

# Navigating the Data Landscape: A Journey through Incremental Refresh & Hybrid Tables in Power BI



Nalaka Wanniarachchi

## Work

10+ years of Data Warehousing and Business intelligence solutions development and mentoring.  
PowerBI everything and Oracle BI etc..

## Background

CIMA(UK) Qualified Ex-Banker  
(ACMA / CGMA),  
16+ years of financial industry experience,  
Father of two   
Employed @ 

Nalaka Wanniarachchi

Tech Specialist  
Lead Business Intelligence Engineer



# AGENDA

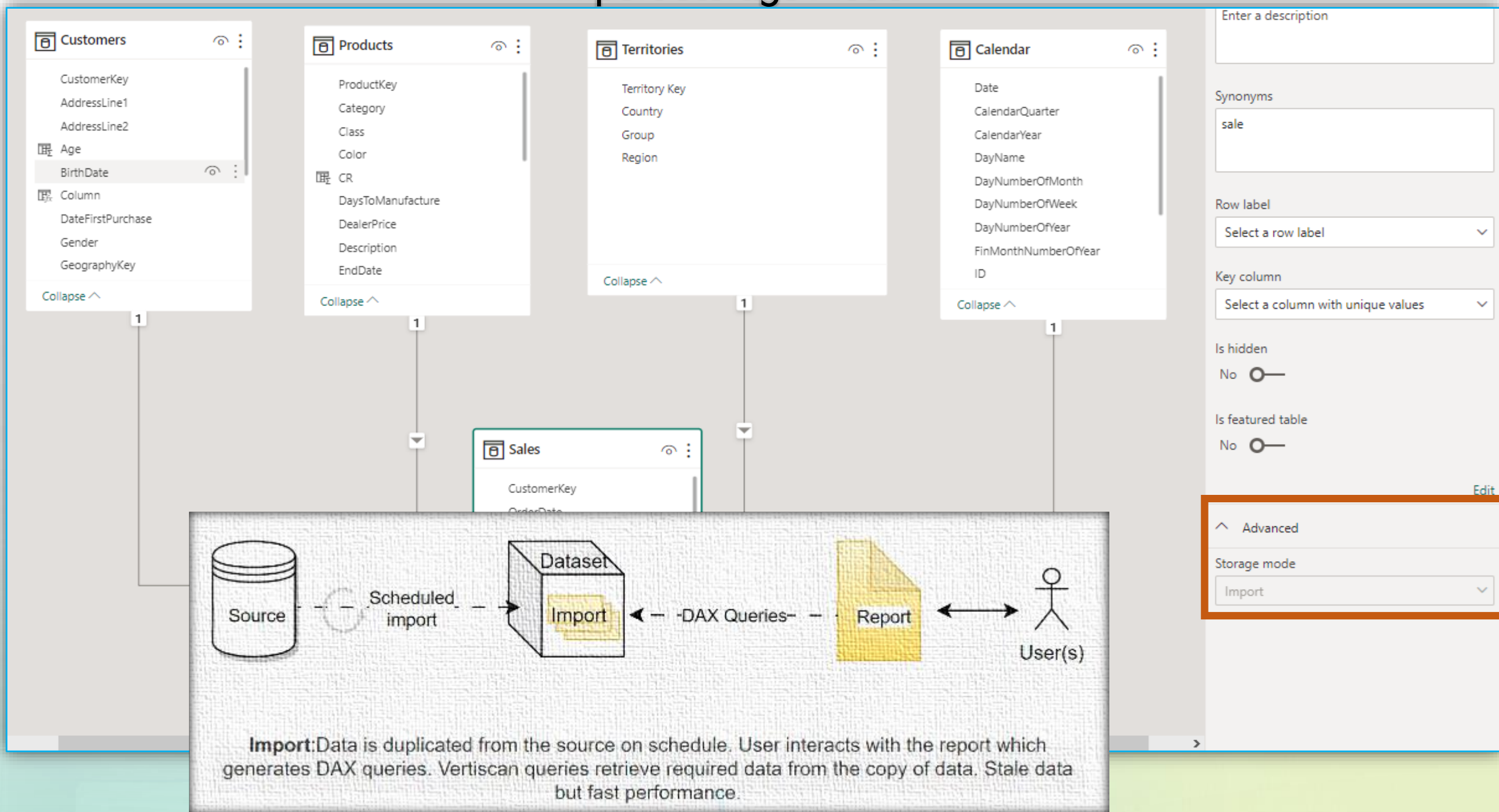
- Table Storage Modes / Connection Types
- Incremental Refresh
- Partition Considerations
- Hybrid Mode
- Optional Settings in Incremental Refresh
- Direct Lake Mode
- Demo
- Reverse Hybrid Workaround
- Custom Partitioning
- Third Party Tools / Advanced incremental refresh

# Table storage modes / Connection Types

- Import Mode
- Direct Query Mode
- Live connection Mode
- Composite Mode or Mixed Mode
- Dual Mode
- Hybrid Tables: Two Parts in same table
- Direct Lake (Fabric)

