Microsoft

SAP on Azure

Power BI: Deep dive into SAP connectivity

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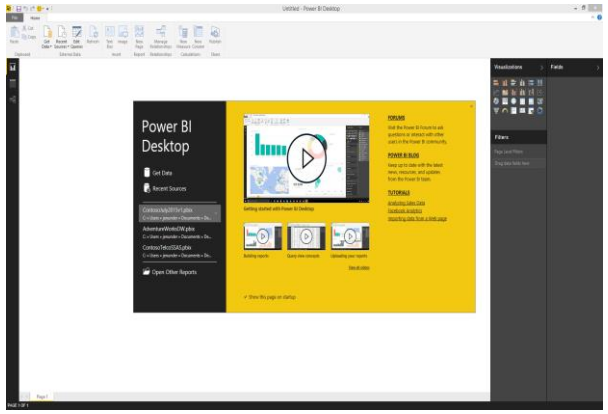
Microsoft

SAP HANA

Power BI

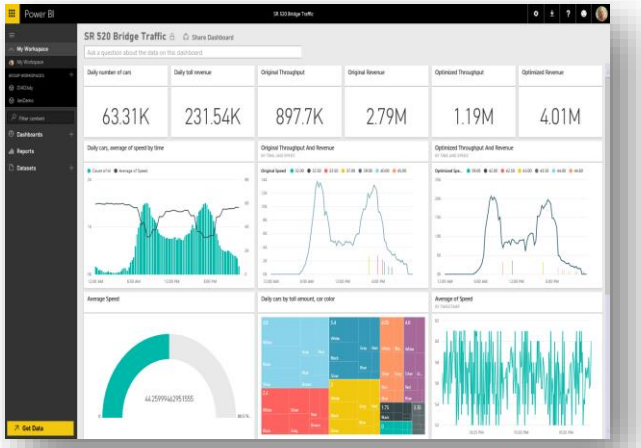
Power BI transforms your company's data into rich visuals and analytics. Stay in the know, spot trends as they happen, and push your business further

What is Power BI?



