Please answer 4 questions before we start at: http://bit.ly/datamindsconnect

Nicky van Vroenhoven

NickyvV.com

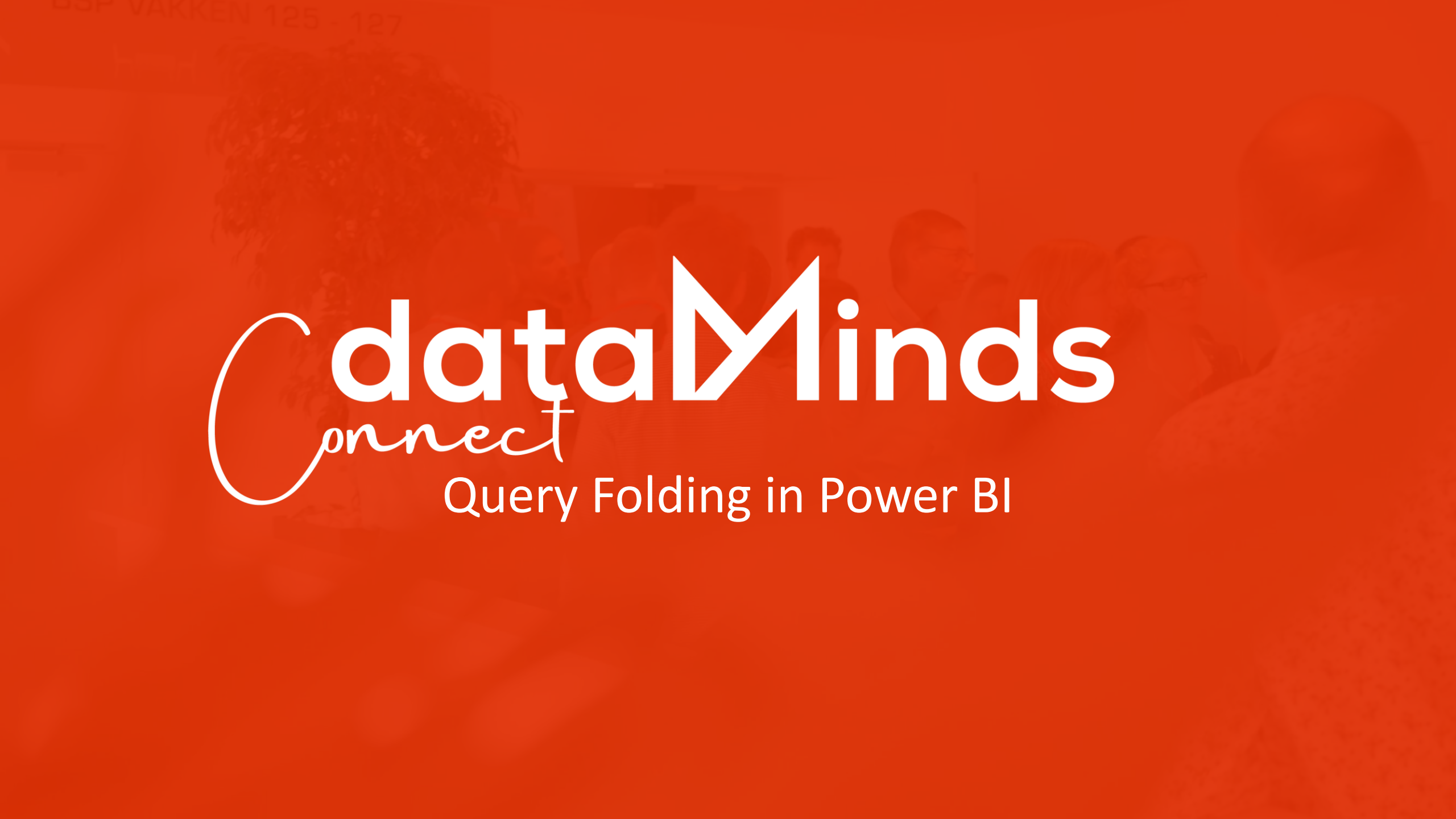
@NickyvV

Query Folding in Power BI

Power Query allows you to extract and transform data from a variety of data sources. Have you ever experienced that the importing of data is slower than you expected? In most of those cases, query folding is not happening fully optimized.

Query folding is important because it offloads data transformations to the source, instead of performing them in Power BI.

Attend this session to learn how to ensure that you get all the performance improvements possible within your reports! As a bonus, you will also learn in which cases query folding is not your best friend.

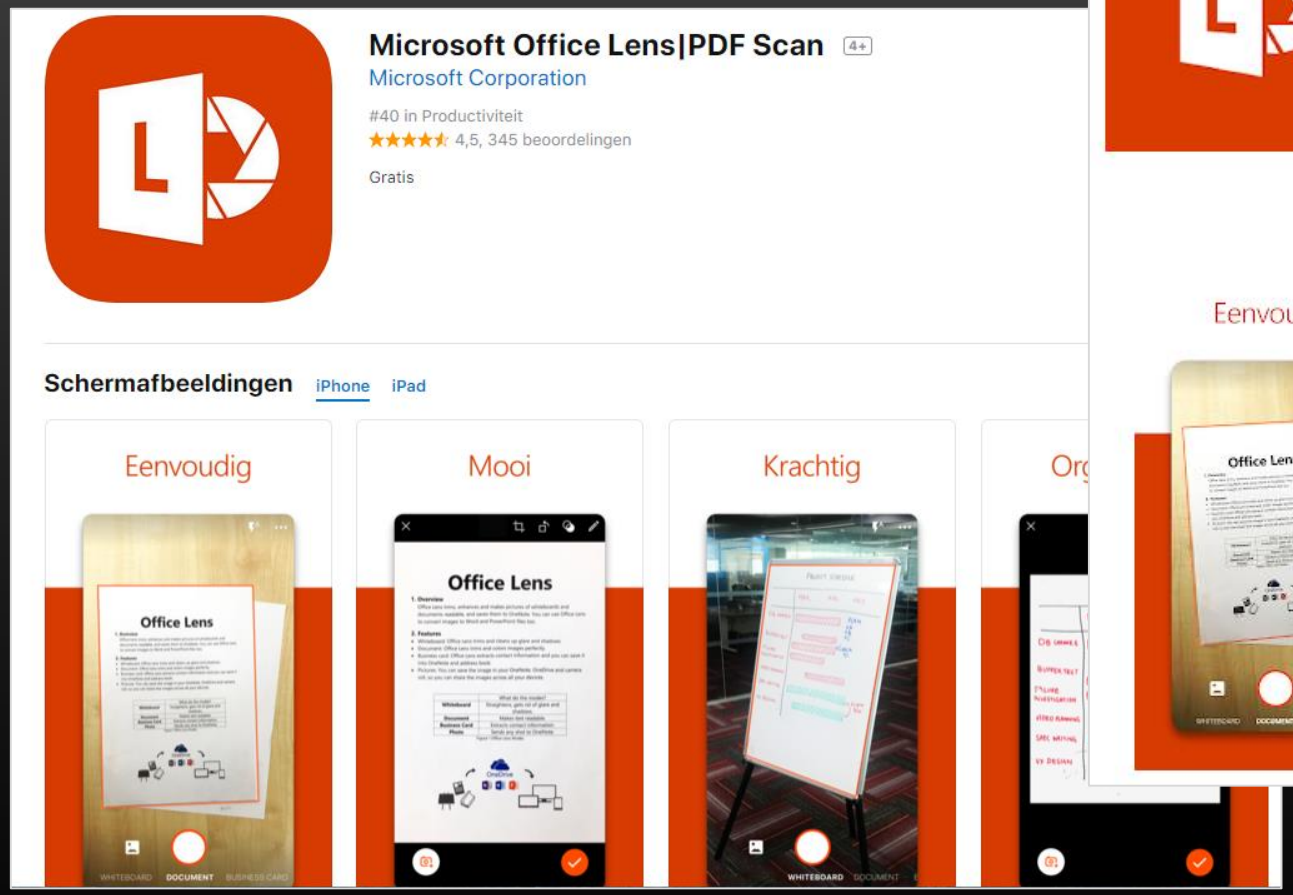

dataMinds
Connect
Query Folding in Power BI

Sponsors – Thank you!