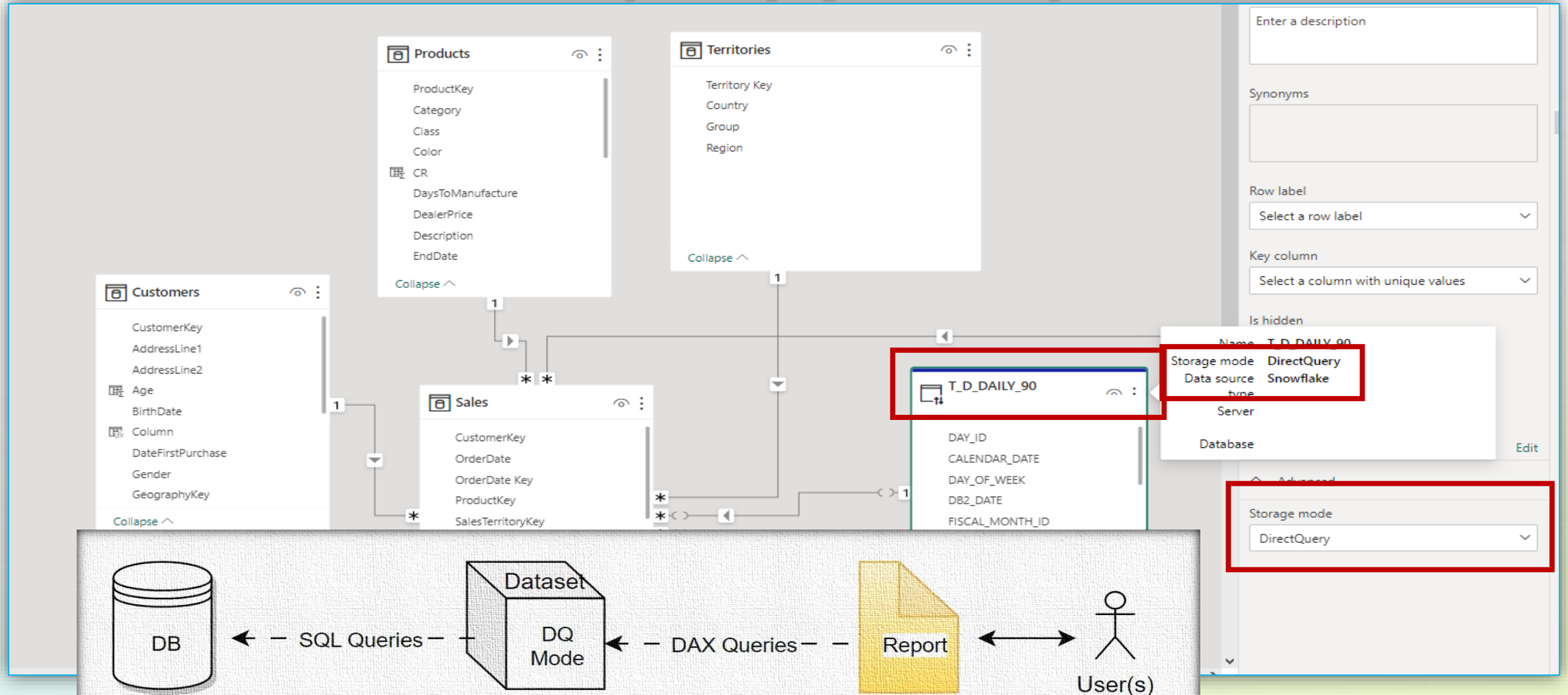


# Import Storage Mode





# Direct Query Mode-[Regular Sources]



**Direct Query:** User interacts with the report which generates DAX queries. These DAX queries are translated to SQL and sent to the database to get the data. Latest data but slow performance.

# Direct Query Mode-To [AS]

The screenshot displays the Power BI Desktop interface with a dataset named "Customer Parent" selected. The dataset is connected to a "SQL Server Analysis Services" data source. The storage mode is set to "DirectQuery". The "Create connections" dialog box is open, showing the connection name "DirectQuery to AS - ATB Monthly Version" and the status "Evaluating...". The "Advanced" settings pane is also visible, showing the "Storage mode" dropdown set to "DirectQuery".

**Dataset Properties:**

| Name             | Customer Parent                       |
|------------------|---------------------------------------|
| Storage mode     | DirectQuery                           |
| Data source type | SQL Server Analysis Services database |
| Server           |                                       |

**Create connections dialog:**

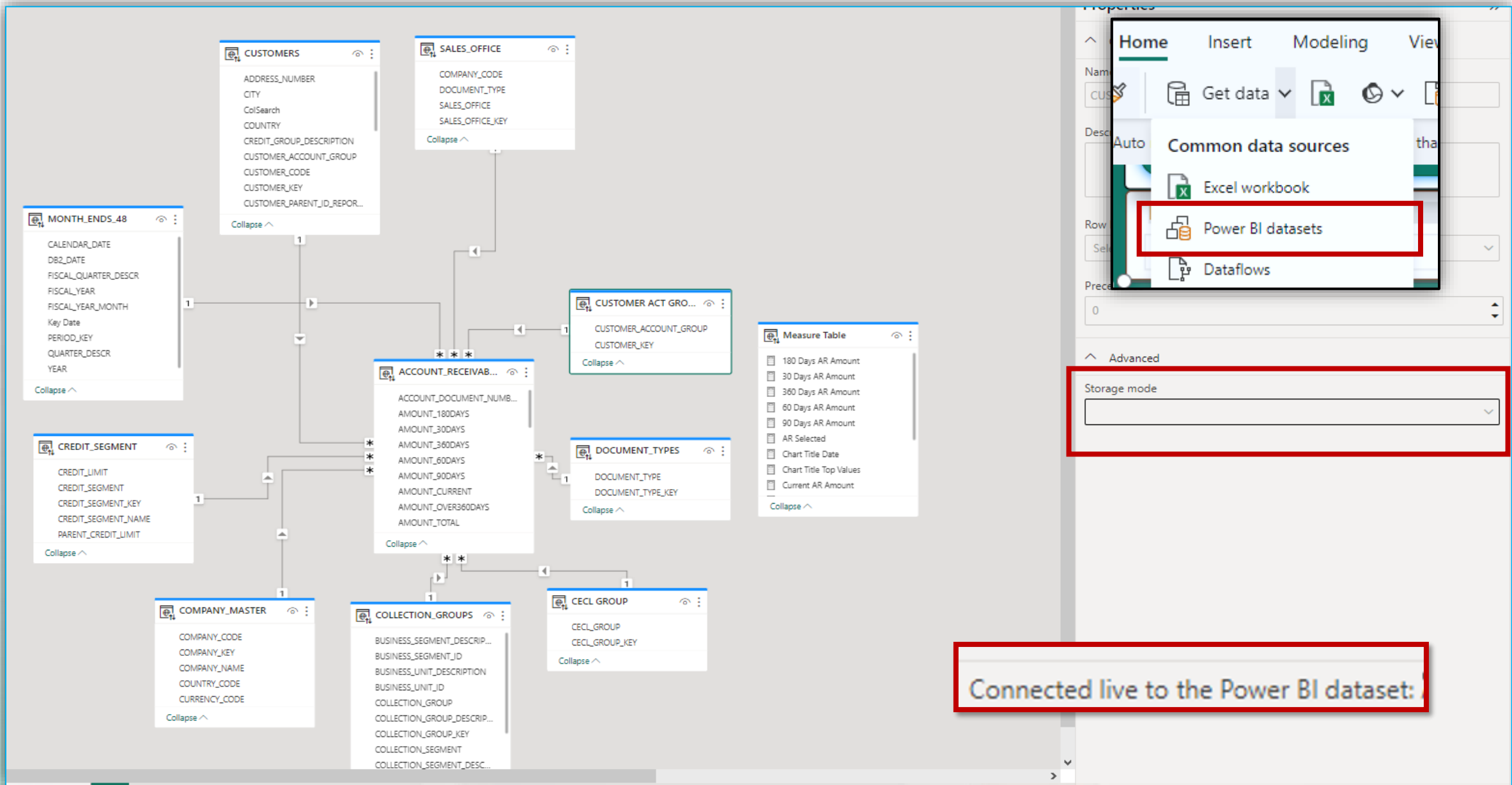
| Connection Name                         | Status        |
|---|---------------|
| DirectQuery to AS - ATB Monthly Version | Evaluating... |

