Must be an integer in the range of 100-16000.

Default Value: 2000.

go-debug *go_debug_variables*

Specify the comma-separated list of GO Debug variables.

Must be a string.

go-max-procs *max_cpu*

Specify the maximum number CPU cores used simultaneously.

Must be an integer in the range of 1-32.

Default Value: 4.

map *slot_partitions*

Specify the number of partitions to be created for slot.

Must be an integer in the range of 1-1024.

Default Value: 1.

memory-limit *max_memory*

Specify the maximum memory allowed in megabytes.

Must be an integer in the range of 512-131072.

Default Value: 131072.

memory-request *min_memory*

Specify the minimum memory required in megabytes.

Must be an integer in the range of 256-65536.

Default Value: 256.

patch-url *patch_url*

Specify the URL to download the datastore application patch.

Must be a string.

replica *ha_instances*

Specify the number of HA instances to be created.

Must be an integer in the range of 1-4.

Default Value: 2.

write-factor *write_factor*

Specify the number of copies to be written into slot before a successful response.

Must be an integer in the range of 1-4.

Default Value: 2.

Usage Guidelines Use this command to configure slot pod parameters.

cdl datastore slot notification

Configures notification configuration towards application.

Command Modes Exec > Global Configuration

Syntax Description

```
cdl datastore slot notification { connection-count connection_count |
dynamic-provisioning { false | true } | host host_name | limit notification_tps
 | max-concurrent-bulk-notifications max_bulk_task_notifications |
notification-retry-seconds notification_retry_interval | port notification_server_port
 | remote-system-id remote_system_id }
```

connection-count *connection_count*

Specify the Notification connections to the application notification endpoint.

Must be an integer in the range of 1-20.

Default Value: 4.

dynamic-provisioning { false | true }

Specify whether notification endpoint is provisioned by application or to use static config. If true, dynamic provisioning is enabled.

Must be one of the following:

- **false**
- **true**

Default Value: false.

host *host_name*

Specify the notification server's host name.

Must be a string.

Default Value: datastore-notification-ep.

include-conflict-data { false | true }

Specify to enable the setting to receive the original data and the data from the request along with the DB conflict notification.

Must be one of the following:

- **false**
- **true**

Default Value: false.

limit *notification_tps*

Specify the notification server's transactions per second (TPS).

Must be an integer in the range of 1-2000.

Default Value: 200.

max-concurrent-bulk-notifications *max_notifications*

Specify the maximum number of bulk task notifications that CDL can process concurrently.

Must be an integer in the range of 1-20.

Default Value: 1.

notification-retry-seconds *notification_retry_interval*

Specify the number of seconds after which the CDL will retry notification to application, if the application does not update next eval time post timer expiry notification.

Must be an integer in the range of 10-100.

Default Value: 10.

port *notification_server_port*

Specify the notification server's port number.

Default Value: 8890.

remote-system-id *remote_system_id*

Specify the list of remote System IDs. Notification will be sent from the CDL if a record has owner system ID which matches one of the remote IDs.

use-stream { false | true }

Specify to enable streaming for sending notifications from CDL to the application.

Must be one of the following:

- **false**
- **true**

Default Value: false.

Usage Guidelines Use this command to configure notification configuration towards application.

cdl datastore slot notification metrics

Configures the CDL slot metrics parameters.

Command Modes Exec > Global Configuration

Syntax Description **`metrics report-idle-session-type { false | true }`**

report-idle-session-type { false | true }

Specify whether to report idle session types.

Must be one of the following:

- **false**
- **true**

Default Value: false.

Usage Guidelines Use this command to configure the CDL slot metrics parameters.

cdl datastore zookeeper

Configures the Zookeeper for Geo Replication.

Command Modes Exec > Global Configuration

Syntax Description **`cdl zookeeper { data-storage-size`** *`data_storage_size`* **`| { enable-JMX-metrics | enable-persistence } { false | true } | log-storage-size`** *`log_storage_size`* **`| replica`** *`ha_instances`* **`| log-level { debug | error | fatal | info | trace | warn } }`**

data-storage-size *data_storage_size*

Specify the Zookeeper data storage size in GB.

Must be an integer in the range of 1-64.

Default Value: 20.

enable-JMX-metrics { false | true }

Specify to enable or disable JMX metrics.

Must be one of the following:

- **false**
- **true**

Default Value: true.

enable-persistence { false | true }

Specify to enable or disable persistence for Zookeeper data.

Must be one of the following:

- **false**
- **true**

Default Value: false.

log-level

Specify the Zookeeper logging level. The logging levels include debug, error, fatal, info, trace, and warn. The changes specified here will trigger rolling restart of Zookeeper pods.

Must be one of the following:

- **debug**
- **error**
- **fatal**
- **info**
- **trace**
- **warn**

log-storage-size *log_storage_size*

Specify the Zookeeper data log storage size in GB.

Must be an integer in the range of 1-64.

Default Value: 20.

replica *ha_instances*

Specify the number of HA instances to be created.

Must be an integer from the following: 1, 3.

Default Value: 3.

to-earliest

Specify to enable parallel pod management policy.

Must be one of the following:

- **false**
- **true**

Default Value: false.

Usage Guidelines Use this command to configure the Zookeeper for Geo replication.

cdl label-config

Configures the list of label configuration for CDL pods.

