

# KNIME Google Cloud Integration User Guide

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# Overview

KNIME Analytics Platform includes a set of nodes to support several Google Cloud services. The supported Google Cloud services that will be covered in this guide are [Google Dataproc](#), [Google Cloud Storage](#), and [Google BigQuery](#).

KNIME Analytics Platform provides further integration for [Google Drive](#) and [Google Sheets](#).

## Google Cloud Storage

[KNIME Google Cloud Storage Connection](#) extension provides nodes to connect to Google Cloud Storage.

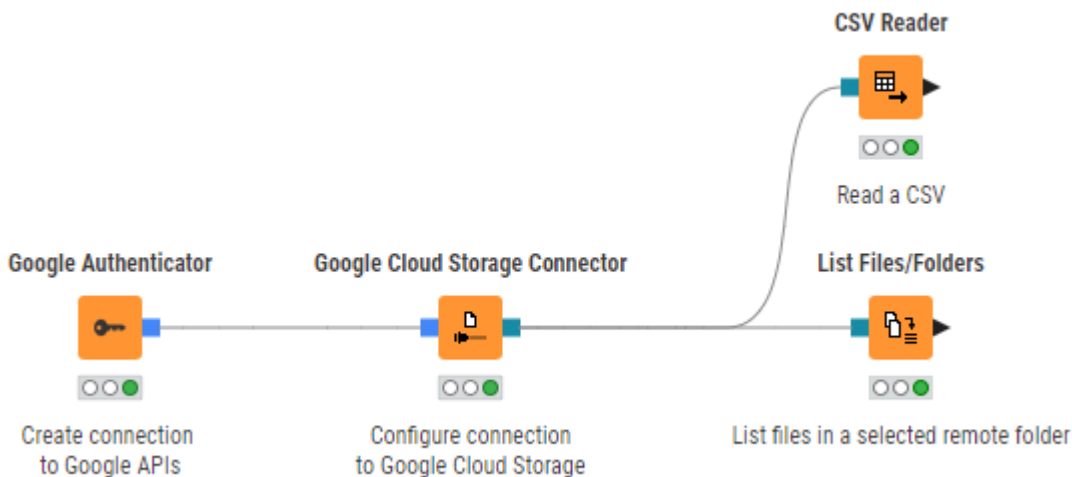


Figure 1. Connecting to and working with Google Cloud Storage

Figure 1 shows an example on how to connect to Google Cloud Storage and work with the remote files.

### Google Authenticator

The [Google Authenticator](#) node allows you to authenticate with the various Google APIs using an API key file. To be able to use this node, you have to create a project at the [Google Cloud Console](#). For more information on how to create a project on Google Cloud Console, please follow the [Google documentation](#).

Then you need to create a service account and an API key. You can either select *JSON* or *P12* as API key file format (see [\[fig\\_select\\_p12\]](#)). The service account email has the format of `sa-name@project-id.iam.gserviceaccount.com` where `sa-name` is a unique identifier, and

project-id is the ID of the project.