Power BI Desktop

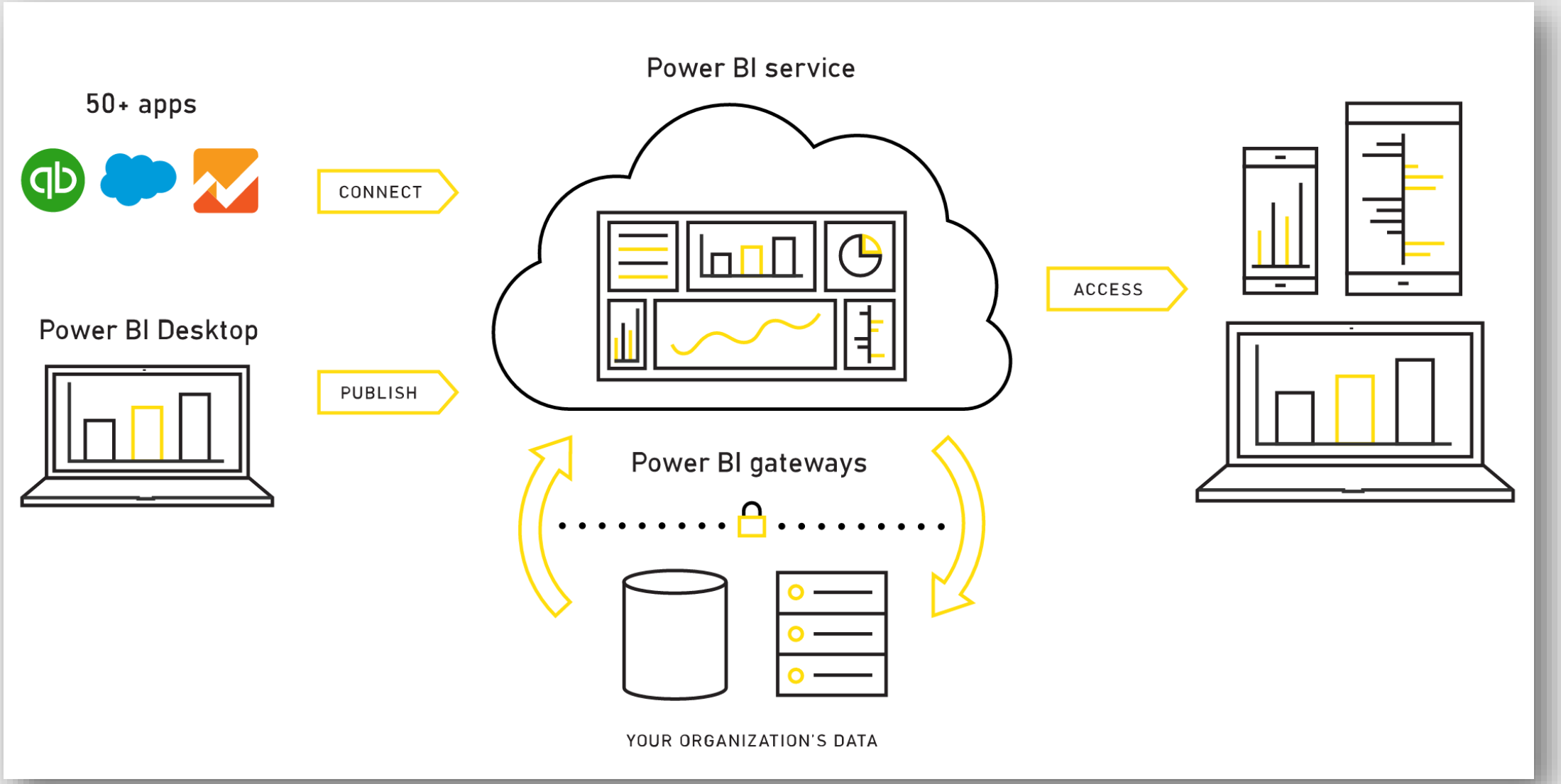
Mobile Apps for iOS, Android



PowerBI Service

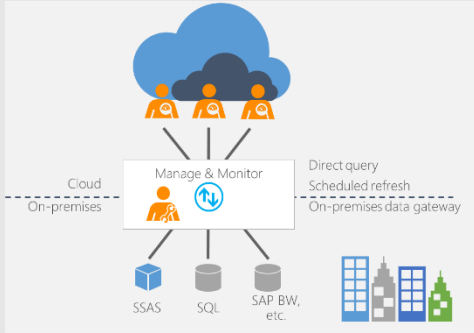
Power BI for Developers

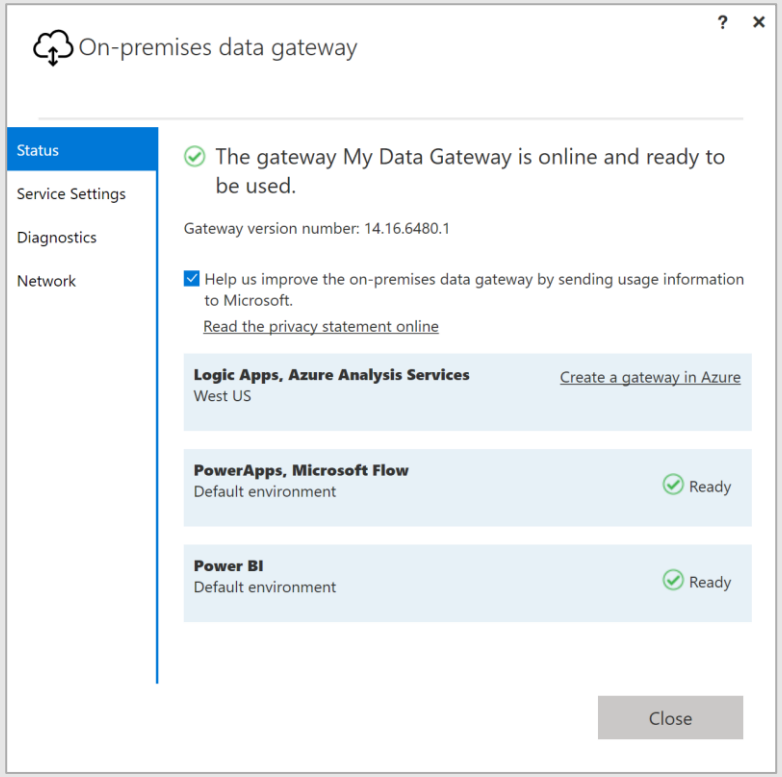
Power BI Overview



On-premises data gateway

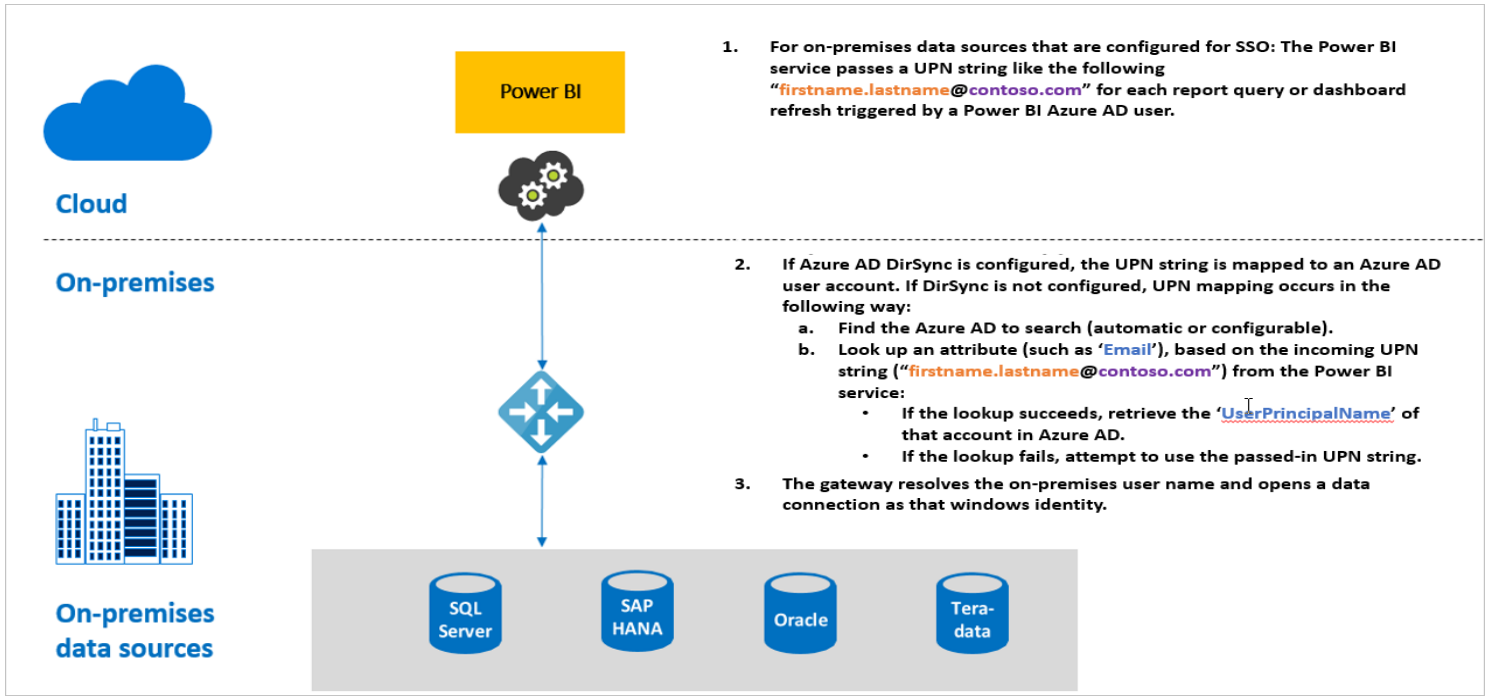
allows multiple users to connect to multiple on-premises data sources, and can be used by Power BI, PowerApps, Power Automate and Azure Logic apps, all with a single gateway installation.
Both DirectQuery and scheduled refresh are supported.

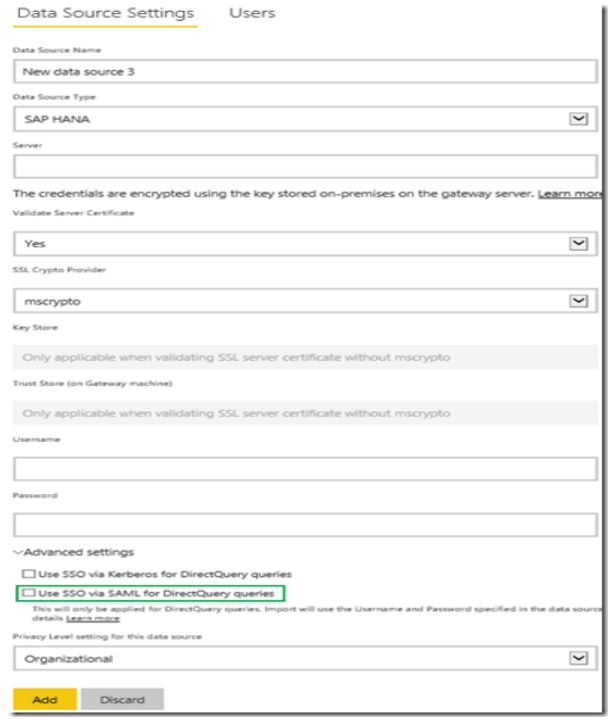




Single Sign-On Support when connecting to SAP from Power BI

Single Sign-On when connecting to SAP HANA(Kerberos/SAML) and SAP BW(Kerberos) using DirectQuery mode from Power BI





Single Sign-On (SSO) Overview

[Overview of single sign-on (SSO) for gateways in Power BI]

Single Sign-On (SSO) Kerberos

[Use Kerberos for single sign-on (SSO) from Power BI to on-premises data sources]

Single sign-on (SSO) SAML

[Use Security Assertion Markup Language (SAML) for single sign-on (SSO) from Power BI to on-premises data sources]

SAP Connectivity Options in Power BI

- SAP HANA Connector - ODBC based driver connects to the HANA Database

- SAP Business Warehouse Connector – NetWeaver based driver connects to the application layer

SAP HANA Connector

SAP HANA Connector Overview

Specialized Connector for SAP HANA

- Supports **HANA Information Models** (Analytic/Calculation views)
- **Direct SQL** Support for Row & Column Tables
- Optimized Navigation for HANA Models
- Two connector modes: **Relational** & **Multidimensional**
- **Rich support for native SAP HANA concepts**, ahead of other 3rd party BI tools: Hierarchies, Non-Additive Measures, Default Variable Values, etc.

Enables Enterprise-grade Power BI Capabilities

- **Import** & **DirectQuery** Modes
- Supported in **On-premises Data Gateway** (Enterprise mode) for Power BI Service Refresh
- **Single Sign-On Support via Kerberos-constrained Delegation or SAML** for user-impersonation in Power BI Service (DirectQuery)

Endorsed by SAP

- Built on top of **SAP's HANA ODBC driver**
- Received **official SAP Certification for HANA**

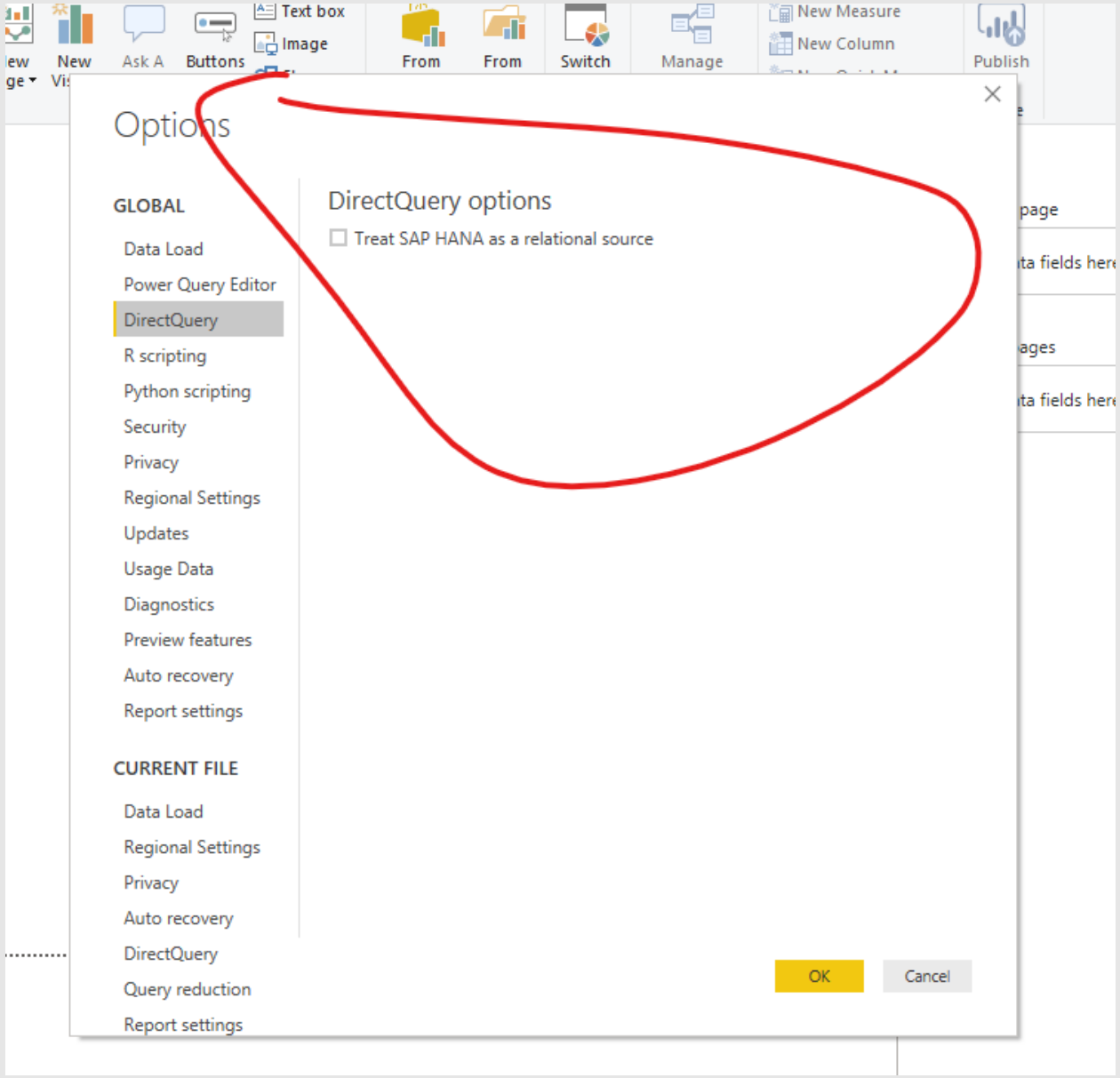
SAP® Certified
Integration with SAP HANA®

HANA Connector – Relational vs Multidimensional

Direct Query Mode

Feature	Relational	Multidimensional
Performance		✓
Parent Child Hierarchy		✓
SSL		✓
Correct treatment of non-additive measures		✓
Data Modeling operations (Calculated columns, measures)	✓	
Composite Modeling	✓	

SAP HANA DirectQuery Options



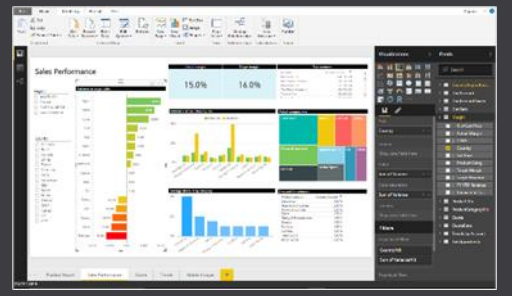
SAP HANA - M function

```
SapHana.Database("server:port", [Implementation="2.0"])
```

- Options record
  - **`Query`**: Native SQL query.
  - **`Distribution`**: Used for statement routing.
  - **`Implementation`** : Use 2.0 for new multidimensional implementation. Leave empty for backwards compatibility.

