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# Open Data Protocol (OData)

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## DOCUMENT ACCESS

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# Open Data Protocol (OData)

*Estimated time to read: 7 minutes*

Open Data Protocol (OData) is an "open" application-level protocol for interacting with data via RESTful APIs. It supports the description of data models, and the editing and querying of data according to those models, in a simple and standard way.

This document will provide a quick guide for the configuration of an OData data source to easily retrieve MES data that can be used for advanced analysis in external tools.

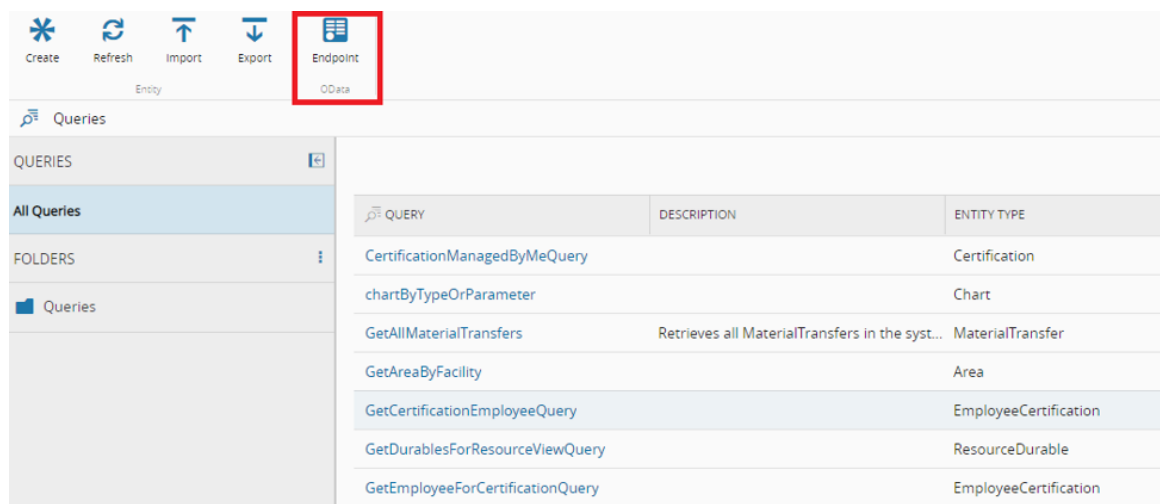
## Overview

OData is a widely accepted standard that is supported by Analytics tools such as Microsoft Excel, Microsoft Power BI, Tableau, QlikView among many others. To provide easy interoperability, and provide quick and simple access to MES data, which can then be used for any sort of user advanced analysis (and dashboards), starting on version 8.0, all MES queries are exposed under an OData API.

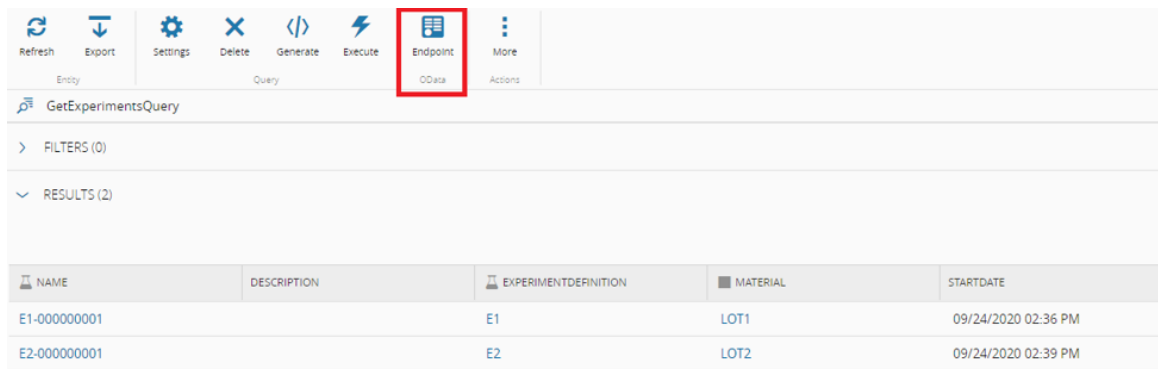
## Configuration

First of all, if the required data is not already covered by an existing MES Query, you should create a new one in the MES. More information can be found in the [Queries](#) section of the User Guide.

You can select the **Endpoint** button on the top ribbon in either the main **Queries** page or a specific **Query** page and get the specific endpoint for the OData API:

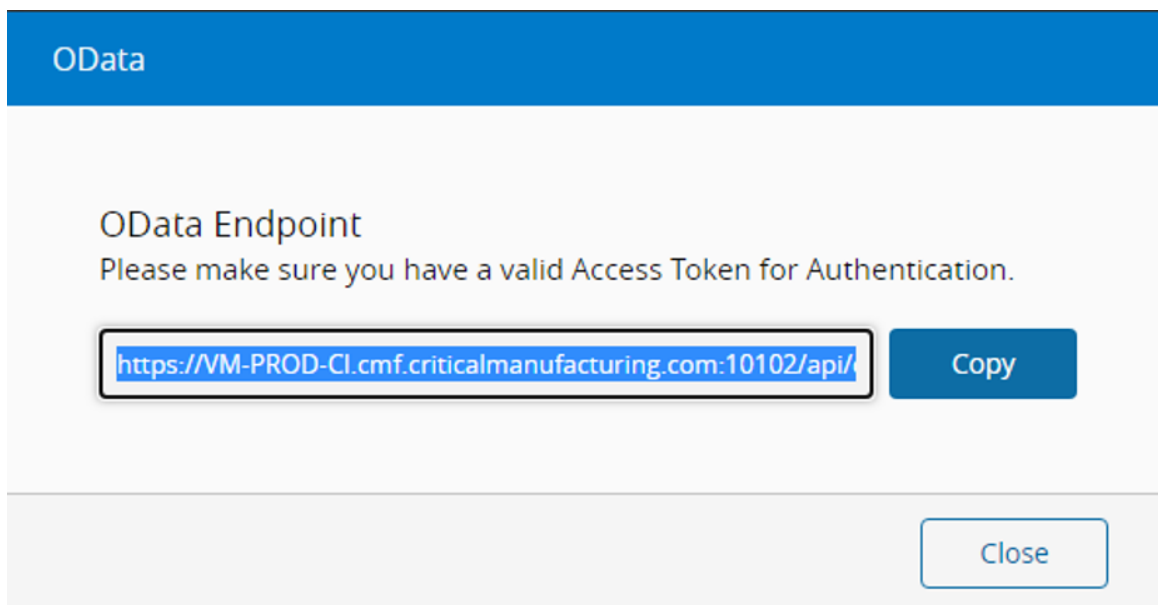


QUERY	DESCRIPTION	ENTITY TYPE
CertificationManagedByMeQuery		Certification
chartByTypeOrParameter		Chart
GetAllMaterialTransfers	Retrieves all MaterialTransfers in the syst...	MaterialTransfer
GetAreaByFacility		Area
GetCertificationEmployeeQuery		EmployeeCertification
GetDurablesForResourceViewQuery		ResourceDurable
GetEmployeeForCertificationQuery		EmployeeCertification



NAME	DESCRIPTION	EXPERIMENTDEFINITION	MATERIAL	STARTDATE
E1-000000001		E1	LOT1	09/24/2020 02:36 PM
E2-000000001		E2	LOT2	09/24/2020 02:39 PM

In either situation, a new wizard will open with an option to copy the endpoint URL and use it when configuring the access on the external tool.



**OData**

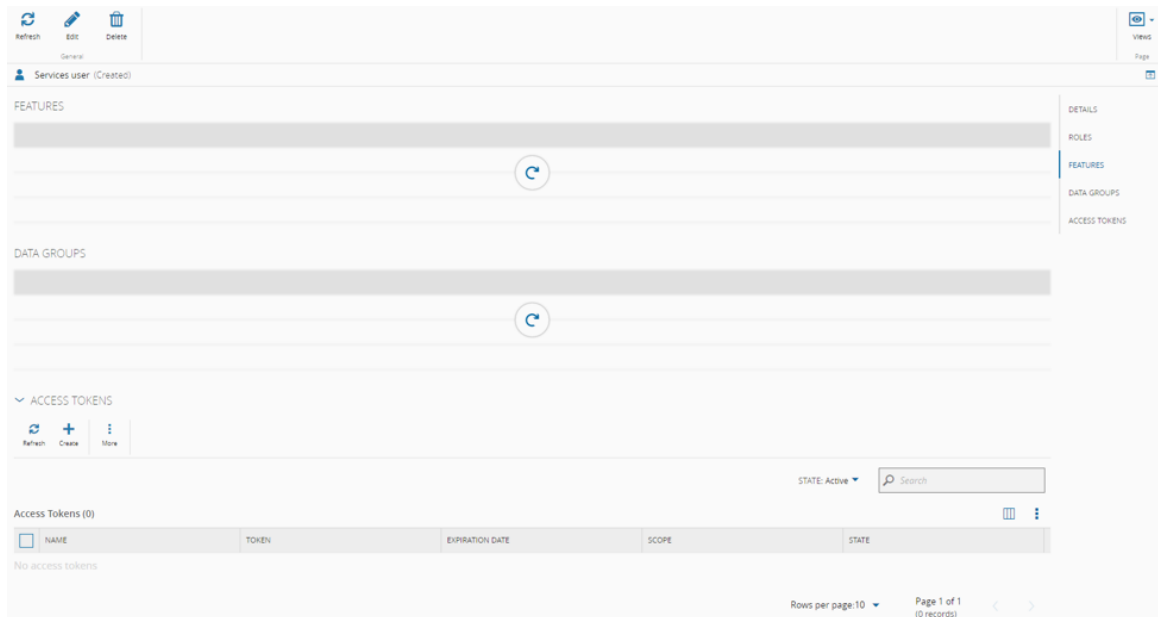
**OData Endpoint**  
Please make sure you have a valid Access Token for Authentication.