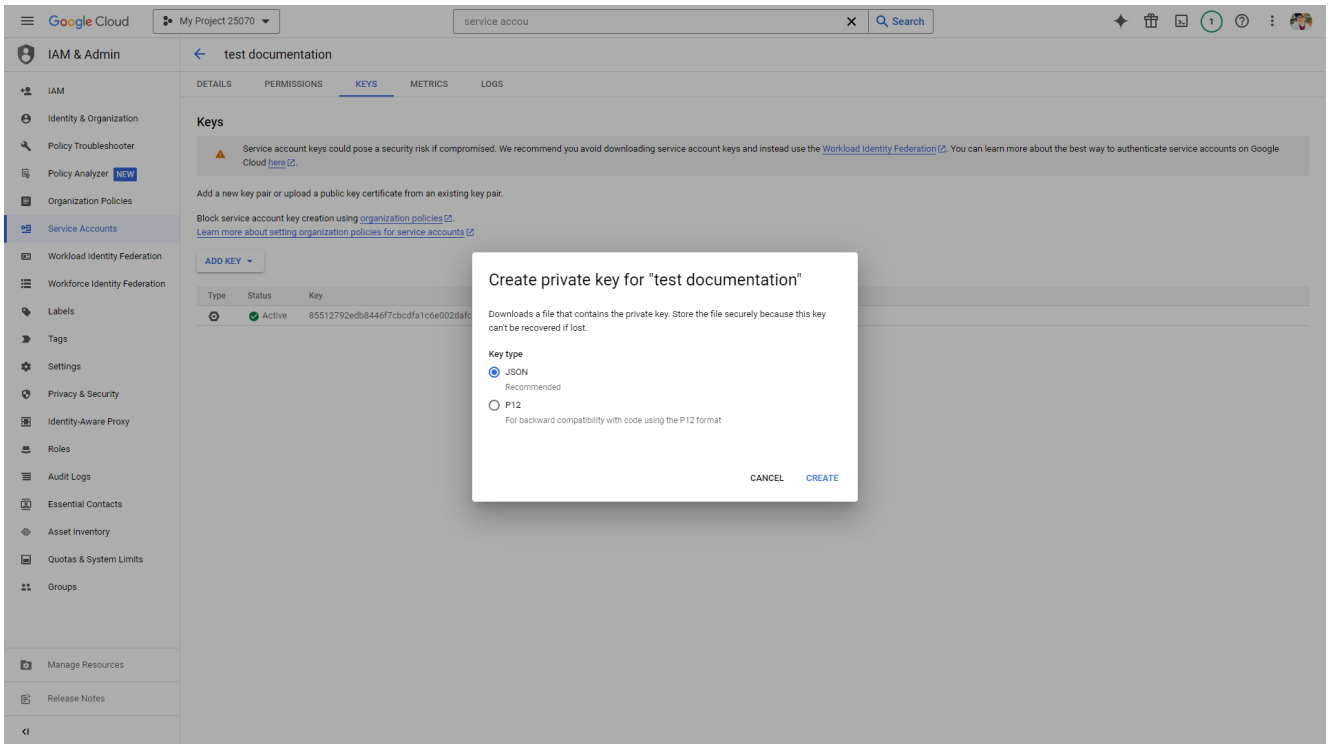


Figure 2. Select JSON or P12 file as the service account key

The API key file will be downloaded automatically to your local machine. Note that you should store the file in a secure place on your local system.

Open the Google Authenticator node configuration dialog:

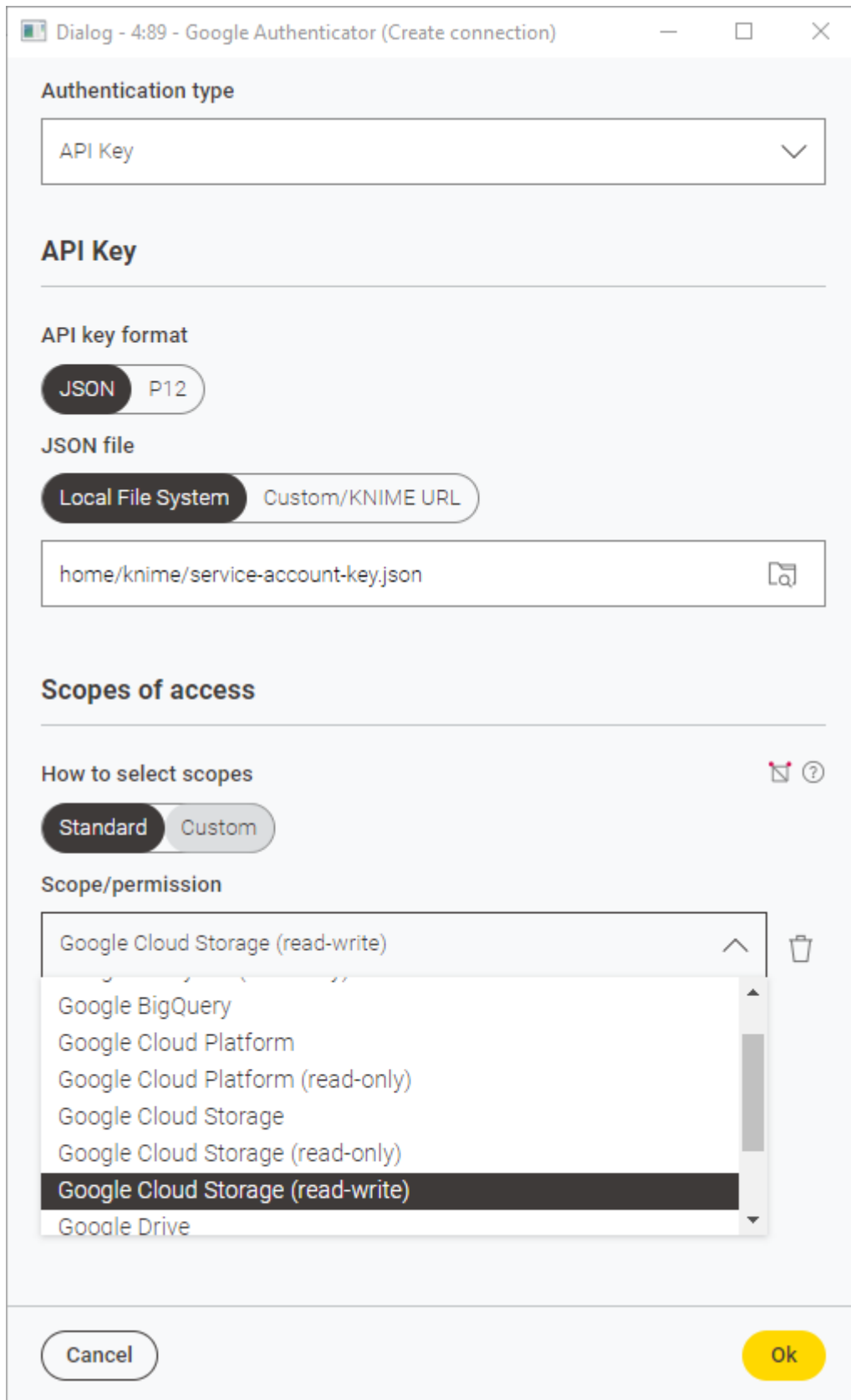



Figure 3. Node configuration dialog of Google Authenticator node

Under *Authentication type* select *API Key*. Now, inside the node dialog, you have to configure the following settings:

- Select the API key format. You can select either a JSON or a P12 API key format.
  - If you select *P12* as the API key format then add your **Service account** email. If you don't have one already, please follow the **Google documentation** on how to create a service account.
- In the node dialog select *Local File System* and then insert the *Local file path* in the field.
- Add the **OAuth 2.0 scopes** that will be granted for this connection. You should select the scopes depending on the level of access that you need. To do so you can select *Standard*, click *Add Scope* and choose a scope among those available in the menu.



