# SAP Connector Guide

PV8.4.0 SV1.1.0

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# Solution Overview

OneStream SAP Connector is a OneStream Solution designed to reduce integration time and enable implementation without specialized coding knowledge. This solution enables you to do the following:

- Create and test the RFC connection to the SAP environment.
- Connect to SAP through a Web API.
- Use Smart Integration Connector to connect to a Web API when a firewall is present.
- Generate a OneStream connector rule without writing any code.
- Preview the data in a DataGrid.
- Create Web API Endpoint Connectors with a step-by-step guide.
- Use substitution variables while creating Web API Endpoint Connectors.

# Setup and Installation

This section contains important details related to the planning, configuring, and installation of your solution. Before you install the solution, familiarize yourself with these details.

See OneStream Solution Modification Considerations.

# Dependencies

| Component | Description |
|---|---|
| OneStream 8.4.0 or later | Minimum OneStream Platform version required to install this version of SAP Connector. |
| OneStream Smart Integration Connector enabled if environment is SAAS | For RFC Connections, Smart Integration is required to connect an SAP data source that is on a private network and not public facing / exposed to the public internet.<br><br>For Web API connections, Smart Integration Connector is optional if the APIs are publicly available over the internet. |

## Smart Integration Connector

Before using the SAP Connector, if you need to use the Smart Integration Connector, you must:

- Set up Smart Integration Connector. See "Installation and Setup" in the *Smart Integration Connector Guide*.
- Verify that the Smart Integration Connector can communicate outbound over port to 443. See "Whitelist Outbound Traffic" in the *Smart Integration Connector Guide*.

## DLL Setup for RFC Connections

Below is an example of how to set up the necessary DLLs for ERPConnect. These DLLs are needed for the RFC Connection type in the connector. For additional information, see ERPConnect Help Center.

1. From the Platform page of Solution Exchange, download the DLL Packages, which contains the ERPConnectStandard20.dll file.
2. Extract the compressed zip file and then move the ERPConnectStandard20.dll to your Referenced Assemblies Folder.
3. Install the required Visual C++ Redistributable latest supported downloads.
4. Login to your sap.com account and then download SAP NetWeaver RFC Library DLL (sapnwrfc.dll) and associated icudtXX.dll, icuinXX.dll, icuucXX.dll files.
    a. Copy SAP NetWeaver RFC Library DLL (sapnwrfc.dll) to the Referenced Assemblies folder.
    b. Copy icudtXX.dll, icuinXX.dll, and icuucXX.dll to C:\Windows\System32.

    > **NOTE:** XX in the DLL file name will vary on the version of the NetWeaver Remote Function Call Software Development Kit.

See "Support for DLL Migration" in the *Smart Integration Connector Guide*.

### Web API Using Smart Integration Connector

A Smart Integration Connector direct or database connection is required to use the Web APIs with Smart Integration Connector. See "Create a Direct Connection" in the *Smart Integration Connector Guide*.

# Supported Architectures

## RFC Supported SAP Systems

While not all have been tested using the SAP Connector, based on the Theobald documentation, the following SAP systems are supported when creating and using RFC connections.

- All SAP ABAP based systems that provide RFC connectivity and all SAP S/4 HANA (Cloud) systems that provide OData connectivity are supported.
- SAP ABAP systems on any database are supported (including HANA). The database used by the SAP system is irrelevant, because the integration occurs at SAP application server level.
- SAP systems running on Big Endian and Little Endian hardware are supported.
- SAP industry solutions like IS-U, IS-R, etc. are supported.
- SAP releases 4.6C and newer are supported.
- All operating systems are supported.

See Supported SAP Systems and Releases on the ERP Help Center for more information.

## Web API SAP Products with OData Support

The following products have OData support as described on the SAP Business Accelerator Hub.

| SAP Product | Support Type | |
|---|---|---|
| | OData V2 | OData V4 |
| SAP S/4HANA Cloud Public Edition | X | X |
| SAP S/4HANA Cloud Private Edition | X | X |
| SAP Customer Experience | X | X |
| SAP Business Technology Platform (BTP) | X | X |
| SAP Gateway | X | X |
| SAP SuccessFactors | X | X |
| SAP Ariba | | X |
| SAP Fieldglass | X | |
| SAP Integrated Business Planning | X | X |
| SAP S/4HANA | X | X |
| SAP Cloud for Customer (C4C) | X | |
| SAP Business ByDesign (ByD) | X | |
| Datasphere | | |

## Datasphere Supported SAP Systems

SAP provides an SAP HANA ODBC driver to connect with SAP HANA data sources. Many of SAP's products run on SAP HANA, such as Datasphere.

> **NOTE:** OData API V2 and V4 using Datasphere are not currently supported.

For more information, see:

- What is SAP HANA?
- SAP Help Portal - SAP Online Help

# Select the SAP Connector Development Location

Before installation, decide whether to build the solution directly in the Production OneStream application or in a separate Development OneStream application. This section provides some key considerations for each option.

**Production OneStream Application:** The primary advantage of building the solution in a Production application is that you will not have to migrate the resulting work from a Development application. However, there are intrinsic risks when making design changes to an application used in a Production capacity and it is not advised.

> **NOTE:** OneStream strongly recommends that you implement the solution in the Development environment with a fresh copy of the Production application before starting work.

**Development OneStream Application**: As a best practice, use the Development OneStream application to build the solution.

# Create the OneStream Development Application

1. Ensure all the OneStream artifacts relating to SAP Connector such as **Workflow Profiles** and **Entities** are in the Production application.
2. Copy your Production OneStream application to your Development environment and rename it. This Development version is used for your SAP Connector project.

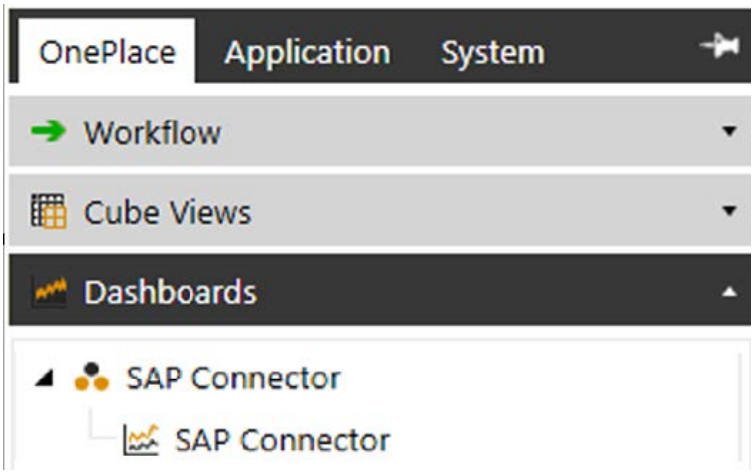
# Install SAP Connector

1. In OneStream Solution Exchange, go to **OneStream Solutions** and click the **SAP Connector** tile.
2. On the **SAP Connector** page, in the **Platform Version** drop-down list, select the appropriate OneStream Platform version.
3. In the **Solution Version** drop-down list, select the most recent version. Click **Download**.
4. Log into OneStream.
5. On the **Application** tab, go to **Tools** > **Load/Extract**.
6. On the **Load** tab, use the **Select File** icons to locate the solution package. Click **Open**.
7. When the solution file name appears, click **Load**.
8. Click **Close** to complete the installation.

# Set Up SAP Connector

The first time SAP Connector is run, you are guided through SAP Connector Setup screen.

1. On the **OnePlace** tab, expand **Dashboards**, then select **SAP Connector** from the SAP Connector profile.




## Create Tables

1. Click **Step 1: Setup Tables**. After setup, these tables required for SAP Connector automatically generate in your OneStream application:
    - XFW_SPC_BWQueries
    - XFW_SPC_Connection
    - XFW_SPC_ControlLists
    - XFW_SPC_CustomFunctions
    - XFW_SPC_Queries
    - XFW_SPC_QueryParameters

- XFW_SPC_Tables
- XFW_SPC_WebAPIAuth
- XFW_SPC_WebAPIAuthScheme
- XFW_SPC_WebAPIConfigs
- XFW_SPC_WebAPIList

2. After setup is complete, click **Step 2: Launch Solution**. After the setup has been run, the next time the SAP Connector link is clicked it will take you to the SAP Connector viewer.

# Package Contents

The Workspace Maintenance Unit provides the user interface for SAP Connector and includes the required dashboard groups, components, data adapters, parameters and files.

## Business Rules

The following Smart Integration Function business rules are included:

- SPC_IntegrationHelper
- SPC_WebApiHelper

# Settings

The **Settings** page contains the **General Settings** tile in which key properties that guide administration are set as well as **Uninstall** options.

## General Settings

Use the **General Settings** page to set key properties that guide global SAP Connector.

### Security Role [Manage Solution]

Determines which security groups can manage the solution.

### Theobald Table Extract Function Name

Custom function module installed on the target SAP instance that extracts data from tables. This setting is only applicable to the RFC Connection. See Tables on ERPConnect Help Center.

### RFC SIC Gateway Execution Timeout Limit (Sec)

Enter a whole number to set the timeout limit for the SIC gateway in seconds. This determines how long a query will run before it hits the timeout limit.

### Web API Timeout Limit (Sec)

Enter a positive integer to set the timeout limit for the Web API in seconds. This determines how long a query will run before it hits the timeout limit.

## Web API SIC Remote Gateway Job Timeout (mins)

Enter a positive integer less than or equal to 240 minutes to set the timeout limit for the Web API SIC Remote Gateway connection. This determines how long a database connection will run before it hits a timeout limit.

# Uninstall

Use the Uninstall feature to remove the SAP Connector User Interface or the entire solution. If part of an upgrade, any modifications performed on standard SAP Connector objects are removed. These are the uninstall options:

- **Uninstall UI** removes SAP Connector, including related dashboards and business rules, but retains the database and related tables. For some releases, perform this step before accepting a new solution version as some of the dashboards or other objects may have changed. Choose this option to update SAP Connector without removing the data tables. The Release Notes indicate if an overinstall is supported.
- **Uninstall Full** removes all related data tables, data, and SAP Connector dashboards and business rules. Choose this option to completely remove SAP Connector or to perform an upgrade that is so significant in its changes to the data tables that this method is required.

