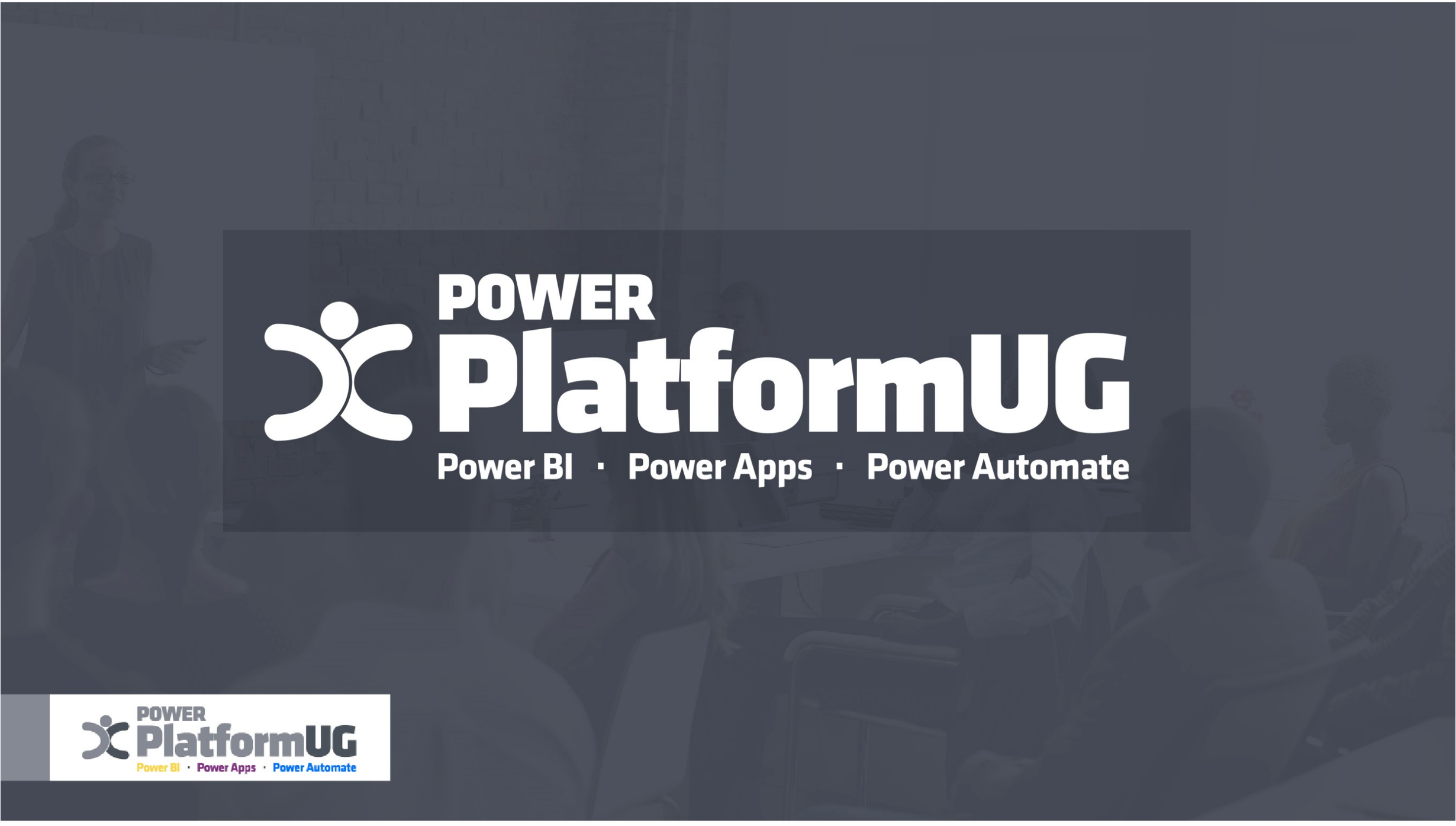
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Performance, Optimization, and Error Handling in Power Query

Presenter Introduction

- **Reid Havens**
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  - Microsoft MVP
  - PBI User Group Co-Organizer – Redmond, WA
  - Nickname: “The Viz Wiz”
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Performance, Optimization, and Error Handling in Power Query

Reducing Query Data
Optimizing Query Performance
Leveraging Query Folding
Handling Conversion Errors