To see the corresponding *Scope* under the *Standard* list of scopes you need to have installed first the extension. For example, **KNIME Google Cloud Storage Connection** or **KNIME Big Query** extension.

- Alternatively, select *Custom* and add the desired *Scope/permission* to the field. You can add multiple custom scopes by clicking *Add Scope* and you can delete the scopes you added by clicking the  icon.

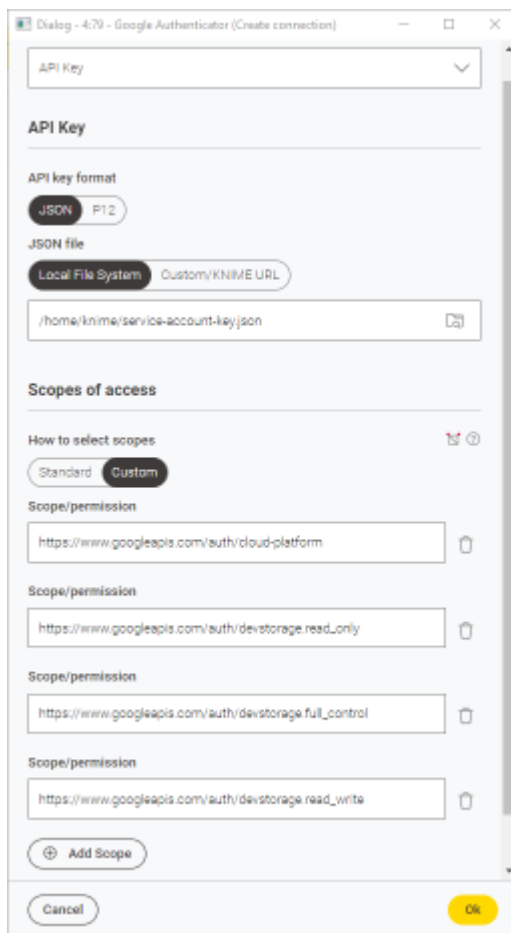


Figure 4. Node configuration dialog of Google Authenticator node - custom scopes

## Google Cloud Storage Connector

The **Google Cloud Storage Connector** node connects to Google Cloud Storage and allows downstream nodes to access Google Cloud Storage inside a certain project using the new KNIME file handling nodes.

The node configuration dialog of the Google Cloud Storage Connector node contains:

- **Project ID.** This is the Google Cloud project ID. For more information on how to find your project ID, please check out the [Google documentation](#).
- **Working directory.** The working directory must be specified as an absolute path and it allows downstream nodes to access files/folders using relative paths, i.e. paths that do not have a leading slash. If not specified, the default working directory is `/`.

**Path syntax:** Paths for Google Cloud Storage are specified with a UNIX-like syntax, e.g. `/mybucket/myfolder/myfile`. The path usually consists of:

- A leading slash (`/`)
  - Followed by the name of a bucket (`mybucket` in the above example), followed by a slash
  - Followed by the name of an object within the bucket (`myfolder/myfile` in the above example).
- **Normalize paths.** Path normalization eliminates redundant components of a path, e.g. `/a/./b/./c` can be normalized to `/b/c`. When these redundant components like `./` or `.` are part of an existing object, then normalization must be deactivated in order to access them properly.
  - Under the *Advanced* tab, it is possible to set the connection and read timeout.



This node currently only supports the Google Authenticator node for authentication.

# Google BigQuery

KNIME Analytics Platform includes a set of nodes to support [Google BigQuery](#). The [KNIME BigQuery](#) extension is available from KNIME Analytics Platform version 4.1.

Setting up KNIME Analytics Platform for Google BigQuery has the following prerequisites:

1. Create a project in the Google Cloud Console. For more information on how to create a project on Google Cloud Console, please follow the [Google documentation](#).
2. Create a service account. If you don't have one already, please follow the [Google documentation](#) on how to create a service account.
3. Download the [JDBC driver for Google BigQuery](#), unzip, and store it in your local machine. Register the JDBC driver on KNIME Analytics Platform by following the tutorial in the [KNIME documentation](#).

