Cloudera Streaming Analytics 1.7.0

# Connectors

**Date published: 2019-12-17**
**Date modified: 2022-05-05**

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# Contents

# Connector support in SSB

SQL Stream Builder (SSB) supports different connector types and data formats for Flink SQL tables to ease development and access to all kinds of data sources.

The following table summarizes the supported connectors and how they can be used in SSB:

| Connector | Type | Description |
|---|---|---|
| Kafka | source/sink | Supported as exactly-once-sink |
| Hive | source/sink | Can be used as catalog |
| Kudu | source/sink | Can be used as catalog |
| Schema Registry | source/sink | Can be used as catalog |
| JDBC | source/sink | Can be used with Flink SQL. PostgreSQL, MySQL and Hive are supported. |
| Filesystems | source/sink | Filesystems such as HDFS, S3 and so on. Can be used with Flink SQL |
| Debezium CDC | source | Can be used with Flink SQL. PostgreSQL, MySQL, Oracle DB, Db2 and SQL Server are supported. |
| Webhook | sink | Can be used as HTTP POST/PUT with templates and headers |
| PostgreSQL | sink | Materialized View connection for reading views. Can be used with anything that reads PostgreSQL wire protocol |
| REST | sink | Materialized View connection for reading views. Can be used with anything that reads REST (such as notebooks, applications, and so on) |
| BlackHole | sink | Can be used with Flink SQL. |

## Kafka connectors

When using the Kafka connector, you can choose between using an internal or external Kafka service. Based on the connector type you choose, there are mandatory fields where you must provide the correct information.

You can choose from the following Kafka connectors when creating a table in Streaming SQL Console:

**Template: local-kafka**

Using the Kafka service that is installed on your cluster.

Type: source/sink

The following fields are mandatory to use the connector:

- scan.startup.mode: Startup mode for the Kafka consumer. group-offsets is the default value. You can choose from earliest-offset, latest-offset, timestamp and specific-offsets as startup mode.
- topic: The topic from which data is read as a soruce, or the topic to which data is written to. No default value is specified. You can also add a topic list in case of sources. In this case, you need to separate the topics by semicolon. You can only specify the topic-pattern or topic for the sources.
- format: The format used to deserialize and serialize the value part of Kafka messages. No default value is specified. You can use either the format or the value.format option.

**Template: kafka**

Using an external Kafka service as a connector. To connect to the external Kafka service, you need to speficy the Kafka brokers that are used in your deployment.

Type: source/sink

The following fields are mandatory to use the connector:

- properties.bootstrap.servers: Specifying a list of Kafka brokers that are separated by comma. No default value is specified.
- topic: The topic from which data is read as a soruce, or the topic to which data is written to. No default value is specified. You can also add a topic list in case of sources. In this case, you need to separate the topics by semicolon. You can only specify the topic-pattern or topic for the sources.
- format: The format used to deserialize and serialize the value part of Kafka messages. No default value is specified. You can use either the format or the value.format option.

**Template: upsert-kafka**

Using the upsert Kafka service as a connector. For more information about the upsert Kafka connector, see the Apache Flink documentation.

Type: source/sink

- properties.bootstrap.servers: Specifying a list of Kafka brokers that are separated by comma. No default value is specified.
- topic: The topic from which data is read as a soruce, or the topic to which data is written to. No default value is specified. You can also add a topic list in case of sources. In this case, you need to separate the topics by semicolon. You can only specify the topic-pattern or topic for the sources.
- key.format: The format used to deserialize and serialize the key part of Kafka messages. No default value is specified. Compared to the regular Kafka connector, the key fields are specified by the PRIMARY KEY syntax.
- value.format: The format used to deserialize and serialize the value part of Kafka messages. No default value is specified. You can use either the format or the value.format option.

### Using the Kafka connectors

You can access and import the templates of the Kafka connectors from Streaming SQL Console:

1. Navigate to the Streaming SQL Console.
   a. Go to your cluster in Cloudera Manager.
   b. Click on SQL Stream Builder from the list of Services.
   c. Click on the SQLStreamBuilder Console.

   The Streaming SQL Console opens in a new window.
2. Click Create Job or select a previous job on the **Getting Started** page.
3. Click Templates at the SQL Editor.
4. Select one of the Kafka templates you want to use.

   The template is imported to the SQL window.
5. Provide information to the mandatory fields of the template.
6. Click Execute.

## CDC connectors

You can use the Debezium Change Data Capture (CDC) connector to stream changes in real-time from MySQL, PostgreSQL, Oracle, Db2, SQL Server and feed data to Kafka, JDBC, the Webhook sink or Materialized Views using SQL Stream Builder (SSB).