Command Modes Exec > Global Configuration

Syntax Description **cdl label-config** *label_config_name*

label_config_name

Specify the label configuration name.

Must be a string.

Usage Guidelines Use this command to configure the list of label configuration for CDL pods.

cdl label-config endpoint

Configures endpoint label configuration.

Command Modes Exec > Global Configuration

Syntax Description **endpoint key** *label_key* **value** *label_value*

key *label_key*

Specify the label key.

Must be a string.

value *label_value*

Specify the label value.

Must be a string.

Usage Guidelines Use this command to configure the endpoint label configuration.

cdl label-config index map

Configures map-level label configuration for CDL index.

Command Modes Exec > Global Configuration

Syntax Description **index map map-id** *map_id*

key *label_key*

Specify the label key.

Must be a string.

map-id *map_id*

Specify the map-based label configuration.

Must be an integer.

value *label_value*

Specify the label value.

Must be a string.

Usage Guidelines Use this command to configure map-level label configuration for CDL index.

cdl label-config slot map

Configures map-level label configuration for CDL slot.

Command Modes Exec > Global Configuration

Syntax Description **`slot map map-id`** *`map_id`*

key *label_key*

Specify the label key.

Must be a string.

map-id *map_id*

Specify the map-based label configuration.

Must be an integer.

value *label_value*

Specify the label value.

Must be a string.

Usage Guidelines Use this command to configure map-level label configuration for CDL slot.

cdl logging

Configures the CDL logging parameters.

Command Modes Exec > Global Configuration

Syntax Description

```
cdl logging default-log-level default_log_level error-stack { false | true }
 sync-logging { false | true }
```

default-log-level *default_log_level*

Specify the default logging level for the CDL modules.

Must be one of the following:

- **debug**
- **error**
- **info**
- **off**
- **trace**
- **warn**

Default Value: warn.

error-stack { false | true }

Specify to enable or disable the stack trace along with error logs. To enable, set to true.;

Must be one of the following:

- **false**
- **true**

Default Value: false.

json-logging { false | true }

Specify to enable or disable logging in json format.

Must be one of the following:

- **false**
- **true**

Default Value: false.

sync-logging { false | true }

Specify to enable or disable synchronous logging. To enable, set to true.

Must be one of the following:

- **false**
- **true**

Default Value: false.

Usage Guidelines Use this command to configure CDL logging parameters.

cdl logging logger

Configures logs for each module.

Command Modes Exec > Global Configuration

Syntax Description **cdl logging logger** *cdl_module_name* **level** *default_log_level*

level *default_log_level*

Specify the logging level for each module.

Must be one of the following:

- **debug**
- **error**
- **info**
- **off**
- **trace**
- **warn**

cdl_module_name

Specify the name of the CDL module.

Must be a string.

Usage Guidelines Use this command to configure logs for each module.

cdl remote-site

Configures the list of remote sites.

Command Modes Exec > Global Configuration

Syntax Description **cdl remote-site** *system_id* **{ db-endpoint { host** *host_name* **| port** *port_number* **} | kafka-server {** *host_name port_number* **} }**

system_id

Specify the remote system or site identity.

Must be an integer.

Usage Guidelines Use this command to configure the list of remote sites.

cdl remote-site db-endpoint

Configures the list of remote DB endpoints.

Command Modes Exec > Global Configuration

Syntax Description **cdl remote-site** *system_id* **db-endpoint { host** *host_name* **| port** *port_number* **}**

host *host_name*

Specify the remote DB endpoint's hostname or IP address.

Must be a string of 1-64 characters.

port *port_number*

Specify the remote DB endpoint's port number.

Usage Guidelines Use this command to configure the list of remote DB endpoints.

cdl remote-site kafka-server

Configures the list of Kafka servers.

Command Modes Exec > Global Configuration

Syntax Description **cdl remote-site** *system_id* **kafka-server** *host_name port_number* **ssl-port** *ssl_port_number*

ssl-port *ssl_port_number*

Specify the SSL port exposed by remote Kafka Broker.

host_name

Specify the host name or IP address of the remote Kafka server.

Must be a string of 1-64 characters.

port_number

Specify the remote Kafaka server's port number.

Usage Guidelines Use this command to configure the list of Kafka servers.

cdl ssl-config

Configures SSL configuration parameters.

Command Modes Exec > Global Configuration

Syntax Description

```
cdl ssl-config enable { false | true }
```

enable { false | true };

Specify to enable or disable SSL configuration.

Must be one of the following:

- **false**
- **true**

Default Value: false.

Usage Guidelines Use this command to configure SSL configuration parameters.

cdl ssl-config certs

Configures database endpoint specific SSL configuration parameters.

Command Modes Exec > Global Configuration

Syntax Description

```
certs ip fqdn_ip_address ssl-key ssl_key_file ssl-ca ssl_ca ssl-crt ssl_cert_file
```

host *hostname_ip_address*

Specify the hostname or IP address of external host.

Must be a string.

ssl-ca *ssl_ca*

Specify the CA certificate file content.

ssl-crt *ssl_cert_file*

Specify the SSL Cert file.

ssl-key *ssl_key_file*

Specify the SSL key file.

Usage Guidelines Use this command to configure database endpoint specific SSL configuration parameters.