## Connect to BigQuery

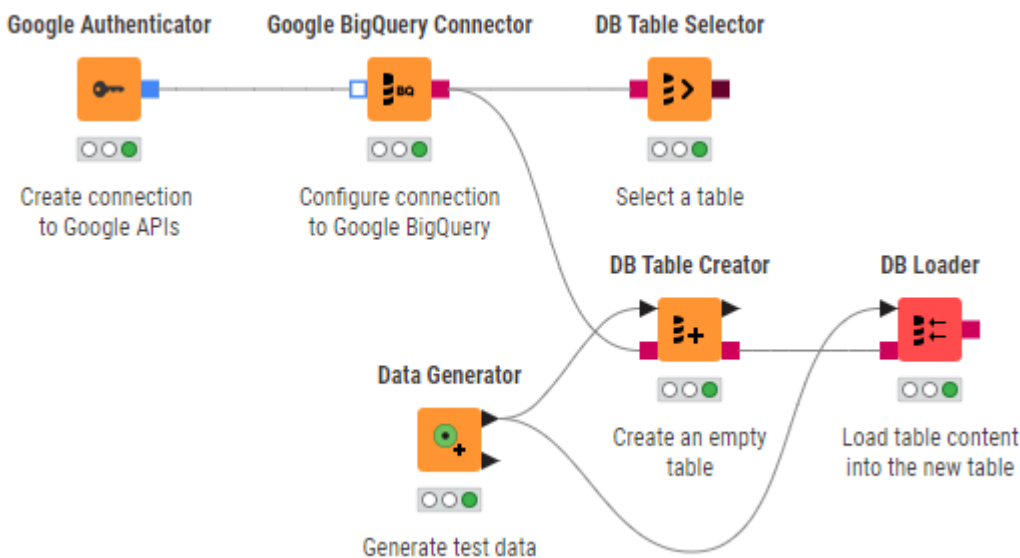


Figure 5. Connecting to and working with Google BigQuery

Figure 5 shows how to authenticate using the [Google Authenticator](#) node and the [Google BigQuery Connector](#) node to establish a connection to BigQuery via JDBC driver. To configure Google Authenticator node, please refer to the [Google Authenticator](#) section.

To configure the Google BigQuery Connector node, please check out how to connect to a predefined database in the [KNIME documentation](#). For the hostname in BigQuery, you can specify <https://www.googleapis.com/bigquery/v2> or [bigquery.cloud.google.com](https://bigquery.cloud.google.com). As the database name, use the project ID you created on the Google Cloud Console.





For more information on the *JDBC parameters* tab or the *Advanced* tab in the node configuration dialog of Google BigQuery Connector node, please check out the [KNIME documentation](#).

Executing this node will create a connection to the BigQuery database and you can use any [KNIME database nodes](#) to visually assemble your SQL statements.



For more information on KNIME database nodes, please check out the [KNIME Database documentation](#).

## Create a BigQuery table

To export data from KNIME Analytics Platform to Google BigQuery (shown in [Figure 5](#)):

1. Create the database schema/dataset where you want to store the table, if it doesn't exist already. To create a dataset, please check the [Google documentation](#).
2. Create an empty table with the right specification. To do this, use the [DB Table Creator](#) node. Inside the node configuration dialog, specify the schema as the name of the dataset that you created in the previous step. For more information on the DB Table Creator node, please check the [KNIME documentation](#).



If the table has column names that contain space characters, e.g. `column 1`, make sure to delete the space characters because they would be automatically replaced with `_` during table creation, e.g. `column_1` and this will lead to conflict, since column names will no longer match.

3. Once the empty table is created, use the [DB Loader](#) node to load the table content into the newly created table. For more information on the DB Loader node, please check the [KNIME documentation](#).

# Google Dataproc

## Cluster Setup with Livy

To create a Dataproc cluster using the Google Cloud Platform web console, follow the step-by-step guide provided by [Google documentation](#).

To setup [Apache Livy](#) in the cluster, the following additional steps are necessary:

1. Copy the file `livy.sh` from [Git repository](#) into your cloud storage bucket. This file will be used as the initialization action to install Livy on a master node within a Dataproc cluster.



Please check [best practices](#) of using initialization actions.

## 2. During cluster creation, open the *Advanced options* at the bottom of the page

The screenshot shows the 'Dataproc Create a cluster' interface. On the left is a navigation menu with 'Clusters' selected. The main area is titled 'Machine configuration' and contains several sections:

- Machine family:** 'General-purpose' (Machine types for common workloads, optimized for cost and flexibility)
- Series:** 'N1' (Powered by Intel Skylake CPU platform or one of its predecessors)
- Machine type:** 'n1-standard-4 (4 vCPU, 15 GB memory)'
- Resource summary:** 4 vCPU, 15 GB Memory, 0 GPUs
- CPU platform and GPU:** Primary disk size (500 GB), Primary disk type (Standard persistent disk)
- Nodes (minimum 2):** 2 nodes, Local SSDs (0-8): 0 x 375 GB
- YARN resources:** YARN cores: 8, YARN memory: 24 GB
- Autoscaling policy (Optional):**  Enable autoscaling on the cluster. This project does not currently have any applicable policy to enable autoscaling in this region. [Learn how to create autoscaling policy.](#)
- Component gateway:**  Enable access to the web interfaces of default and selected optional components on the cluster. [Learn more](#)
- Advanced options:** A link with a dropdown arrow, circled in red.
- Buttons:** 'Create' and 'Cancel'

Figure 6. Advanced options in the cluster creation page

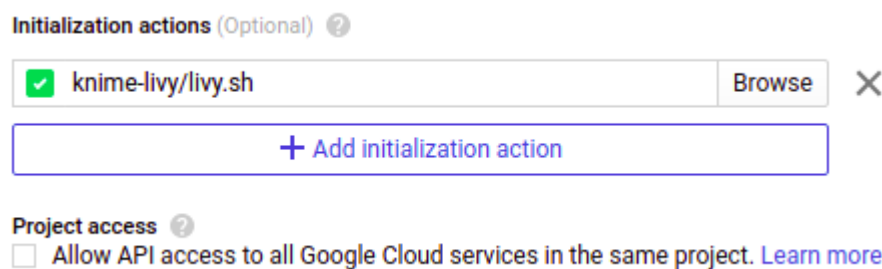
3. Select the network and subnet. Remember the network and subnet for the **Access to Livy** section.



The screenshot shows a configuration form with three sections. The first section, 'Network', has a dropdown menu with 'default' selected. The second section, 'Subnetwork', has a dropdown menu with 'default (10.128.0.0/20)' selected. The third section, 'Network tags (Optional)', has an empty text input field.