Microsoft Office Lens app

Android

iOS



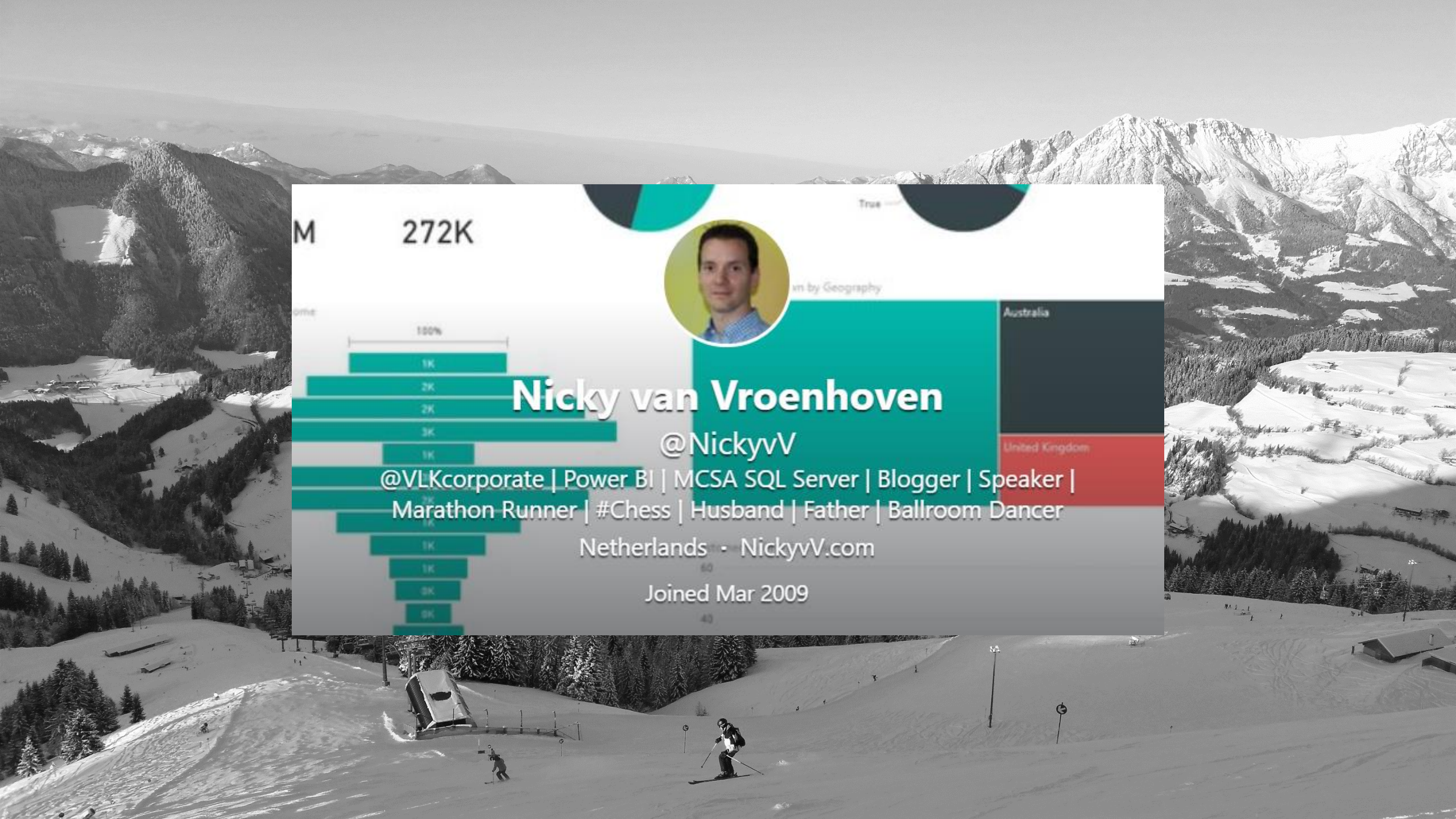
Please answer 4 questions before we start at: http://bit.ly/datamindsconnect

Microsoft Office Lens app

without Lens

with Lens

Please answer 4 questions before we start at: http://bit.ly/datamindsconnect


M
272K
Australia
United Kingdom
Nicky van Vroenhoven
@NickyvV
@VLKcorporate | Power BI | MCSA SQL Server | Blogger | Speaker |
Marathon Runner | #Chess | Husband | Father | Ballroom Dancer
Netherlands · NickyvV.com
Joined Mar 2009