<https://VM-PROD-Cl.cmf.criticalmanufacturing.com:10102/api/> Copy

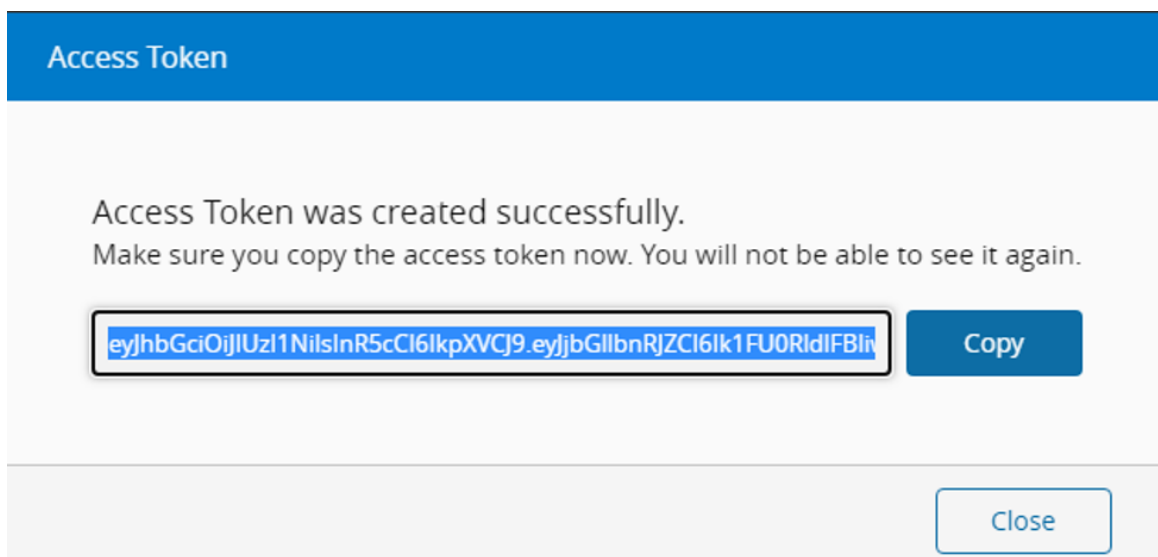
Close

## Access Token

Besides the endpoint URL, you will need to generate an access token which will then be used for authentication. For that, you should open your **User** page and go to the **Access Tokens** section:



Select the **Create** button on the top ribbon, fill in a meaningful name (important in case you need to invalidate the token in future), set an expiration date, select **Create** and then copy the new token:



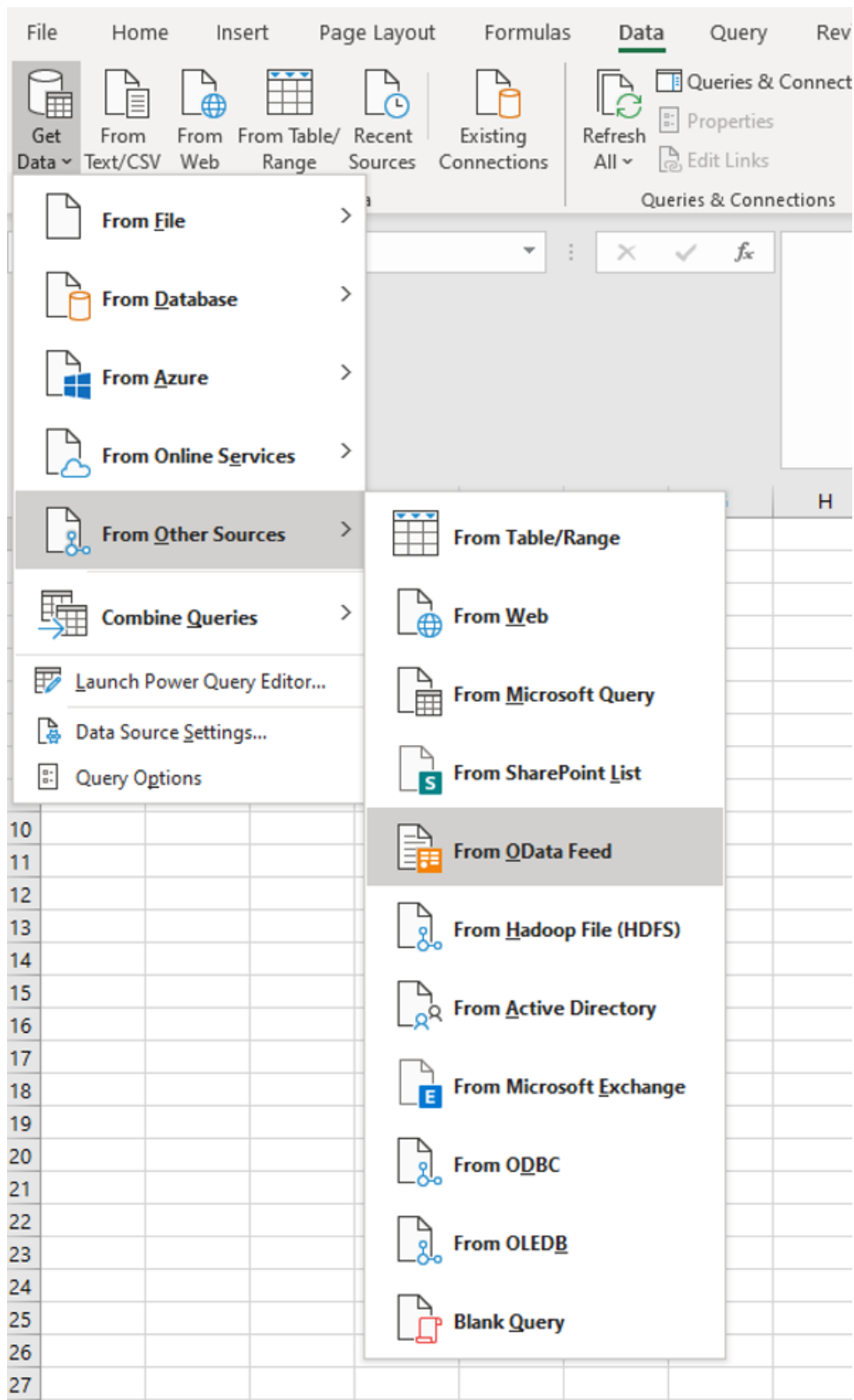
**Warning**

This token will only appear once, so you must store it in a safe location for future use.