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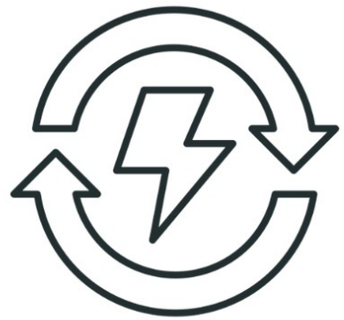
Reducing Query Data

Common Transformations

- **Common reduction transformations are:**
  - Column modification
  - Reducing rows

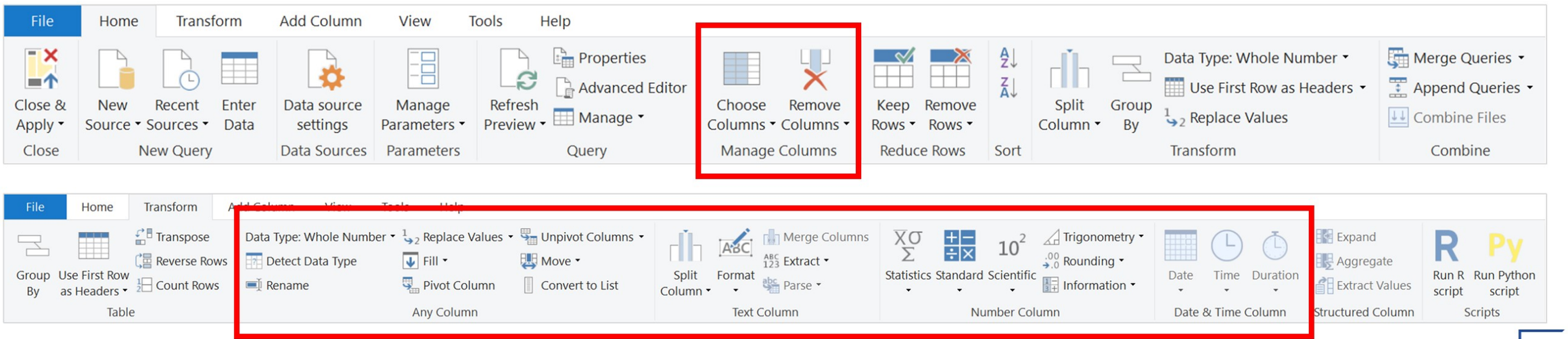


Reducing Query Data

Common Transformations ► Column Modification

- **Types of column modifications:**
  - *Choosing* or *removing* columns
  - *Modifying* columns

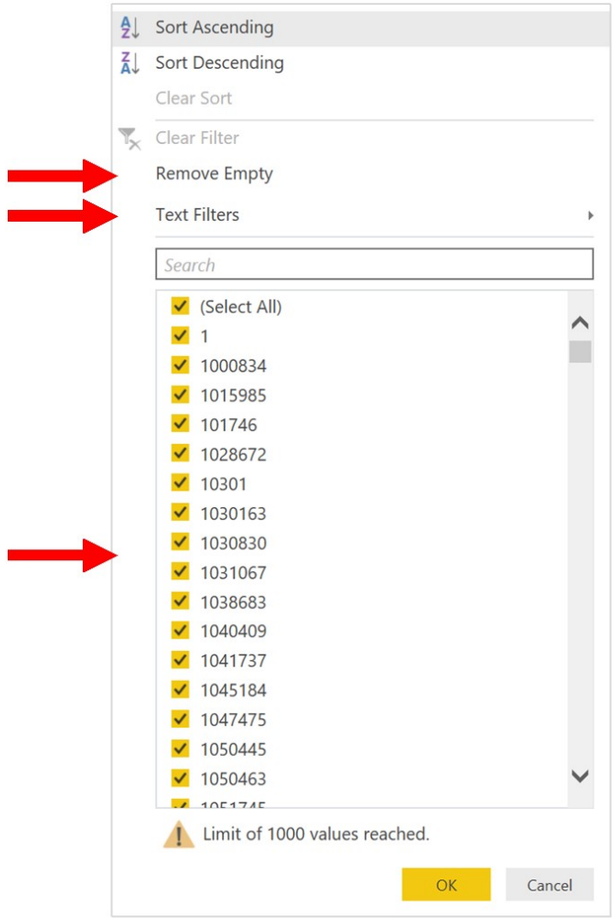
Most column modifications can be added without any coding required