Agenda

- Power Query
- Query Folding
- Constraints
- Demo

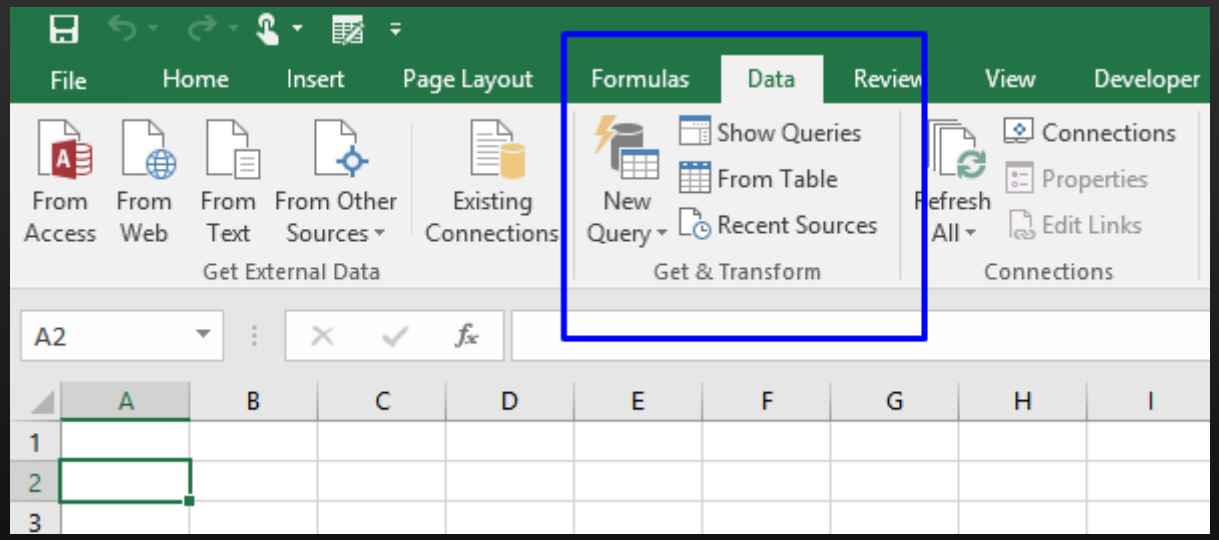
Agenda

- Power Query
- Query Folding
- Constraints
- Demo

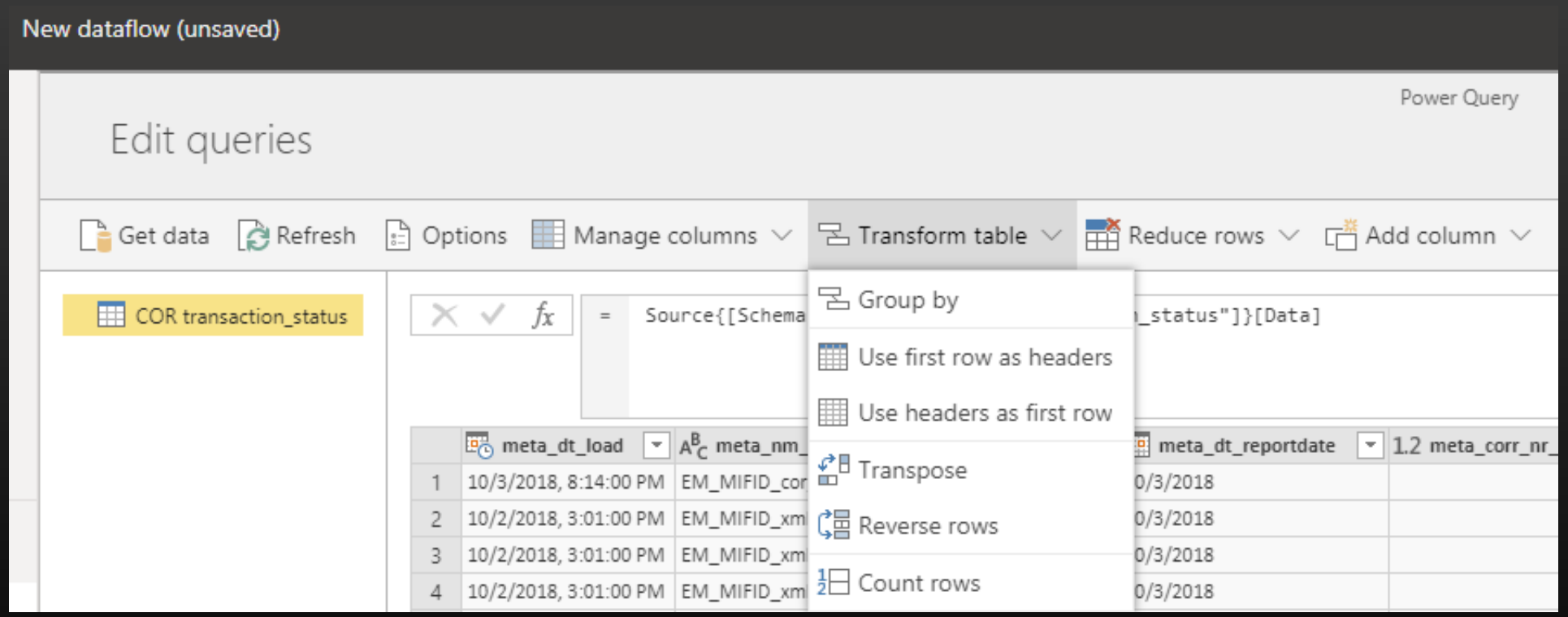
Power Query

+

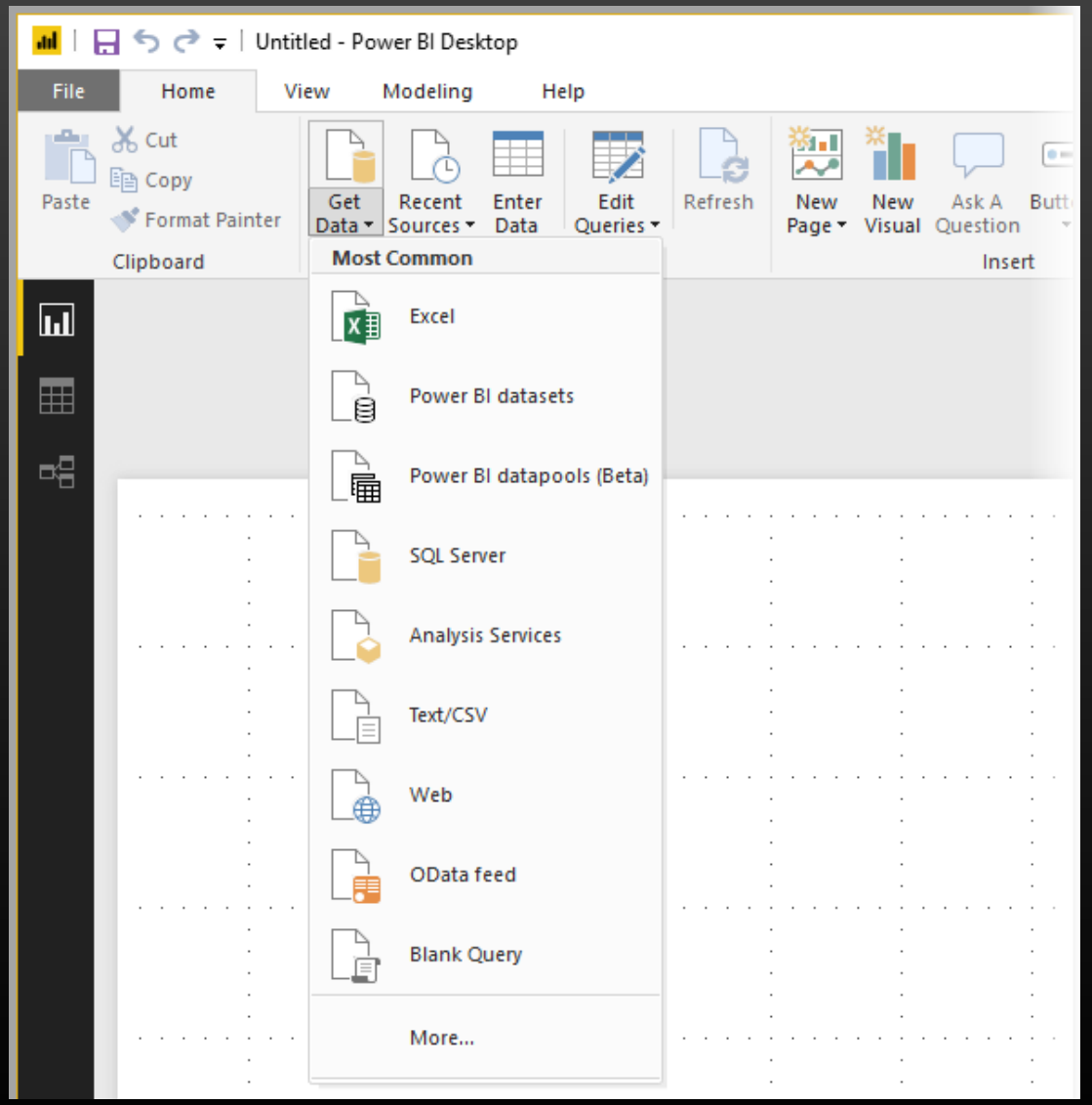
Power Query


File
Home
Insert
Page Layout
Formulas
Data
Review
View
Developer
From Access
From Web
From Text
From Other Sources
Existing Connections
Get External Data
New Query
Show Queries
From Table
Recent Sources
Get & Transform
Refresh All
Connections
Properties
Edit Links
Connections
A2
A
B
C
D
E
F
G
H
I
1
2
3

Power Query


New dataflow (unsaved)
Power Query
Edit queries
Get data
Refresh
Options
Manage columns
Transform table
Reduce rows
Add column
COR transaction_status
Source{[Schema
_status"]}[Data]
Group by
Use first row as headers
Use headers as first row
Transpose
Reverse rows
Count rows
meta_dt_load
meta_nm_
meta_dt_reportdate
1.2 meta_corr_nr_
1 10/3/2018, 8:14:00 PM EM_MIFID_cor 0/3/2018
2 10/2/2018, 3:01:00 PM EM_MIFID_xm 0/3/2018
3 10/2/2018, 3:01:00 PM EM_MIFID_xm 0/3/2018
4 10/2/2018, 3:01:00 PM EM_MIFID_xm 0/3/2018

Power Query


Untitled - Power BI Desktop
File
Home
View
Modeling
Help
Paste
Cut
Copy
Format Painter
Clipboard
Get Data
Recent Sources
Enter Data
Edit Queries
Refresh
New Page
New Visual
Ask A Question
Insert
Most Common
Excel
Power BI datasets
Power BI datapools (Beta)
SQL Server
Analysis Services
Text/CSV
Web
OData feed
Blank Query
More...