- Authentication
  - Database: username and password
  - Windows (Single Sign On)

SAP HANA Connector Demo



SAP Business Warehouse Connector

SAP BW Connector Overview

Specialized Connector for SAP BW

- Supports SAP BW 7.x+
- Ability to connect to **Application Server** & Message Server
- Connect to InfoCubes & QueryCubes (including BEx queries)
- Multi-Dimensional connector that supports the nuances of BW accurately (hierarchies, variables, etc.)
- Supports Display Names & Technical Names for easier navigation, as well as Variables, Hierarchy/Hierarchy nodes, Member Properties (Key/Short/Medium/Long Text, custom), …

Enables Enterprise-grade Power BI Capabilities

- **Import** & **DirectQuery** Modes
- Supported in **On-premises Data Gateway** (Enterprise mode) for Power BI Service Refresh
- **Single Sign-On Support via Kerberos-constrained Delegation** for user-impersonation in Power BI Service (DQ)

Endorsed by SAP, two implementations:

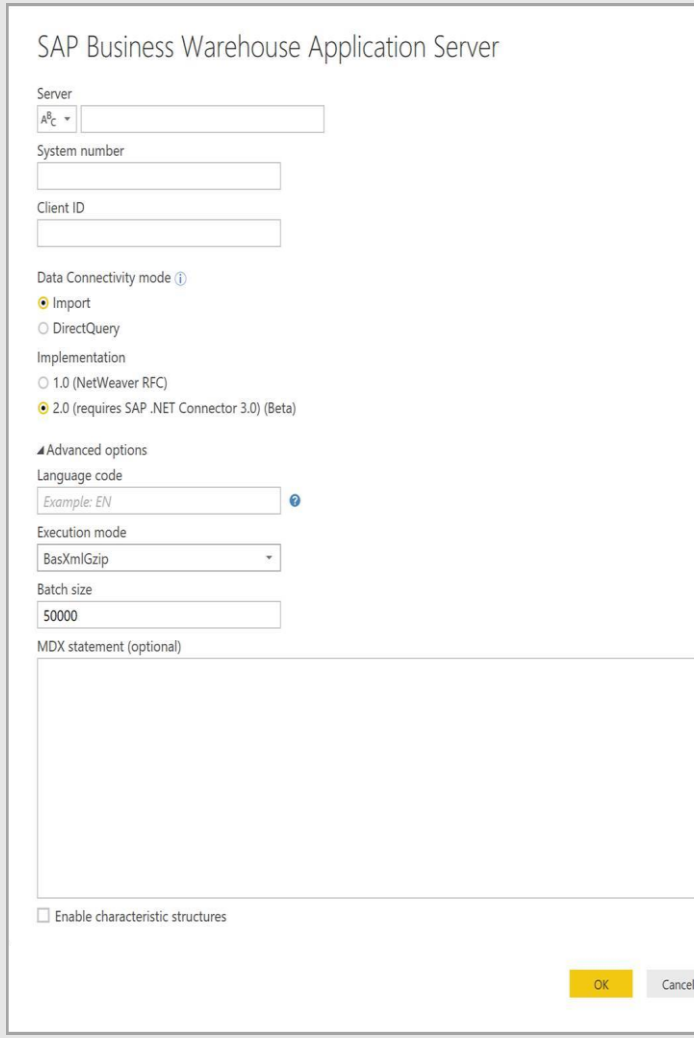
1. Built on top of **SAP's NetWeaver RFC**
   Certified by SAP
2. Implementation "2.0" built on top of **SAP .NET Connector 3.0**
   Received official SAP Certification for BW

SAP® Certified
Integration with SAP BW

SAP BW Power Query function

```
SapBusinessWarehouse.Cubes
    ("server", "system number", "client id", [Implementation="2.0"])
    ("server", "system id", "client id", "logon group", [Implementation="2.0"])
```

- Options record
  - **Query**: Native MDX query. (only supported in Import mode)
  - **LanguageCode / Culture**: Explicitly specify language and culture.
  - **ScaleMeasures**: A logical value indicating whether measure values should have scaling applied.
  - **Implementation**: Use 2.0 for new multidimensional implementation. Leave empty for backwards compatibility.
- Implementation 2 options
  - **EnableStructures**: A logical value indicating whether characteristic structures are recognized.
  - **BatchSize**: Specifies the maximum number of rows that will be retrieved at one time.
  - **ExecutionMode**: Specifies the MDX interface used to execute queries on the server.
    - BasXml, BasXmlGzip, DataStream



- Authentication
  - Database, username and password
  - Windows (Single Sign On)

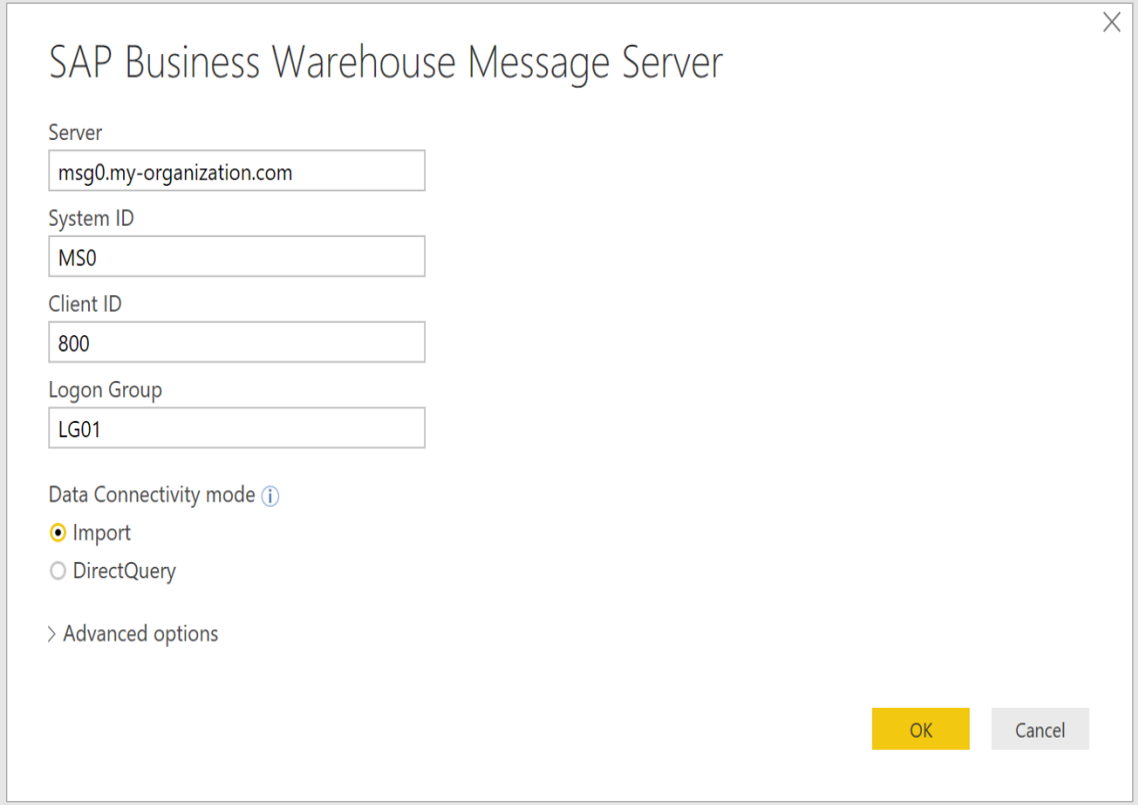
SAP Business Warehouse Message Server

Server: The message server (hostname or IP address) configured in your SAP system landscape