Figure 7. Network and subnet

4. Select the `livy.sh` file from your cloud storage bucket in the **initialization actions** section



The screenshot shows the 'Initialization actions (Optional)' section. It features a list of files with a checkmark next to 'knime-livy/livy.sh' and a 'Browse' button with a close icon. Below the list is a button labeled '+ Add initialization action'. Underneath, the 'Project access' section has a checkbox labeled 'Allow API access to all Google Cloud services in the same project. Learn more'.

Figure 8. Set `livy.sh` as initialization action

5. Configure the rest of the cluster settings according to your needs and create the cluster.

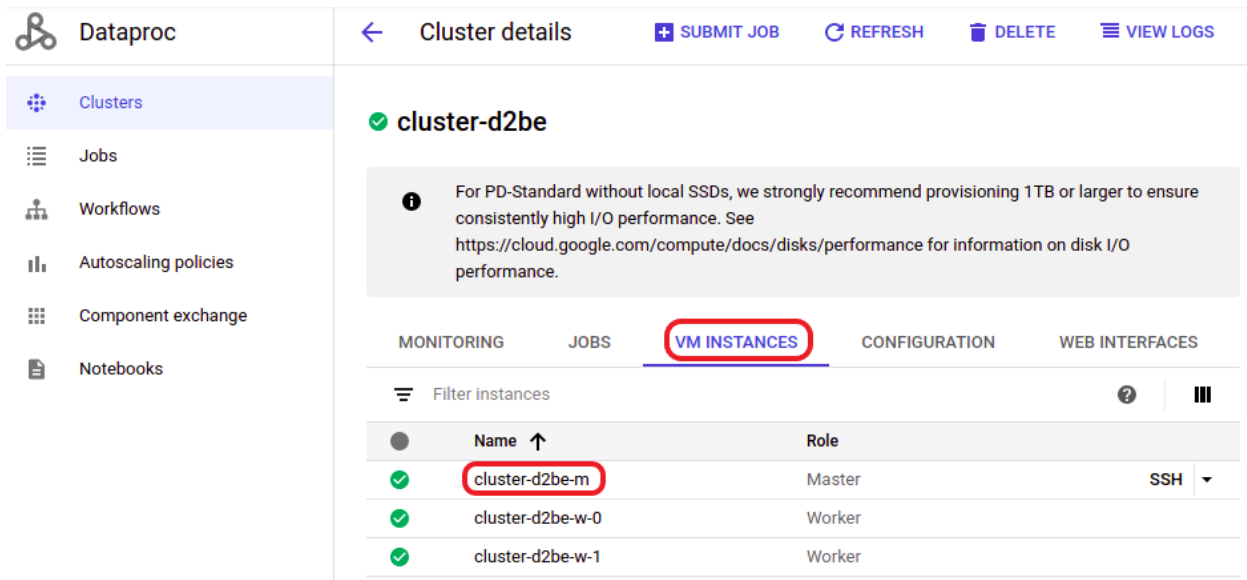


Apache Livy is a service that interacts with a Spark cluster over a REST interface. It is the recommended service to create a Spark context in KNIME Analytics Platform.

## Access to Livy

To find the external IP address of the master node where Livy is running:

1. Click on the cluster name in the cluster list page
2. Go to *VM Instances* and click on the master node

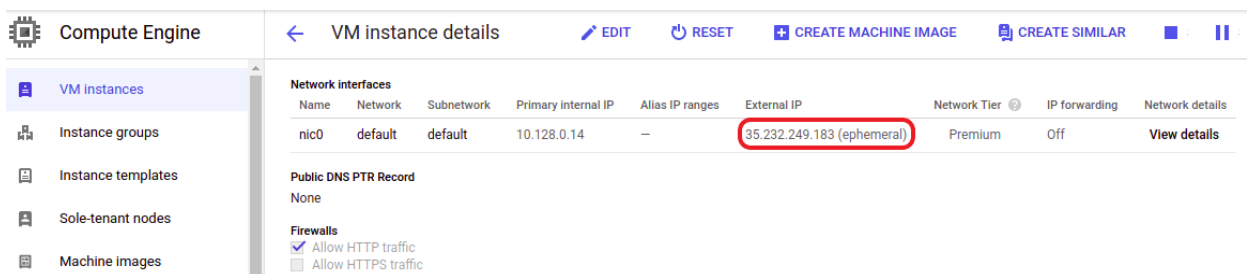


The screenshot shows the Dataproc 'Cluster details' page for 'cluster-d2be'. The 'VM INSTANCES' tab is selected and highlighted with a red circle. Below the tab, a table lists the instances:

Name ↑	Role
cluster-d2be-m	Master
cluster-d2be-w-0	Worker
cluster-d2be-w-1	Worker

Figure 9. Select the master node in the VM instances list

3. On the *VM Instances* page, scroll down to the *Network interfaces* section. Find the network and subnet that you selected in the previous [Cluster Setup with Livy](#) section, and you will find the external IP address of the master node.