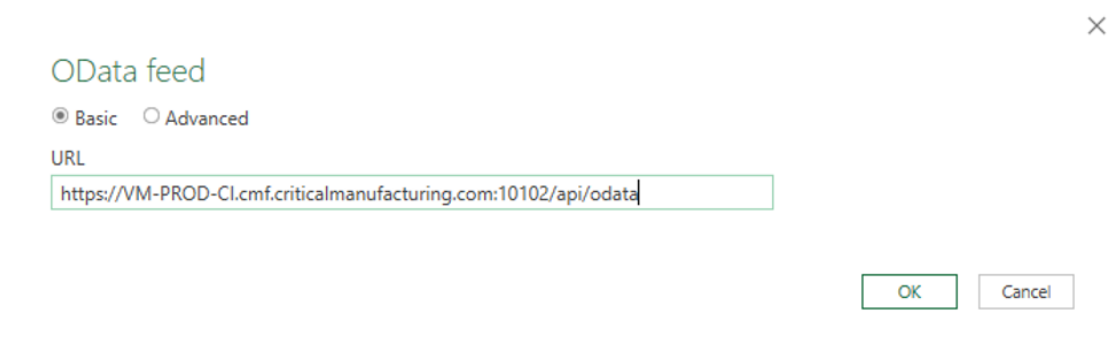
## External Tool Configuration

Using Microsoft Excel as an example, and to open the OData dataset, the steps are as follows:

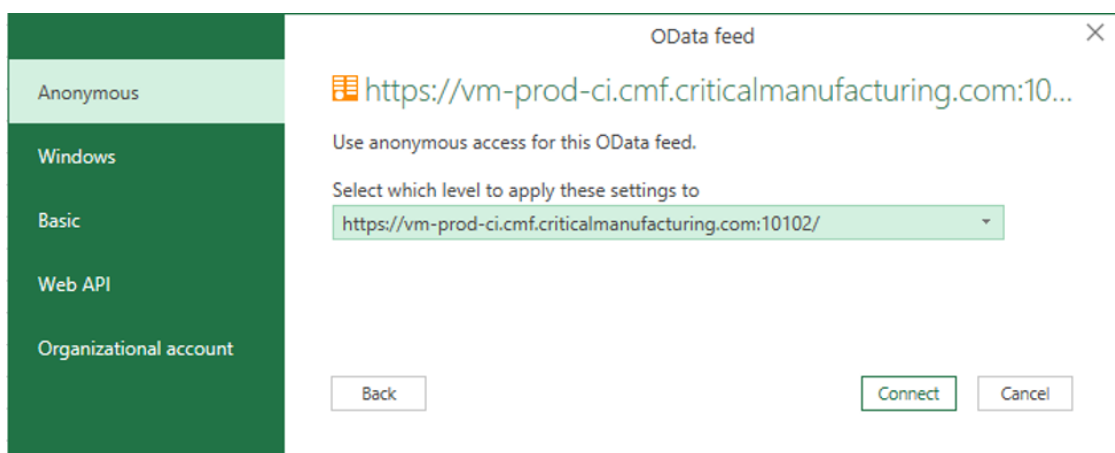
1. Use the **Get Data** functionality from the **Data** menu, as shown in the image below, and select the **From OData Feed** option in the **From Other Sources** submenu:



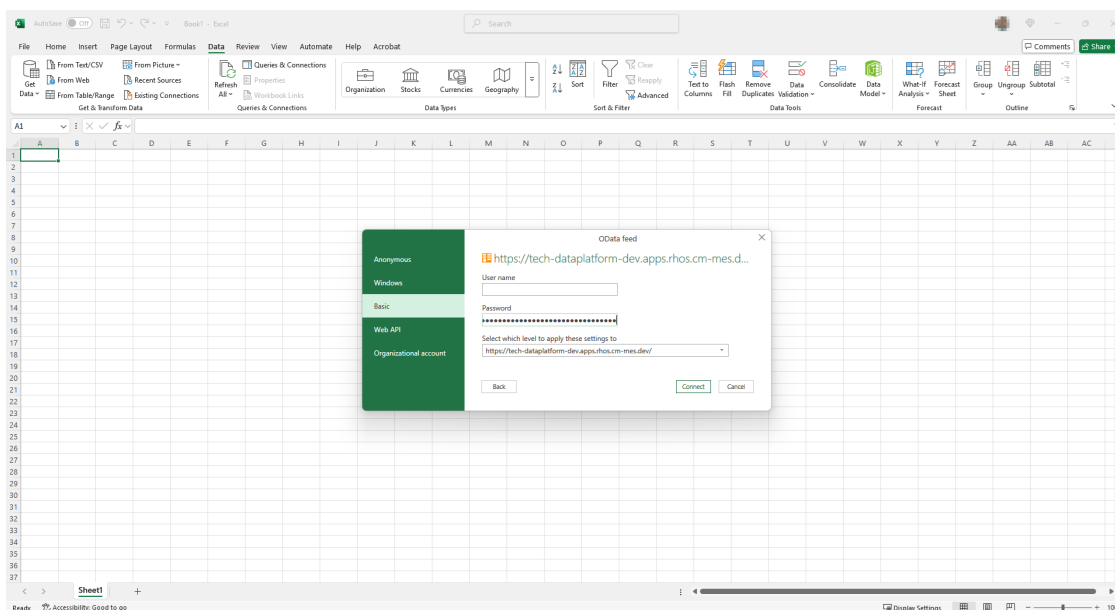
2. Paste the OData endpoint into the URL field and select **OK**. The application should redirect you to the **OData feed** window.