### Concept of Change Data Capture

Change Data Capture (CDC) is a process to capture changes in a source system, and update the data within a downstream system or application with the changes.

The Debezium implementation offers CDC with database connectors from which real-time events are updated using Kafka and Kafka Connect. Debezium captures every row-level change in each database table of an event stream. Applications read these streams to see the change events in the same order as they occurred. The change events are routed to a Kafka topic from which Kafka Connect feeds the records to other systems and databases.

For more information about Debezium, see the official Debezium site.

CDC in Cloudera Streaming Analytics (CSA) does not require Kafka or Kafka Connect as Debezium is implemented as a library within the Flink runtime. This means that the captured changes are propagated downstream to any connector that Flink supports. CSA allows queries to be issued at change data capture time, which means filtering, grouping, joining, and so on, can be performed on the change stream as it comes from the source database.

For more information about the Flink implementation of Debezium, see the official Apache Flink documentation.

From the supported set of Debezium connectors, MySQL, PostgreSQL, Oracle, Db2, and SQL Server are supported in Cloudera Streaming Analytics.

**Note:** You need to configure the databases, users and permissions for the supported connectors before you are able to use them in SSB. For more information about setting up the databases, see the MySQL, PostgreSQL, Oracle, Db2 or SQL Server documentation.

### Using the CDC connectors

You can access and import the templates of the CDC connectors from Streaming SQL Console:

1. Navigate to the Streaming SQL Console.
   a. Go to your cluster in Cloudera Manager.
   b. Click on SQL Stream Builder from the list of Services.
   c. Click on the SQLStreamBuilder Console.

   The Streaming SQL Console opens in a new window.
2. Click Create Job or select a previous job on the **Getting Started** page.
3. Click Templates at the SQL Editor.
4. Select one of the CDC templates you want to use.

   The template is imported to the SQL window.
5. Provide information to the mandatory fields of the template.
6. Click Execute.

## JDBC connector

When using the JDBC connector, you can choose between using a PostgreSQL, MySQL or Hive databases. Based on the connector type you choose, there are mandatory fields where you must provide the correct information.

**Template: jdbc**

Using either PostgreSQL, MySQL or Hive as databases. When you use the JDBC connector, you must specify the JDBC database which are going to be used for the connection.

Type: source/sink

The following fields are mandatory to use the connector:

- url: The URL of the JDBC database. No default value is specified.
- table-name: The name of the JDBC table in the database that you need to connecto to. No default value is specified.

### Using the JDBC connector

You can access and import the templates of the JDBC connector from Streaming SQL Console:

1. Navigate to the Streaming SQL Console.
   a. Go to your cluster in Cloudera Manager.
   b. Click on SQL Stream Builder from the list of Services.
   c. Click on the SQLStreamBuilder Console.

   The Streaming SQL Console opens in a new window.
2. Click Create Job or select a previous job on the **Getting Started** page.
3. Click Templates at the SQL Editor.
4. Select the JDBC template.

   The template is imported to the SQL window.
5. Provide information to the mandatory fields of the template.
6. Click Execute.

## Filesystem connector

When using the Filesystem connector, you can choose between HDFS, S3 and so on storage systems. Based on the connector type you choose, there are mandatory fields where you must provide the correct information.
**Template: filesystem**

Using either HDFS, S3 or any type of storage system. When you use the Filesystem connector, you must specify the path to the file system which are going to be used for the connection.

Type: source/sink

The following fields are mandatory to use the connector:

- path: Path to the root directory of the table data. No default value is specified.
- format: The format used to for the file system. No default value is specified.

### Using the Filesystem connector

You can access and import the templates of the Filesystem connector from Streaming SQL Console:

1. Navigate to the Streaming SQL Console.
   a. Go to your cluster in Cloudera Manager.
   b. Click on SQL Stream Builder from the list of Services.
   c. Click on the SQLStreamBuilder Console.

   The Streaming SQL Console opens in a new window.
2. Click Create Job or select a previous job on the **Getting Started** page.
3. Click Templates at the SQL Editor.
4. Select the Filesystem template.

   The template is imported to the SQL window.
5. Provide information to the mandatory fields of the template.
6. Click Execute.

## Datagen connector

The Datagen connector can be used a source to generate random data. The Datagen connector works out of the box, no mandatory field is required to use the connector. The Datagen connector is useful when you want to experiment and try out SQL Stream Builder or to test your SQL queries using random data.
**Template: datagen**

You do not need to provide any type of information when using the Datagen connector and template.