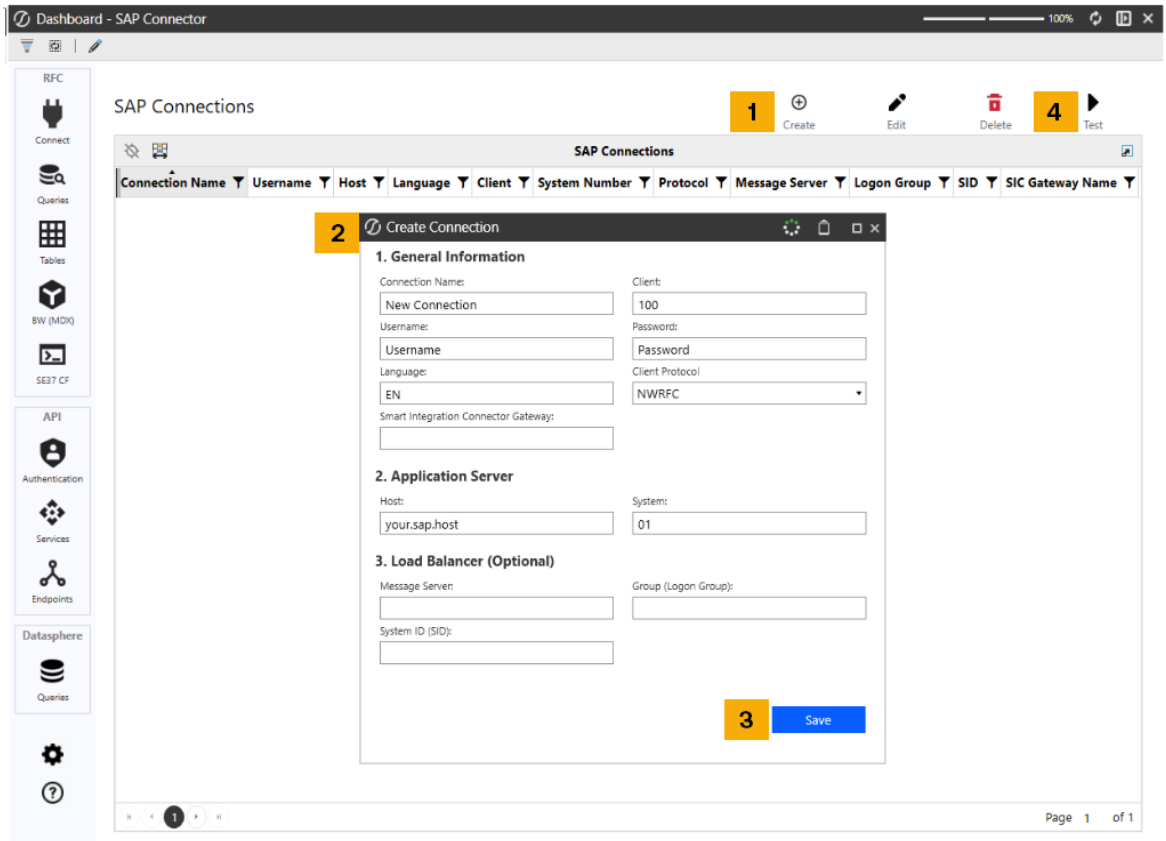
> **CAUTION:** Uninstall procedures are irreversible.

# RFC Connections

Set up RFC connections for use with Query, Table, BW Query, and SE37 Connectors.

## Create Connection

To set up a new RFC connection to your SAP environment, follow these steps:



1. Click the **Create** icon.
2. Populate the **Create Connection** dialog box with the following information:
    - **General Information**
        - **Connection Name**: Name chosen by Administrator
        - **Username**: SAP username
        - **Language**: Preferred language
        - **Smart Integration Connector Gateway**: Set up cloud servicer
        - **Client**: Number corresponding to the SAP client number
        - **Password**: SAP Password
        - **Client Protocol**: RFC or NWRFC used to connect to SAP instance
    - **Application Server**
        - **Host**: Your SAP host
        - **System**: Client System number
    - **Load Balancer (Optional)**
        - **Message Server (optional)**: Message servicer
        - **Group (optional)**: Group Logon
        - **System ID (SID) (optional)**: System ID
3. Click the **Save** button.
4. Click the **Test** button to verify if the connection was successful.

Edit or delete your connections at any time by selecting your connection and using the respective icons.

# Edit Connection

To edit a connection, follow these steps:

1. Select a connection from the list.
2. Click the **Edit** button.
3. Modify the information in the **Edit Connection** dialog box. See Create Connection to review connection fields.
4. Click the **Save** button.
5. To verify successful connection, select the connection and then click the **Test** button.

# Create Connector

After an RFC connection is established, create a connector using these steps:

1. Select the type of connector to create:

**Queries**: Executes queries that can be created by the SAP transactions **SQ02** and **SQ01**.

**Tables**: Reads SAP tables to display.

**BW (MDX)**: Executes MDX Query.

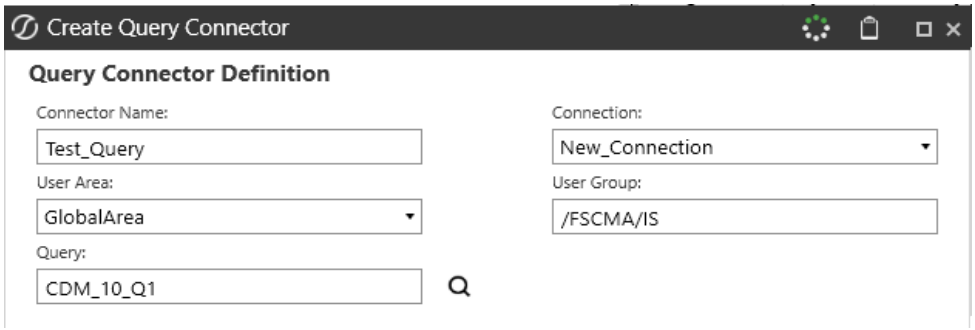
**SE37 CF**: Executes function modules.

2. Click a button to create the respective query.
3. Click the **Create** button.

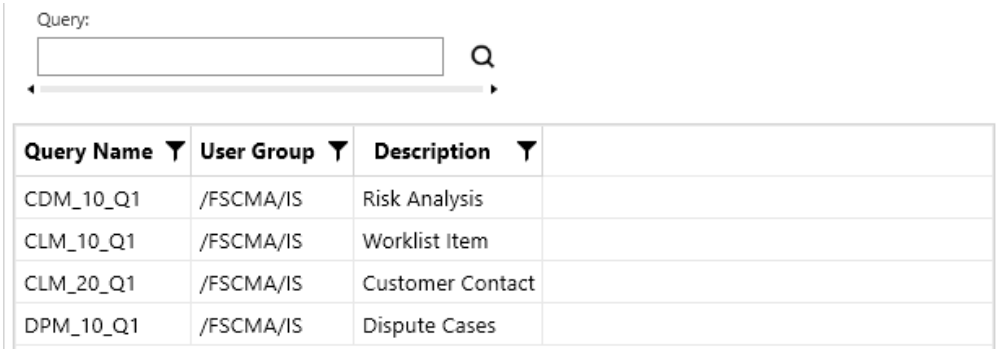
## Example Queries Connector

RFC Queries are used to perform predefined functions in SAP systems. This example walks through how to create a Queries Connector.

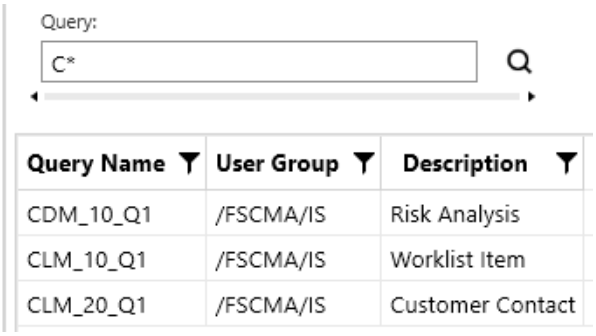
1. Click the **Queries** button.
2. Click the **Create** button.
3. In the **Create Query Connector** dialog box, populate the following fields:




- **Connector Name**: Preferred Name for the Connector.
- **User Area**: Select **GlobalArea** or **StandardArea**.
    - **GlobalArea**: The query objects of the global areas are cross-client objects.
    - **StandardArea**: All query objects are created and managed specifically for each client.
- **Query**: Enter the name of the query to connect to. If you are unsure, locate a query using one of the below options:
    - **Search Button**: Use the search button to open a grid of all available queries. Select any query from the grid to populate the Query field.



- **Search with Wildcard**: Locate a query using * as a wildcard and click the search button. For example C* would pull the following results:

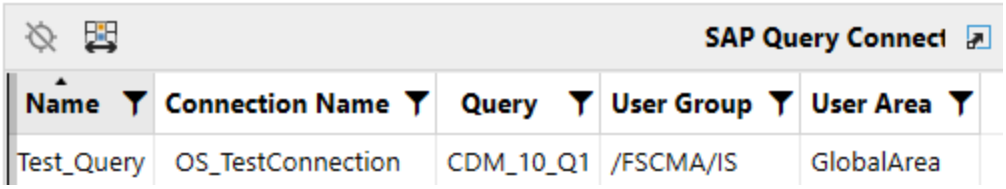



| Query Name | User Group | Description |
|---|---|---|
| CDM_10_Q1 | /FSCMA/IS | Risk Analysis |
| CLM_10_Q1 | /FSCMA/IS | Worklist Item |
| CLM_20_Q1 | /FSCMA/IS | Customer Contact |

> **NOTE:** Connection and User Area fields must be populated to search for a query.

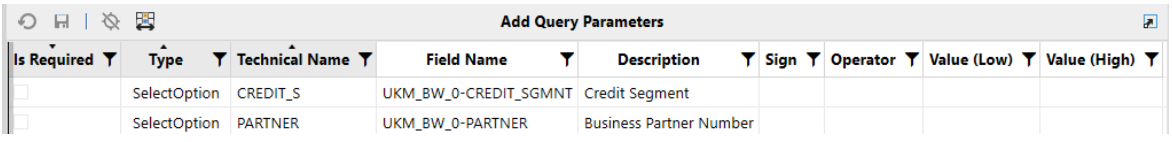
- **Connection**: Use the drop-down menu to select the RFC Connection to use for the query.
- **User Group**: Enter the name of user group the query is assigned to.

4. Click the **Save** button. When saved, the connector displays in the table.




| Name | Connection Name | Query | User Group | User Area |
|---|---|---|---|---|
| Test_Query | OS_TestConnection | CDM_10_Q1 | /FSCMA/IS | GlobalArea |

5. Select the Query to view specific parameters that the query expects to operate. In this example, the parameters include Sign, Operator, Value (Low), and Value (High).

