Mastering Composite Models–

Power BI for the Self-Service Developer

Presented by
David Kofod Hanna

twoday

David Kofod Hanna

Senior Advisor, Data Storytelling @ twoday
+200 courses as Academy Trainer and 10 years as consultant
Certified Tabular Editor 3 Trainer, DP-600, PL-300, CPUX-F

Passionate about guiding self-service Power BI developers for more enterprise manageable concepts in a consumable and practical way

Born on beautiful “Sunshine island”: **Bornholm**
Lives in Silkeborg with wife and 3 kids
Love football and running half-marathons

twoday

Mastering Composite Models –

Power BI for the Self-Service Developer

Live connection vs. Composite Model

The Holy Grail for Self-Service BI and implications for Enterprise setup

Enriching our Semantic Model

Let's dive into what's possible for the Self-Service developer now

The Pitfall of Using Calculation Groups

How the remote and local data sources impacts our model and especially calculation groups

I'm from IT – How can I Disable it?

Depending on your setup, you can consider disabling this feature.

Final Considerations

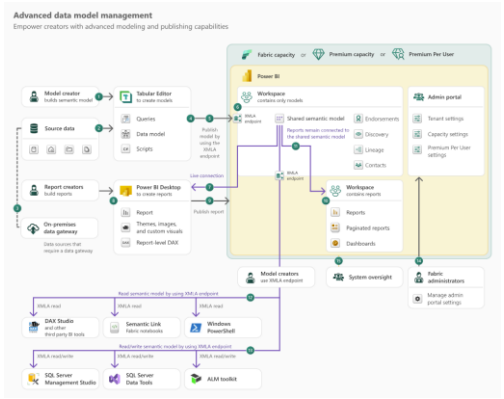
A guide to those who consider using composite model with direct query on Power BI semantic models

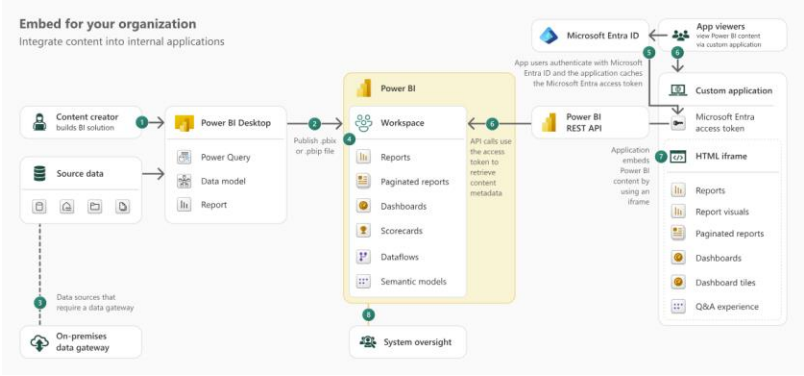
twoday academy

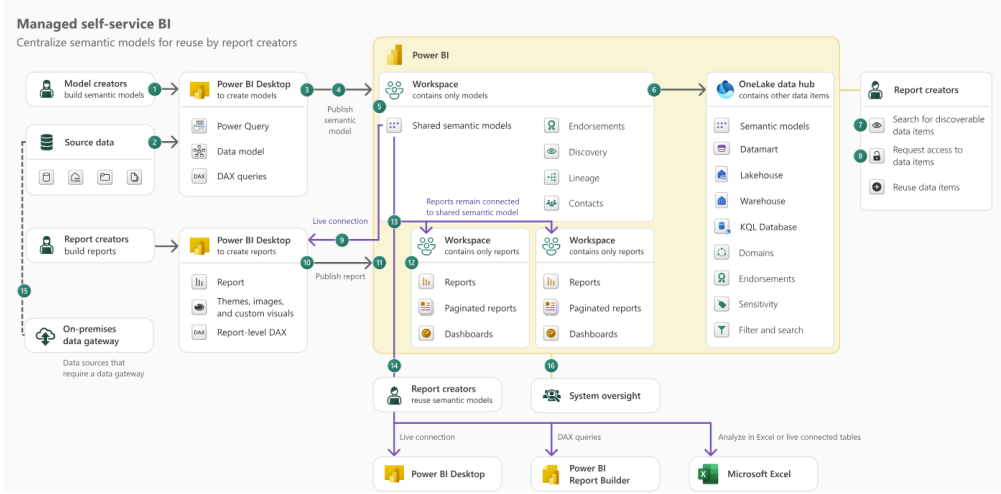
How many have explored **Composite Models** with Direct Query to Power BI Semantic Model?