Type: source

### Using the Datagen connector

You can access and import the templates of the Datagen connector from Streaming SQL Console:

1. Navigate to the Streaming SQL Console.
   a. Go to your cluster in Cloudera Manager.
   b. Click on SQL Stream Builder from the list of Services.
   c. Click on the SQLStreamBuilder Console.

   The Streaming SQL Console opens in a new window.
2. Click Create Job or select a previous job on the **Getting Started** page.
3. Click Templates at the SQL Editor.
4. Select the Datagen template.

   The template is imported to the SQL window.
5. Click Execute.

## Faker connector

The Faker connector can be used a source to generate random data. To use the Faker connector, you need to specify the usage The Datagen connector is useful when you want to experiment and try out SQL Stream Builder or to test your SQL queries using random data.

**Template: faker**

You do not need to provide any type of information when using the Datagen connector and template.

Type: source

The following fields are mandatory to use the connector:

- fields.#.expression: The Java Faker expression to generate the values for a specific field. For more information about the list and use of the Faker expressions, see the flink-faker documentation.

### Using the Faker connector

You can access and import the templates of the Datagen connector from Streaming SQL Console:

1. Navigate to the Streaming SQL Console.
   a. Go to your cluster in Cloudera Manager.
   b. Click on SQL Stream Builder from the list of Services.
   c. Click on the SQLStreamBuilder Console.

   The Streaming SQL Console opens in a new window.
2. Click Create Job or select a previous job on the **Getting Started** page.
3. Click Templates at the SQL Editor.
4. Select the Faker template.
5. Provide information to the mandatory fields of the template.
6. Click Execute.

## Blackhole connector

The Blackhole connector can be used a sink where you can write any type of data into. The Blackhole connector works out of the box, no mandatory field is required to use the connector. The Blackhole connector is useful when you want to experiment and try out SQL Stream Builder or to test your SQL queries using random data.

**Template: blackhole**

You do not need to provide any type of information when using the Blackhole connector and template.

Type: sink

### Using the Blackhole connector

You can access and import the templates of the Blackhole connector from Streaming SQL Console:

1. Navigate to the Streaming SQL Console.
   a. Go to your cluster in Cloudera Manager.
   b. Click on SQL Stream Builder from the list of Services.
   c. Click on the SQLStreamBuilder Console.

   The Streaming SQL Console opens in a new window.
2. Click Create Job or select a previous job on the **Getting Started** page.
3. Click Templates at the SQL Editor.
4. Select the Blackhole template.

   The template is imported to the SQL window.
5. Click Execute.