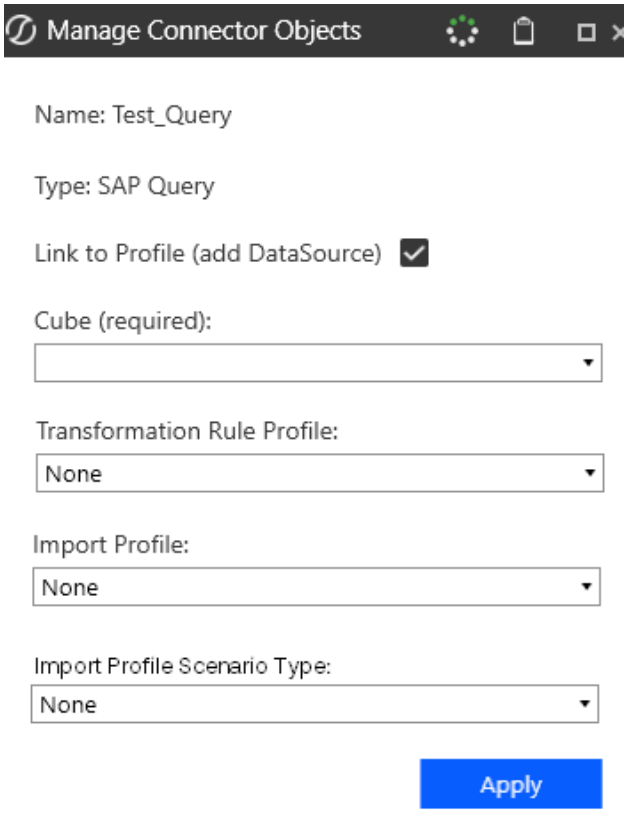



| Is Required | Type | Technical Name | Field Name | Description | Sign | Operator | Value (Low) | Value (High) |
|---|---|---|---|---|---|---|---|---|
| | SelectOption | CREDIT_S | UKM_BW_0-CREDIT_SGMNT | Credit Segment | | | | |
| | SelectOption | PARTNER | UKM_BW_0-PARTNER | Business Partner Number | | | | |

6. After the parameters are entered, click the **Preview** button to view all columns for the query connector. There is no row limit on the preview for query connectors.
7. When you are satisfied with the data the connector is pulling, click the **Manage Objects** button to write the business rule.

> **NOTE:** The business rule is created from a template and the given template adapts based on what type of connector that is being generated in SPC.

8. In the **Manage Connector Objects** dialog box, if you select **Link to Profile (add DataSource)**, it will create a data source, which prompts you to select a cube. The Transformation Rule Profile, Import Profile, and Import Profile Scenario Type fields are optional.



9. When done, click the **Apply** button to complete the creation of the business rule.

# Web API Connections

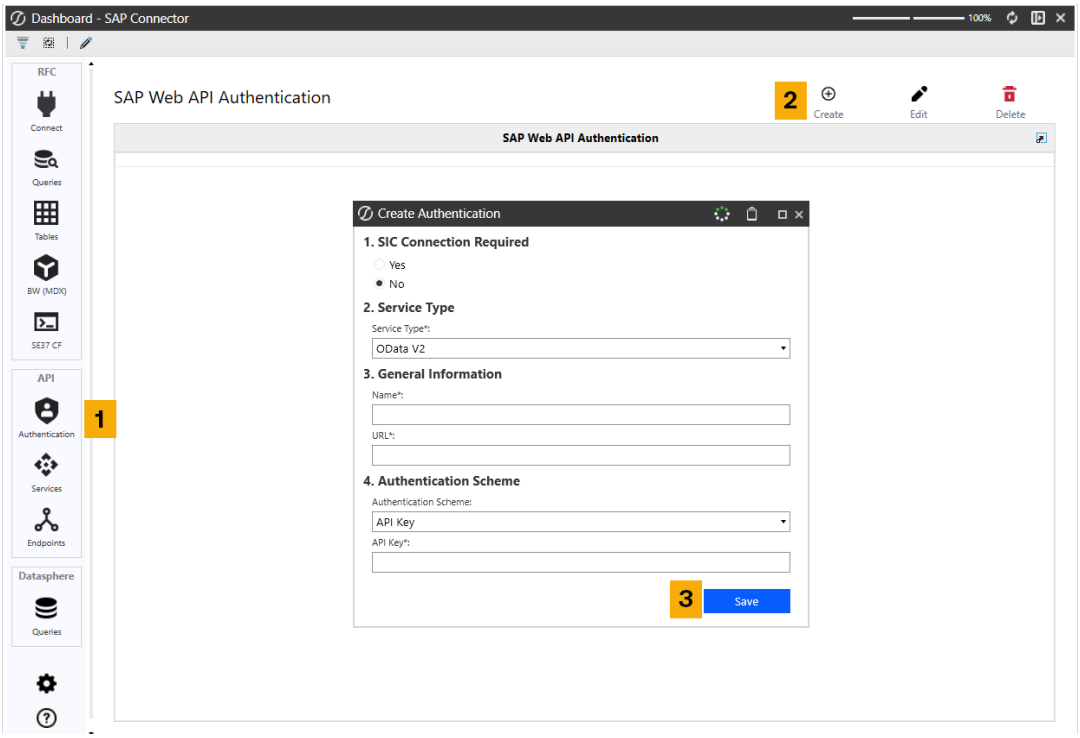
Set up a Web API authentication and create Web API Endpoint connectors using the guidelines outlined in this section.

## Web API Authentication

To connect with your SAP system, credentials will need to be provided to the SAP Connector depending on the type of SAP landscape and whether the system you are integrating with is accessible from the internet or behind a company firewall.

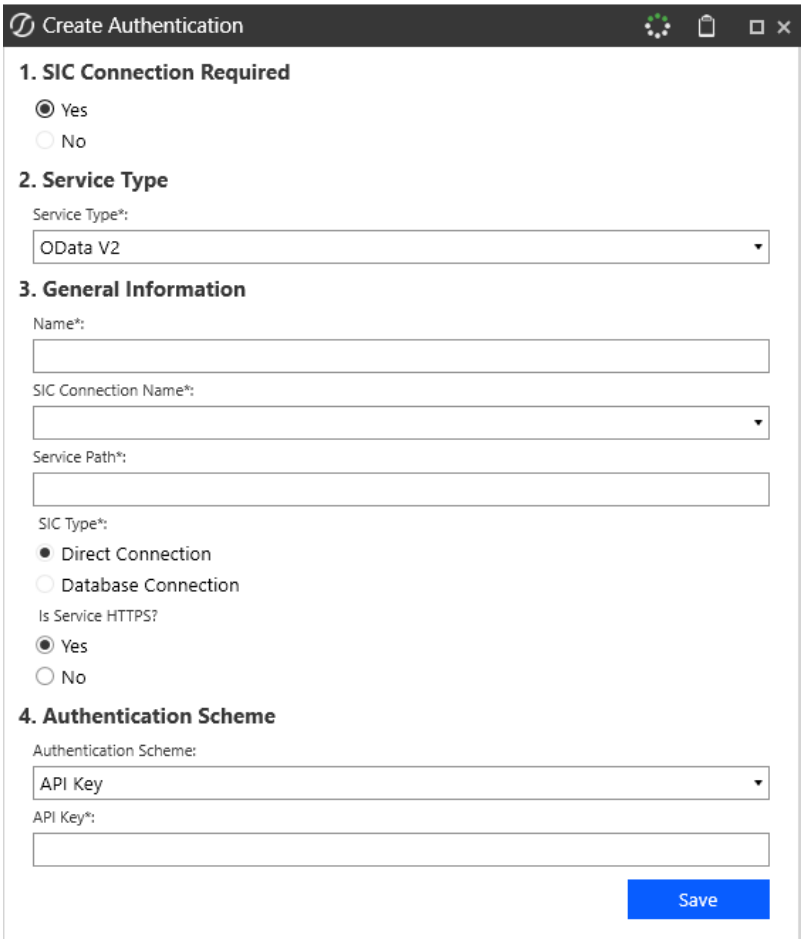
# Set up a New Authentication

To create a new authentication, follow these steps:




1. From the menu, click the **Authentication** button. The Web API Authentication table displays any existing authentications.
2. Click the **Create** button to open a dialog and populate the information.
3. When done, click the **Save** button.

# Create Authentication




## 1. SIC Connection Required

In the **Create Authentication** dialog box, you will be asked if a SIC connection is required:

- Choose **Yes** and you will be prompted to enter the following details in the General Information step:
    - **Name**: This name of the authentication.
    - **SIC Connection Name**: The name of the SIC Connection.
    - **Service Path**: The path used to connect OData services to the SAP gateway. This is typically formatted as: `/sap/opu/odata/sap/<service_name>`.
    - **SIC Type**: The type of connection, either Direct or Database connection. When you choose Database, you are prompted to enter the host. See Smart Integration Connector Terms to learn more about the Remote Gateway Host.
    - **Is Service HTTPS?**: Determines if http or https should be used when retrieving data. The default option is **Yes** which uses https. Select **No** to use http.

> **NOTE:** If you need to route around a firewall, select Yes.

- Choose **No** and you are prompted to enter a Name and URL in the General Information Step. This is the default selection when creating a new authentication.

## 2. Service Type

Use the **Service Type** drop-down menu to choose which service type you would like to use. Select either OData V2, which is the default, or OData V4. See Web API Services.

## 3. General Information

The fields in this section dynamically update based on your previous selection. Populate the respective fields.

> **NOTE:** For both Yes and No selections, only the Name field is required. However, leaving the other fields blank will prompt a warning.

## 4. Authentication Scheme

In the **Authentication Scheme** field, choose **Basic**, **OAuth 2.0**, or **API Key**.

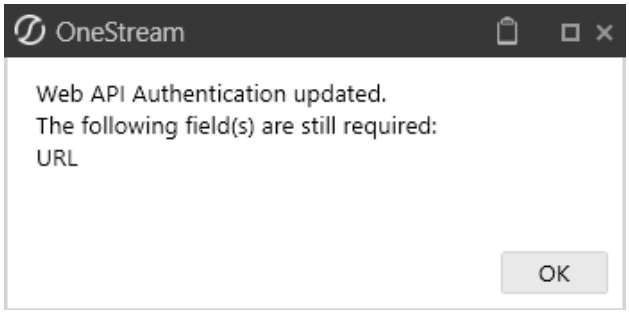
- Choose **Basic** and the Username and Password fields will populate, both of which are required. This is the default selection when creating a new authentication.
- Choose **OAuth2.0** and the following fields will display. All fields are required:
    - **Token Provider URL**: URL token provider required to make access token requests.
    - **Grant Type**: OAuth Grant Type.

      > **NOTE:** Currently the only supported Grant Type is "client_credentials".

    - **Client ID**: Unique identifier that identifies an application to the OAuth server.
    - **Client Secret**: Shared secret that authenticates an OAuth application to an authorization server.
    - **Scope**(optional): One or more scopes to request access to. For example, /.default.
    - **Authentication Method**: Determines how the credentials will be sent, either in the body or in the Basic Auth header.
- Choose **API Key** and the required API Key field will populate. When choosing Basic or OAuth2.0 authentication schemes, an optional API Key field will be included.