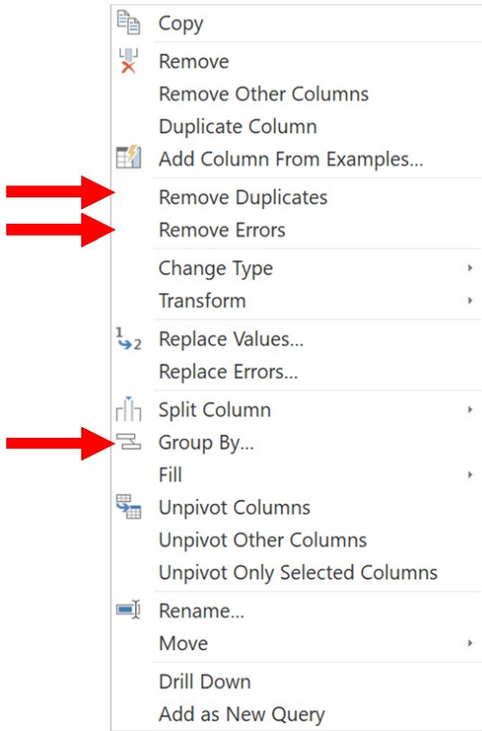


Reducing Query Data

Common Transformations ► Reducing Rows

- Types of row reduction:
  - **Filtering rows:**
    - Filtering by *category* or *date*[1]
    - Removing *empty rows*
    - Removing *duplicates*
    - Removing *errors*
  - **Group by column(s)**[2]





1: Depending on data type
2: The **Group By** function aggregates rows up to a level higher than the original granularity of the table

Demonstration

Recommended Practices

- Query data reduction practices:
  - **Select columns:**
    - Select only columns that meet the current report requirements
  - **Filter rows:**
    - Filter by date (history)
    - Filter by category (subset of source data)
  - **Reduce granularity:**
    - Remove row level details outside the scope of report requirements
  - **Change data type:**
    - Set columns to appropriate data types

References

- Power Query Docs
  - https://docs.microsoft.com/en-us/power-query/
- Common Power Query Tasks
  - https://docs.microsoft.com/en-us/power-bi/desktop-common-query-tasks
- HC – Power Query Videos Playlist
  - https://www.youtube.com/playlist?list=PLzN99cpDw6oBuidLOD20RVv83RusrBQ3o

Questions?

Performance, Optimization, and Error Handling in Power Query

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Demonstration

Recommended Practices

- Query optimization practices:
  - **Row and column selection first:**
    - Choose columns and filter rows before transformations to reduce the amount of information processed by the mashup engine
  - **Avoid duplicate applied steps:**
    - Try to avoid having multiple applied steps for the same types of transformations. Common transformations where this occurs are: change type, rename columns, or choose columns.
  - **Remove duplicates:**
    - When remove duplicates from a column – avoid using the Group By command, unless an aggregation is required. Otherwise use the remove duplicates command
  - **Add columns using left joins:**
    - Left joins with other tables typically calculate faster than adding a new column using the conditional column command

Recommended Practices

- Query optimization practices:
  - **Use list commands for column calculations:**
    - Whenever a calculation against a column is needed, such as min/max or sort commands. It is better to treat the column as a list using Statistical commands or the Group By and aggregate commands.

References

- The BIccountant – Speed and Performance Aspects in Power Query
  - https://www.thebiccountant.com/speedperformance-aspects/
- HC – Power Query Videos Playlist
  - https://www.youtube.com/playlist?list=PLzN99cpDw6oBuidLOD20RVv83RusrBQ3o

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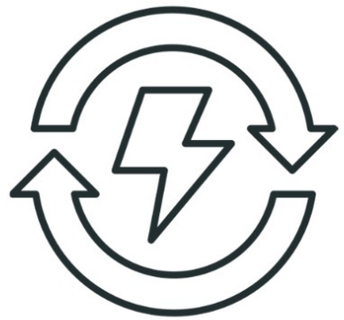
Query Folding

Introducing Query Folding

- Query folding is the ability for a Power Query query to generate a **single query statement** to retrieve and transform data *at the source*
  - Query folding is the **most efficient path** to connect a Power BI model table to its *underlying data source*
- Query folding **may occur** for an *entire Power Query query*, or for a *subset of its steps*
  - When query folding cannot be achieved for an applied step – the transformation is imported and processed by Power Query[1]