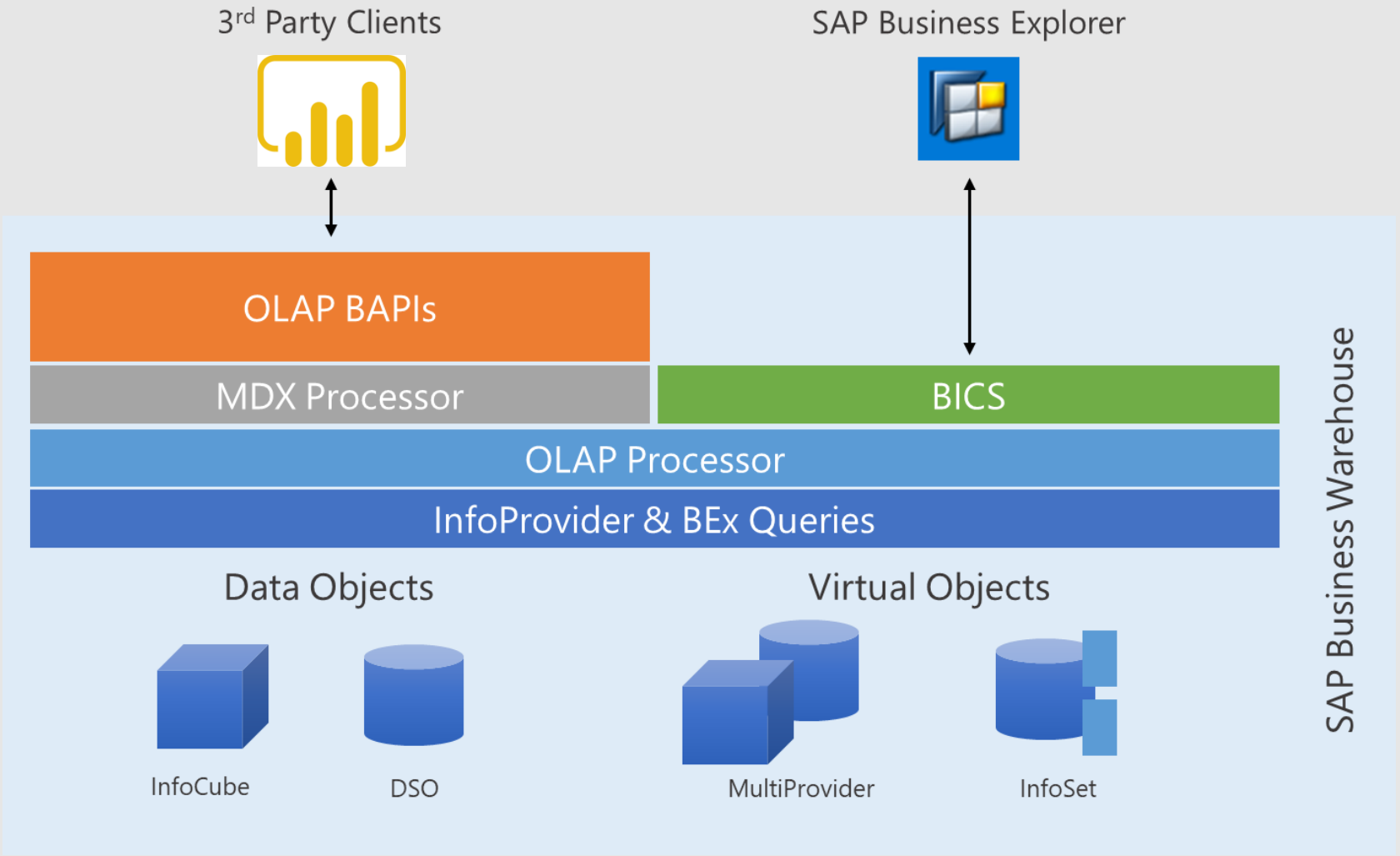
System ID: The system ID of the message server. This is different from *System Number* and is typically a three-character ID.

Client ID: The specific client in the message server that you want to connect to

Logon Group: The logon group of application servers that was configured by your SAP Administrator



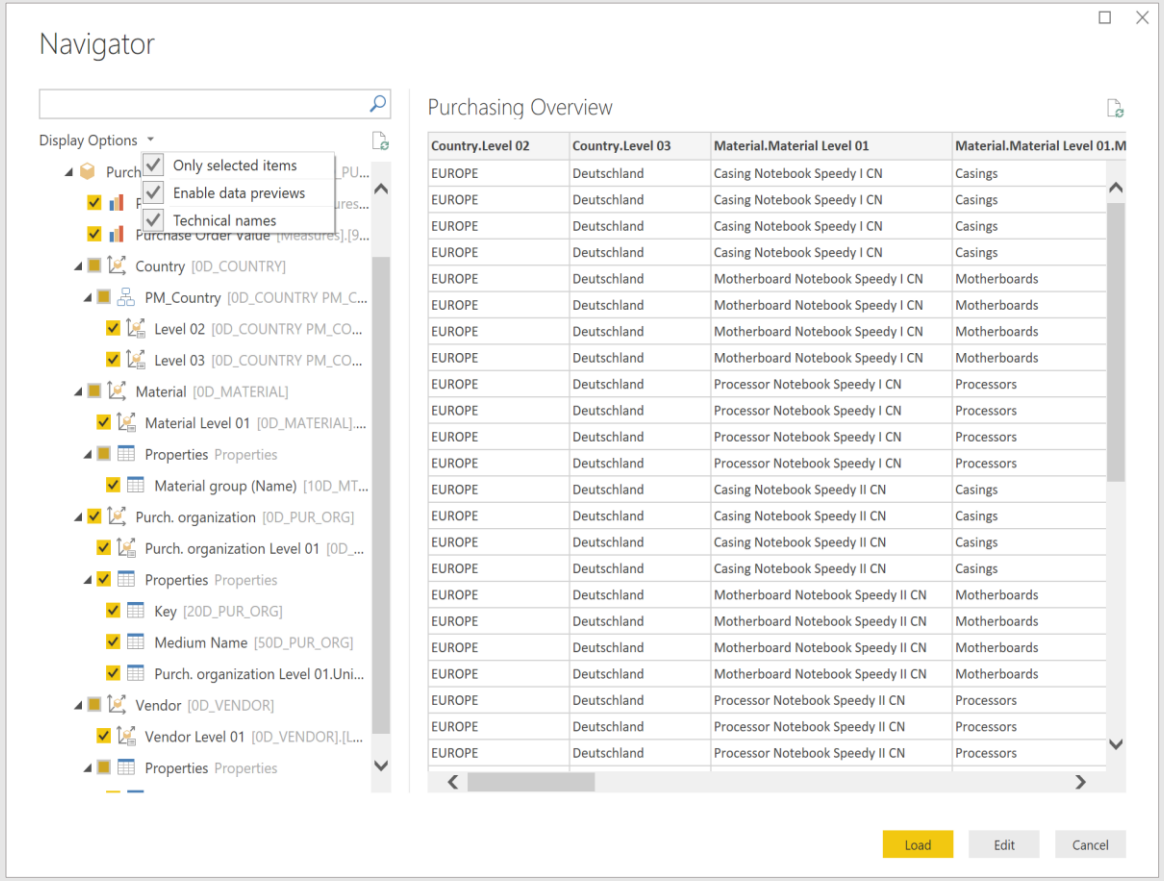
SAP BW Connector architecture



SAP BW Connector “2.0”

- SAP BW Connector implementation, based on different SAP component (SAP .NET Connector)
- Provides same set of capabilities as existing connector, plus more:
  - **Significant Perf Improvements** – Some early comparisons from Private Preview customers:
    - *About 60-75% faster than “v1” (61 vs. 21 secs; 25 vs. 17 secs; 50 vs. 20 mins)*
    - *“Extracting 20k records takes less than 2 minutes, which is even faster than MicroStrategy.”*
      - *With your SAP BW “v1” connector, this used to take 30-40 minutes*
  - Ability to **retrieve several million rows of data**, and fine tuning through the batch size option.
  - Support for **compressed mode**. Especially beneficial for high-latency connections or large datasets.
  - Improved **detection of Date variables.**
  - Expose **Date** (ABAP type DATS) and **Time** (ABAP type TIMS) **dimensions as dates and times** respectively, instead of text values. Exposed in the ‘**Key**’ column.
  - **Better exception handling**: Errors that occur in SAP BAPI calls are now surfaced.
  - **Column folding** in BasXml and BasXmlGzip modes.
    - If the generated MDX query retrieves 40 columns but the current selection only needs 10, this request will be passed onto the server to retrieve a smaller dataset.
  - Support for **currency**, **units** and **formatted values**