The screenshot shows the Compute Engine 'VM instance details' page for 'cluster-d2be-m'. The 'Network interfaces' section is expanded, showing a table with the following data:

Name	Network	Subnetwork	Primary internal IP	Alias IP ranges	External IP	Network Tier	IP forwarding	Network details
nic0	default	default	10.128.0.14	—	35.232.249.183 (ephemeral)	Premium	Off	<a href="#">View details</a>

Figure 10. Find the external IP address of the master node

## Livy Firewall Setup

To allow access to Livy from the outside, you have to configure the firewall:

1. Click on the cluster name in the cluster list page
2. Go to *VM Instances* and click on the master node
3. On the *VM Instances* page, scroll down to the *Firewalls* section and make sure the checkbox *Allow HTTP traffic* is enabled

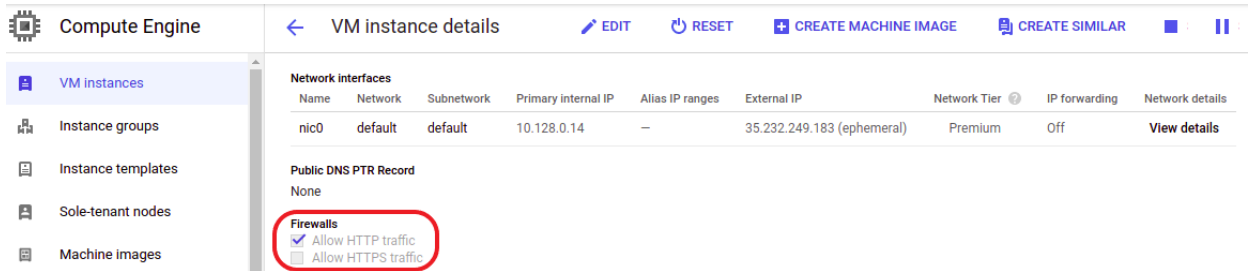


Figure 11. Check Allow HTTP traffic in the Firewalls section

4. Next, go to the *VPC network* page
5. In *Firewall* section of the *VPC network* page, select the *default-allow-http* rule

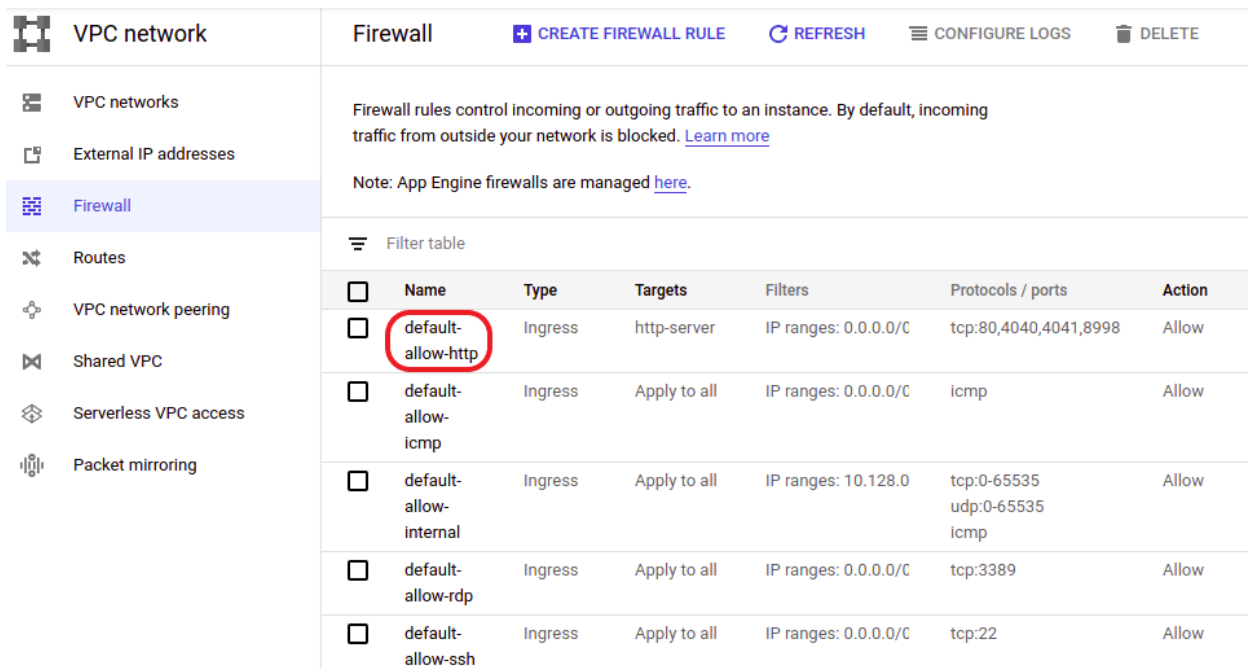
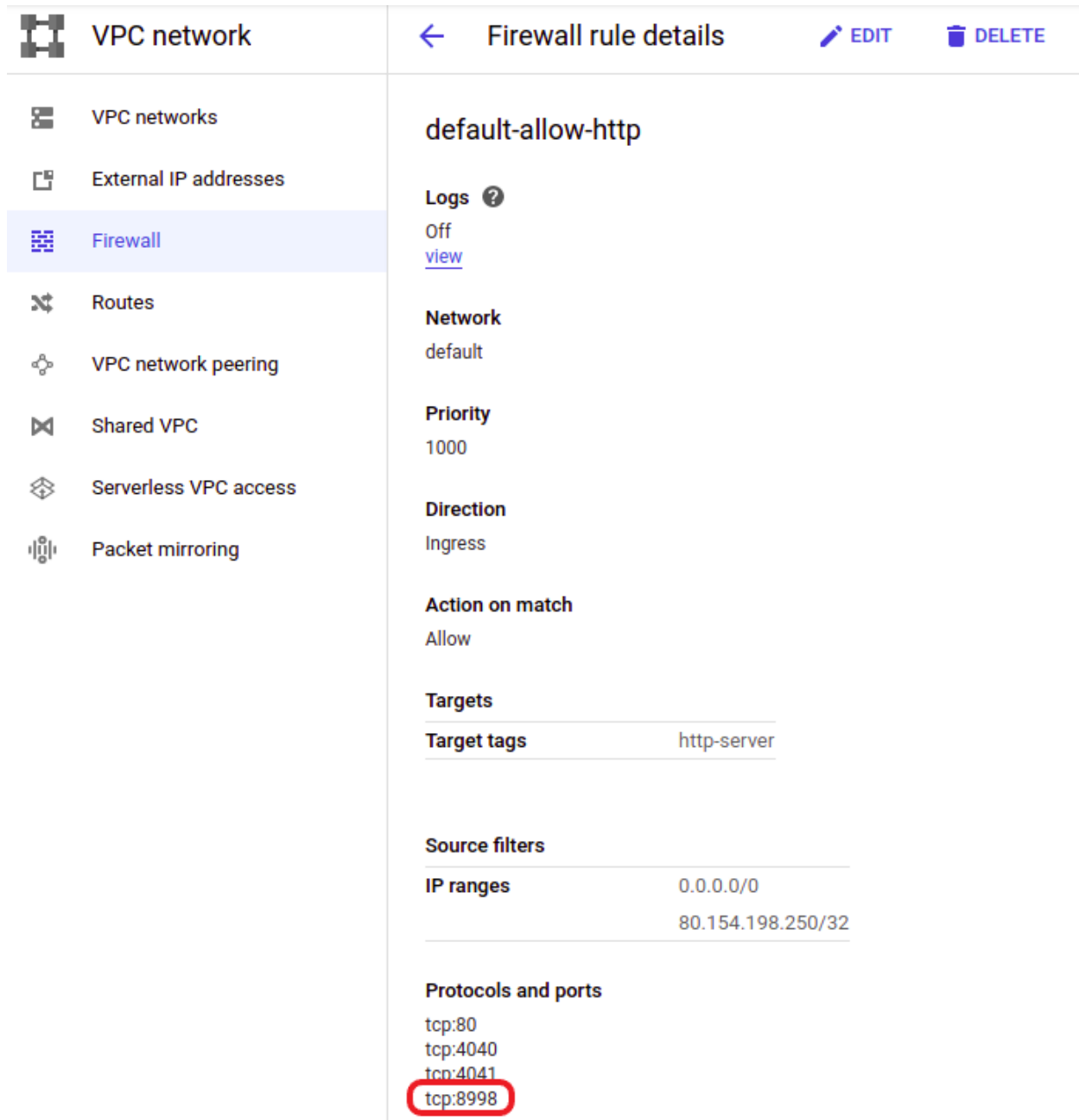