## Required Fields Note

- Naming your authentication is required. If saved without a name, you will be prompted to enter one.
- Authentications can be saved with only a name. However a dialog box will display indicating which required fields are missing.




- To establish a working connection, all required fields must first be filled out.
- When on the Endpoints page, selecting an Authentication Name that has been saved without all the required fields populated will generate an error indicating the authentication was not successful. It also indicates which required fields are still missing. You will not be able to progress beyond this step until the required fields have been filled out.

# Web API Services

Before creating a Web API Endpoint Connector, you must first define the OData services you want to connect with in the SAP Connector. OneStream supports the use of OData V2 and V4, increasing the flexibility of SAP Connector. The OData V2 services can be found here, and OData V4 here.

## Define Services

1. Click the **Insert Row** icon to create a new entry in the **API Service List** table.
2. Populate the following fields:
    - **Name**: Insert any unique name.
    - **Service**: The technical name of the OData service in your SAP system, contact your SAP administrator.
    - **Authentication**: The type of authentication for the specified service; either OData V2 or V4.
    - **SAP Client**: The identifier used to separate your SAP system into distinct business unites or entities. OneStream uses 100 as the default. You can choose to update this field to ensure your data is routing to the correct SAP client. Numbers can range from 000 to 999.
3. After adding one or more entries, click the **Save** button.

After creating Web API Endpoint Connectors, these entries will be available in the API Name drop-down menu.

# Test Services

This icon enables you to run a test of your connection to verify the service successfully reaches its destination.

To run a test, use these steps:

1. Select a service from the **API Service List**.
2. Click the **Test** button.

If successful, a dialog box will display this message: Service connection test successful. If the test fails, a dialog box will verify the test was unsuccessful and direct you to the Error Log to view additional details.

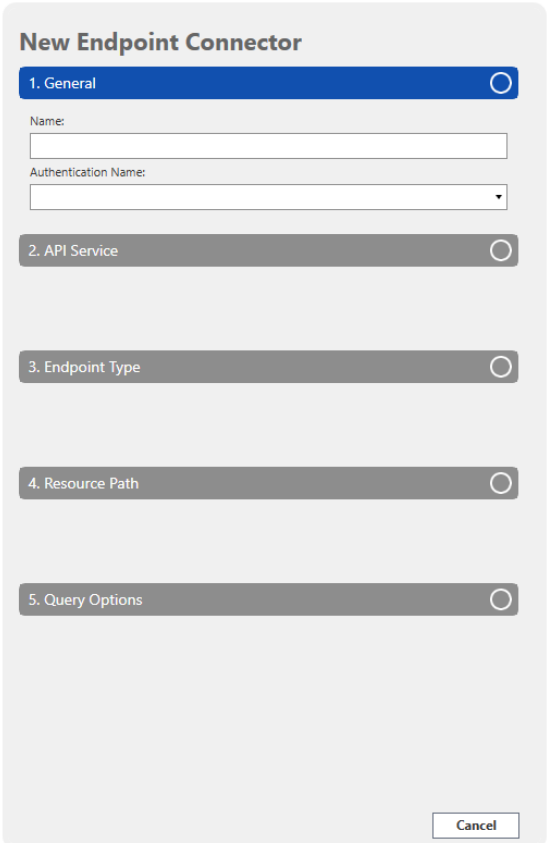
# Web API Endpoints

The Endpoints page displays the SAP Web API Endpoints table, which lists all existing endpoint connectors. Click the name of a connector to view editable details and make changes using the dynamic sidebar.

## Create a New Endpoint Connector

When you click the **Create** button, a dynamic sidebar opens. The dynamic sidebar is a component that appears after when creating a new endpoint connector or when you edit an existing endpoint connector. It guides you through the steps required to establish a successful endpoint connector and helps in understanding the S/4HANA Cloud API Reference Options. The active step header will be filled in blue while incomplete step headers remain gray. After a step is completed, the header will turn green.

> **NOTE:** The Create, Copy, Delete, Preview, and Manage Objects buttons will be grayed out and disabled during this process.




## 1. General

In the General section, populate the following fields:

- **Name**: Enter the name of your new endpoint connector.
- **Authentication Name**: Select from a drop-down menu. Options vary depending on the authentication created in the Authentication pane.

## 2. Service

In the Service section, use the **API Name** drop-down menu to select your API. Options vary depending on the selected Authentication. Contact your SAP Administrator for additional information.

## 3. Endpoint Type

In the Endpoint Type section, use the **Endpoint Type** drop-down menu to choose an endpoint type. Options vary depending on the selected API. View available endpoints for OData V2 and V4 using these links:

- OData V2 Endpoints
- OData V4 Endpoints

## 4. Resource Path

In the Resource Path section, use the drop-down menu to select a resource path. Options vary depending on the selected entity type. Learn more about resource paths for different endpoints using these steps:

1. Navigate to the respective OData Endpoint page on the SAP Business Accelerator Hub.
    - OData V2 Endpoints
    - OData V4 Endpoints
2. Choose an endpoint.
3. Click the **API Overview** tab.

## 5. Query Options

Fields displayed in this section are determined by previous dynamic selections.

## Set Select Values

1. Click the **Set Select Values** button to generate a dialog box showing all values in the Available Values pane.
2. Select one or more values and click the single arrow to move it to the **Selected Values** pane. To move all values, click the double arrow. The same functionality applies to moving values from the Selected pane to the Available pane.
3. Click the **Save** button to keep the changes and close the dialog box. Click **Cancel** to close the dialog box without saving any changes.

> **NOTE:** Set Select Values is required when using service type C_TrialBalance_CDS. This ensures that the balances are calculated for only the specified dimensions rather than all available dimensions. See Trial Balance on the SAP Help Portal.

## OneStream Parameter

When the connection has a date parameter, you have the option to use a OneStream parameter, known as a substitution variable. See Use Substitution Variables in Web API.

Choose one of the following:

- **Yes**: Enables the use of substitution variables in the text boxes. The date format must be YYYY-MM-DD. The connector will save even if the date format in the parameter is not valid, but you will see an error asking you to resolve the format.
- **No** (Default): Set the **Posting Date From** and **Posting Date To** fields using the integrated date picker.

## Filter

The **Filter** text field may be required, as indicated by an asterisk. The contents are added to the $filter parameter of the OData request, enabling you to filter your data on the SAP server, increasing performance. See $filter in SAP SuccessFactors API Reference Guide (ODataV2) and URI Conventions on OData.org.

Substitution Variables can be used. See Use Substitution Variables in Web API.

## Set Order By Values

This feature returns your data in ascending or descending order depending on your selection. If you don't make a selection, the default is empty and your data will not be sorted.

1. Click the **Set Order By Values** button to generate a dialog box showing all values in the Available Values pane. Each value is shown twice; once as [Value] and again as [Value desc]. Values with "desc" display your data in descending order while those without will show your data in ascending order. You cannot select both types of values.
2. Select one or more values and click the single arrow to move it to the **Selected Values** pane. To move all values, click the double arrow. The same functionality applies to moving values from the Selected pane to the Available pane.
3. Click **Save** to keep the changes and close the dialog box. Click the **Cancel** button to close the dialog box without saving any changes.

## Miscellaneous Parameters

The **Miscellaneous Parameters** field may be included and display values such as Company Code or Fiscal Year, depending on previous selections.

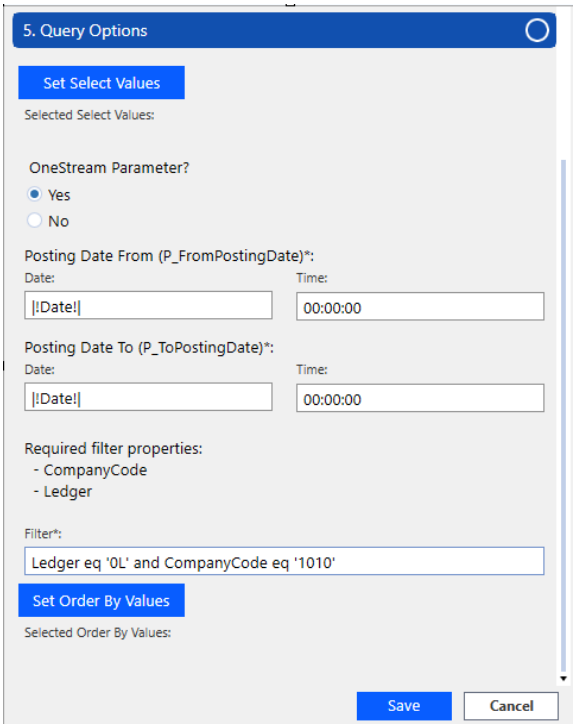
Click the **Save** button to save the endpoint connector and it will become a line item on the SAP Web API Endpoints table. If there are unsaved changes and the **Cancel** button is selected, you will be asked to confirm the cancellation. Click **Confirm** to close the sidebar. If Cancel is selected with no unsaved changes made, the sidebar will close without a confirmation pop-up.

### Custom Query Options

When your data includes custom query parameters, text fields become available where you can type the data to retrieve. After saving, the parameters you entered display in the Custom Query Options column in the SAP Web API Endpoints table.

## Use Substitution Variables in Web API

While creating a new connection or editing an existing connection, you can use substitution variables in the Query Options section to use dynamic values. Type your substitution variable syntax into the Filter text box using values that include parameters within OneStream. For example, |WFYear| or |!CustomParam!|. Save your connection and use the **Preview** button to see your substitution variables applied.




# Copy an Endpoint Connector

1. Select an existing endpoint connector from the table.
2. Click the **Copy** button. A dialog box will generate and ask for a new endpoint connector name to be entered.
3. Click the **Save** button and a new table item containing the same dynamic sidebar details will be created. Click **Cancel** to close the dialog box and no new endpoint connector will be created.

## Delete an Endpoint Connector

1. Select an existing endpoint connector from the table.
2. Click the **Delete** button and a confirmation dialog box will generate displaying the name of the connector you are deleting.
3. Click the **Delete** button to delete the endpoint connector from the table. Click **Cancel** to close the dialog box and the endpoint connector will remain on the table.

## Preview an Endpoint Connector

1. Select an existing endpoint connector from the table.
2. Click the **Preview** button to populate a data preview containing:
    - Total number of entries
    - All data columns in alphabetical order
    - 50 rows

## Manage Connector Objects

Manage Objects creates or updates a Connector Business Rule and, optionally, a Data Source for the selected connector.

> **NOTE:** Each time you edit an endpoint connector, you must regenerate the Connector Object, which creates a new business rule and, optionally a Data Source. The new business rule will overwrite the existing one.