Navigating the Query Objects in SAP BW



Country.Level 02	Country.Level 03	Material.Material Level 01	Material.Material Level 01.M
EUROPE	Deutschland	Casing Notebook Speedy I CN	Casings
EUROPE	Deutschland	Casing Notebook Speedy I CN	Casings
EUROPE	Deutschland	Casing Notebook Speedy I CN	Casings
EUROPE	Deutschland	Casing Notebook Speedy I CN	Casings
EUROPE	Deutschland	Motherboard Notebook Speedy I CN	Motherboards
EUROPE	Deutschland	Motherboard Notebook Speedy I CN	Motherboards
EUROPE	Deutschland	Motherboard Notebook Speedy I CN	Motherboards
EUROPE	Deutschland	Motherboard Notebook Speedy I CN	Motherboards
EUROPE	Deutschland	Processor Notebook Speedy I CN	Processors
EUROPE	Deutschland	Processor Notebook Speedy I CN	Processors
EUROPE	Deutschland	Processor Notebook Speedy I CN	Processors
EUROPE	Deutschland	Processor Notebook Speedy I CN	Processors
EUROPE	Deutschland	Casing Notebook Speedy II CN	Casings
EUROPE	Deutschland	Casing Notebook Speedy II CN	Casings
EUROPE	Deutschland	Casing Notebook Speedy II CN	Casings
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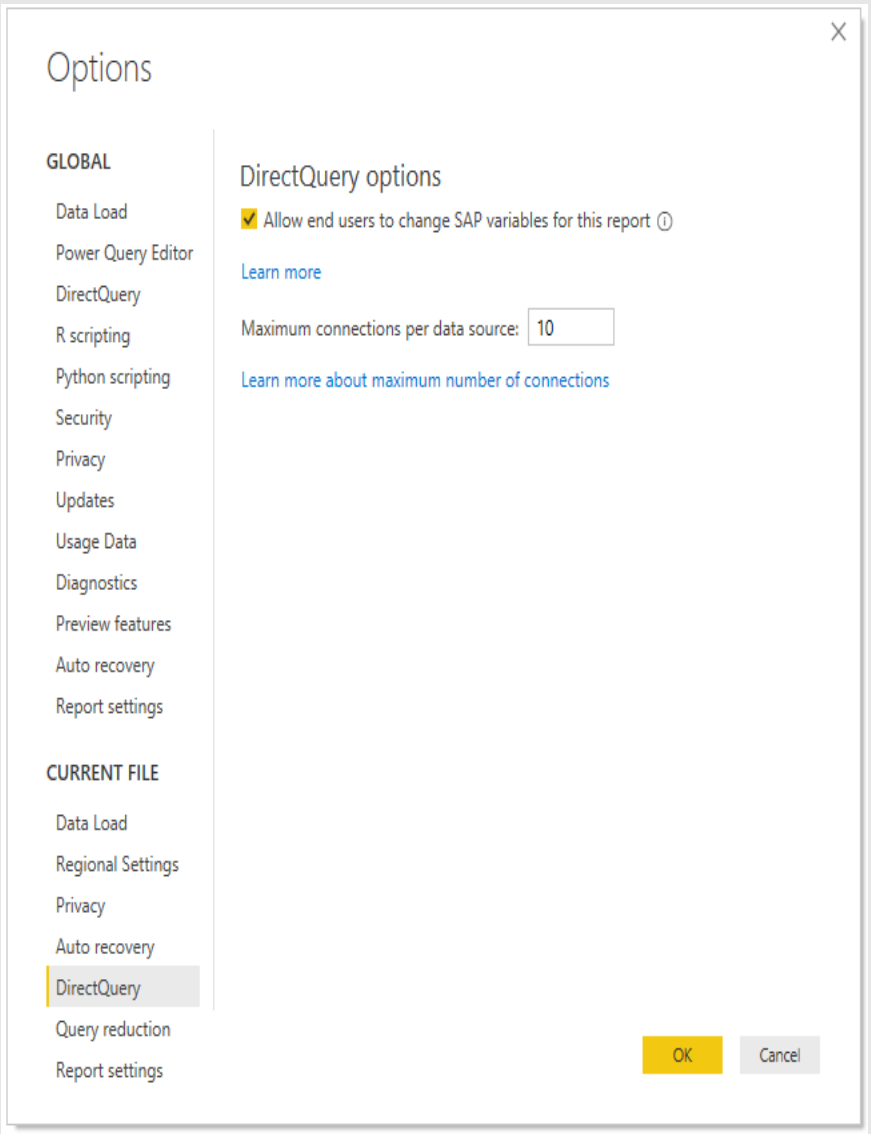
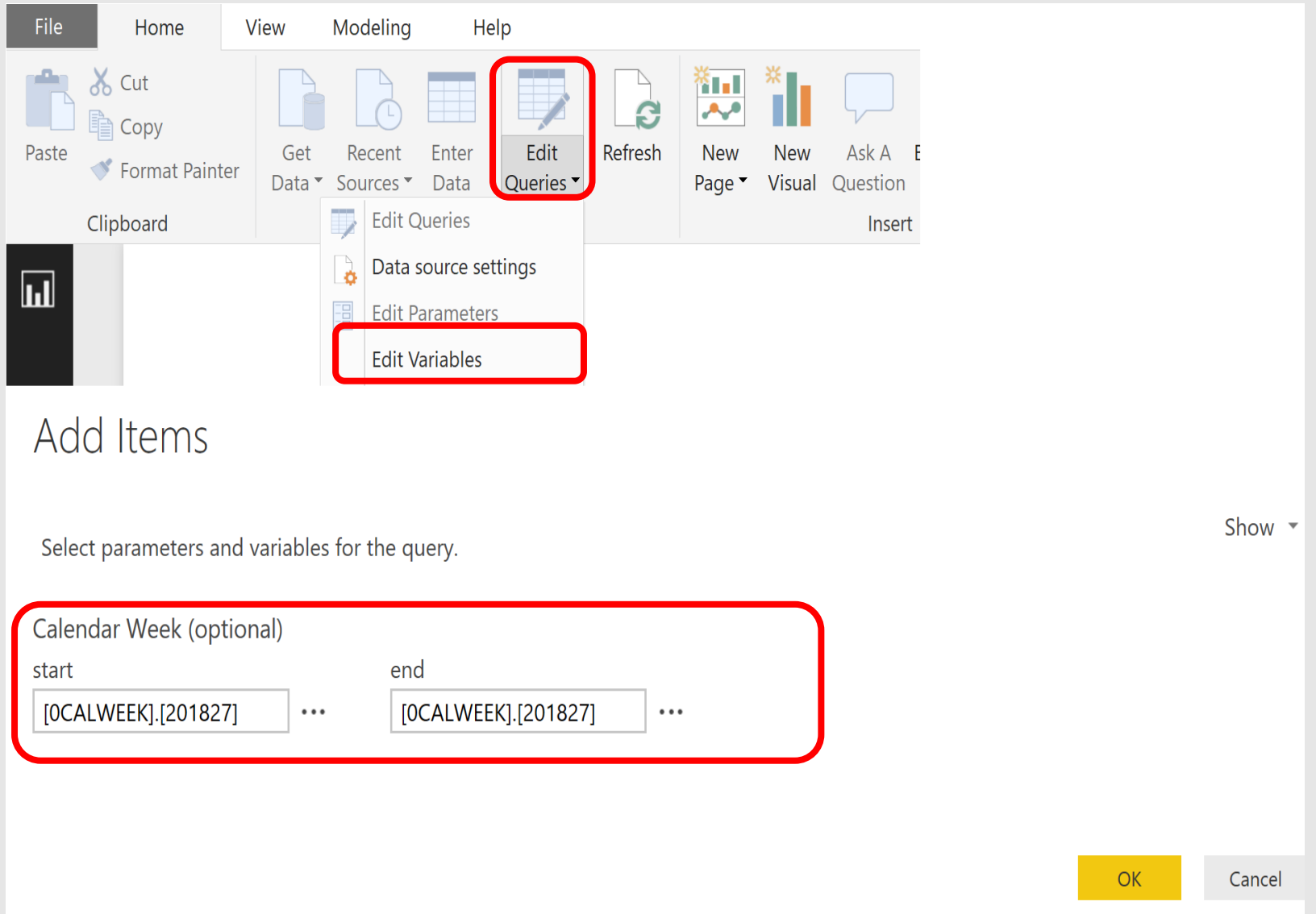
EUROPE	Deutschland	Processor Notebook Speedy II CN	Processors
EUROPE	Deutschland	Processor Notebook Speedy II CN	Processors
EUROPE	Deutschland	Processor Notebook Speedy II CN	Processors

- Catalog - either **$INFOCUBE** or an InfoProvider
- InfoCube or a BEx Query
- Key figure
- Characteristic
- Characteristic Level
- Property (Attribute)
- Hierarchy

Power BI Desktop with SAP BW Variables



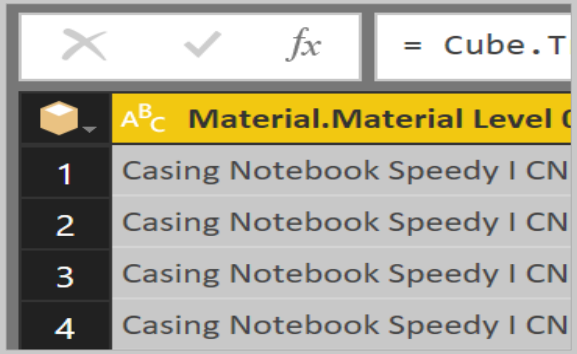


https://docs.microsoft.com/en-us/power-bi/service-edit-sap-variables

What do these connectors have in common?

- They are both “cube” connectors
- Use Direct Query over Power Query

Leverage Cube module functions:	Folding only functions:
• Cube.DisplayFolders • Cube.Dimensions • Cube.Measures • Cube.ReplaceDimensions • Cube.Transform • Cube.AddMeasureColumn • Cube.AddAndExpandDimensionColumn • Cube.CollapseAndRemoveColumns • Cube.Properties • Cube.MeasureProperties	• Cube.AttributeMemberId • Cube.AttributeMemberProperty • Cube.PropertyKey • Cube.MeasureProperty

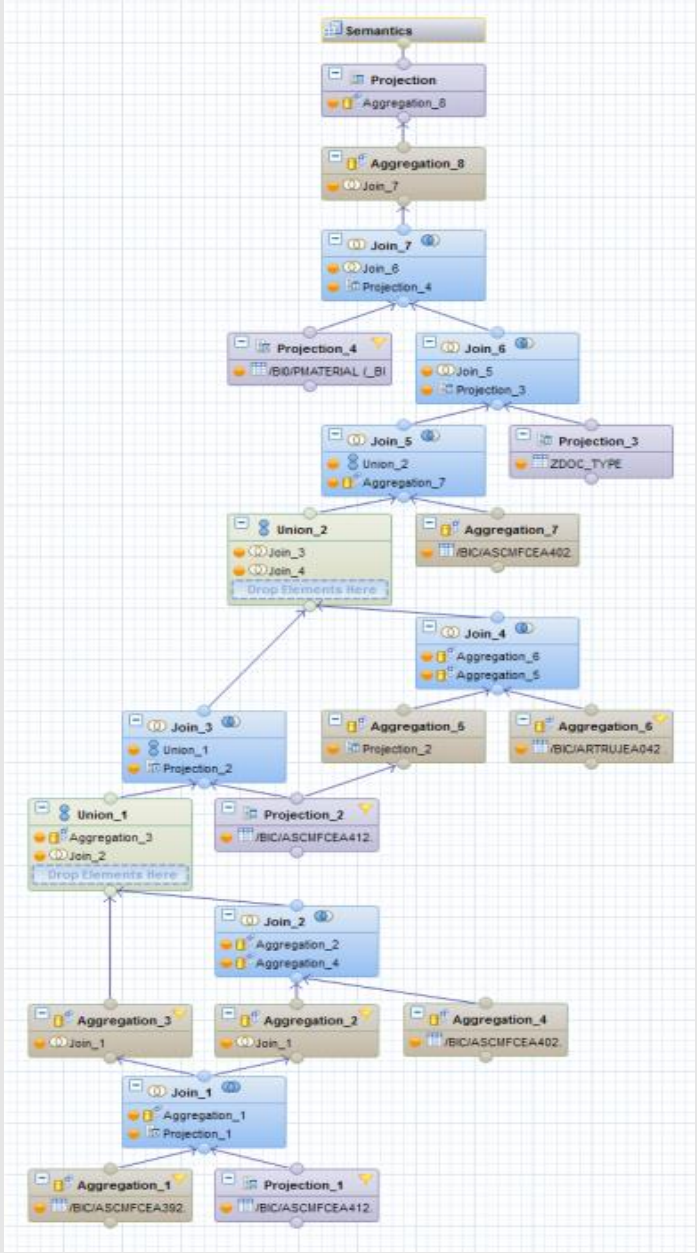


SAP BW Connector Demo

Tips & best practices

SAP Connectors - Performance

- Getting the most out of multidimensional in Direct Query mode
  - Typical performance issues come from:
    - Number of visuals on the page
    - HANA view with numerous joins and aggregations
    - DirectQuery Measures created in Power BI
  - Solution
    - Reduce number of visuals
    - Materialize HANA views where possible
    - Create all measures in HANA