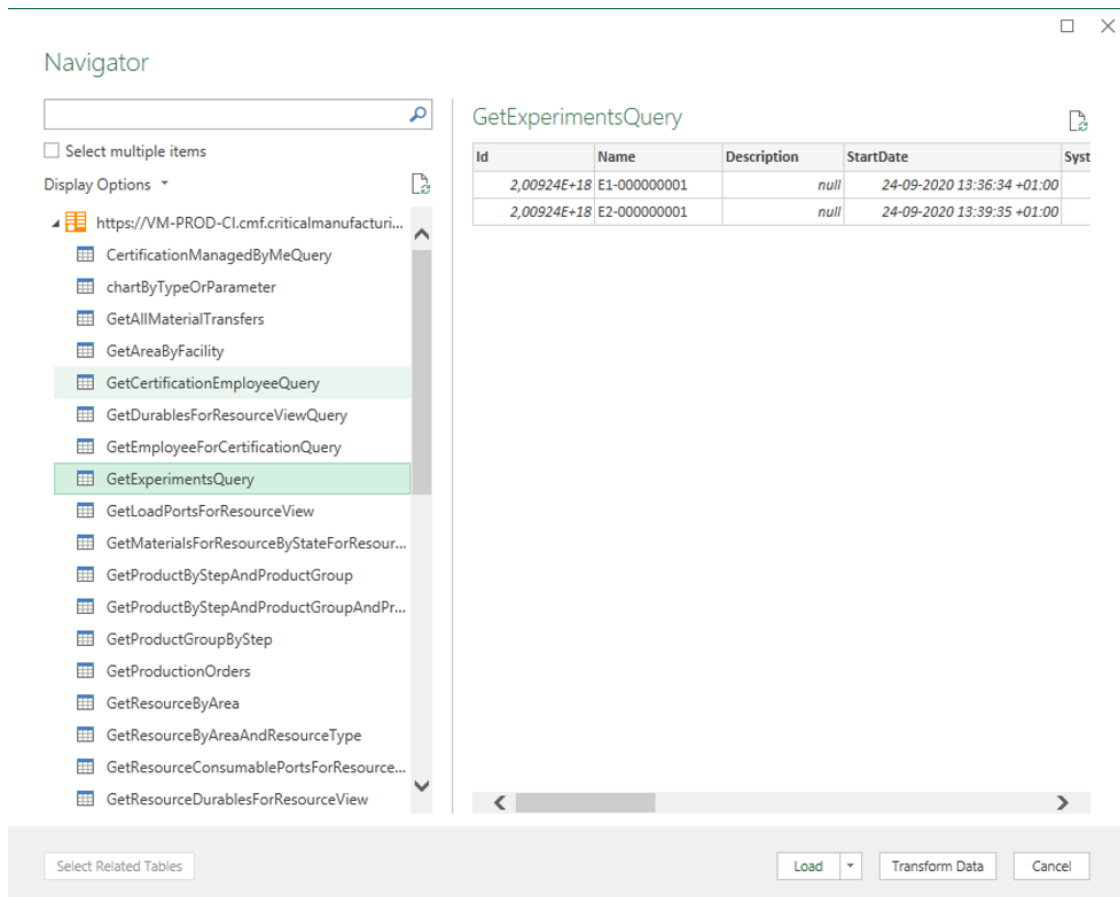
**Info**  
If this redirection does not happen or if the system throws an error, see the [Credentials Cleanup](#) section.



3. Select the **Basic** option on the left side panel and paste your **Access Token** in the **Password** field and select **Connect** (you can leave the **User name** field empty):



4. If the access token is valid, the **Navigator View** should open and provide a list of all the available Queries:

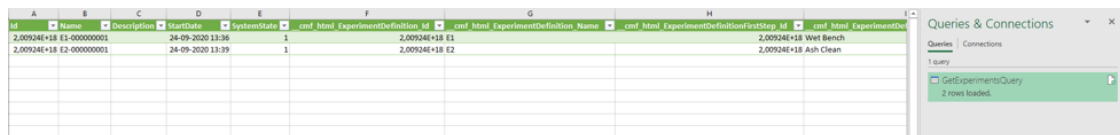


The Navigator window displays a list of queries under the URL `https://VM-PROD-CL.cmf.criticalmanufacturi...`. The query `GetExperimentsQuery` is selected. A preview of its output is shown in a table:

Id	Name	Description	StartDate	Syst
2,00924E+18	E1-000000001	null	24-09-2020 13:36:34 +01:00	
2,00924E+18	E2-000000001	null	24-09-2020 13:39:35 +01:00	

At the bottom of the Navigator window, there are buttons for `Select Related Tables`, `Load`, `Transform Data`, and `Cancel`.

5. A sneak preview of the output data for each query is shown, allowing you to select the queries that should be imported. After selecting **Load**, the data will be imported:



The screenshot shows an Excel spreadsheet with the following data:

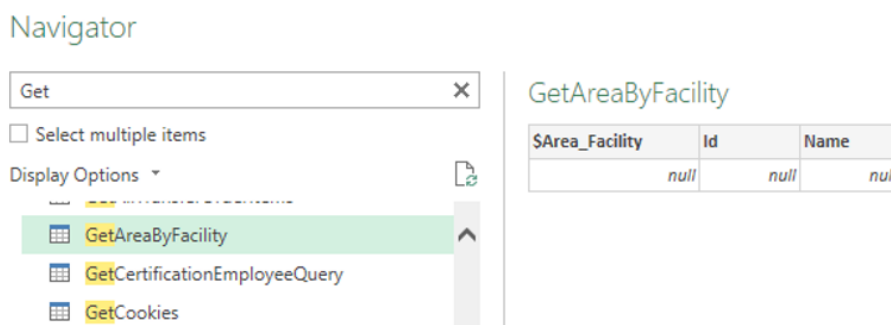
Id	Name	Description	StartDate	SystemState	cmf.html.ExperimentDefinition.Id	cmf.html.ExperimentDefinition.Name	cmf.html.ExperimentDefinition.FirstStep.Id	cmf.html.ExperimentDe
2,00924E+18	E1-000000001		24-09-2020 13:36	1	2,00924E+18	E1	2,00924E+18	Wet Bench
2,00924E+18	E2-000000001		24-09-2020 13:39	1	2,00924E+18	E2	2,00924E+18	Ash Clean

On the right side, the `Queries & Connections` pane shows the `GetExperimentsQuery` with a green checkmark and the text `2 rows loaded`.

## Support for MES Queries with parameters

Parameterization of MES Queries increases the complexity of integration by OData since additional steps are required to correctly configure the OData feed.