To begin, use these steps:

1. Select a query from the table.
2. Click the **Manage Objects** button.
3. The **Manage Connector Objects** dialog box opens and displays the following information:
    - **Name**: The name of the selected query.
    - **Type**: The connection type of the selected query.
    - **Link to Profile (add DataSource)**: A checkbox determining if a the business rule, data source, or both will be created or updated. By default, the checkbox is cleared, which means only the Connector Business Rule will be created or updated.

      If you choose to select the checkbox, the Connector Business Rule and a Data Source will be created or updated. You will be prompted to populate the following fields:

        - **Cube**(required): The cube name for the newly created Data Source.
        - **Transformation Rule Profile**: Assigns the selected Transformation Rule Profile to the selected Import Workflow Profile.
        - **Import Profile**: Assigns the newly created Data Source to the selected Import Workflow Profile.
        - **Import Profile Scenario Type**: Creates the object using a specified scenario type.
4. When done, click the **Apply** button. The business rule is written.

## Connector Business Rule

In the generated Connector Business rule for your Endpoint Connector, you will find a predefined method called **BrowseSapWebAPI**. In this method, Parameters and Filters string variables are set and can be modified before pulling data for a given Endpoint Connector.

The initial values of these strings are determined by your Endpoint Connector configuration, and a comment is generated after each line showing the values of each variable.

- The Parameters variable must be a string of key value pairs where the key is the name of the OData parameter, and the value is the value of the OData parameter using OData's data type syntax.
- The Filter variable must adhere to OData's filter syntax. Examples of Parameter and Filter transformations are provided in the comments.

Any changes to the Parameter and Filter variables can be made in the body of the BrowseSapWebAPI method. In the return statement you will see that connectorController.BrowseSapWebAPI is called, taking the Parameters and Filters strings set earlier in the method. The object, connectorController, integrates with the SAP Connector Workspace Assembly to facilitate your SAP connection.

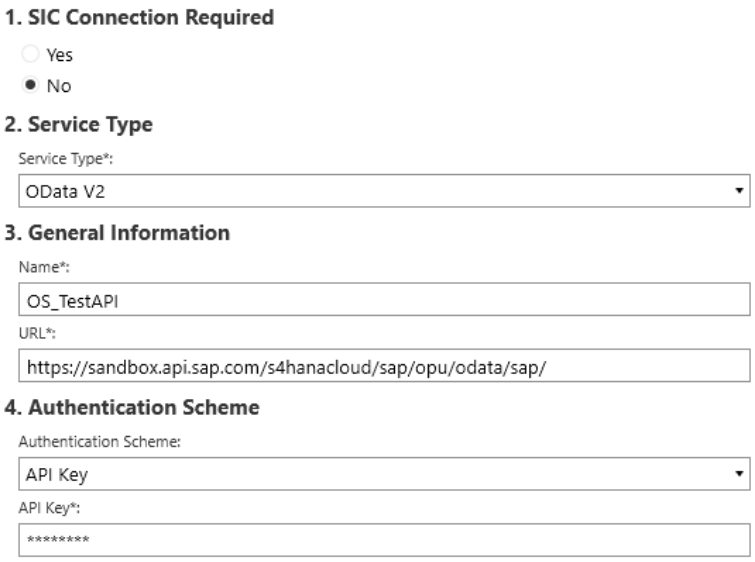
# Example Web API Endpoint

This example walks you through how to create a Web API Endpoint.

## Authentication

Before creating an endpoint, you will first need to set up an authentication for your Web API.

1. From the menu, click the **Authentication** button. The Web API Authentication table displays any existing authentications.
2. Click the **Create** button to open a dialog box. Populate the required fields:




- SIC Connection
- Service Type, either OData V2 or V4
- Name
- URL
- Authentication Scheme and associated details

  See Create Authentication for details on these fields.

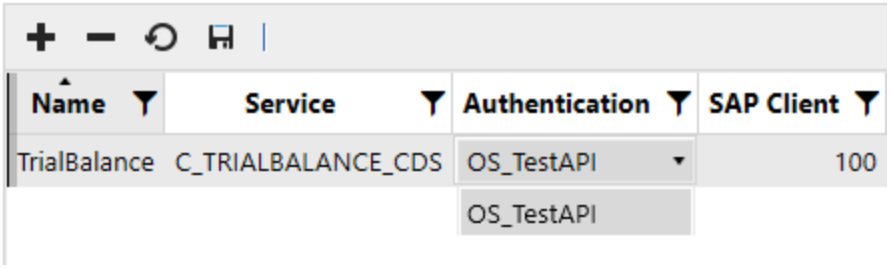
3. When done, click the **Save** button.

# Services

## Setup

After you create your authentication, you must set up the Web API Services.

1. From the menu, click the **Services** button. The API Service List table displays all existing services that you have configured.
2. Click the **Insert Row** button and populate the Name, Service, and Authentication fields. The Authentication field drop-down will display a list of the authentications you have created in SAP Connector. Additionally, you can update the default value of 100 in the SAP Client field if needed to ensure your data is routing to the correct SAP client.




### Test

Verify if your service is reaching SAP successfully using the Test button.

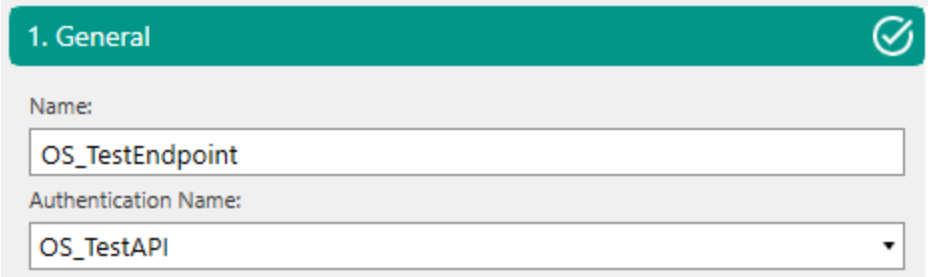
1. Select your connection from the API Services table.
2. Click the **Test** button.

## Endpoints

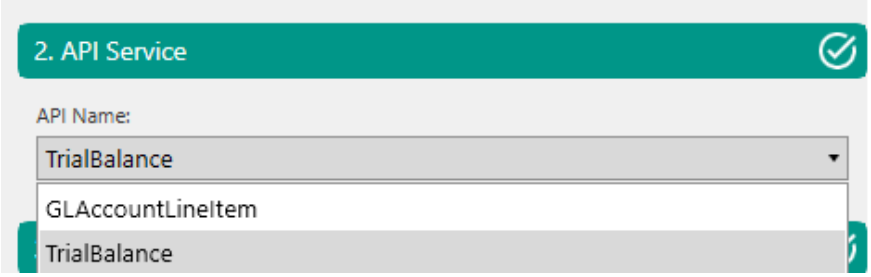
You can now set up your endpoints.

1. From the menu, click the **Endpoints** button. Previously created endpoints display in the SAP Web API Endpoints Table.
2. Click the **Create** button to open the dynamic sidebar.

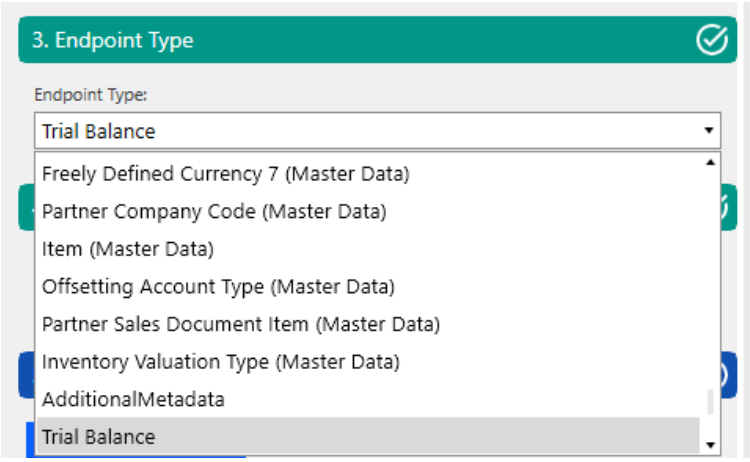
3. In the General step, enter a Name for the endpoint and choose an Authentication from the Authentication Name drop-down menu.



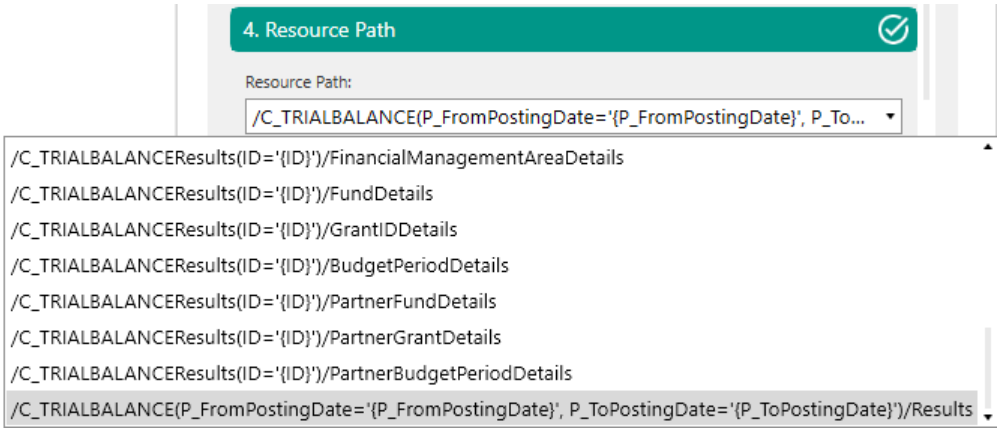

4. Use the **API Service** step to select an API Name from the drop-down menu. Options displayed are pulled from the services set up in the Web API Services page.




5. For **Endpoint Type**, use the drop-down menu to select from the list of available endpoints. Options displayed dynamically update from previous selections. See 3. Endpoint Type.