**Advanced Settings:**

| Storage mode |
|--------------|
| DirectQuery  |

Using PowerBI  
Datasets

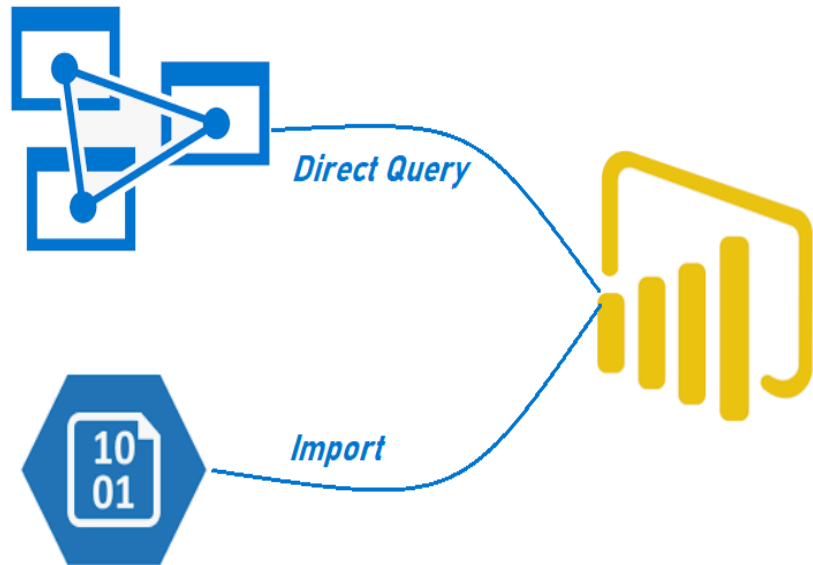
# Live Connection Mode



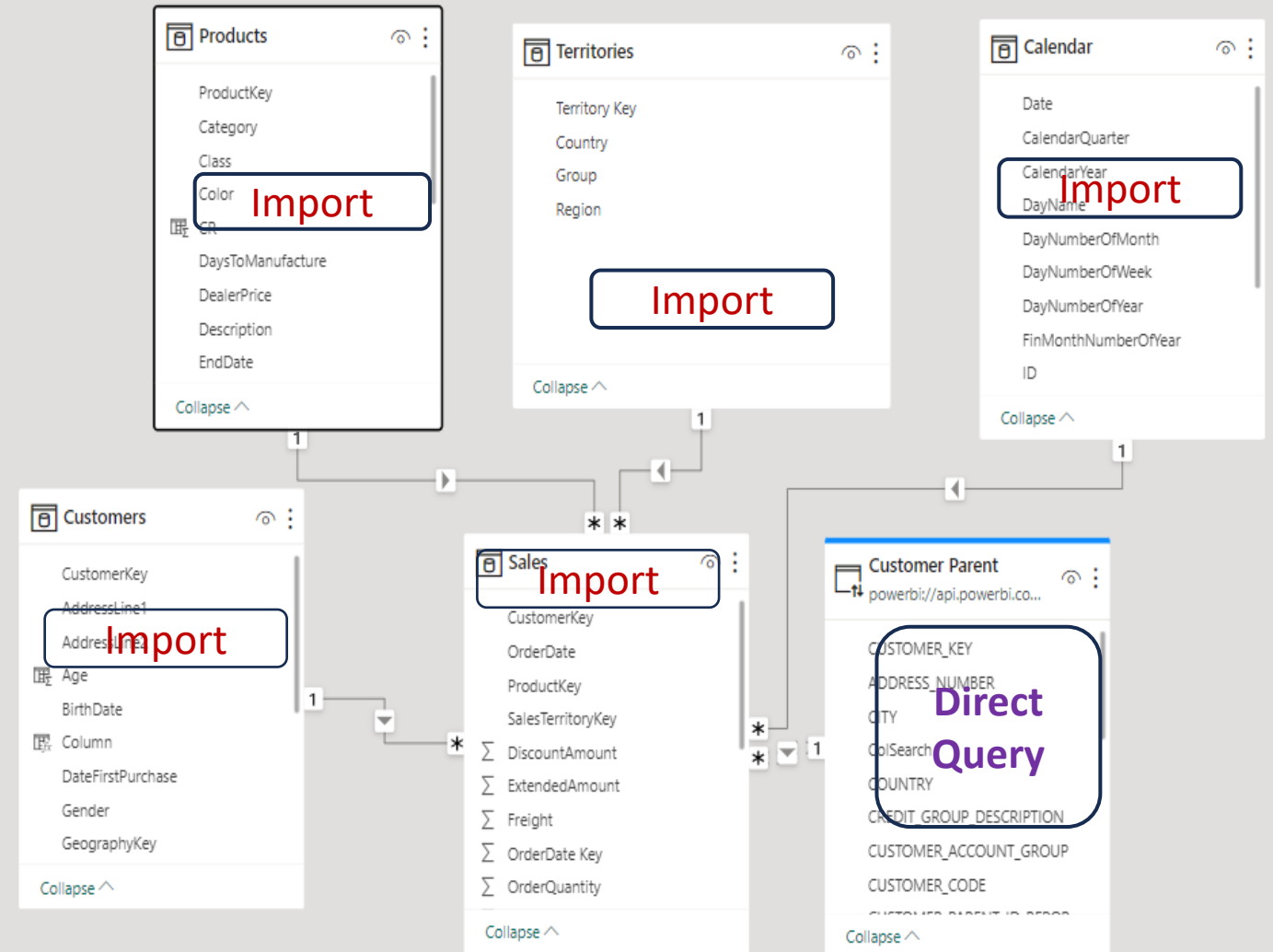


# Mixed Mode

## Composite Model using Analysis Service Direct Query



Storage Mode: Mixed



# Dual Mode

DayNumberOfWeek

Name **T\_D\_DAILY\_90**

Storage mode **Dual**

Data source **Snowflake**

type

Server

Database

Data refreshed 10/15/2023, 10:58:09 PM

Select a row label

Key column

Select a column with unique values

Is hidden

No ☐

Is featured table

No ☐

Edit

Advanced

Storage mode

Dual

T\_D\_DAILY\_90

CALENDAR\_DATE

DAY\_ID

DAY\_OF\_WEEK

DB2\_DATE

FISCAL\_MONTH\_ID

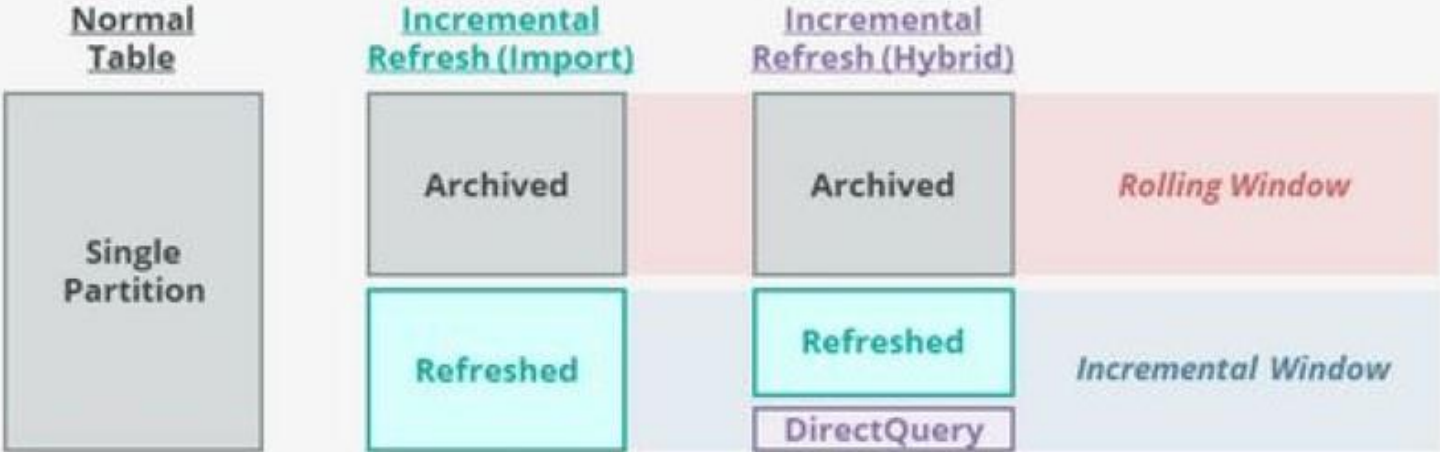
FISCAL\_QUARTER\_DESCR

FISCAL\_QUARTER\_ID


FISCAL\_YEAR

Collapse


# Incremental Refresh & Hybrid Tables Overview



**Other Configuration**



**Refresh Complete Periods**  
(IncrementalPeriodOffset)



**Detect Data Changes**  
(Polling Expression)

[Image from docs.tabulareditor.com](https://docs.tabulareditor.com)

# Incremental Refresh

## Key Benefits of IR

- Lower Refresh Times
- Stability and Reliability -Reduce the risk of refresh failures
- Less Resource Consumption
- Cost Savings –When data transfer cost matters

Apply one or more filter conditions to the rows in this table.

☒ Basic ☐ Advanced

Keep rows where 'OrderDate'

is after or equal to RangeStart

☒ And ☐ Or

is before RangeEnd

## 2. Set import and refresh ranges

☒ Incrementally refresh this table

Archive data starting 10 Years before refresh date

Data imported from 1/1/2013 to 10/20/2023 (inclusive)

Incrementally refresh data 3 Days before refresh date starting

Data will be incrementally refreshed from 10/21/2023 to 10/23/2023 (inclusive)