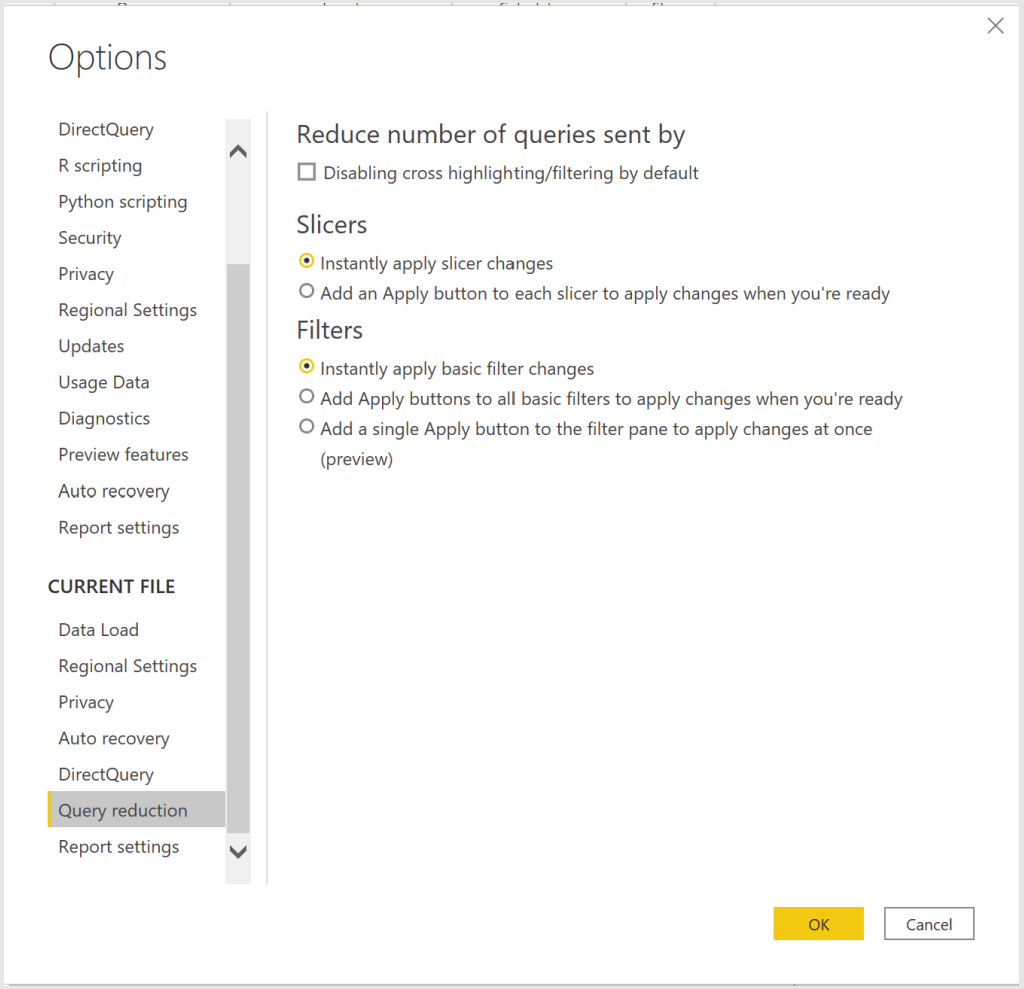


Report Authoring

You can improve authoring performance for complex reports or slower models by limiting the number of queries sent.

Four common scenarios:

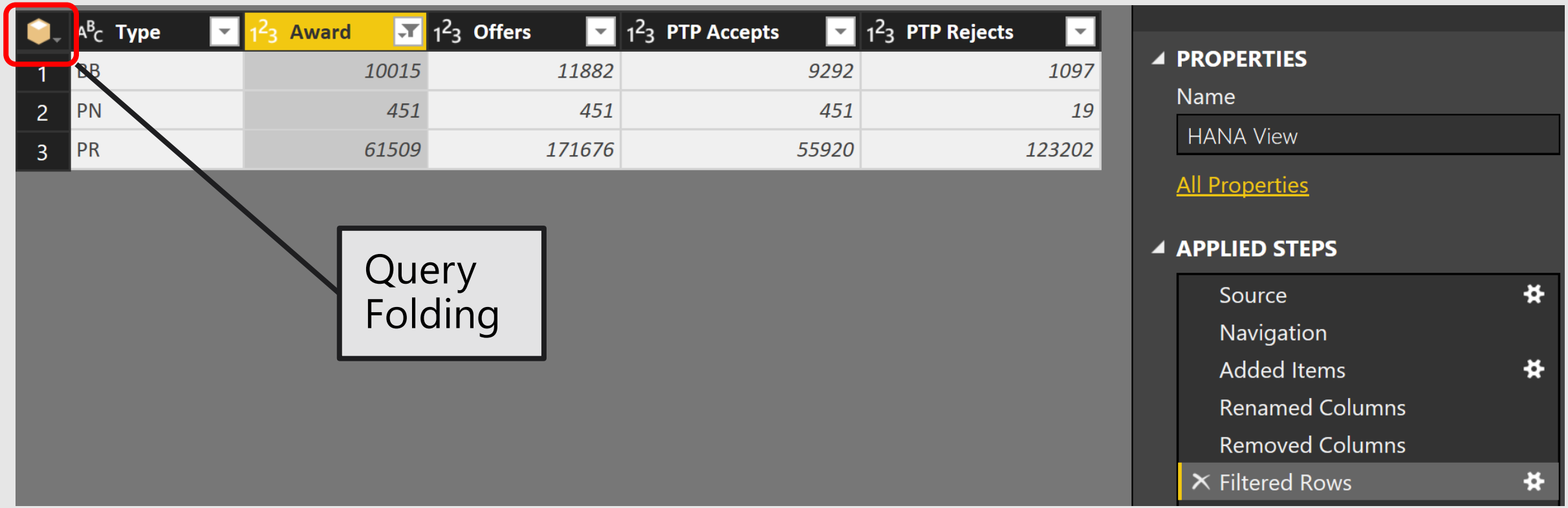
- When a visual generates a new query and a previous query hasn't finished, the previous query gets cancelled.
- When hiding a visual, a running query on that hidden visual gets cancelled.
- When you switch to another report page, queries from the previous page are cancelled
- Closing a report, cancels the running queries



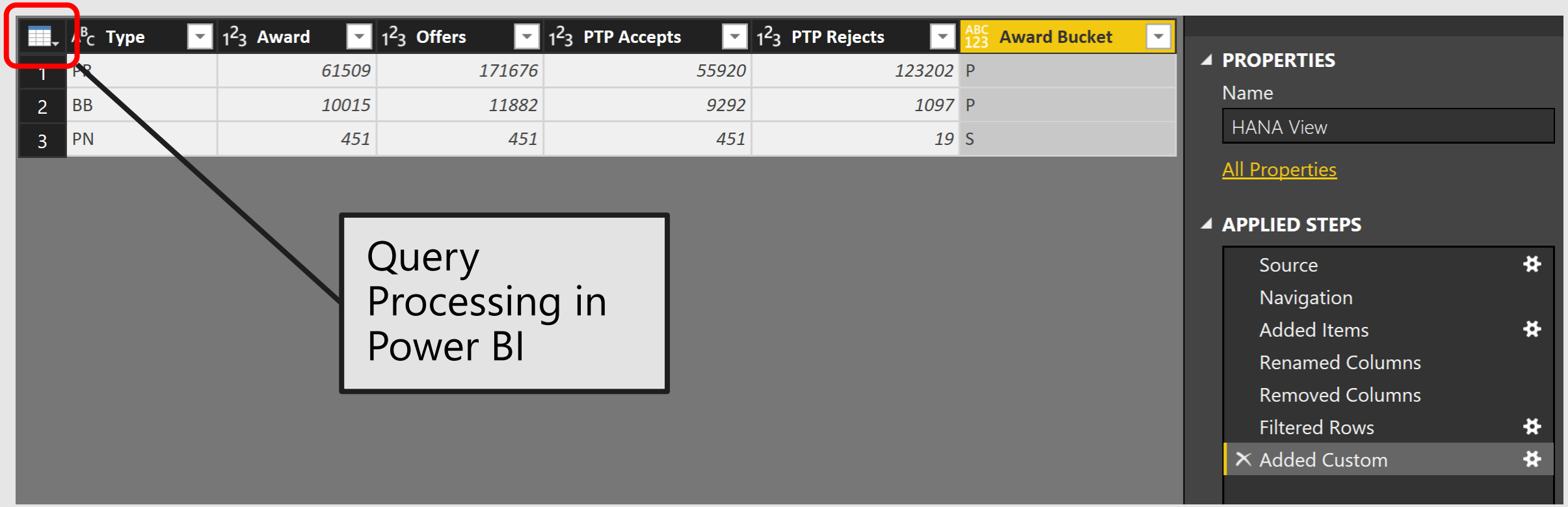
Incremental Refresh

- SAP connectors are typically used to import large volumes of data
  - It might take hours to get a full refresh of data
- This can be alleviated by using Incremental Refresh
  - **Refreshes are faster** - Only data that has changed needs to be refreshed. For example, refresh only the last five days of a ten-year dataset.
  - **Refreshes are more reliable** - It's no longer necessary to maintain long-running connections to volatile source systems.
  - **Resource consumption is reduced** - Less data to refresh reduces overall consumption of memory and other resources.
  - https://docs.microsoft.com/en-us/power-bi/service-premium-incremental-refresh
- For SAP HANA, keep in mind that dates are stored in `yyyymmdd` format, which will need to be converted into Date data type