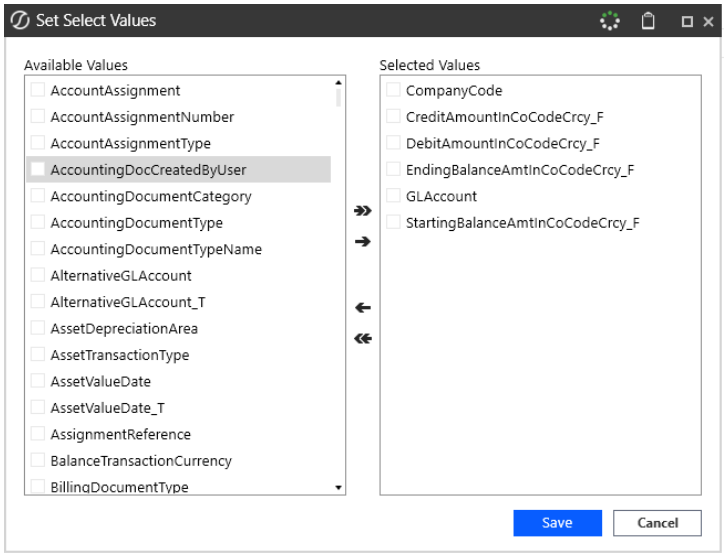



6. Use the **Resource Path** drop-down menu to select the applicable path. See 4. Resource Path.

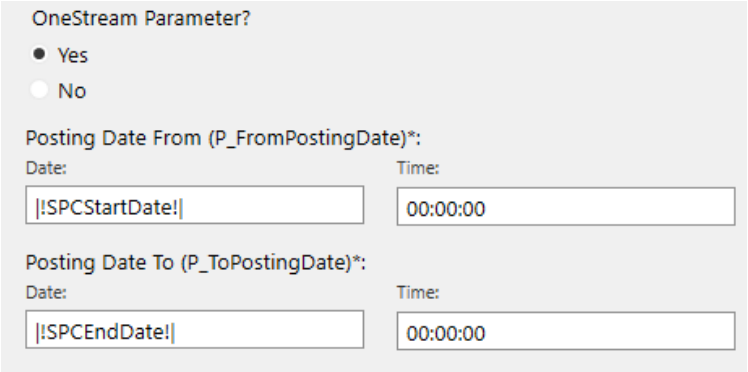



7. Populate the final **Query Options** step, which includes the following fields:

- **Set Select Values**: Optionally, click the **Set Select Values** button to choose which data points to include. If you skip this step, all values are included.

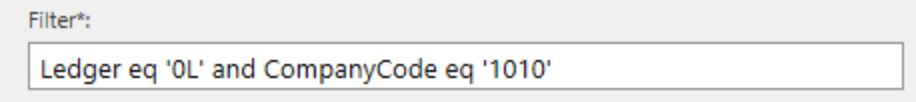



- **OneStream Parameter**: If your data has a date parameter, optionally enable the **OneStream Parameter?** setting. See Use Substitution Variables in Web API.




If you select no, you can set your dates using the integrated date picker to choose your posting date.

- **Filter Text**: Populate the **Filter** text field, if applicable. Content you add will be used to filter your data using the SAP server, increasing your performance.




- **Set Order By Values**: Optionally, click the **Set Order By Values** button to choose to display your data in ascending or descending order. If you do not make a selection, your data will not be sorted. See Set Order By Values.

8. Click the **Save Connector** button.

## Connector Objects

Create a Connector Business Rule and, optionally, a Data Source for you connector.

1. Select your connection on the SAP Web API Endpoints table.
2. Click the **Manage Objects** button.
3. Optionally choose to **Link to Profile (add DataSource)**. If enabled, use the drop-down menus to choose your Cube, Transformation Rule Profile, Import Profile, and Import Profile Scenario Type.
4. Click the **Apply** button to create your business rule.

You have now successfully set up a Web API Authentication, Service, and Endpoint Connector.

# Datasphere Connections

Set up Datasphere connections to enable users assigned to a space to access the connected source or target for data modeling using SQL queries.

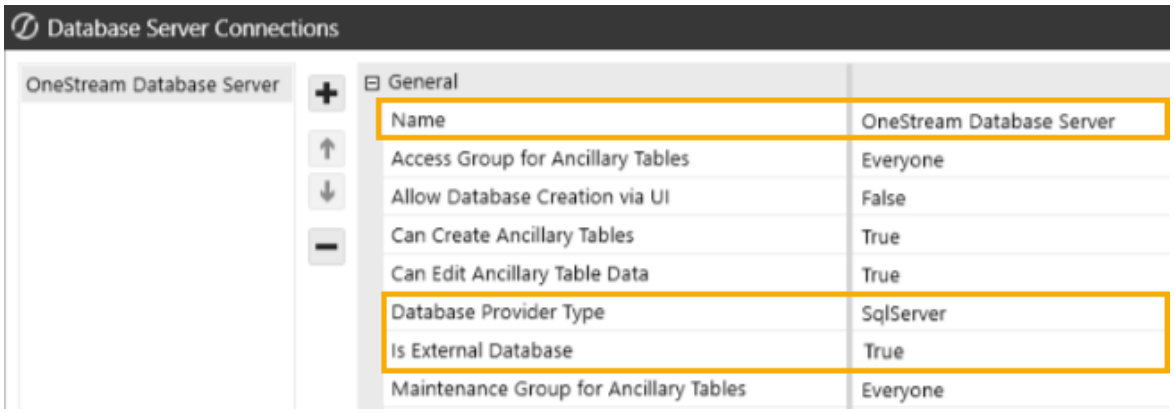
# Create Connection

## OneStream Application Server

To set up a new Datasphere connection, you must create an external database connection using the OneStream Server Configuration. To create a connection to your SAP environment, follow these steps:

1. Locate the OneStream folder on your computer where the installation files are housed.
2. Open the **XFServerConfig.exe** file. This file is helpful when editing XML configurations.
3. In the **OneStream Server Configuration** dialog box, click **File** > **Open Application Server Configuration File**.
4. Locate the configuration file using File Explorer, select it, and click the **Open** button. The file will open and display a list of available settings.
5. In the configuration file, find **Databases** > **Database Server Connections** setting. Click the **ellipsis** to open the Database Server Connection dialog box.
6. The **Database Server Connection** dialog opens and displays the standard OneStream Database Server settings. The **+** icon enables you to add a new connection. Click the **+** button to add a new connection.

7. In the **General** category, set these fields:




   - **Name**: Enter a name for your connection.
   - **Database Provider Type**: Use the drop-down menu to choose SQLServer.
   - **Is External Database**: Set to **True**.

8. In the **Connection String Settings** category, use the **Connection String** field to enter the connection string of the database you plan to use.

   **Example:**
   ```
   Data Source=localhost;Initial Catalog=DatasphereDatabase;Integrated Security=False;User ID=TestUser;Password=TestPassword;Encrypt=False;
   Trust Server Certificate=True
   ```

9. Click the **Save** button.
10. Restart IIS and open OneStream SAP Connector.
11. Click the Datasphere **Queries** button and use the **Connection** drop-down menu to view your connection.

12. Repeat for all connections you want to create.

### Database Connections with Smart Integration Connector

You can also set up your database connection using Smart Integration Connector. To learn more, See "Installation and Setup" section of the *Smart Integration Connector Guide*.

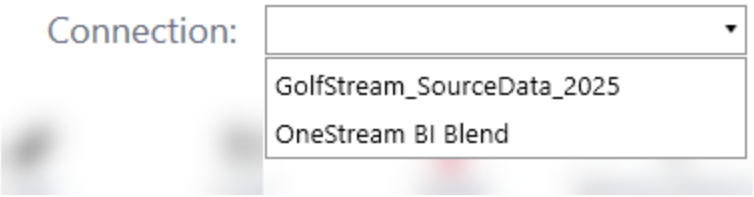
- ODBC Data Provider
- Define Custom Database Connections in OneStream System Configuration Setup

# Datasphere Queries

Navigate to the Datasphere Queries page using the Queries icon.

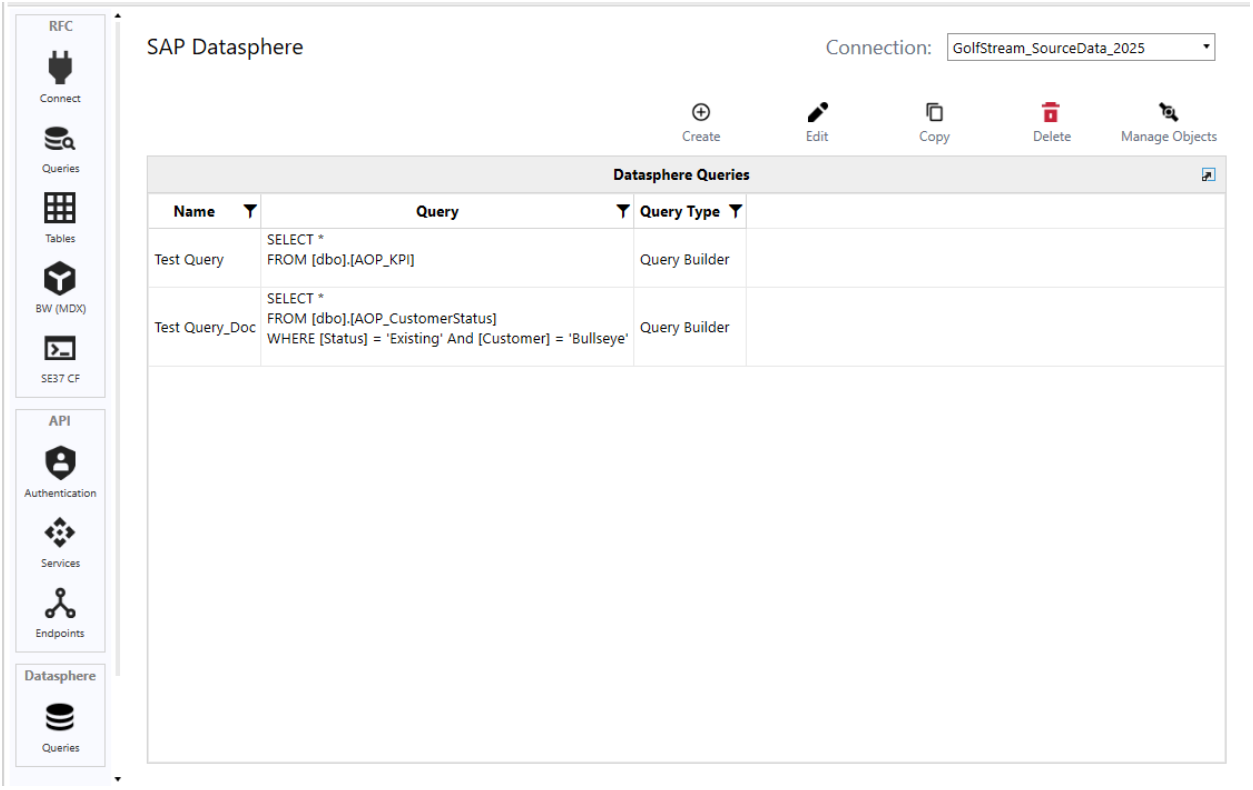
**Queries**: Enables you to write SQL queries manually or using the SQL Query Builder.

The Datasphere Queries home page displays a table listing all existing Datasphere queries. View available queries by first choosing a Connection from the **Connection** drop-down menu.

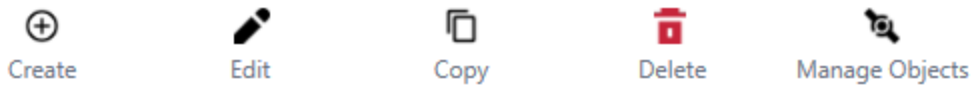



The Datasphere Queries table displays these columns:

- **Name**: The name of the query.
- **Query**: The full SQL query in text form.
- **Query Type**: Displays how the query was created and saved. The values will display either Query Builder or Manual.