One Size Fits All?

1. Advanced data model management
2. Advanced data preparation
3. Customizable managed self-service BI
4. Departmental BI
5. Embed for your customers
6. Embed for your organization
7. Enterprise BI
8. Enterprise content publishing
9. Managed self-service BI
10. On-premises reporting
11. Personal BI
12. Prototyping and sharing
13. Self-service content publishing
14. Self-service data preparation
15. Self-service real-time analytics
16. Team BI



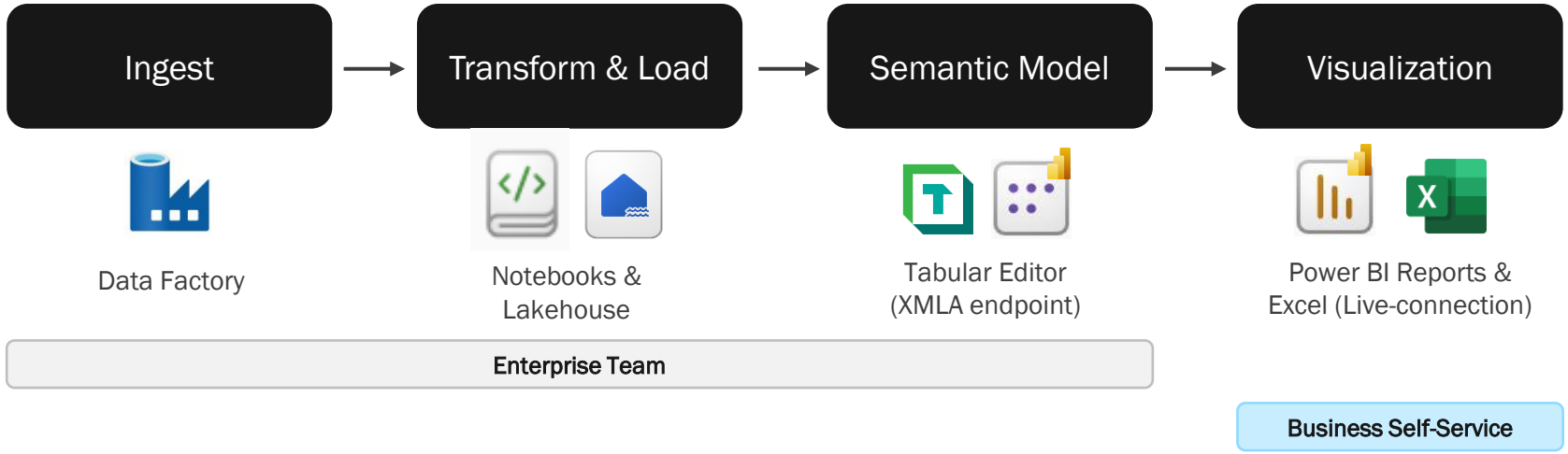




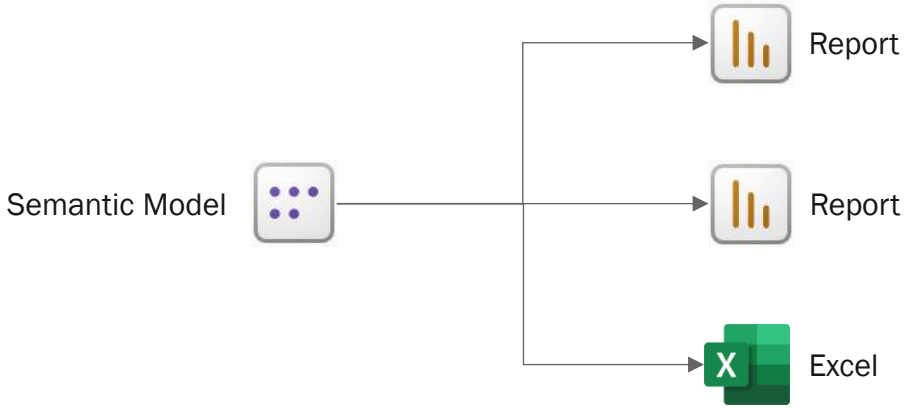
https://learn.microsoft.com/en-us/power-bi/guidance/powerbi-implementation-planning-usage-scenario-diagrams