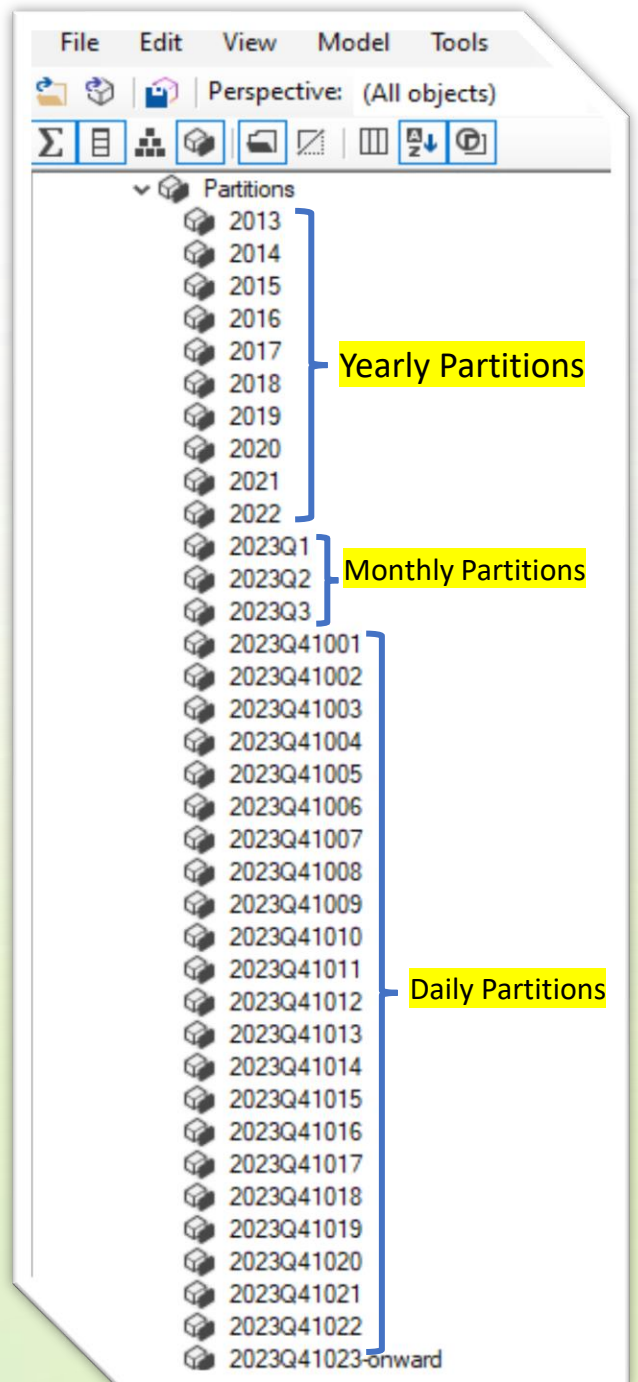
Archived

Incremental Refresh

10 years before  
refresh date

3 days before  
refresh date

Refresh date



# Partitions Considerations

- Query Folding

## Incremental refresh



Unable to confirm if the M query can be folded. It is not recommended to use incremental refresh with non-foldable queries. [Learn more](#)

- Make sure filtration happens at source.- (where clause matters)
- Too many partitions can hurt performance.

## Things to Know Beforehand



This file can't be downloaded yet

You can't download this file because the dataset was altered through incremental refresh.

[Learn more](#)

## Incremental refresh and real-time data

Refresh large tables faster with incremental refresh. Plus, get the latest data in real time with DirectQuery (Premium only). [Learn more](#)

① These settings will apply when you publish the dataset to the Power BI service. Once you do that, you won't be able to download it back to Power BI Desktop. [Learn more](#)

### 1. Select table

### 2. Set import and refresh ranges

☒ Incrementally refresh this table

Archive data starting   before refresh date

Incrementally refresh data starting   before refresh date

### 3. Choose optional settings

☐ Get the latest data in real time with DirectQuery (Premium only) [Learn more](#)

☐ Only refresh complete periods [Learn more](#)

☐ Detect data changes [Learn more](#)

### 4. Review and apply

Archival Start Date  ☒ Incremental Refresh

Apply

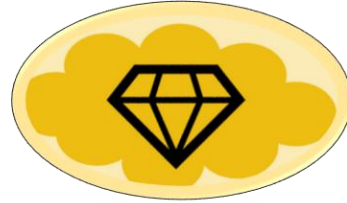
Cancel

# Hybrid Mode

## Incremental refresh and real-time data

### 1. Select table

TOP20\_Fact



### 2. Set import and refresh ranges

☒ Incrementally refresh this table

Archive data starting 47 Months before refresh date

Data imported from 10/1/2019 to 7/31/2023 (inclusive)

Incrementally refresh data starting 2 Months before refresh date

Data will be incrementally refreshed from 8/1/2023 to 9/30/2023 (inclusive)

### 3. Choose optional settings

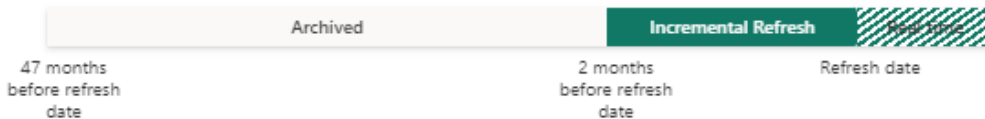
☒ Get the latest data in real time with DirectQuery (Premium only) [Learn more](#)

Real-Time data will be from 10/1/2023 (inclusive) onwards

☒ Only refresh complete months [Learn more](#)

☐ Detect data changes [Learn more](#)

### 4. Review and apply



Combining import and DirectQuery makes this a hybrid table. Set your related tables, **COMPANY MASTER, CREDIT SEGMENT, and MONTH ENDS\_48 ...**, to dual mode to speed up their performance with hybrid tables. [Learn more](#)

These settings will apply when you publish the dataset to the Power BI service. Once you do that, you won't be able to download it back to Power BI Desktop. [Learn more](#)

BEST PRACTICE

### Storage Modes

Import

Direct Query

Dual

Hybrid Table + Dual



# Optional Settings In Incremental Refresh

## 2. Set import and refresh ranges

☒ Incrementally refresh this table

Archive data starting   before refresh date

Data imported from 8/1/2023 to 10/18/2023 (inclusive)

Incrementally refresh data starting   before refresh date

Data will be incrementally refreshed from 10/19/2023 to 10/20/2023 (inclusive)

## 3. Choose optional settings

☒ Get the latest data in real time with DirectQuery (Premium only) [Learn more](#)

Real-Time data will be from 10/21/2023 (inclusive) onwards

☒ Only refresh complete days [Learn more](#)

☒ Detect data changes [Learn more](#)

Only refresh data in the last 2 days if the maximum value of this datetime column changes:

- Once activated the **Hybrid** option; PowerBI automatically Activates the “**Only refresh complete days/months**” setting. This ensures all rows for the entire day are included in the refresh operation.
- **Detect data changes** setting enables even more selective refresh. **Do not use the same date/time column used in IR.** This further reduce the days that is incrementally refreshed .