Select any query from the table to view editable details and take the following actions:



- **Create**: Write a query manually or using the SQL Query Builder. See Create a New Query.
- **Edit**: Modify an existing query. See Edit a Query.
- **Copy**: Make a copy of the selected query. See Copy a Query.
- **Delete**: Remove the selected query from the table and from SAP Connector. See Delete a Query.
- **Manage Objects**: Create or update a Connector Business Rule and, optionally, a Data Source for the selected connector. See Manage Connector Objects.

## Create a New Query

> **IMPORTANT:** When creating or editing queries, the performance of SAP Connector highly depends on the efficiencies of your underlying tables in your SAP environment.

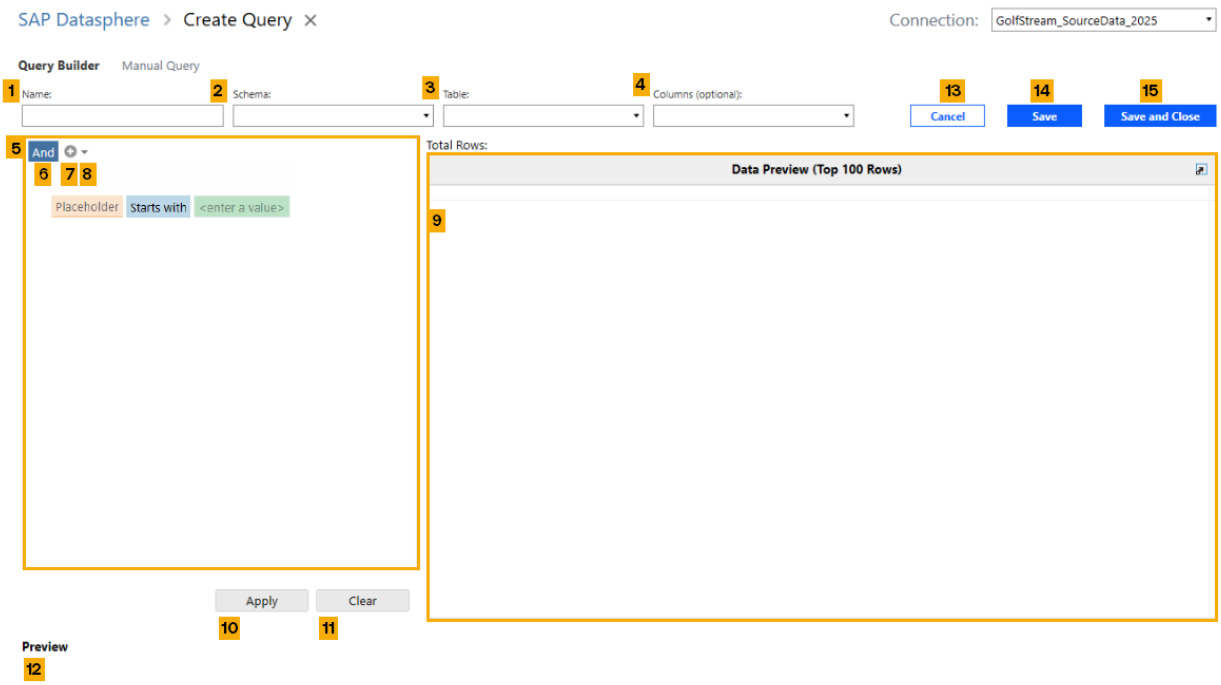
After you have linked your external database connection, use these steps to create a new query:

1. On the SAP Datasphere page, use the **Connection** drop-down menu to select the connection you want to query from.
2. Click the **Create** button.
3. In the **Create Query** page, select either:
    - **Query Builder** (Default): Choose this option to be guided through your query creation. See Query Builder.
    - **Manual Query**: Choose this option to write your own SQL query. See Manual Query.

> **NOTE:** The Create, Copy, Delete, and Manage Objects buttons will be unavailable during this process.

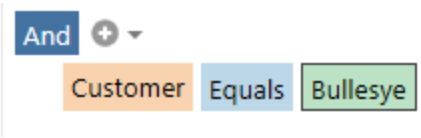
## Query Builder

The Query Builder streamlines your SQL query building process, enabling you to write accurate and successful SQL queries. By default, when you click the Create button, the Create Query page opens and the Query Builder displays. It consists of the following components:




1. **Name**: A text box for you to enter a name for your query.
2. **Schema**: A drop-down menu displaying available schemas in the connection.
3. **Table**: A drop-down menu where you can choose a table to pull. Tables displayed are pulled from the selected connection and function as the FROM clause in your SQL query syntax. After you select a table, a preview of the data displays in the query builder. The column names of the table are the values used to dynamically populate various drop-down menus in the builder.

4. **Columns** (optional): Use this multi-select drop-down menu to choose the columns to include in your query. When left blank, the SQL preview defaults to "*", and all columns in the chosen table are included.
5. **Filter Editor**: Use this area to build your query using booleans and conditions. When you add a condition, the following drop-downs display:




   - **Column drop-down**: Shown in orange, this the first drop-down menu. Use it to select a column header.
   - **Operator drop-down**: Shown in blue, this is the second drop-down menu. Use it to select an operator. The Query Builder uses the following operators, which dynamically change based on your data:
     - Equals
     - Does not equal
     - Is greater than
     - Is greater than or equal to
     - Is less than
     - Is less than or equal to
     - Is null
     - Is not null
     - Is between
     - Is not between

- Contains
- Does not contain
- Starts with
- Ends with
- Is like
- Is not like
- Is blank
- Is not blank

- **Value drop-down**: Shown in green, this is the third drop-down menu. Use it to select an available value. The options displayed dynamically update based on your Column drop-down selection.

6. **Booleans or Logical Connectives**: Use this drop-down menu of available booleans when writing your SQL query. Options include:
    - And
    - Or
    - Not and
    - Not or
7. **+ Icon**: Click the + button to add a condition to the Filter Editor.
8. **Add Conditions/Add Group/Add Custom Expression Drop-Down**: Use the drop-down arrow to select from the following options:

- **Add Condition**: An alternative to the + icon, select Add Condition to add another filter criteria to your query.
- **Add Group**: Select Add Group when you want to use a boolean operator on more than one condition. Adding a group indents the boolean and begins a new group where you can add one or more conditions to the boolean.
- **Add Custom Expression**: This is another method of manually entering a query. When you choose this option, the Expression Editor dialog box displays where you can choose columns, constants, and operators. After you make a selection, the values for each are displayed next to it.

> **IMPORTANT:** OneStream does not recommend using Add Custom Expression feature in the SQL Query Builder. Instead, you should use the Manual query page. See Manual Query.

Conditions in the Query Builder represent the WHERE clause in your SQL query. This clause enables you to filter rows by selecting only those containing the values you selected in the specified column.

> **TIP:** Conditions are stacked on top of one another in Platform Version 8.4 rather than below one another. We recommend identifying which booleans to use in advance and building out condition groups first to streamline query creation and accommodate for this type of stacking.

9. **Data Preview**: This area displays the filtered results of your query, in table form, after you hit the Apply button. The preview only displays the top 100 records.
10. **Apply**: Click this button to apply the query criteria. This enables you to view your query results dynamically in the Data Preview.
11. **Clear**: Click this button to clear all criteria from the filter builder area and start again.

12. **Preview**: After you click the Apply button, a preview of your SQL query, in text form, displays.
13. **Cancel**: Exit the Create Query page. Unsaved changes will be lost.
14. **Save**: When clicked, your query will be saved and you remain on the Create Query page.
15. **Save and Close**: When clicked, the query will save and you will return to the Datasphere Queries page.

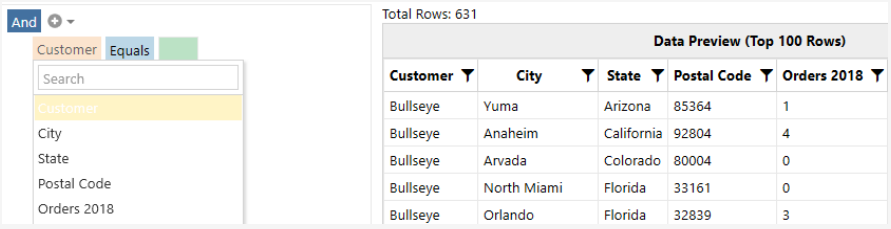
## Use the Query Builder

> **IMPORTANT:** If you write your query using the Query Builder, you can switch to the Manual Query page to continue writing your query manually. Edits made in the Manual Query page do not transfer back to the Query Builder page.

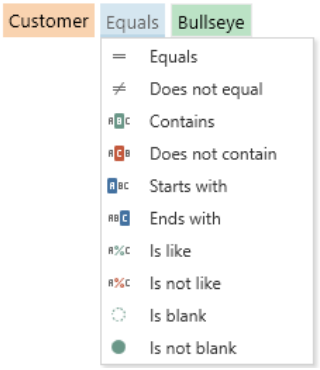
To use the Query Builder, follow these steps:

1. In the **Name** field, enter a name for your query.
2. Use the **Schema** drop-down menu to choose an available schema from the selected connection.
3. In the **Table** drop-down menu, select a table to query.
4. Optionally, use the **Columns** drop-down to multi-select the columns to include in your query. This narrows the scope of your query to start, but it is not required.
5. To add a condition, click the **+** button or the **down arrow** to use the drop-down menu to choose either Add Condition or Add Group.
6. In the Filter Editor, use **Column** drop-down menu to select the column header name. The options listed are pulled from the column headers of the table you selected. Your selection specifies which column you are looking to retrieve a specified value from.

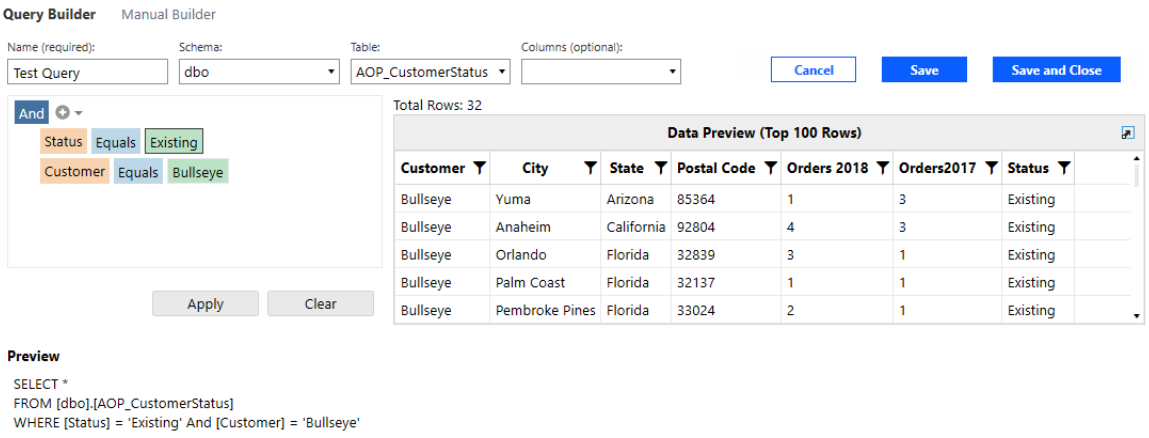
**Example:** Options displayed in the Column drop-down are identical to the column headers in the table preview.