Agenda

- Power Query
- Query Folding
- Constraints
- Demo

Converts M to native query

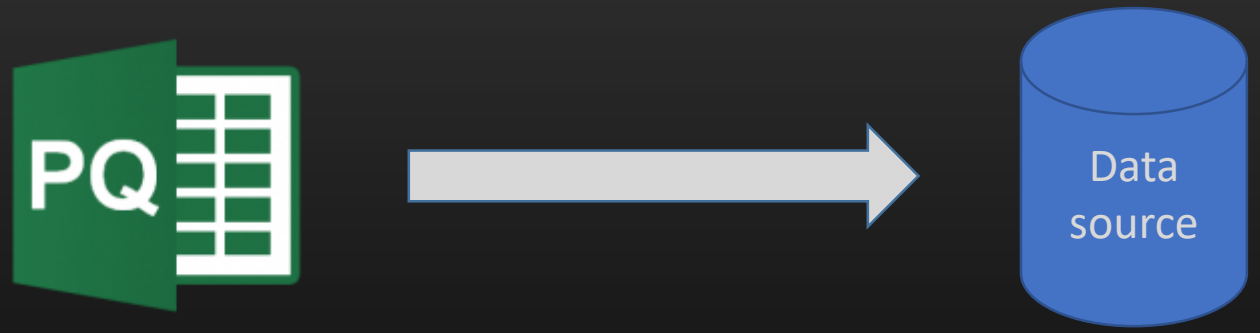
Fact Movement

```
let
    Source = Sql.Databases("."),
    WideWorldImportersDW = Source{[Name="WideWorldImportersDW"]}[Data],
    Fact_Movement = WideWorldImportersDW{[Schema="Fact",Item="Movement"]}[Data],
    #"Filtered Rows" = Table.SelectRows(Fact_Movement, each Date.QuarterOfYear([Date Key]) = 1),
    #"Expanded Dimension.Customer" = Table.ExpandRecordColumn(#"Filtered Rows", "Dimension.Customer", {"Customer"
    #"Uppercased Text" = Table.TransformColumns(#"Expanded Dimension.Customer",{{"Dimension.Customer.Customer", T
    #"Expanded Dimension.Supplier" = Table.ExpandRecordColumn(#"Uppercased Text", "Dimension.Supplier", {"Primary
    #"Merged Columns" = Table.CombineColumns(Table.TransformColumnTypes(#"Expanded Dimension.Supplier", {{"Custom
in
    #"Merged Columns"
```

Native Query

```
select [$Outer].[Movement Key] as [Movement Key],
    [$Outer].[Date Key] as [Date Key],
    [$Outer].[Stock Item Key] as [Stock Item Key],
    [$Outer].[Customer Key2] as [Customer Key],
    [$Outer].[Supplier Key2] as [Supplier Key],
    [$Outer].[Transaction Type Key] as [Transaction Type Key],
    [$Outer].[WWI Stock Item Transaction ID] as [WWI Stock Item Transaction ID],
    [$Outer].[WWI Invoice ID] as [WWI Invoice ID],
    [$Outer].[WWI Purchase Order ID] as [WWI Purchase Order ID],
    [$Outer].[Quantity] as [Quantity],
    [$Outer].[Lineage Key2] as [Lineage Key],
    [$Outer].[t0_0] as [Dimension.Customer.Customer],
    [$Outer].[Category2] as [Dimension.Customer.Category],
    [$Inner].[Primary Contact] as [Dimension.Supplier.Primary Contact]
from
(
    select [_].[Movement Key] as [Movement Key],
        [_].[Date Key] as [Date Key],
        [_].[Stock Item Key] as [Stock Item Key],
        [_].[Customer Key2] as [Customer Key2],
        [_].[Supplier Key] as [Supplier Key2],
        [_].[Transaction Type Key] as [Transaction Type Key],
        [_].[WWI Stock Item Transaction ID] as [WWI Stock Item Transaction ID],
        [_].[WWI Invoice ID] as [WWI Invoice ID],
        [_].[WWI Purchase Order ID] as [WWI Purchase Order ID],
        [_].[Quantity] as [Quantity],
        [_].[Lineage Key2] as [Lineage Key2],
        [_].[Category] as [Category2],
        upper([_].[Customer]) as [t0_0]
    from
    (
        select [$Outer].[Movement Key],
            [$Outer].[Date Key],
            [$Outer].[Stock Item Key],
```