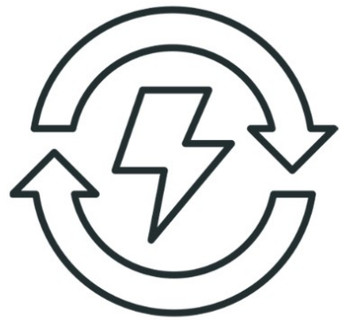


1: For large datasets this can be very resource intensive and slow

Query Folding

Compatible Data Sources

- Most data sources that have the **concept of a query language** *support query folding* – these can include:
  - Relational databases
  - OData feeds (including SharePoint lists), Exchange, and Active Directory.
- Data sources that are **<u>not</u> supported:**
  - Flat files
  - Blob
  - Web

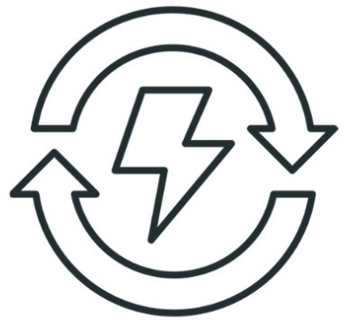


Query Folding

Compatible Applied Steps

Applied steps that **can** be query folded:

- Removing columns
- Renaming columns
- Changing a column data type
- Filtering rows with static values or Power Query parameters
- Grouping and summarizing
- Expanding record columns
- Non-fuzzy merging of fold-able queries from the same source
- Appending fold-able queries from the same source
- Adding custom columns with simple logic
- Pivoting and unpivoting

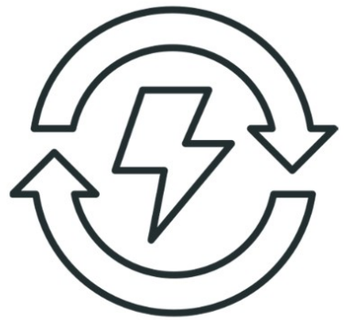


Query Folding

Incompatible Applied Steps

Applied steps that **cannot** be query folded:

- Using a custom SQL statement[1]
- Merging queries based on different sources
- Appending queries based on different sources
- Adding custom columns with complex logic.
- Adding index columns
- Using the Buffer command
- Using any command to remove errors
- Transformations that use a List function[2]

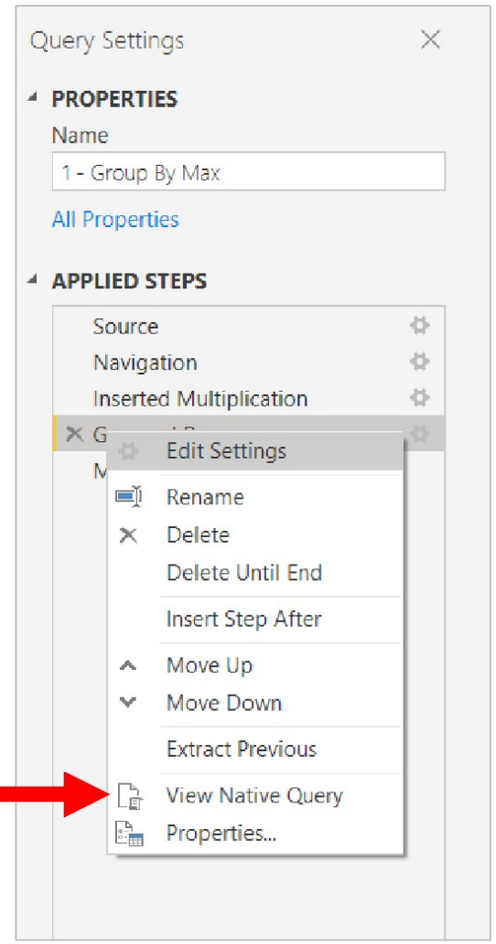


1: Compared to connecting to a **native SQL query** that support folding
2: Unless used as an aggregation function inside a **Group By** command