On parameterized MES Queries, parameters are seen in the Excel navigator as `$VarName`. In the example below, the MES Query `GetAreaByFacility` has a parameter named `$Area_Facility`:

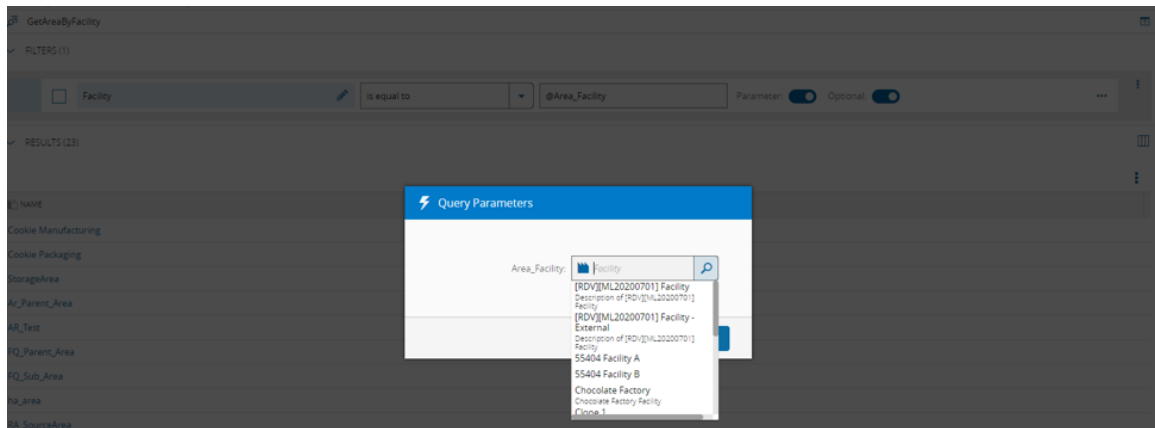


The Navigator window shows the `GetAreaByFacility` query selected. A preview of its output is shown in a table:

\$Area_Facility	Id	Name
null	null	null

As expected, a query that includes a mandatory parameter without a default value defined will return no data. Let us walk through this example to illustrate how to properly configure the OData feed. Additional functionalities such as filtering, ordering, and paging are also supported when using the advanced query options.

First, you need to know what sort of parameter `$Area_Facility` represents. In this case we can use the MES UI to try to run the same MES Query:

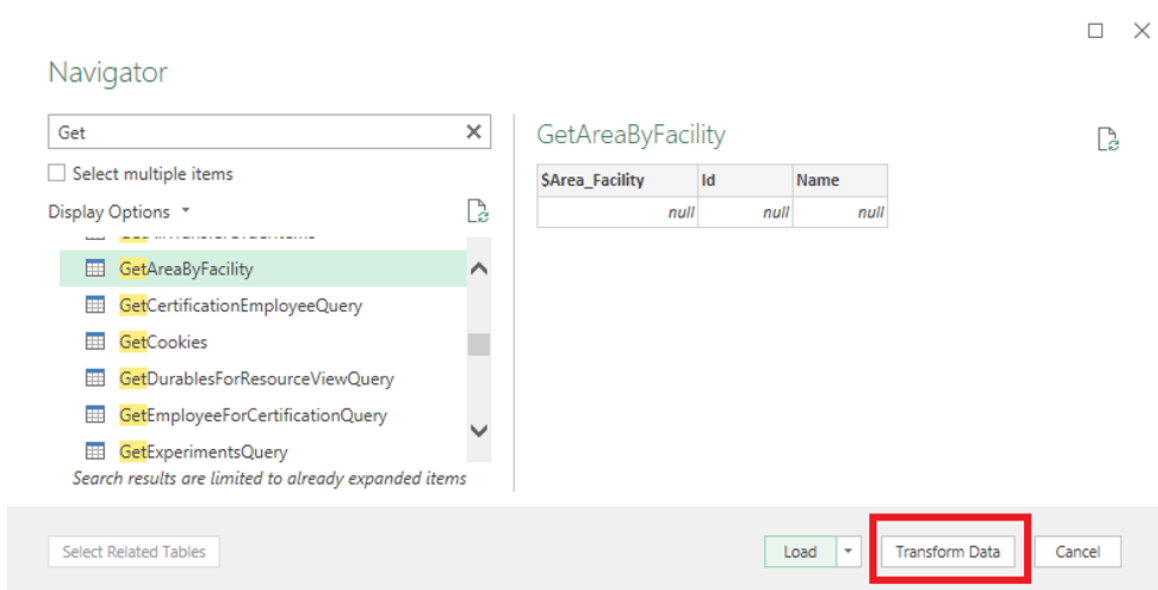


It is important to notice that although an entity filter option will be presented in the MES UI, the parameter itself will pass the Id of the **Facility** to the Query engine. This, however, is not a rule and depends on how the MES Query is defined.

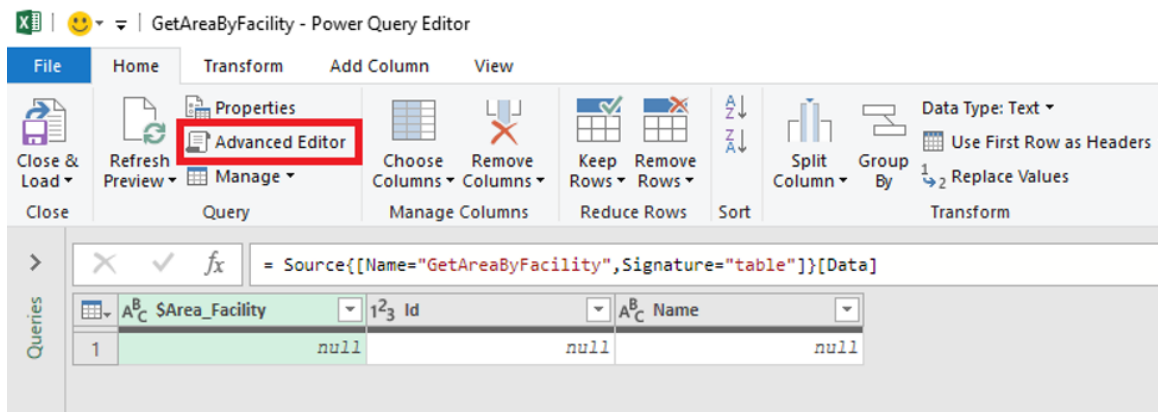
For this example, the target **Facility** for which you want to retrieve existing **Areas** is called Cookie Factory. At this moment, the Id of the Cookie Factory **Facility** most likely is still unknown but can be consulted in the MES UI by simply opening the target **Facility** and copying from the **Info** section:



Now that the parameter value is known, you can select the **GetAreasByFacility** entity in the Navigator view and select **Transform Data**:



The Power Query editor should open, and you should select the **Advanced Editor** button:



Now you should replace the existing code by:

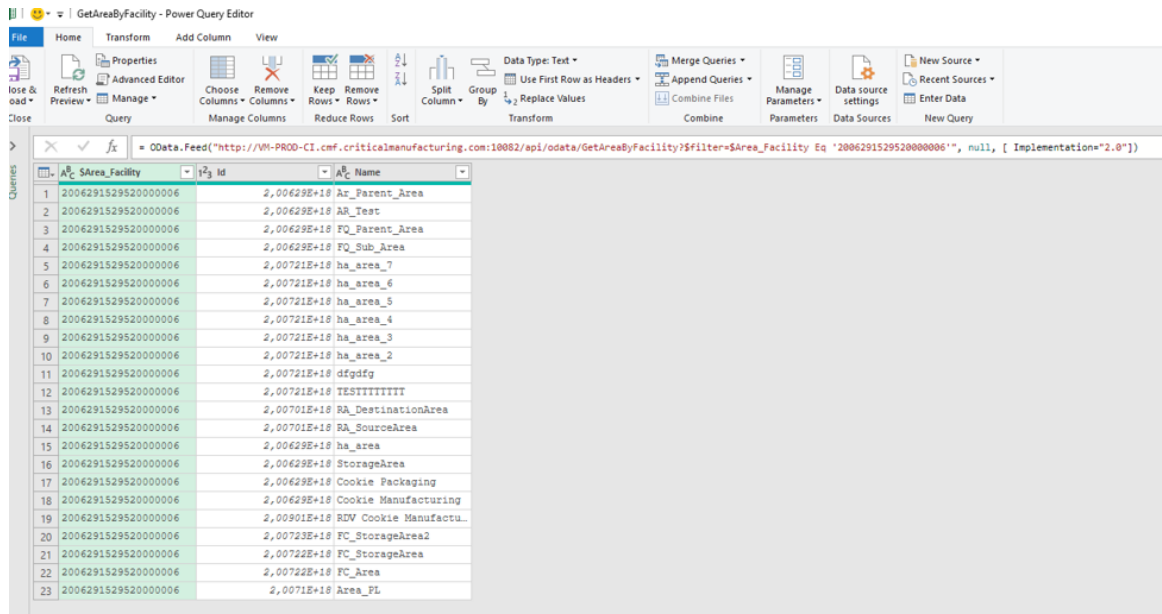
```
OData.Feed("<odataURL>/<QueryName>?$filter=$VarName Eq 'value'", null, [ Implementation="2.0"])
```

Using the current example this line would be:

```
OData.Feed("http://VM-PROD-CI.cmf.criticalmanufacturing.com:10082/api/odata/GetAreaByFacility?&filter=$Area_Facility Eq '2006291529520000006'", null, [ Implementation="2.0"])
```



Select **Done** and you should be able to see the expected results:



In case of error, check whether the parameter is numeric or string. If it is numeric, you should set the filter as:

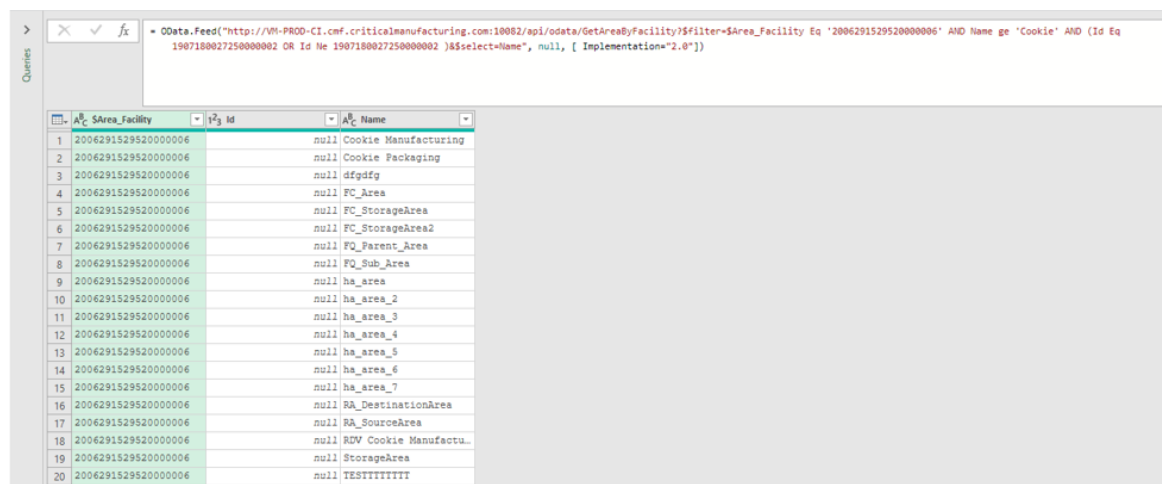
```
$filter=$Area_Facility Eq 2006291529520000006" instead of "$filter=$Area_Facility Eq '2006291529520000006'
```

You can also apply additional conditions like filtering, sorting and pagination. Except for OData Functions, all other conditions should be supported.