# Direct Lake Mode

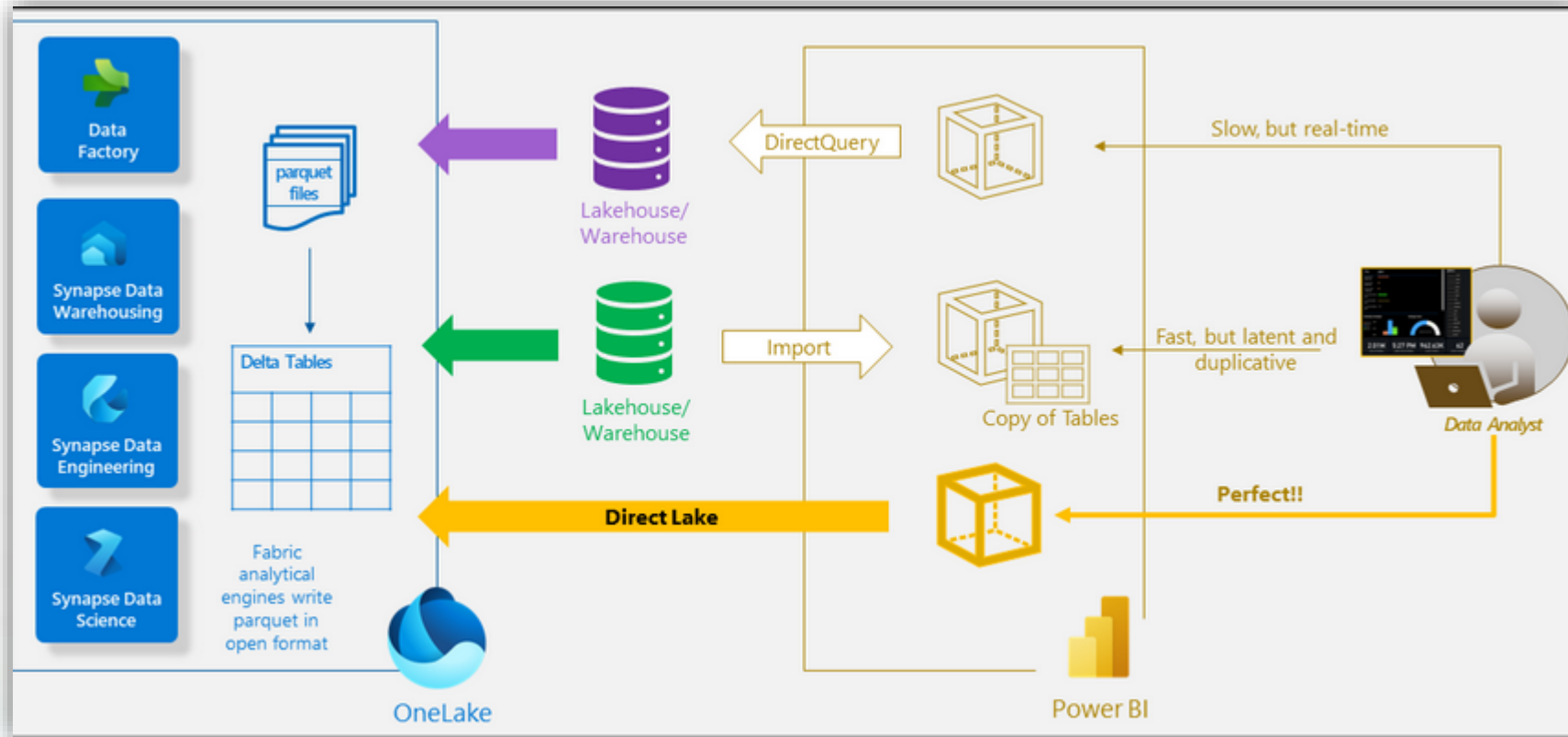
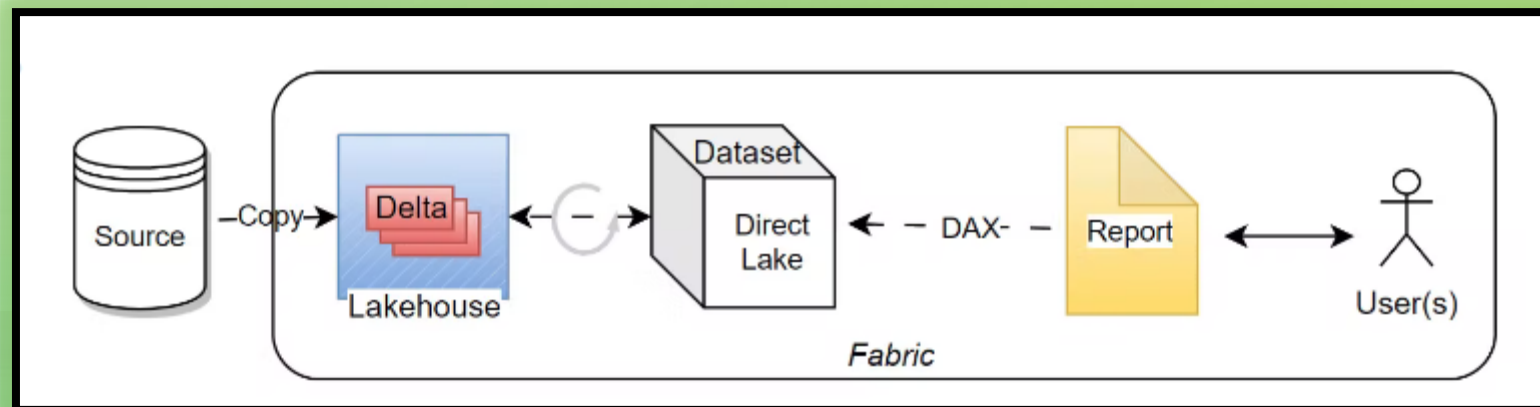


Image from Microsoft



A dimly lit desk setup against a brick wall. A laptop is open on a stand, illuminated by a warm desk lamp. Next to it is a small globe and some books. The scene is moody and professional.