Transformation pushed back to data source

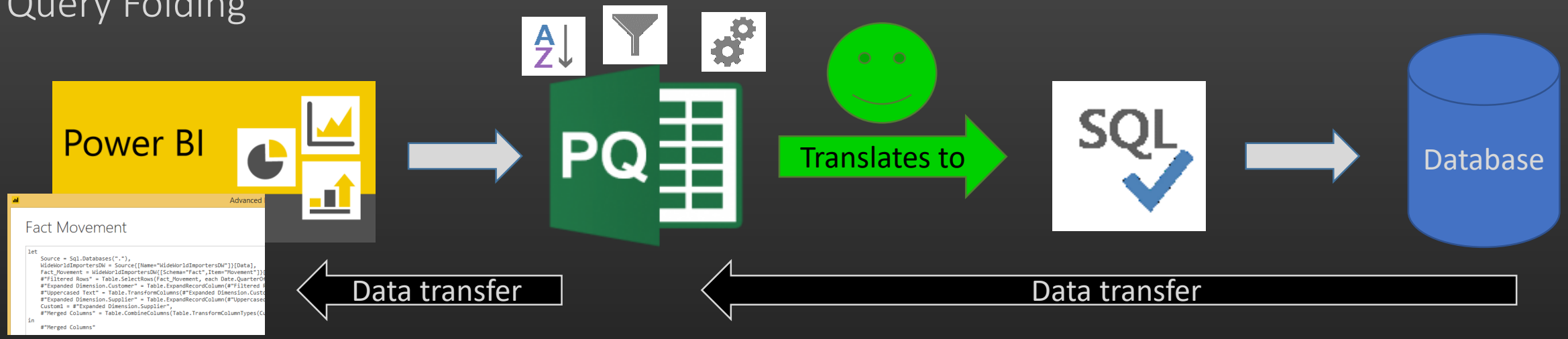


From M to SQL, MySQL, oData, etc

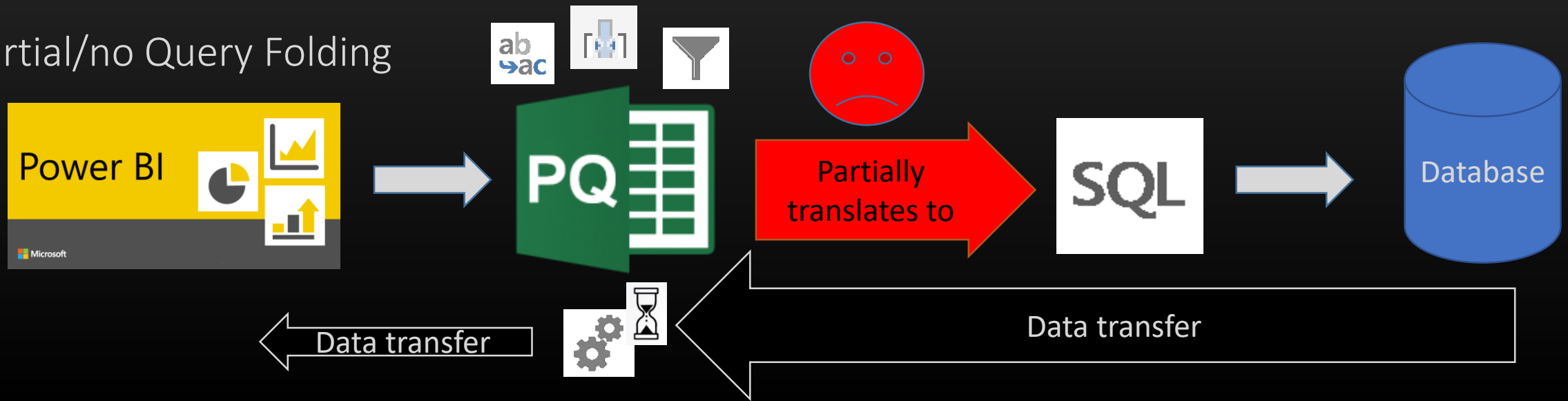
Better performance

Partial folding

Query Folding

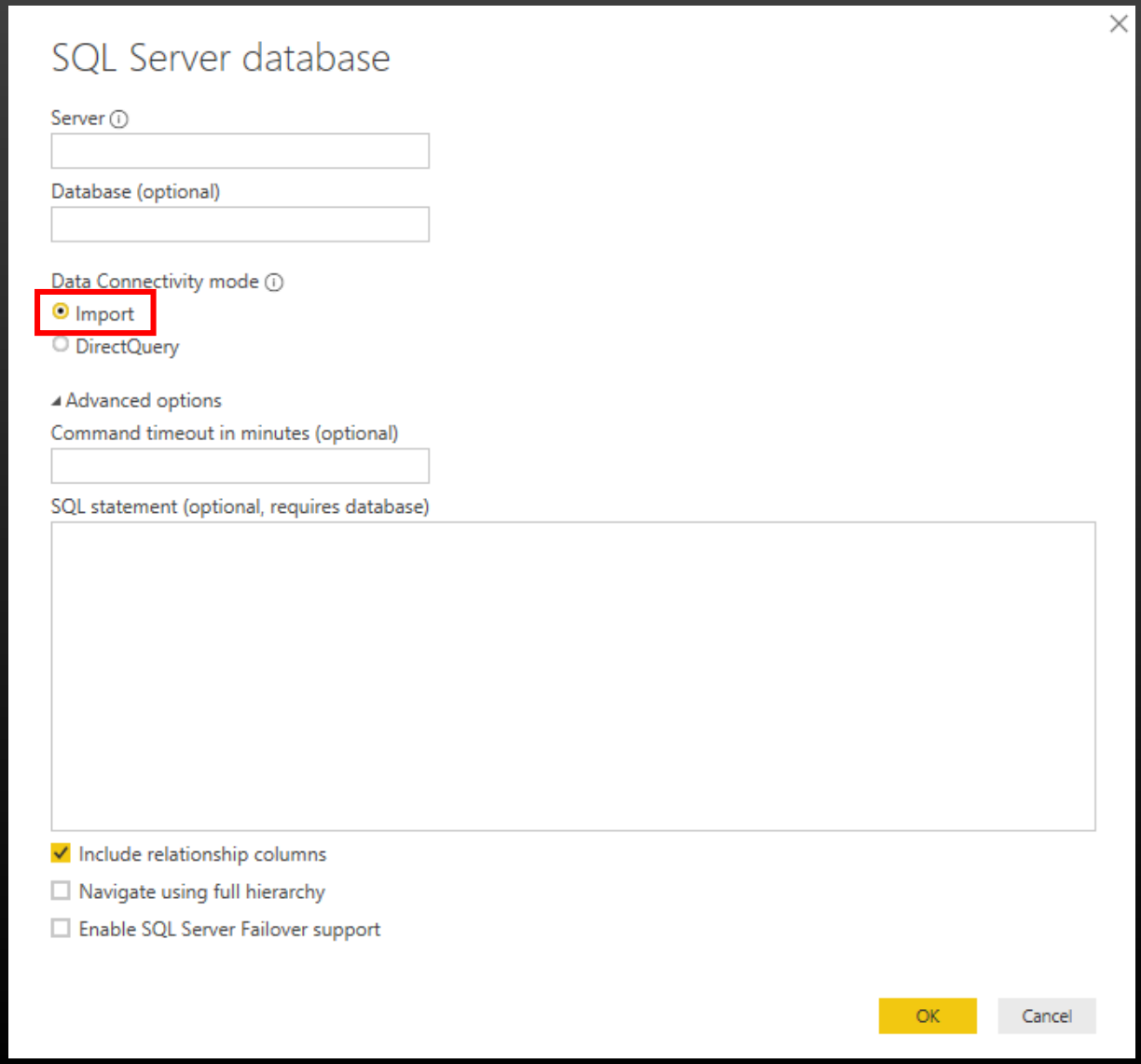


Partial/no Query Folding



To Fold or Not To Fold

- Import mode only



Supported Data Sources

Supported Transformations
(most commonly used)