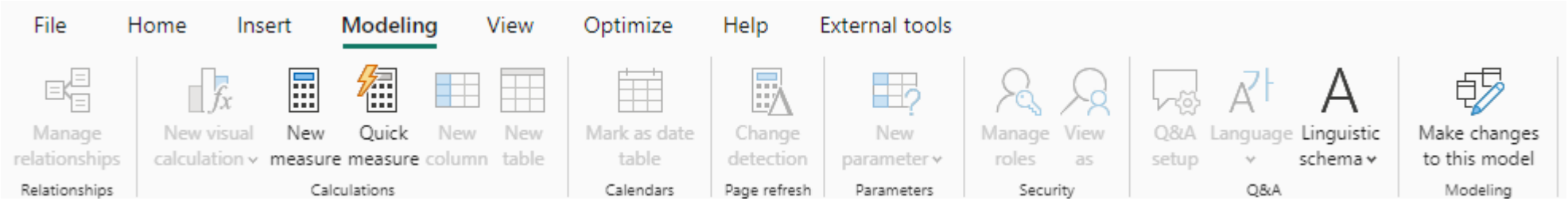
twoday academy

Scenario


Ingest
Transform & Load
Semantic Model
Visualization
Data Factory
Notebooks &
Lakehouse
Tabular Editor
(XMLA endpoint)
Power BI Reports &
Excel (Live-connection)
Enterprise Team
Business Self-Service

I Love Live-Connection, but …





twoday academy

Demo

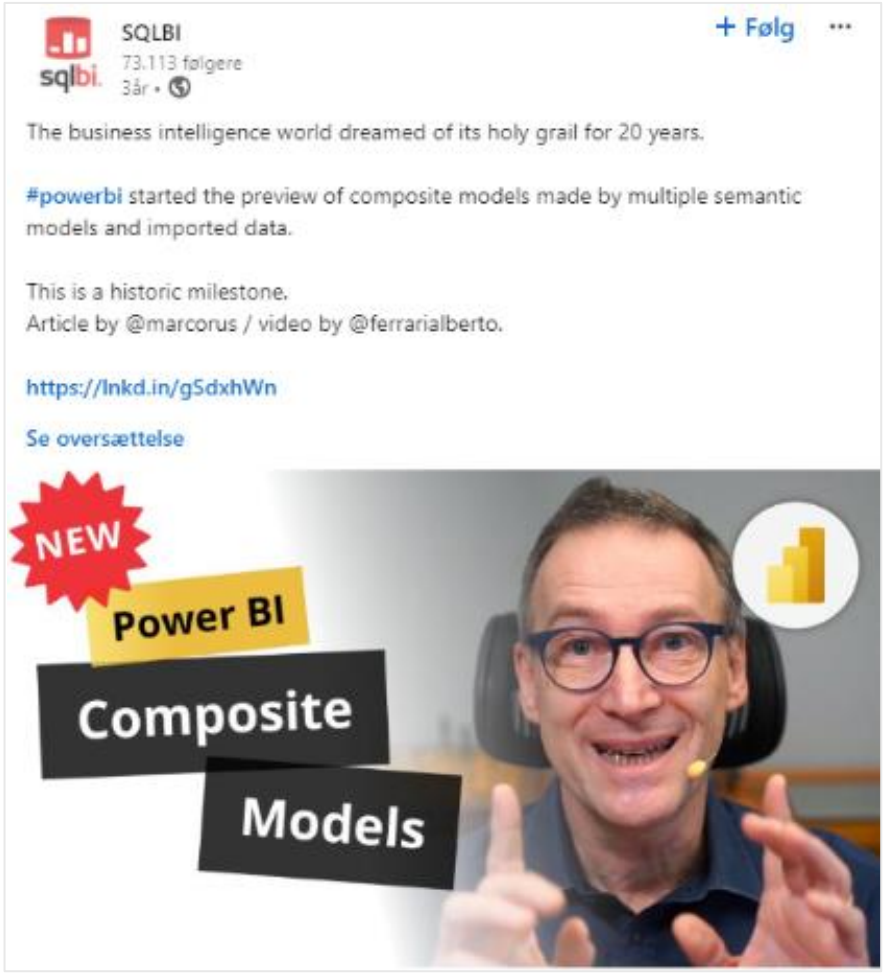
twoday academy

Roche's Maxim of Data Transformation:

> Data should be transformed
> as far upstream as possible, and
> as far downstream as necessary.