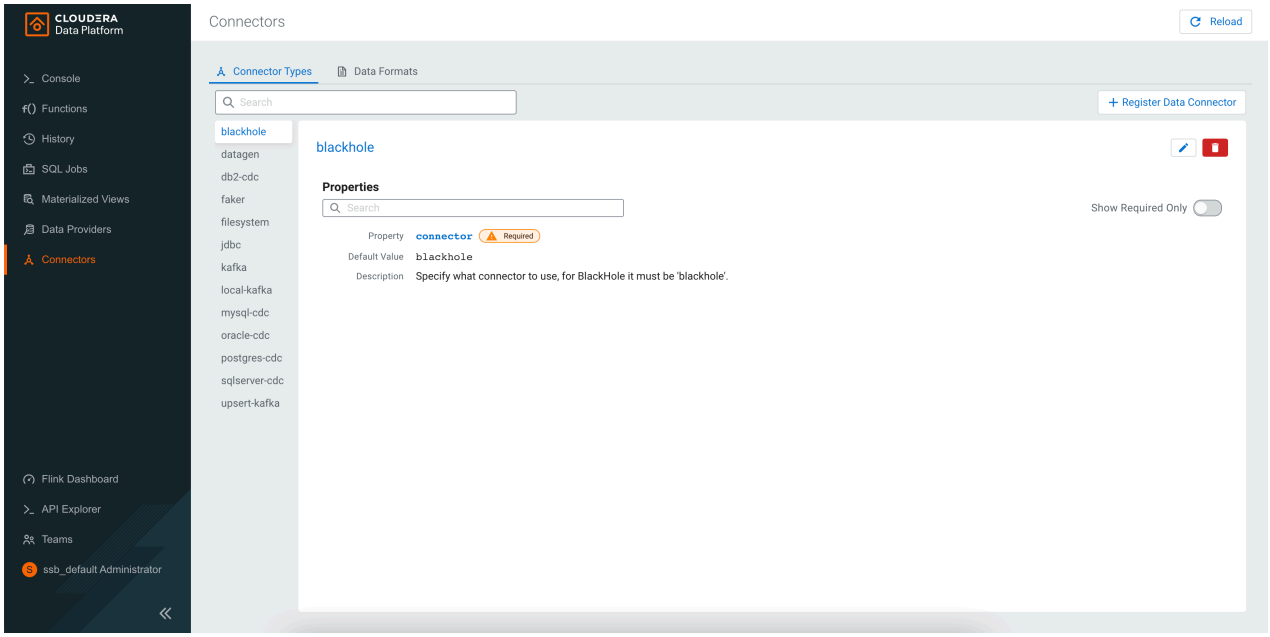
# Managing connectors and data formats

You can add and manage new connectors and data formats in SQL Stream Builder (SSB) using the Streaming SQL Console. The newly added connectors and data formats will appear in Templates at the SQL Editor on the Compose page.

You have the following options when managing the connectors and data formats in SSB:

- Edit the predefined connectors and data formats
- Delete the predefined connectors and data formats
- Add new connectors and data formats
- Edit and delete the added connectors and data formats

When you edit predefined connectors, their template is updated based on the changes. The newly added connectors and data formats are automatically added to the list of Templates in SSB. The templates are built based on the properties and data formats defined for the connectors.

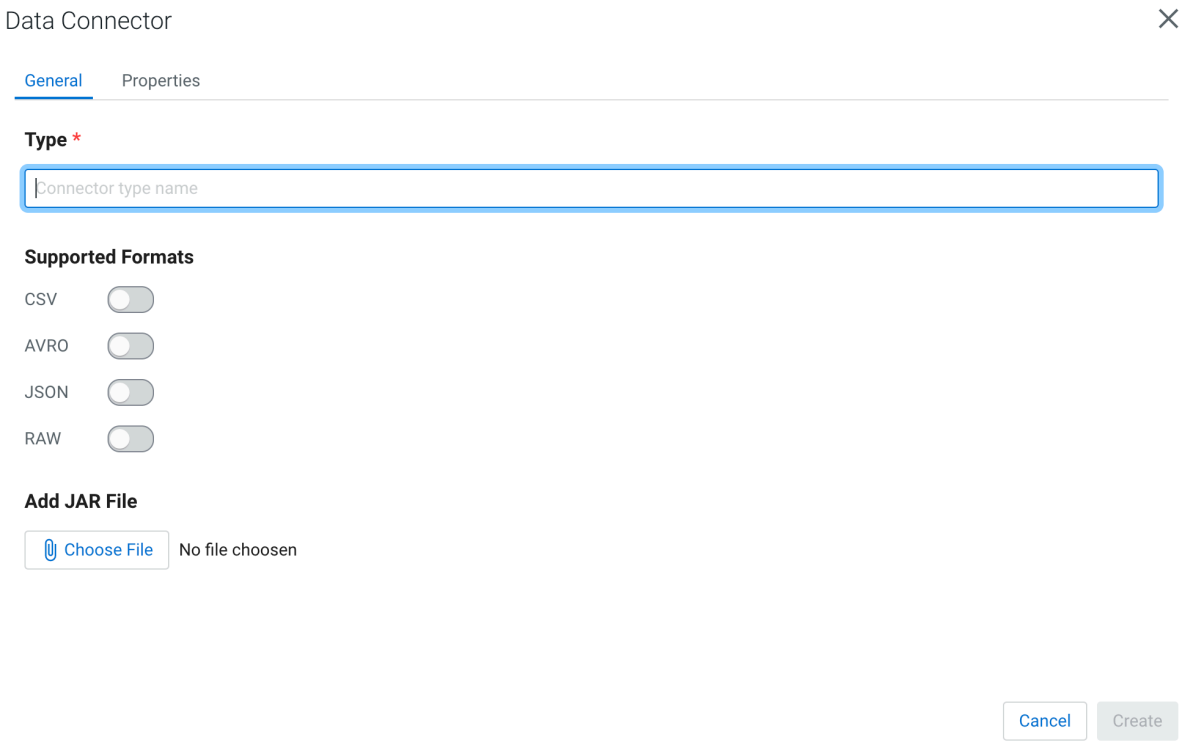



# Adding new connectors

When adding new connectors to SQL Stream Builder, you need to specify the property list, data types and must upload the connector JAR file to the Console.

## Procedure

1. Select Connectors on the main menu.
2. Click Register Data Connector.




3. Provide a name for the connector as Type.

4. Select a data format to be supported for the connector from the Supported Formats.
5. Upload the connector JAR file.
6. Click Properties to add properties to the connector.
   a) Add a name to the property.
   b) Add a default value to the property.
   c) Add a description to the property.
   d) Click Required to make a property mandatory.
   e) Click Add to specify more properties.