Filter

Sort

(Un)Pivot

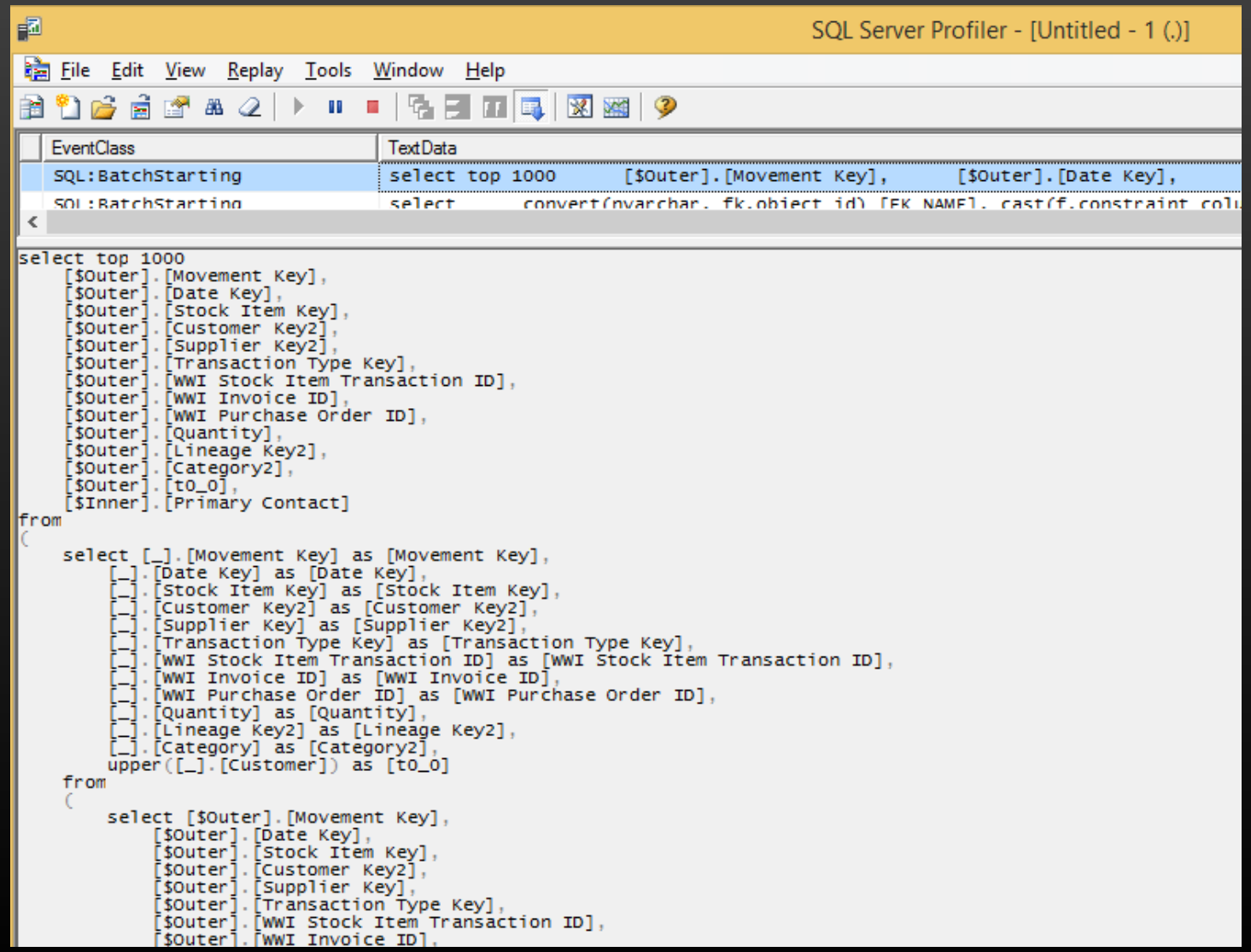
String Manipulations

Top Rows

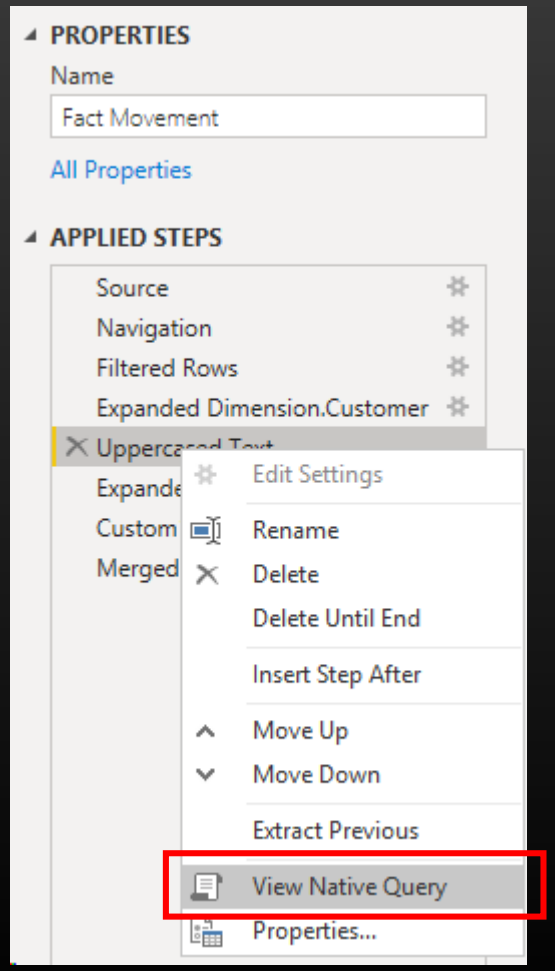
Join (Append)