The Holy Grail for self-service BI

Public Preview in Dec 2020 and General Available in Apr 2023



https://www.sqlbi.com/articles/new-composite-models-in-power-bi-a-milestone-in-business-intelligence/

twoday academy

Composite Model (“Mixed storage mode”)

Is that you Fabric **Metrics** Set?

Extend Enterprise Model

- Direct Query on Power BI Semantic Model
- Import (VertiPaq)

Using composite models with Power BI semantic models and Analysis Services, you can build a composite model using a Direct Query connection to connect to Power BI semantic models, Azure Analysis Services (AAS), and SQL Server 2022 Analysis Services

I Want It All In One Page Dashboard

- Direct Query on Power BI Semantic Model
- Direct Query on Power BI Semantic Model
- Direct Query on Power BI Semantic Model

Bernat Agulló Roselló: https://www.esbrina-ba.com/i-want-it-all-in-one-page/

Near-live + Historic analysis

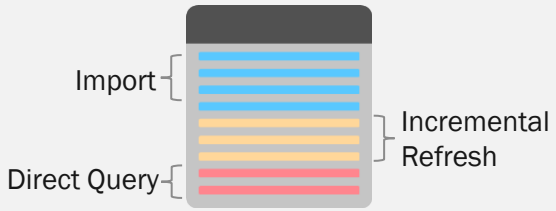
- Direct Query to Database
- Import (VertiPaq)

May-2025 Direct Lake (OneLake) + Import

- Direct Lake
- Import (VertiPaq)