   You can specify as many properties as needed for the connector.
7. Click Create.

   The newly added connector is listed on the Connectors page.

## SSB fails with missing JAR file error

### Condition

When creating a custom connector by uploading a JAR file and adding it to Streaming SQL Console, after a period of time the job submission fails when using the newly created connector with a JAR file missing error. This can be solved by changing the location of the storage directory in Cloudera Manager.

### Cause

The uploaded JAR files are stored under /tmp/ssb_artifacts in SQL Stream Builder (SSB). This temporary folder can be cleaned up periodically by the Operating System (OS), which deletes the JAR files.

### Remedy

### Procedure

1. Open your cluster in Cloudera Manager.
2. Select SQL Stream Builder from the list of services.
3. Select Configuration.
4. Search for Streaming SQL Engine Advanced Configuration Snippet (Safety Valve) for ssb-conf/application.properties in the search bar.
5. Add ssb.artifact.storage.dir=*[***NEW DIRECTORY PATH***]* to the **Safety Valve**.
6. Click Save.
7. Restart the SQL Stream Builder service.

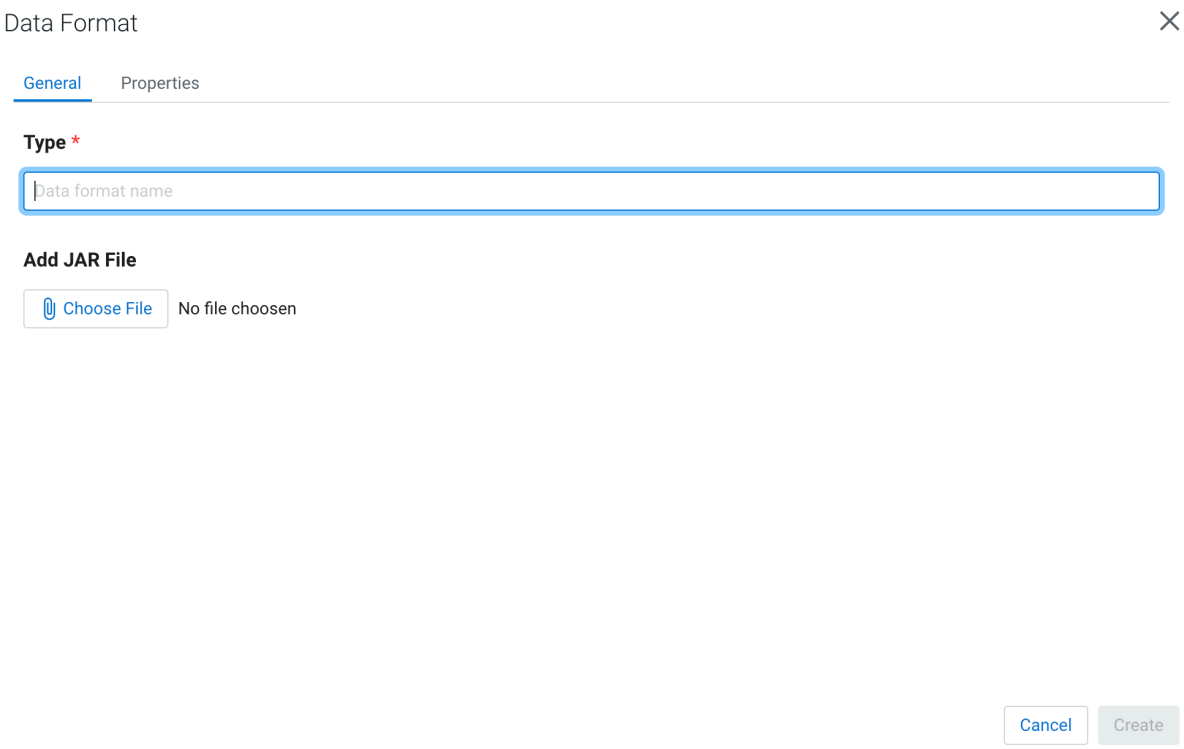
# Adding data formats

When adding new data formats to SQL Stream Builder, you need to specify the property list and must upload the data format JAR file to the Console.

### Procedure

1. Select Connectors on the main menu.
2. Click Data Formats.

3. Click Register Data Format.




4. Provide a name for the data format as Type.
5. Upload the data format JAR file.
6. Click Properties to add properties to the data format.
   a) Add a name to the property.
   b) Add a default value to the property.
   c) Add a description to the property.
   d) Click Required to make a property mandatory.
   e) Click Add to specify more properties.

   You can specify as many properties as needed for the data format.
7. Click Create.

   The newly added data format is listed on the Data Formats page.