### Filtering

Filtering by complex expression with AND / OR and selecting "Name" (Id is returned as null). Expression:

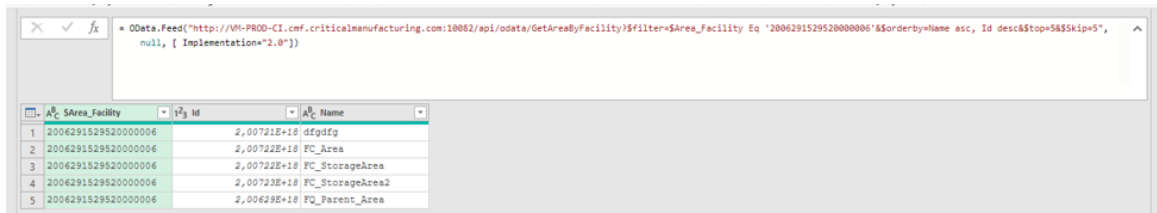
```
$filter=$Area_Facility Eq '2006291529520000006' AND Name ge 'Cookie' AND (Id Eq 1907180027250000002 OR Id Ne 1907180027250000002 )&$select=Name :
```



### Ordering

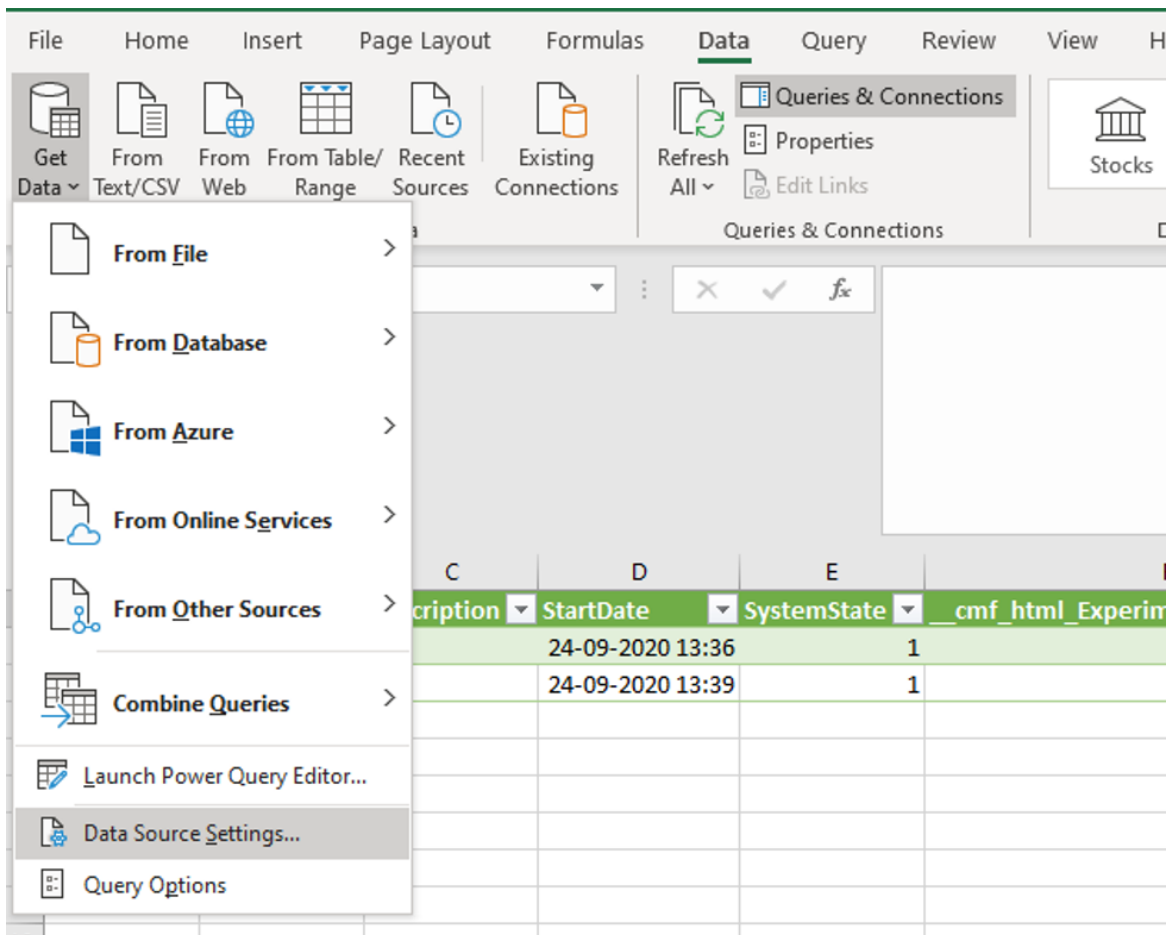
Ordering by Name ascending, Id descending and retrieving the top 5 rows after skipping 5 rows. Expression:

```
$filter=$Area_Facility Eq '2006291529520000006'&$orderby=Name asc, Id desc&$top=5&$Skip=5 :
```



## Credentials Cleanup

If the system hangs when connecting to the OData feed, clearing the database credentials should solve the problem.




Use the **Get Data** functionality from the **Data** menu, as shown in the image above, and select the **Data Source Settings** option. In the following screen, select the endpoint causing the issue and select **Clear permissions**. Select **Delete** in the next dialog to confirm the operation and repeat the connection configuration.

### Data source settings

Manage settings for the data sources used in queries.

Data sources in current workbook    Global permissions

Search data source settings

 <https://vm-prod-ci.cmf.criticalmanufacturing.com:10102/api/odata>

#### Clear Permissions

Are you sure you want to clear permissions for this entry? If you clear it you will have no way of getting it back.

▼



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