Zoe Douglas LinkedIn Post

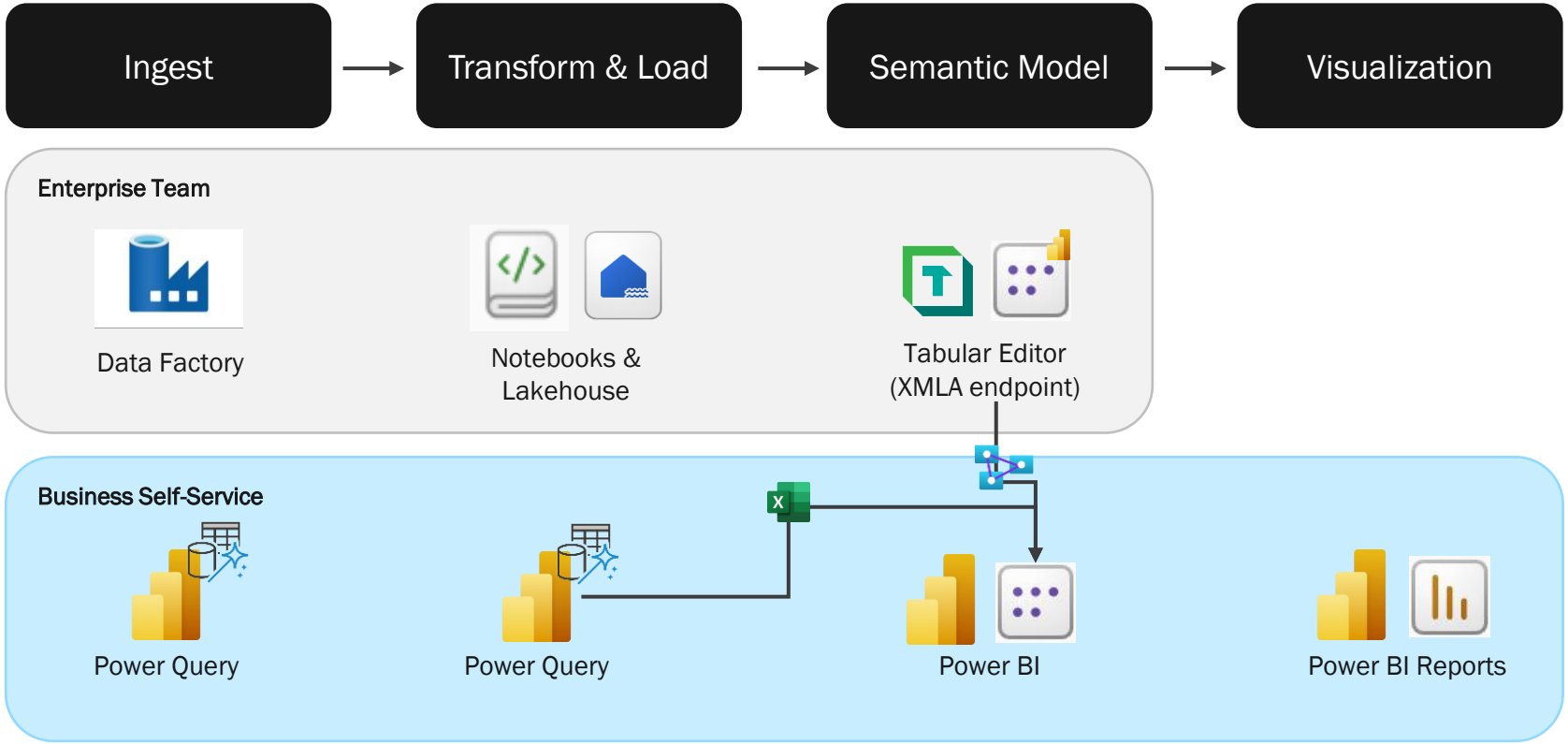
Hybrid Table



There is also Hybrid tables that within one table have import, incremental refresh and Direct Query.

Customizable managed self-service BI

discipline at the core and flexibility at the edge



Microsoft Usage Scenario: https://learn.microsoft.com/en-us/power-bi/guidance/powerbi-implementation-planning-usage-scenario-customizable-managed-self-service-bi