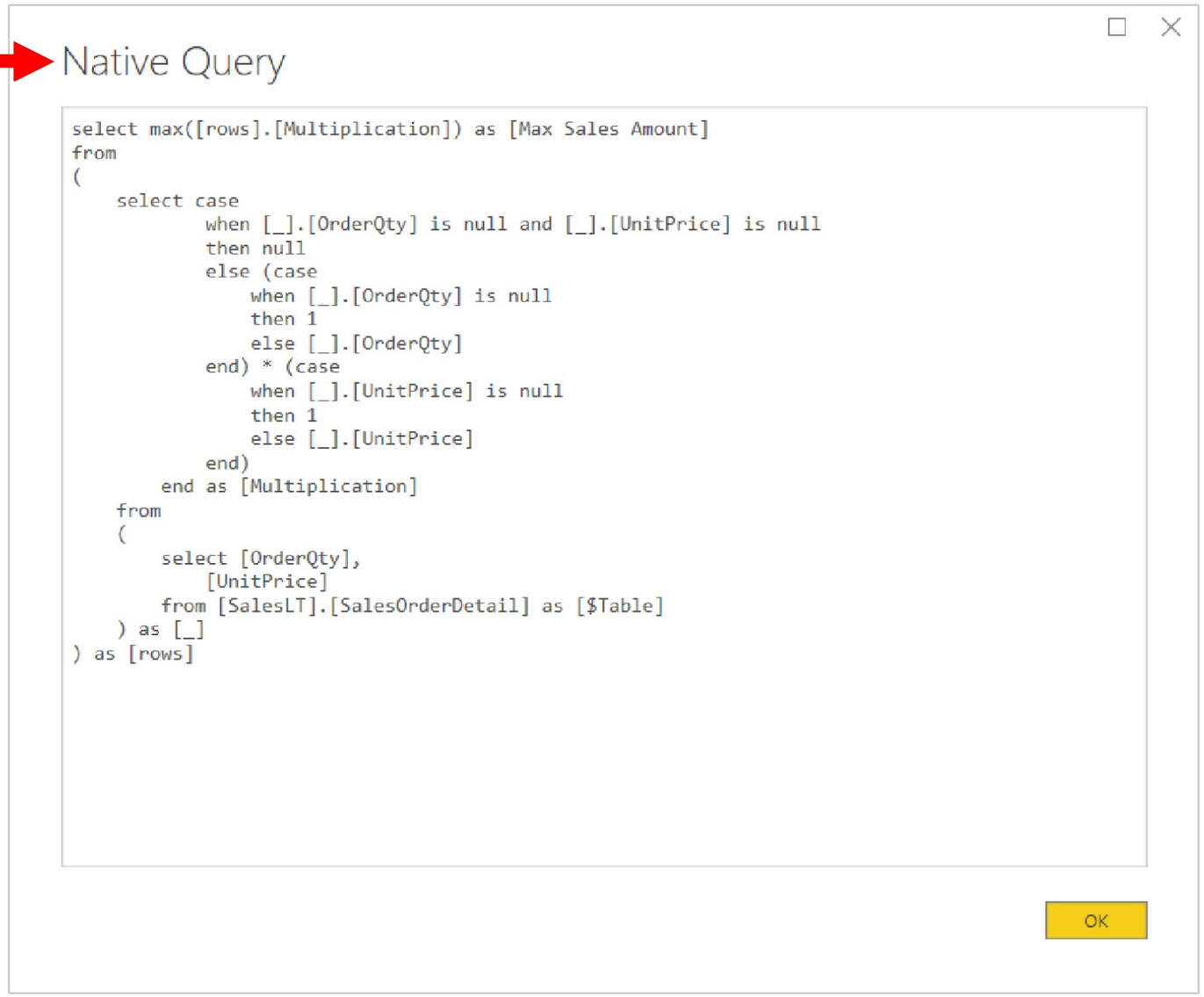
Query Folding

Identifying Query Folding

- In the Power Query Editor window, it is possible to determine if any **applied step** *can be folded*
- In the **Query Settings** pane, when you right-click an applied step, if the **View Native Query** option is enabled (not greyed out) – then the query can be folded



Native query sent to data source



Demonstration

Recommended Practices

- Delegate as much processing to the data source as possible
  - When all steps of a Power Query query cannot be folded, discover the step that prevents query folding
  - When possible, move subsequent steps earlier in sequence so they may be factored into the query folding[1]
- Prepare and transformation data in the source
  - If certain Power Query query steps cannot be folded, it may be possible to apply the transformations in the data source
  - This could be achieved by writing a database view that logically transforms source data, or by physically preparing and materializing data

1: Note that the Power Query mashup engine may be smart enough to reorder your query steps when it generates the source query

References

- Importance of Power Query Folding
  - https://docs.microsoft.com/en-us/power-bi/guidance/power-query-folding
- Handling Query Folding
  - https://docs.microsoft.com/en-us/power-query/handlingqueryfolding