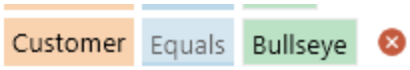

7. Use the **Operator** drop-down menu to select an operator.




8. Use the Value text field to enter the value you want to retrieve from the selected column in the table. The value must match one of the values in the column you selected.
9. Click the **Apply** button to update the grid preview and your SQL text query.
10. Continue adding booleans and conditions until you are satisfied with your query, using the Apply button as needed.




11. Remove any condition by hovering and clicking the **X** button next to the condition.

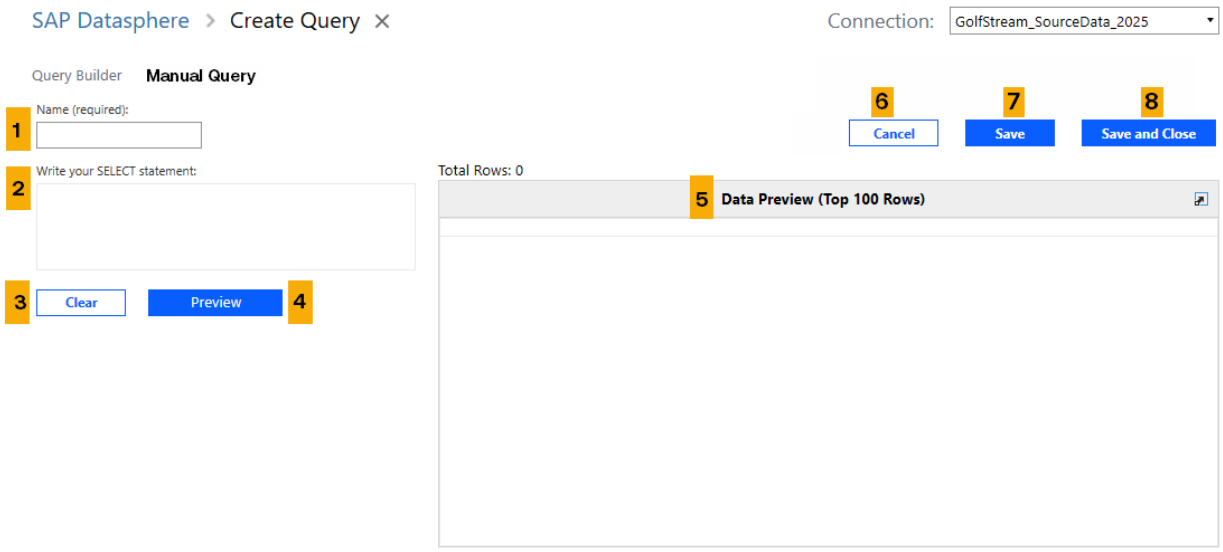



12. When done, perform any of the following actions:

    - Click the **Save** button to save your query to the Datasphere Queries table.
    - Click the **Save and Close** button to save your query and return to the Datasphere Queries page.
    - Click the **Cancel** button to exit the Query Builder page without saving.
    - Click the **Clear** button to clear your query and start again.

## Manual Query

If you prefer to manually write your SQL query, use the **Manual Query** page, which displays the following components:




The Manual Query tab consists of the following components:

1. **Name**: A text box to enter a name for your query.
2. **Write your SELECT statement**: A text box to enter your SQL query.
3. **Clear**: Click this button to clear your SELECT statement and start again.
4. **Preview Button**: Click this button to view a preview of your data in grid form.

   > **NOTE:** Only valid queries will render a preview.

5. **Data Preview**: This area displays the filtered results of your query, in grid form, after you hit the Preview button. The preview only displays the top 100 records.
6. **Cancel**: Exit the Create Query page. Unsaved changes will be lost.
7. **Save**: When clicked, your query will be saved and you remain on the Create Query page.
8. **Save and Close**: When clicked, the query will save and you will return to the Datasphere Queries page.

## Use the Manual Query Page

> **IMPORTANT:** If you begin writing your query manually and switch to the Query Builder tab, your query remains in the Manual Query tab, but the contents do not transfer to the Query Builder tab.

To write the query, use these steps:

1. In the **Name** field, enter a name for your query.
2. In the text box below **Write your SELECT statement manually**, write your query. OneStream recommends referring to the list of suggested logical connectors and operators when writing your query. See Suggested Booleans and Suggested Operators.
3. Click the **Preview** button at any time to preview the results of your query.

   > **NOTE:** Only valid queries will render a preview.

4. When done, click the **Save Query** button to save your query to the Datasphere Queries table. Click the **Cancel** button to exit the **Manual Query** page without saving.

**Suggested Booleans**

- And
- Or
- Not and
- Not or

**Suggested Operators**

| Operator | Description |
|---|---|
| + | Addition |
| - | Subtraction |
| * | Multiplication |
| / | Division |
| AND | Logical conjunction |
| OR | Logical disjunction |
| NOT | Logical negation |
| \| \| | Concatenation |
| < | Less than |
| > | Greater than |
| = | Equal |
| != | Not equal |
| <= | Less than or equal |
| >= | Greater than or equal |

| Operator | Description |
|---|---|
| LIKE | Value similar to |
| IS NULL | Value does not exist |
| BETWEEN | Value between two other values |
| ( ) | Parentheses |

## Edit a Query

Modify any query using the Edit Query button:

1. On the Datasphere Queries page, use the **Connection** drop-down menu to select the connection you want to query from.
2. Select a query from the table and click the **Edit** button.
3. The **Edit Query** page opens. If the selected query was built using the Query Builder, your query preview displays in the Query Builder tab. If the query was built manually, your query preview displays in the Manual Query tab.
4. Make updates to your query as needed. When editing, keep in mind the following:
    - Queries created using the Query Builder can be updated using the Manual Query tab, but will then be saved as a manual query.
    - Queries created manually cannot be edited with the Query Builder. A new query will need to be created.

- If a query was created using the Query Builder, then edited manually, the edits will not transfer to the Query Builder tab when toggling back.

5. When done, click the **Save** button to save your changes.

## Copy a Query

1. Select an existing query from the table.
2. Click the **Copy** button. A dialog box will generate and ask for a new query name to be entered.
3. In the **Copy Query** dialog box, use the **Name** text box to enter a name.
4. Click the **Save** button. A new table item with the same details as the selected query will display. Click **Cancel** to close the dialog box and no new query will be created.

## Manage Connector Objects

Manage Objects creates or updates a Connector Business Rule and, optionally, a Data Source for the selected connector.

> **NOTE:** Each time you edit a query, you must regenerate the Connector Object, which creates a new business rule and, optionally, a Data Source. The new business rule will overwrite the existing one.

To begin, use these steps:

1. Select a query from the table.
2. Click the **Manage Objects** button.
3. The **Manage Connector Objects** dialog box opens and displays the following information:

- **Name**: The name of the selected query.
- **Type**: The connection type of the selected query.
- **Link to Profile (add DataSource)**: A checkbox determining if a business rule, data source, or both will be created or updated. By default, the checkbox is cleared, which means only the Connector Business Rule will be created or updated.

  If you choose to select the checkbox, the Connector Business Rule and a Data Source will be created or updated. You will be prompted to populate the following fields:

  - **Cube** (required): The cube name for the newly created Data Source.
  - **Transformation Rule Profile**: Assigns the selected Transformation Rule Profile to the selected Import Workflow Profile.
  - **Import Profile**: Assigns the newly created Data Source to the selected Import Workflow Profile.
  - **Import Profile Scenario Type**: Creates the object using a specified scenario type.

4. When done, click the **Apply** button. The business rule is written.

# Help and Miscellaneous Information

Access the help documentation.

## Display Settings

OneStream Platform and Solutions frequently require the display of multiple data elements for proper data entry and analysis. Therefore, the recommended screen resolution is a minimum of 1920 x 1080 for optimal rendering of forms and reports.

## Package Contents and Naming Conventions

The package file name contains multiple identifiers that correspond with the platform. Renaming any of the elements contained in a package is discouraged in order to preserve the integrity of the naming conventions.

**Example Package Name:** `SPC_PV8.4.0_SV110_PackageContents.zip`

| Identifier | Description |
|---|---|
| SPC | Solution ID |

| Identifier | Description |
|---|---|
| PV8.4.0 | Minimum Platform version required to run solution |
| SV1.1.0 | Solution version |
| PackageContents | File name |

# Solution Database Migration Advice

A development OneStream application is the safest method for building out a solution with custom tables such as this one. The relationship between OneStream objects, such as workflow profiles and custom solution tables, is that they point to the underlying identifier numbers and not the object names, as seen in the user interface. Prior to the solution configuration and to ensure the identifiers match within the development and production applications, the development application should be a recent copy of the production application. After the development application is created, install the solution and begin design. The following process will help migrate the solution tables properly.

See "Managing a OneStream Environment" in the *Design and Reference Guide*.

1. In the production OneStream application, install the solution and create the data tables. See Configure the OneStream Application Server for Database Server Connection settings and installation details.
2. Data tables are created in the OneStream Development application during the solution installation. Using the Microsoft Data Migration Assistant, copy the data from the tables to the Production Microsoft SQL Server Database. Only the Microsoft SQL Administrator should run the migration assistant.

> **IMPORTANT:** This process may overwrite existing table data in the production application database if data already exists.

# OneStream Solution Modification Considerations

A few cautions and considerations regarding the modification of OneStream Solutions:

- Major changes to business rules or custom tables within a OneStream Solution will not be supported through normal channels as the resulting solution is significantly different from the core solution.
- If changes are made to any dashboard object or business rule, consider renaming it or copying it to a new object first. This is important because if there is an upgrade to the OneStream Solution in the future and the customer applies the upgrade, this will overlay and wipe out the changes. This also applies when updating any of the standard reports and dashboards.
- If modifications are made to a OneStream Solution, upgrading to later versions will be more complex depending on the degree of customization. Simple changes such as changing a logo or colors on a dashboard do not impact upgrades significantly. Making changes to the custom database tables and business rules, which should be avoided, will make an upgrade even more complicated.