**DEMO**



# Reverse Hybrid Workaround

Hybrid Mode



Reverse Hybrid Mode

| Granularity     | Name          | Row Count     |
|-----------------|---------------|---------------|
| Year            | 2011          | 295,489,717   |
| Year            | 2012          | 297,678,498   |
| Year            | 2013          | 295,575,442   |
| Year            | 2014          | 292,477,875   |
| Year            | 2015          | 297,780,469   |
| Year            | 2016          | 294,060,081   |
| Year            | 2017          | 300,419,682   |
| Year            | 2018          | 296,541,108   |
| Year            | 2019          | 292,787,420   |
| Year            | 2020          | 299,273,979   |
| Quarter         | 2021Q1        | 74,135,277    |
| Month           | 2021Q104      | 24,939,498    |
| Day             | 2021Q10501    | 820,805       |
| Day             | 2021Q10502    | 826,885       |
| Day             | 2021Q10503    | 821,043       |
| Day-DirectQuery | 2021Q10504-DQ | 271,110       |
| Total           |               | 3,063,898,887 |

Archived: **Import**

Incremental refresh: **Import**

Real time: **DirectQuery**

History Data : DirectQuery

Incremental Refresh: Import



# Reverse Hybrid Workaround

Choose optional settings

☒ Get the latest data in real time with **DirectQuery** (Premium only) [Learn more](#)

## Reverse Hybrid With Incremental Refresh

### Approach

History Data –DirectQuery  
Latest Data- Import

```
1 let
2
3 NewStart =if RangeEnd > DateTime.LocalNow() then Date.StartOfMonth(Date.AddMonths(DateTime.LocalNow(),-18)) else RangeStart,
4 NewEnd =if RangeEnd > DateTime.LocalNow() then Date.StartOfMonth(Date.AddMonths(DateTime.LocalNow(),-1)) else RangeEnd,
5
6 // updated with Newstart and NewEnd Parameters
7 Source = Snowflake.Databases("Your server Name"),
8 db_EDW_Database = Source{[Name=DB,Kind="Database"]}[Data],
9 _Schema = db_EDW_Database{[Name="Schema name",Kind="Schema"]}[Data],
10 _Table = _Schema{[Name="Table Name",Kind="Table"]}[Data],
11 #"Filtered Rows" = Table.SelectRows(_table, each [CALENDAR_DATETIME] >= NewStart and [CALENDAR_DATETIME] < NewEnd)
12 in
13 ...#"Filtered Rows"
```

 Credits to Pat Mahoney, Patrick LeBlanc @Microsoft

DirectQuery

Past 16 Months

Archive

Sep 2023

Incremental

Oct 2023

# Custom Partitioning

( [DAX] )

[To the Rescue PowerBI **Pro** Users]

1

- Hybrid tables, with **No Premium** and With **No** XMLA endpoint ? --**Yes Possible !!!**

(By mimicking the Hybrid scenario using DAX – Splitting into two storage modes( DQ, import) and then apply the date ranges selectively.)



(👏 Credits to Nikola Ilic)

**No incremental approach, Don't mix IR with custom partitioning.**



- When no dates in the selected tables
- Align partitions with dataset and source
- Process partition in parallel, Speed up the process 🕒

## No dates scenario

3

- Using Premium,XMLA support.
- TE and M scripting helps to do this.
- In this ex:.,Partitions created based on countries.



**No incremental approach**

| Partitions                      |        |
|---------------------------------|--------|
| Partition Name                  | # Rows |
| Internet Sales - United States  | 219595 |
| Internet Sales - Canada         | 78351  |
| Internet Sales - France         | 56478  |
| Internet Sales - Germany        | 57886  |
| Internet Sales - Australia      | 127545 |
| Internet Sales - United King... | 71413  |
| *emet Sales - NA                | 0      |

## Reverse Hybrid with TE] **TABULAR** EDITOR

2

- Using Premium , XMLA support + M scripting  
(Mimicking the Hybrid scenario using M, changing the storage modes.)

| Options         |             |
|-----------------|-------------|
| Data View       | Default     |
| Mode            | Import      |
| Source Type     | Import      |
| Refresh Policy  | DirectQuery |
| End             | Default     |
| Granularity     | Push        |
| RefreshBookmark | Dual        |
| Start           | DirectLake  |