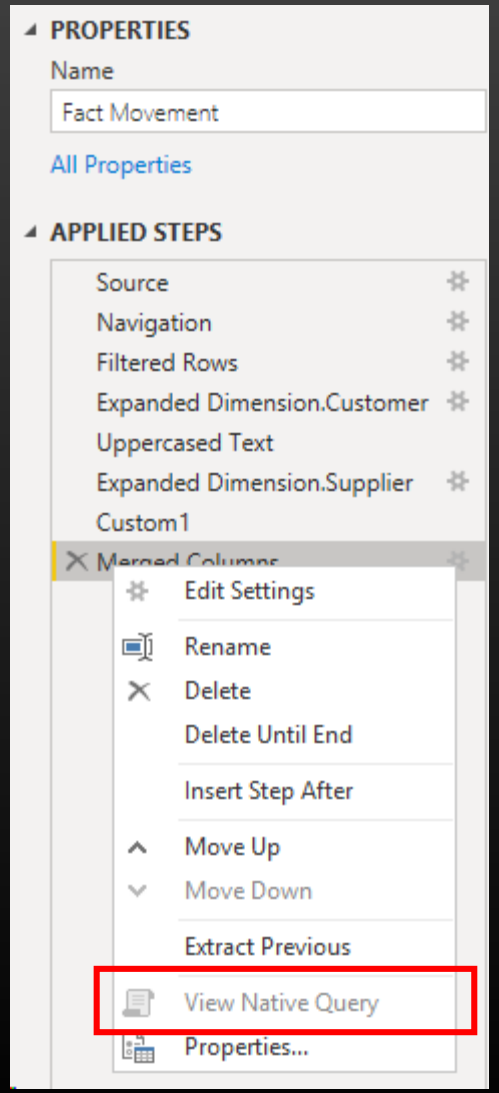
Group By

Is My Query Folding? - SQL

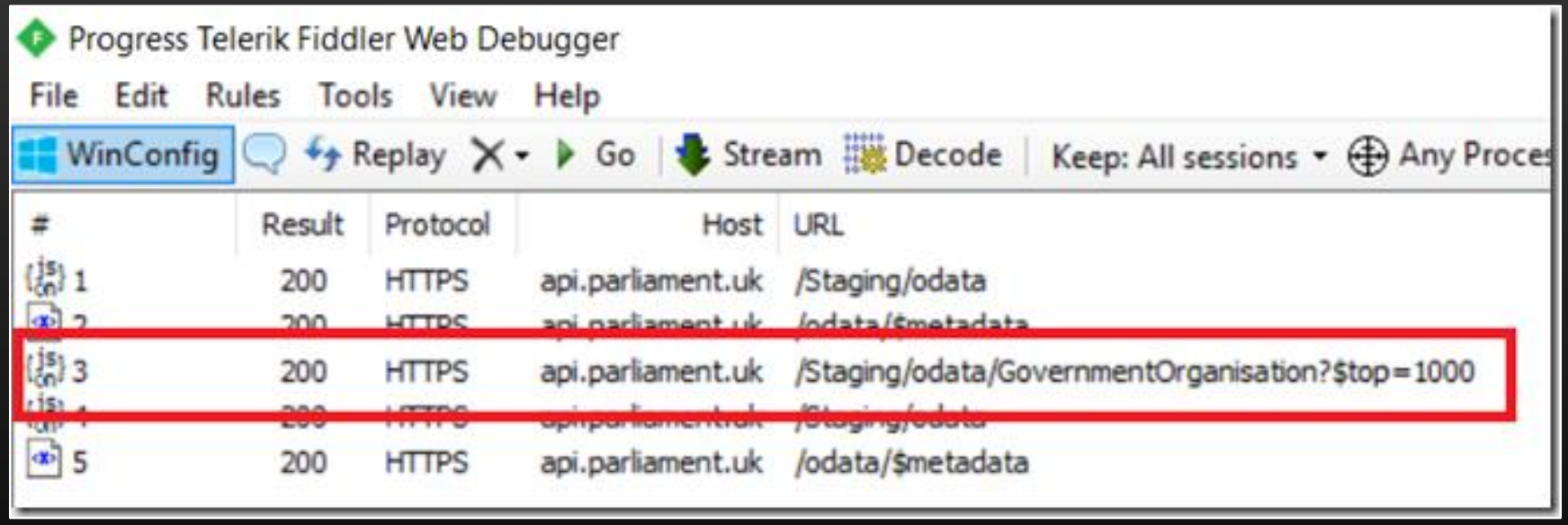


Is My Query Folding? - SQL



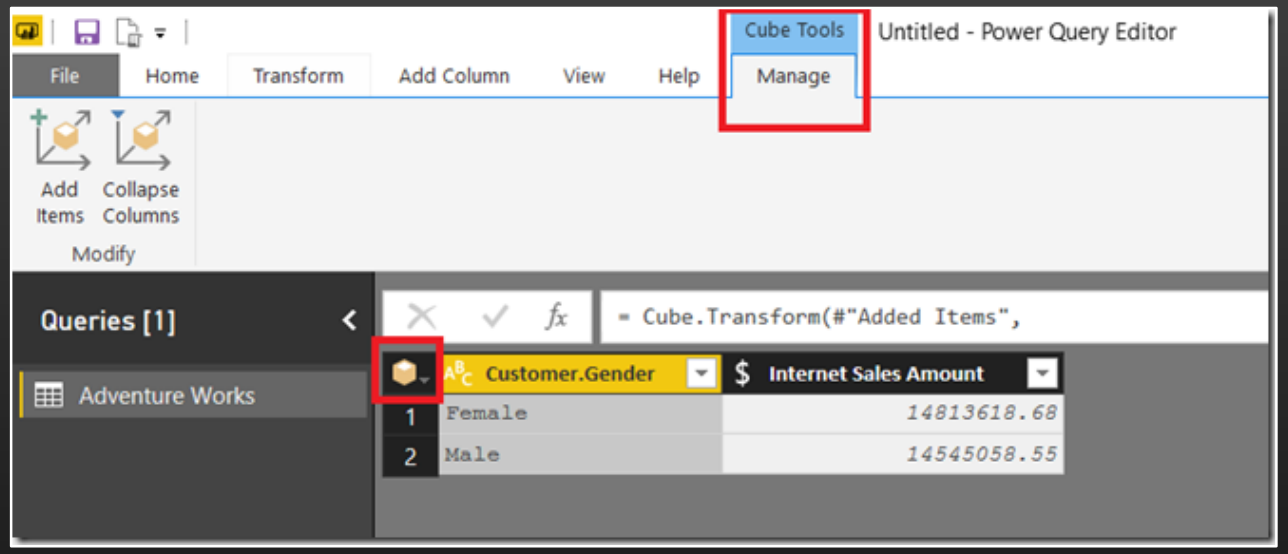


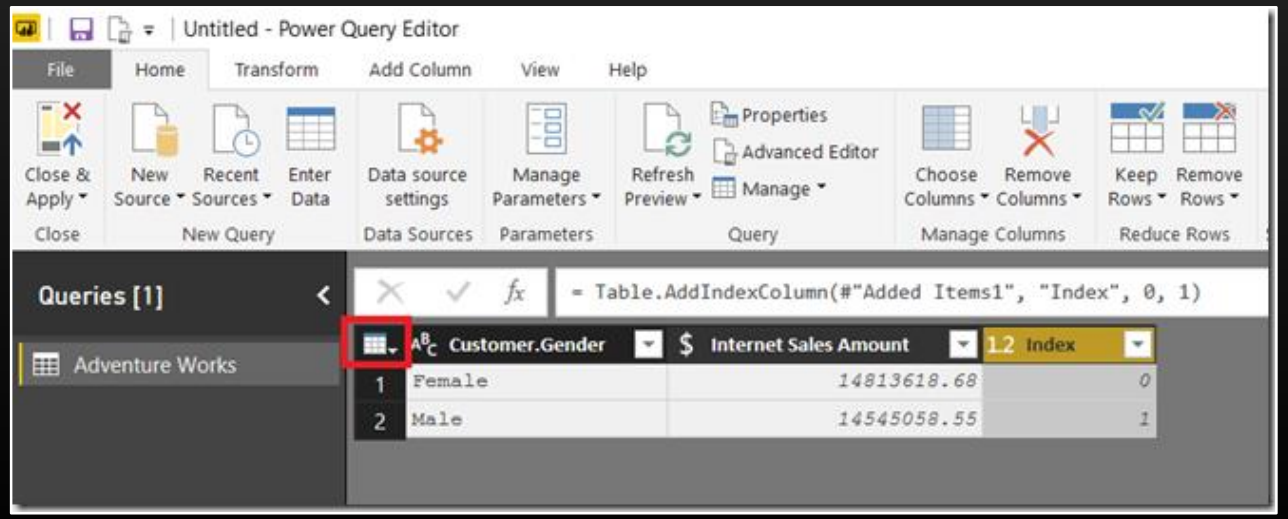
Is My Query Folding? - OData



Source: Chris Webb

Is My Query Folding? - SSAS





Source: Chris Webb

Agenda

- Power Query
- Query Folding
- Constraints
- Demo

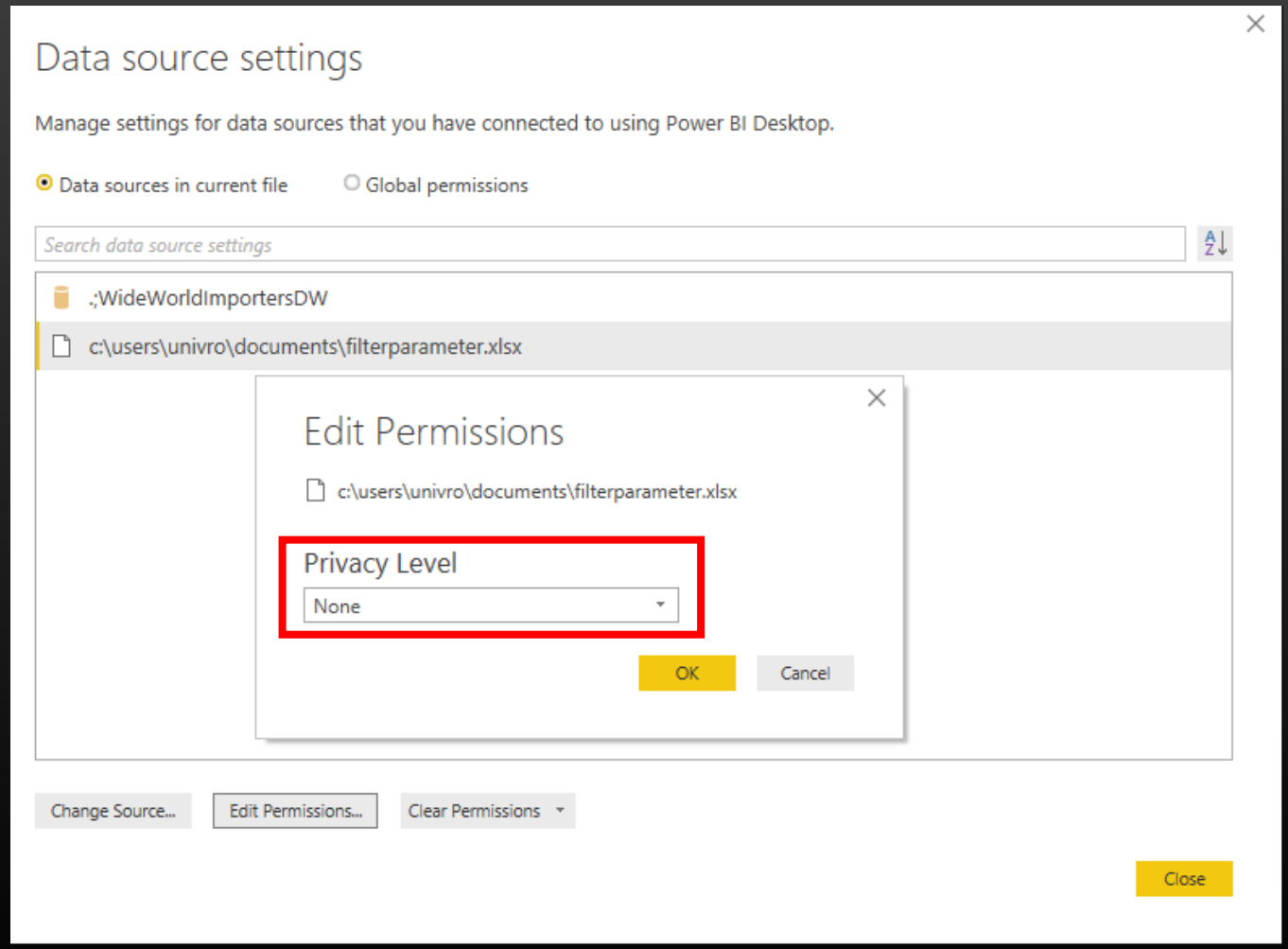
Limitations

- Unsupported data sources
- Unsupported transformations
- Data source privacy level
- Native database query