Figure 12. Open the default-allow-http firewall rule

6. Make sure that `tcp:8998` is included in the allowed protocol and ports list, and that your IP address is included in the allowed IP addresses list.



The screenshot shows the 'Firewall rule details' page for a rule named 'default-allow-http'. The left sidebar contains a navigation menu with 'Firewall' selected. The main content area displays the following details:

- Logs**: Off (with a help icon and a 'view' link)
- Network**: default
- Priority**: 1000
- Direction**: Ingress
- Action on match**: Allow
- Targets**: Target tags: http-server
- Source filters**: IP ranges: 0.0.0.0/0, 80.154.198.250/32
- Protocols and ports**: tcp:80, tcp:4040, tcp:4041, **tcp:8998** (highlighted with a red circle)

Figure 13. Make sure to allow access to certain ports and IP addresses

Once you have followed these steps, you will be able to access the Dataproc cluster via KNIME Analytics Platform using Apache Livy.

## Connect to Dataproc cluster

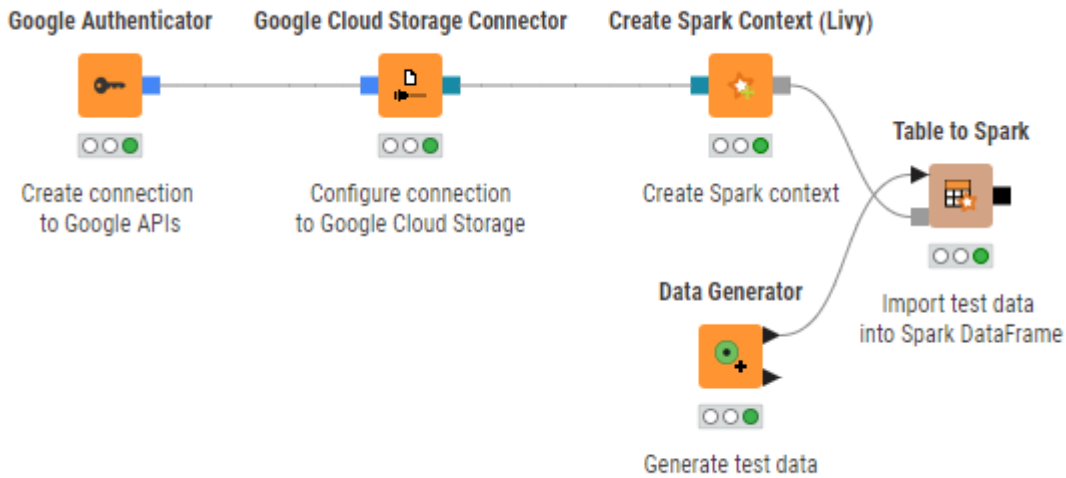


Figure 14. Connecting to Dataproc cluster

Figure 14 shows how to establish a connection to a running Dataproc cluster via KNIME Analytics Platform. The [Google Authenticator](#) node and [Google Cloud Storage Connector](#) node are used to create a connection to google APIs and to Google Cloud Storage respectively. For more information on both nodes, please check out the [Google Cloud Storage](#) section of this guide.