**No incremental approach, Don't mix IR with custom partitioning.**

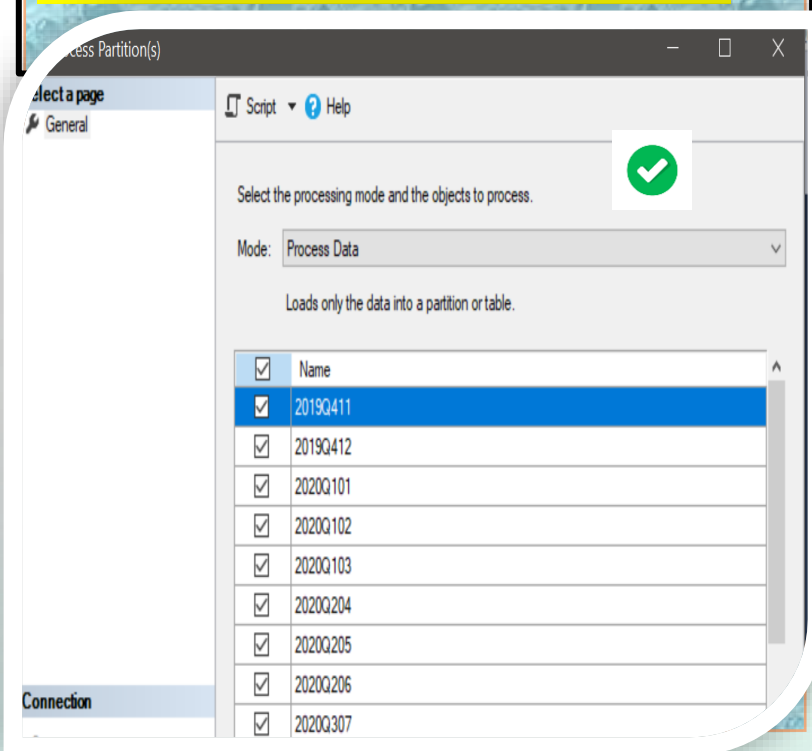




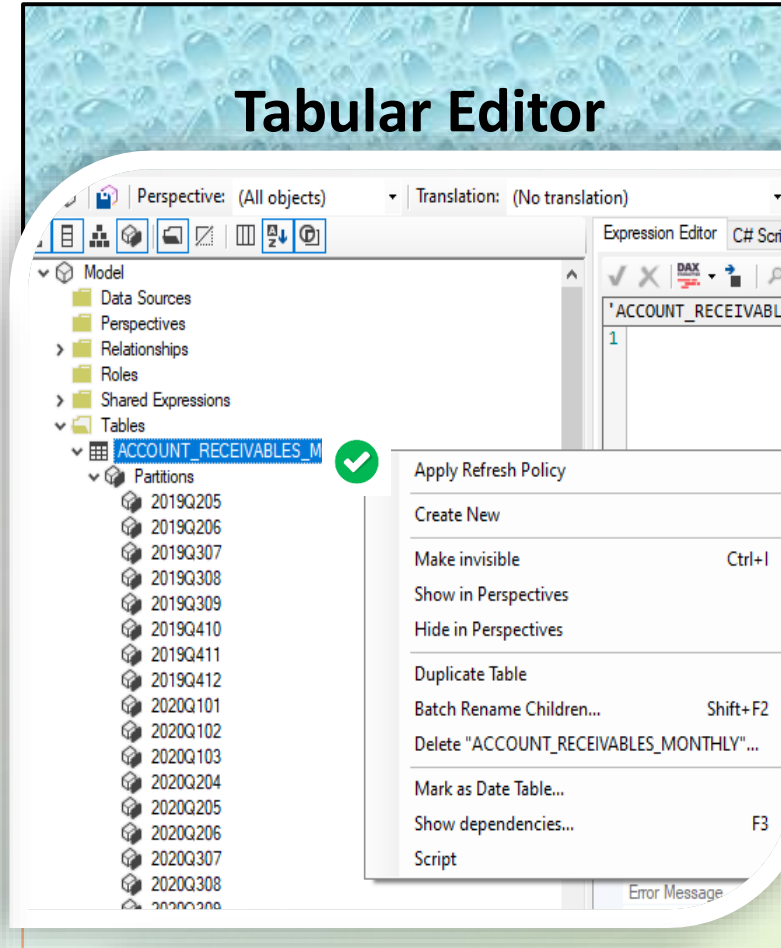
# Supportive tools for better partition management

## SSMS(SQL Server Management Studio)

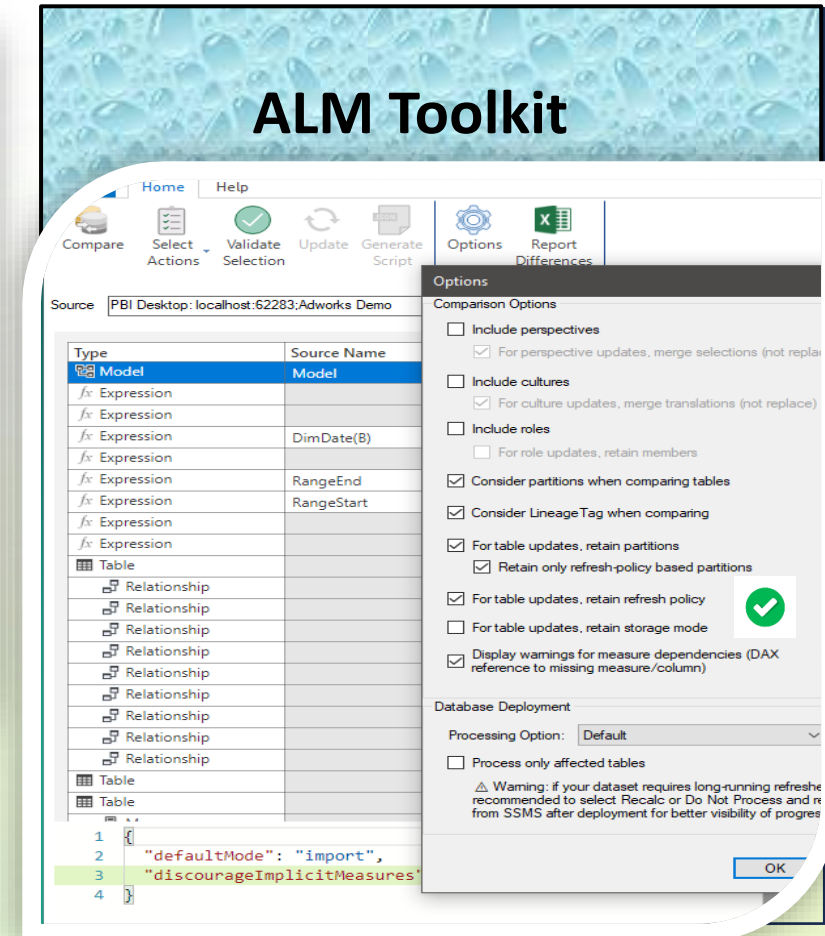
Helpful for bootstrap initial refresh



## Tabular Editor



## ALM Toolkit



# Further Resources

- [Incremental refresh for datasets and real-time data in Power BI - Power BI | Microsoft Docs](#)
- [Announcing Public Preview of Hybrid Tables in Power BI Premium | Microsoft Power BI Blog | Microsoft Power BI](#)
- [Hybrid Tables, Incremental Refresh and Table Partitioning in Power BI | Paul Turley's SQL Server BI Blog](#)
- [Power BI Hybrid Tables with Synapse Analytics Serverless SQL Pools – Serverless SQL](#)
- [Automatic page refresh in Power BI Desktop - Power BI | Microsoft Docs](#)
- [Demystifying Custom Partitions in Power BI](#)
- [Setup a Reverse Hybrid Table without using Tabular Editor for Power BI!](#)
- [Power BI Hybrid tables for poor people!](#)
- [Incremental Refresh and Hybrid Tables in Power BI](#)

# THANK YOU



 [linkedin.com/in/nalakan](https://www.linkedin.com/in/nalakan)

**Blog/YT : Coming Soon**