Limitations – Unsupported Transformations

- **Merge columns**
  - *Solved with a custom column*
- Split column
- Add Index column
- Table.Buffer() M function
- Complex Group By
- Remove errors, duplicates
- **DateTime to Date** (Transform or Date Only)
- And more…

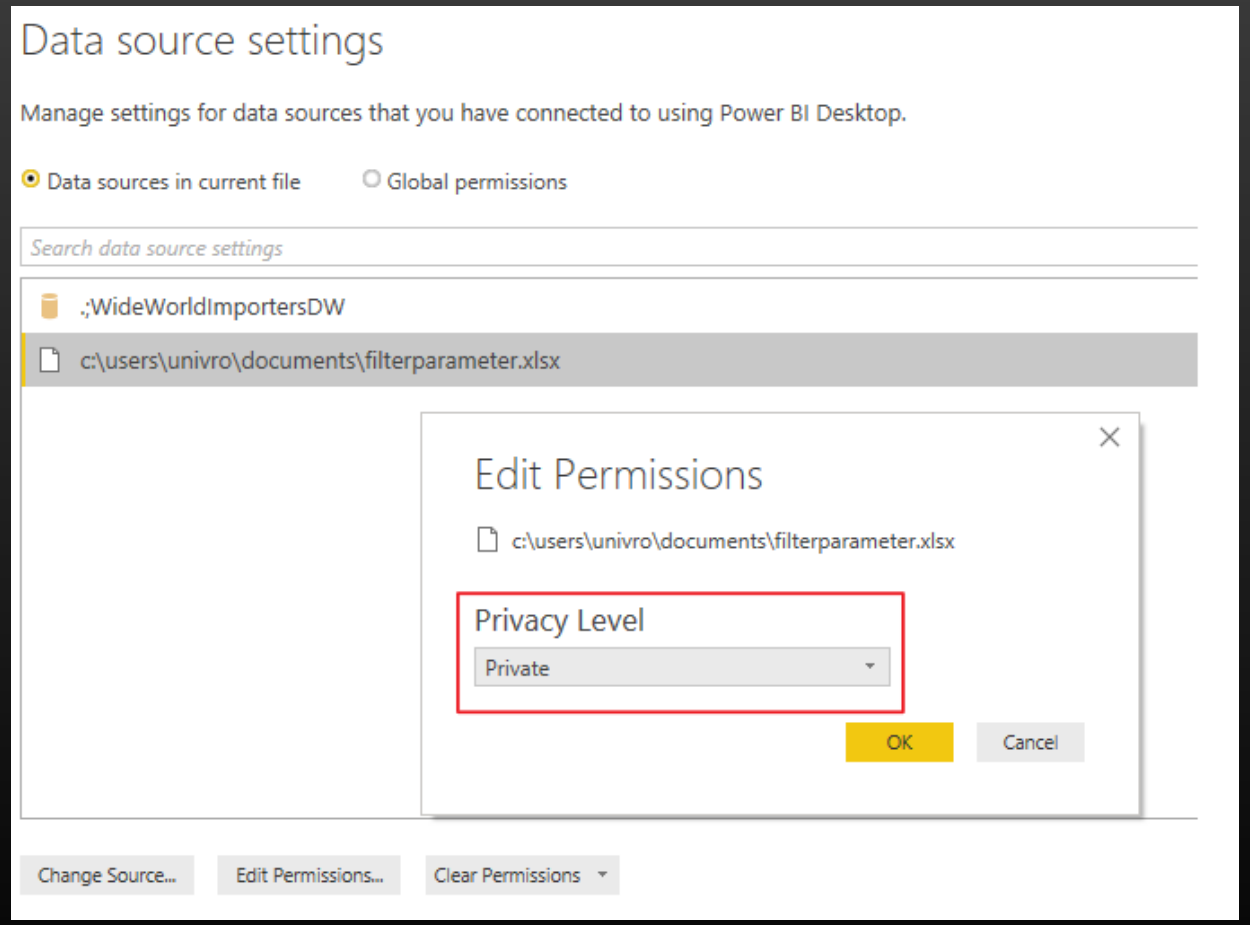
Limitations – Data source privacy level



Limitations – Data source privacy level

```
        from
        (
            select [$Outer].[Movement Key],
                [$Outer].[Date Key],
                [$Outer].[Stock Item Key],
                [$Outer].[Customer Key],
                [$Outer].[Supplier Key],
                [$Outer].[Transaction Type Key],
                [$Outer].[WWI Stock Item Transaction ID],
                [$Outer].[WWI Invoice ID],
                [$Outer].[WWI Purchase Order ID],
                [$Outer].[Quantity],
                [$Outer].[Lineage Key],
                [$Inner].[Calendar Year]
            from [Fact].[Movement] as [$Outer]
            left outer join [Dimension].[Date] as [$Inner] on ([$Out
        ) as [_]
        where [_].[Calendar Year] = 2018 and [_].[Calendar Year] is
    ) as [_]
as [$Outer]
```

Limitations – Data source privacy level



Limitations – Data source privacy level

```
select [$Outer].[Movement Key],
    [$Outer].[Date Key],
    [$Outer].[Stock Item Key],
    [$Outer].[Customer Key],
    [$Outer].[Supplier Key],
    [$Outer].[Transaction Type Key],
    [$Outer].[WWI Stock Item Transaction ID],
    [$Outer].[WWI Invoice ID],
    [$Outer].[WWI Purchase Order ID],
    [$Outer].[Quantity],
    [$Outer].[Lineage Key],
    [$Inner].[Calendar Year]
from [Fact].[Movement] as [$Outer]
left outer join [Dimension].[Date] as [$Inner] on ([$Outer].[
```

Limitations – Native Database Queries

Query the source directly

- PQ isn’t sufficient
- Specific requirements/optimizations
- Existing SQL-query
- Stored Procedures

Limitations – Native Database Queries

- Functions on top of the query results aren’t folded
- No parsing takes place
- No guarantees on frequency of execution

Demo Time!

Demo Recap

- Import data from SQL Server
- Transform data in several ways

Take-aways:

- Filter first, transform later
- View Native Query

Improvements

- Desktop June 2018:
  - ODBC connector improvements
    - Folding support for top rows
  - OData V4 connector enhancements:
    - Use [Implementation="2.0"] in OData.Feed()
- Relative date slicers now also work
- Desktop February 2019:
  - PBI Premium (& pro!): Incremental refresh query verification
- Desktop September 2019:
  - **PostgreSQL connector enhancements over a native query**

Wrap-up

- Concept of Query Folding
- Supported data sources
- Supported transformations
- Don’t write native SQL and add steps afterwards

- View Native Query!

Resources

Blogs that cover Query Folding:

- https://www.mssqltips.com/sqlservertip/3635/query-folding-in-power-query-to-improve-performance/
- http://geekswithblogs.net/darrengosbell/archive/2014/05/16/function-folding-in-powerquery.aspx
- http://www.mattmasson.com/2013/07/filtering-in-data-explorer/
- https://www.mssqltips.com/sqlservertip/4563/power-bi-native-query-and-query-folding/
- https://blog.crossjoin.co.uk/2018/06/27/odata-performance-power-bi/

Power BI Desktop updates

- https://powerbi.microsoft.com/en-us/blog/power-bi-desktop-june-2018-feature-summary/#folding
- https://powerbi.microsoft.com/en-us/blog/power-bi-desktop-june-2018-feature-summary/#oData

Power BI Premium Incremental refresh

- https://powerbi.microsoft.com/en-us/blog/incremental-refresh-query-folding/

What do you think?

1. Open the form
2. Provide constructive feedback
3. Be eligible for an amazing prize!

bit.ly is CASE SENSITIVE!

http://bit.ly/dataMindsConnectSession

Our Partners

Thank you!

NickyvV.com

@NickyvV

www.linkedin.com/in/nickyvanvroenhoven/