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Demonstration

Recommended Practices

- To build a reliable data model in Power BI, you need to account for and handle errors carefully
- Consider the pros and cons of *replacing values*, *replacing errors*, or letting the refresh *fail upon error*
  - If you use the replace errors command consider outputting an errors table in the report for review and analysis when errors occur

References

- Exception Report: Error Rows
  - https://radacad.com/exception-reporting-in-power-bi-catch-the-error-rows-in-power-query
- Errors – Power Query
  - https://docs.microsoft.com/en-us/powerquery-m/errors
- Error Handling for Power Query Connectors
  - https://docs.microsoft.com/en-us/power-query/handlingerrors

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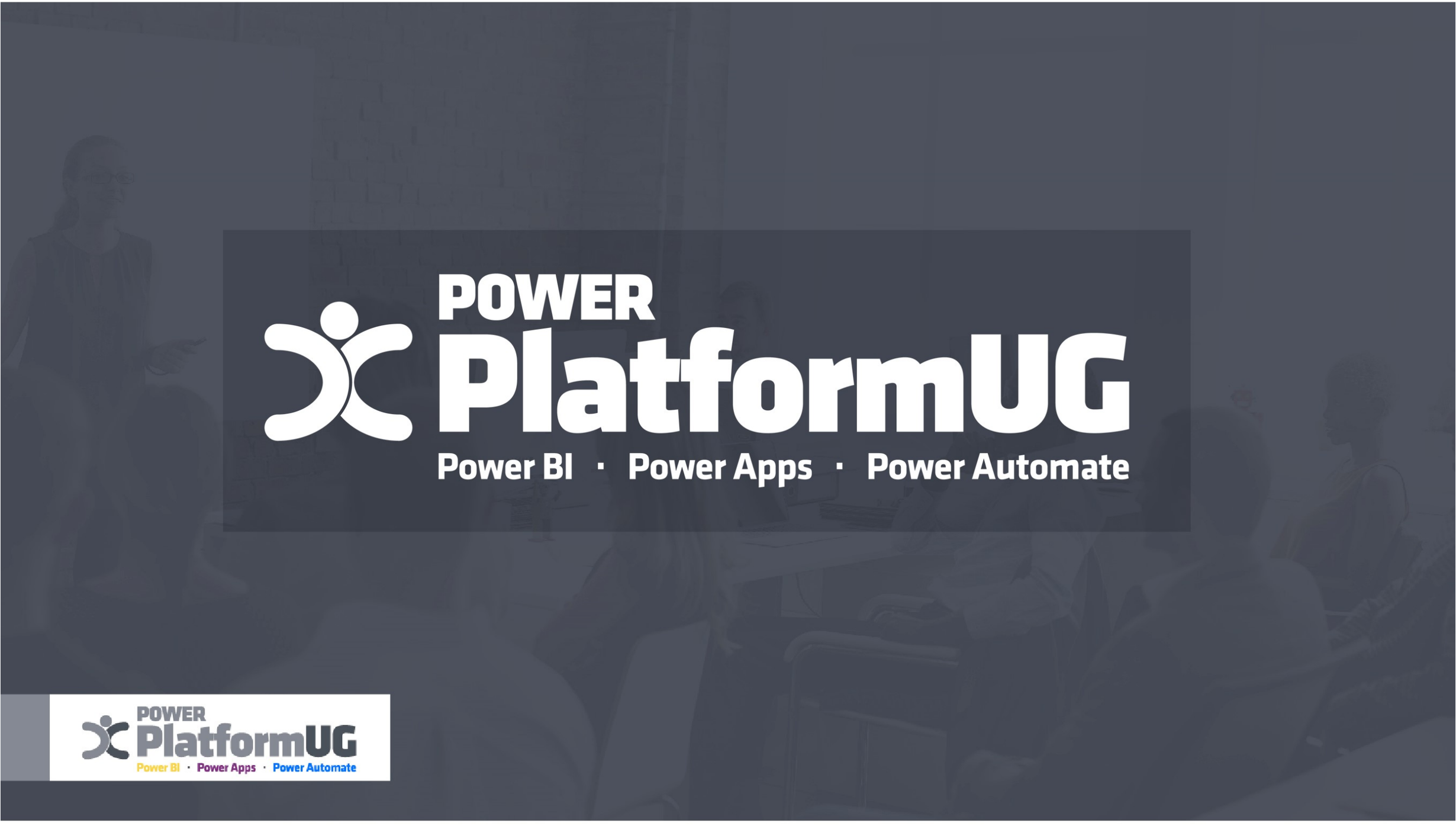
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