The [Create Spark Context \(Livy\)](#) node creates a Spark context via [Apache Livy](#). Inside the node configuration dialog, the most important settings are:

- The Livy URL. It has the format `http://<IP-ADDRESS>:8998` where <IP-ADDRESS> is the external IP address of the master node of the Dataproc cluster. To find the external IP address of your Dataproc cluster, check out the [Access to Livy](#) section.
- Under *Advanced* tab, it is mandatory to set the *staging area for Spark jobs*. The staging area, which is located in the connected Google Cloud Storage system, will be used to exchange temporary files between KNIME and the Spark context.

The rest of settings can be configured according to your needs. For more information on the [Create Spark Context \(Livy\)](#) node, please check out our [Amazon Web Services](#) documentation.

Once the Spark context is created, you can use any number of the KNIME Spark nodes from the [KNIME Extension for Apache Spark](#) to visually assemble your Spark analysis flow to be executed on the cluster.



## Apache Hive in Google Dataproc

This section describes how to establish a connection to Apache Hive™ on Dataproc in KNIME Analytics Platform.

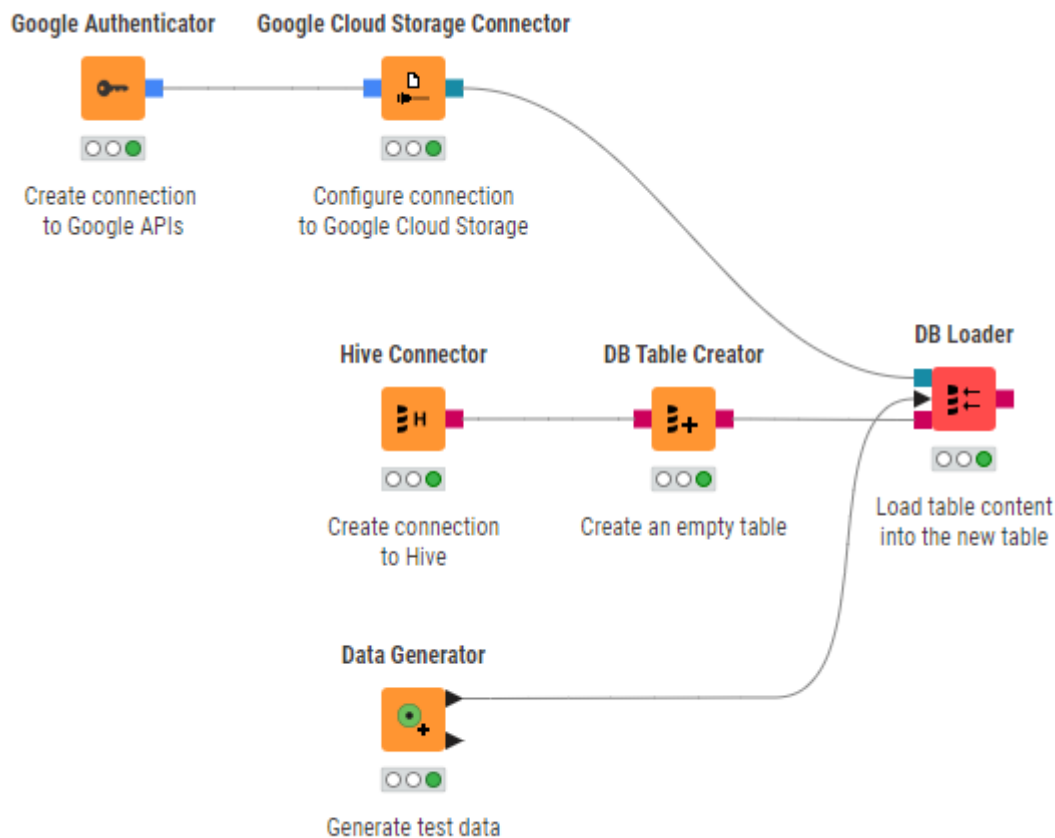


Figure 15. Connect to Hive and create a Hive table

Figure 15 shows how to connect to Hive running on a Dataproc cluster and how to create a Hive table.

The **Hive Connector** node is bundled by default with the open-source Apache Hive JDBC driver. Proprietary drivers are also supported, but need to be registered first. Follow the guide on how to register a Hive JDBC driver in [KNIME documentation](#).

Once the Hive JDBC driver is registered, you can configure the Hive Connector node. For more information on how to configure the settings in the node configuration dialog, please refer to the [KNIME documentation](#). Executing the node will create a connection to Apache Hive and you can use any [KNIME database nodes](#) to visually assemble your SQL statements.

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To enable access to Hive from KNIME Analytics Platform, make sure that the Hive port (10000 by default) is opened in the firewall rules. To configure this, check out the [Livy Firewall Setup](#) section and change the firewall rule accordingly.

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