Query Folding



Query Folding

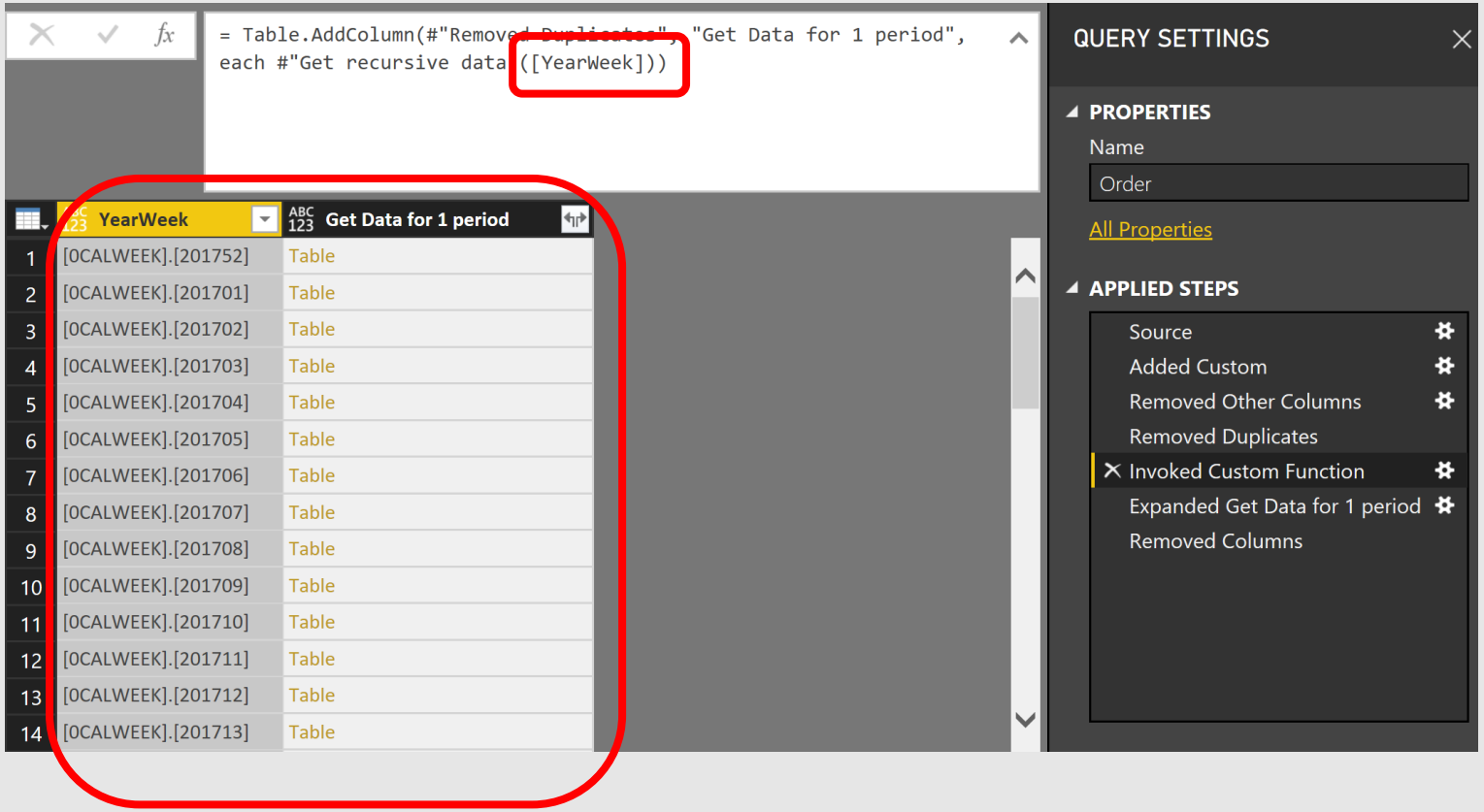


Out of Memory

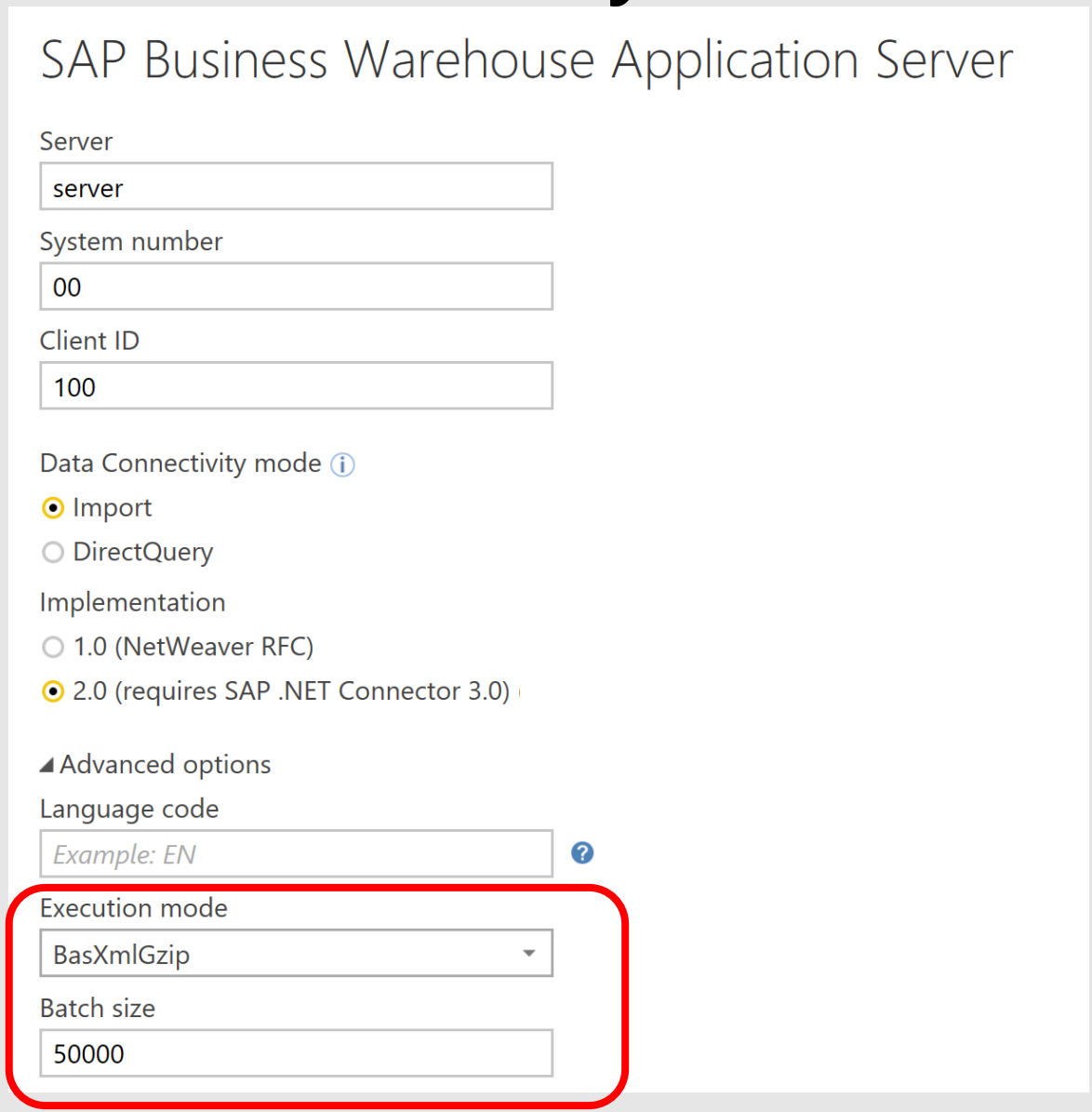
DataSource.Error: SAP Business Warehouse: RfcInvoke failed(RFC_ABAP_RUNTIME_FAILURE): TSV_TNEW_PAGE_ALLOC_FAILED

Details:

DataSourceKind=SapBusinessWarehouse



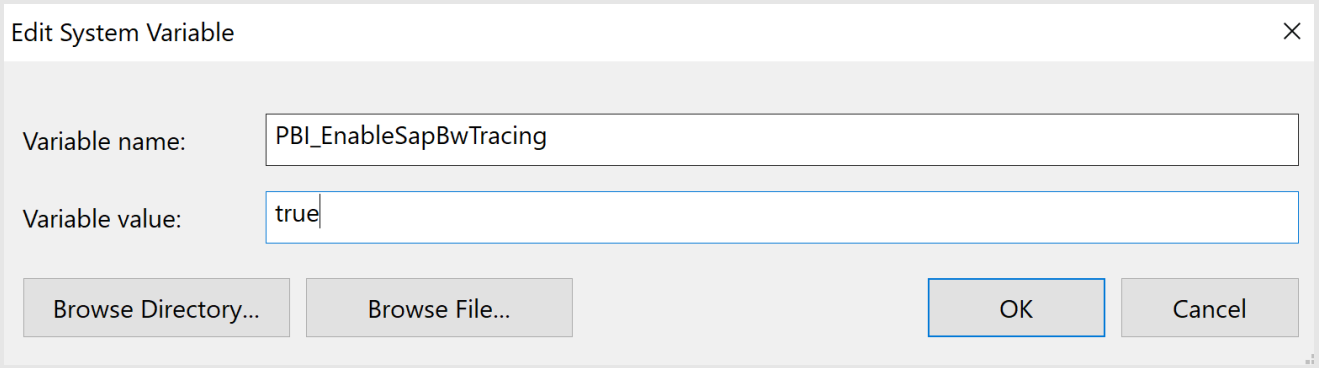
Out of Memory

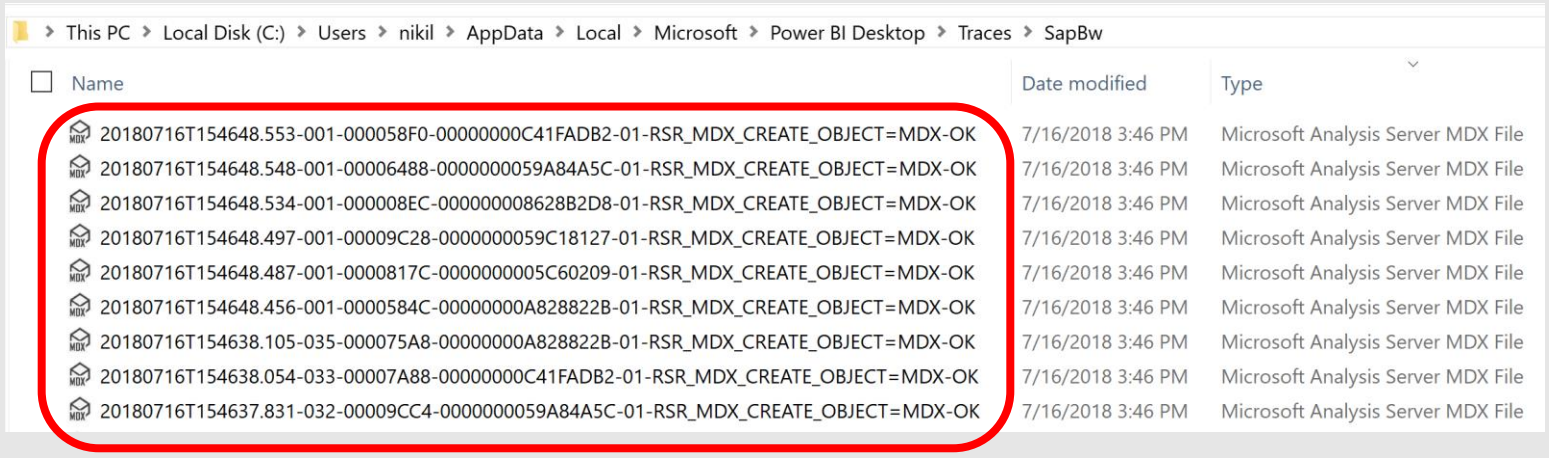


Advanced Tracing

- Standard Trace – **File -> Options and Settings -> Options -> Diagnostics**

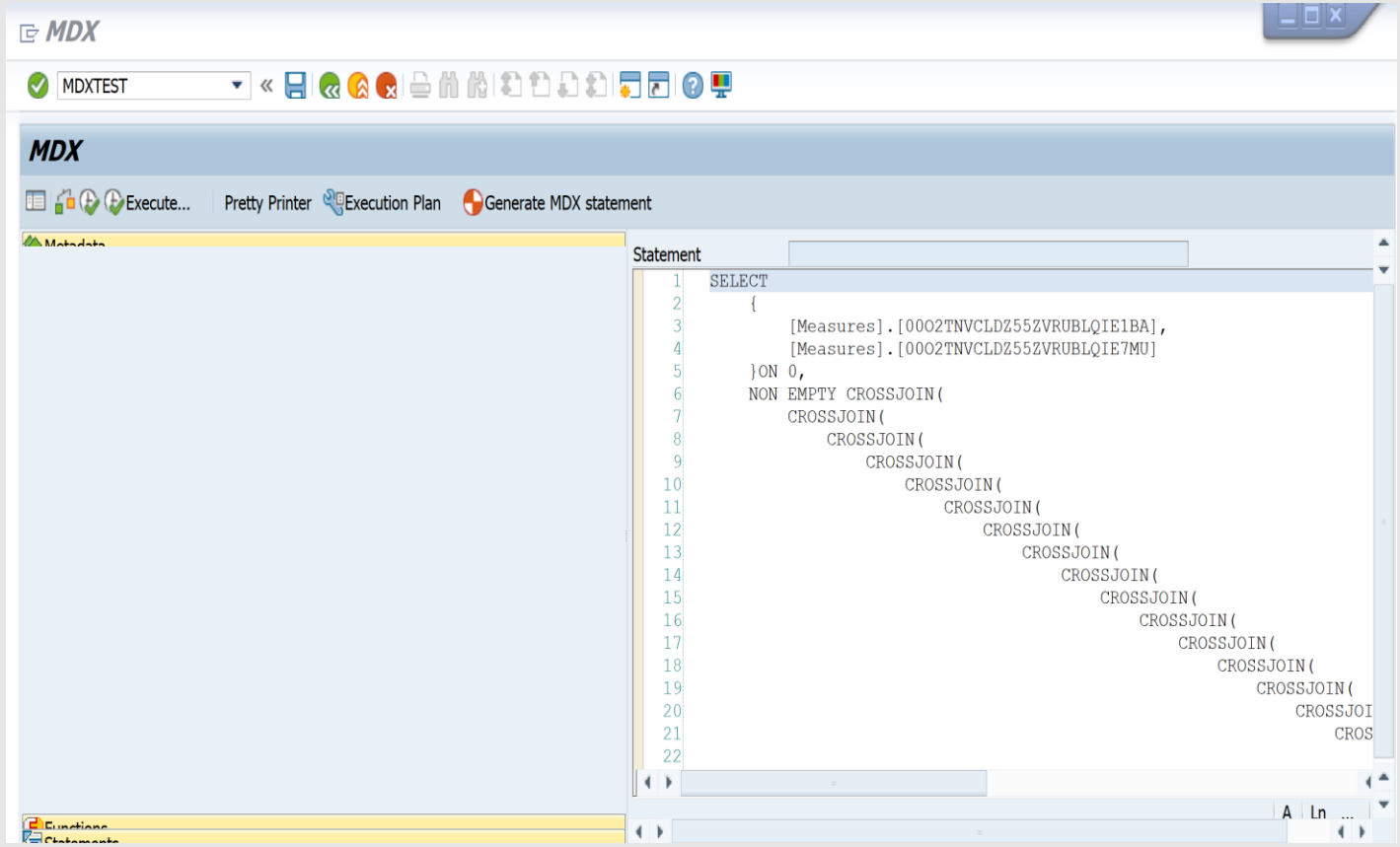
- Create environment variable **PBI_EnableSapBwTracing** and set it to **true**
- For CPIC tracing when using Implementation 2, create **CPIC_TRACE** environment variable and set it to **3**. (To debug authentication issues, for example)

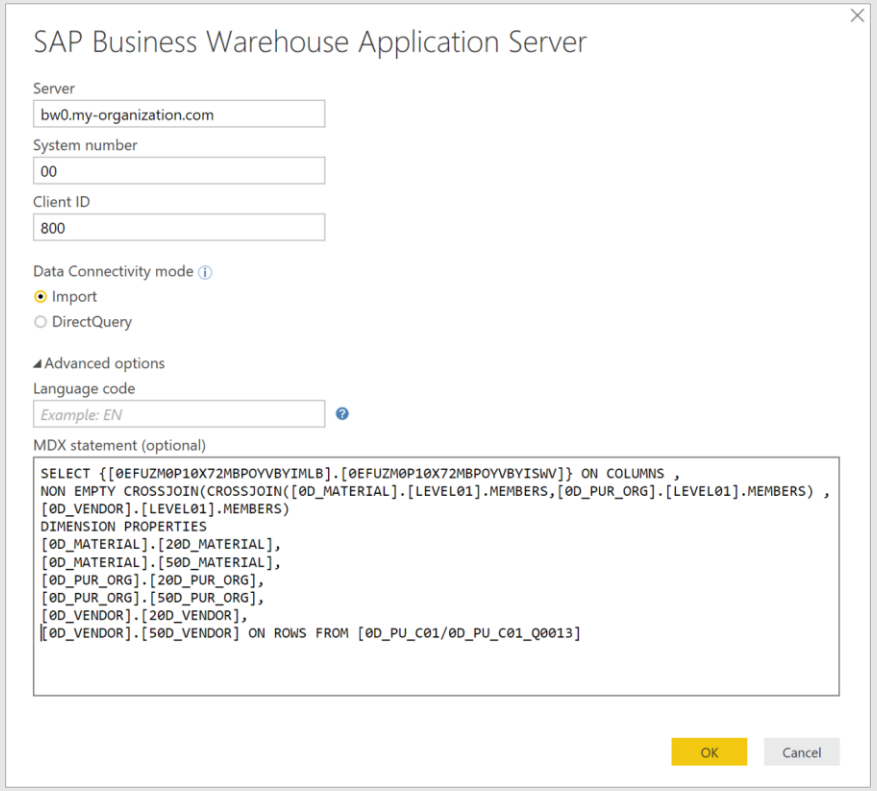




Tip 5: Query troubleshooting

- Use **MDXTEST** transaction code (tcode) in SAP GUI to analyze the MDX query





Q&A

My SAP on Azure PointDrive has links to my recorded delivery video presentations and additional information SAP on Azure PointDrive (http://aka.ms/sapforazure)

Session resources

- SAP HANA Connector Overview:
  https://docs.microsoft.com/en-us/power-bi/desktop-sap-hana
- SAP HANA DirectQuery (relational vs. multidimensional):
  https://docs.microsoft.com/en-us/power-bi/desktop-directquery-sap-hana

- SAP BW Connector Overview:
  https://docs.microsoft.com/en-us/power-bi/desktop-sap-bw-connector
- Power BI & SAP BW Whitepaper:
  https://aka.ms/powerbiandsapbw

- Single Sign-On in Power BI:
  https://docs.microsoft.com/en-us/power-bi/service-gateway-kerberos-for-sso-pbi-to-on-premises-data

Microsoft Azure