twoday academy

Demo

twoday academy

Wholesale

Retail

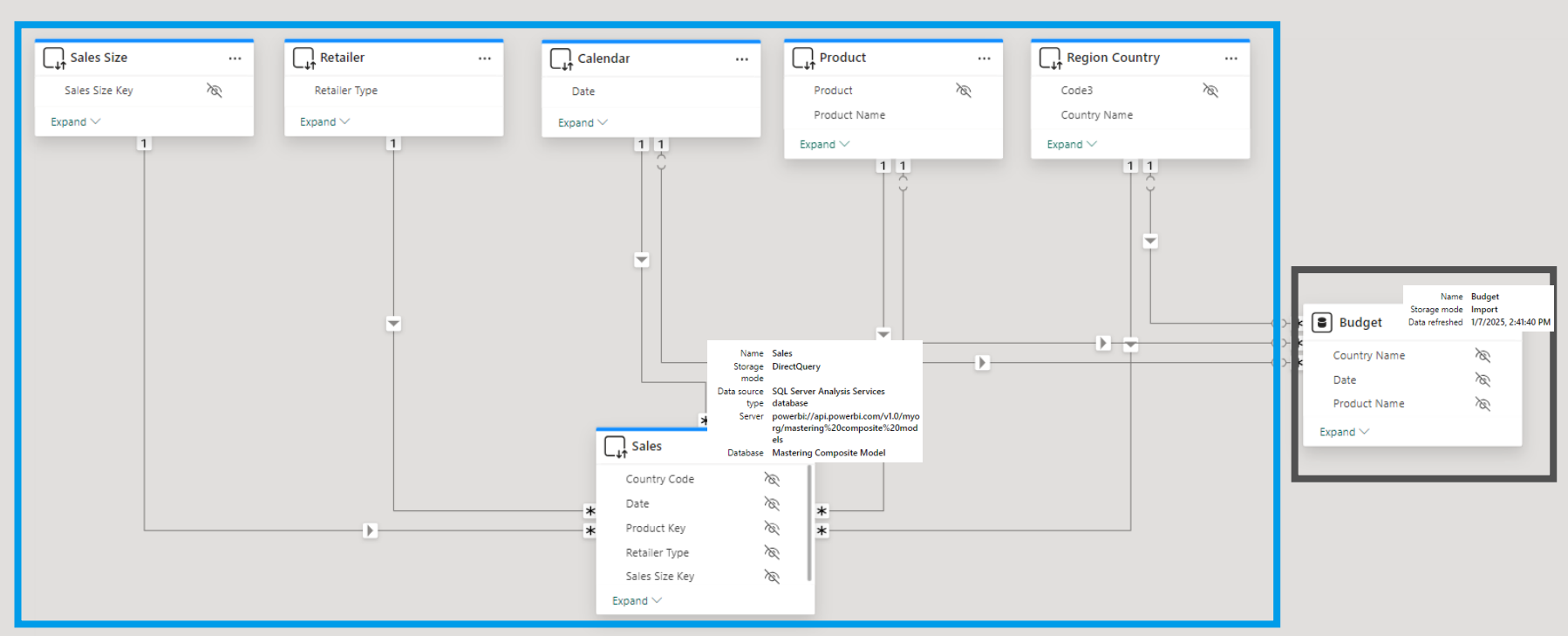
twoday academy

discipline at the core and **flexibility** at the edge

Wholesale
(Remote)
Enterprise Team

Retail
(Local)
Self-Service Business
Dev

Remote & Local



twoday academy

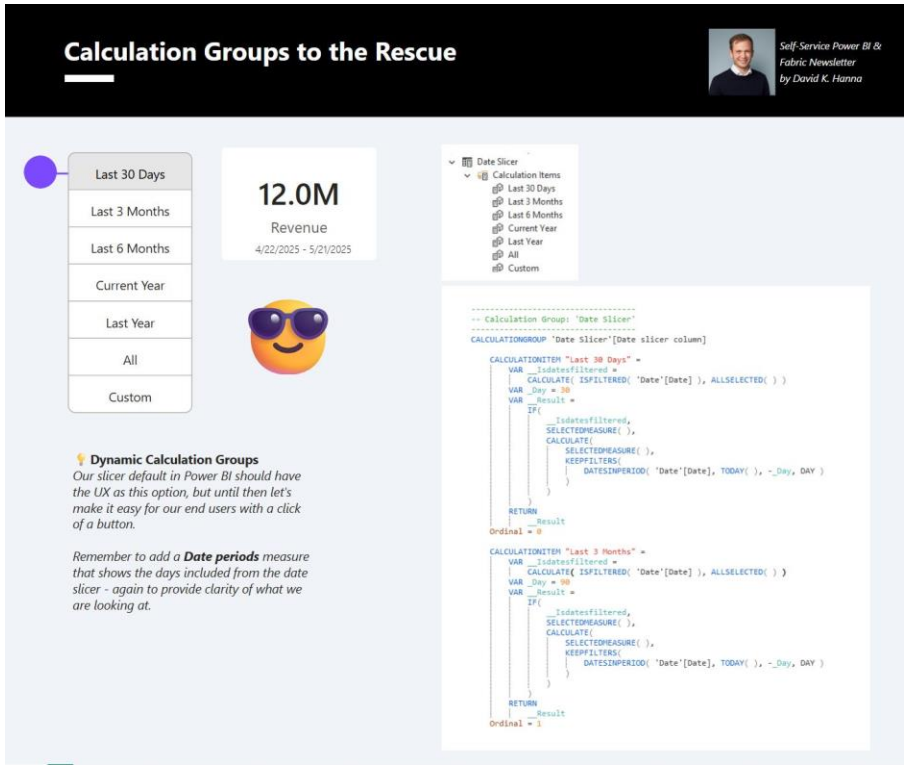
Who loves to include a **calculation group** in their semantic model?

Calculation Group 101

SELECTEDMEASURE()

Reuseable calculation items based on measures in the report canvas

- Time Intelligence *(MTD, QTD, YTD, LY, YOY %)*
- Unit conversion *(show figures in abs, in k, in m)*
- Format String Expressions *(like dynamic format string for measures)*
- Handling Multiple Dates *(USERELATIONSHIP to switch between order and invoice date)*
- Custom Date or Week Periods as slicer in report
- My vs. All stats
- And more …



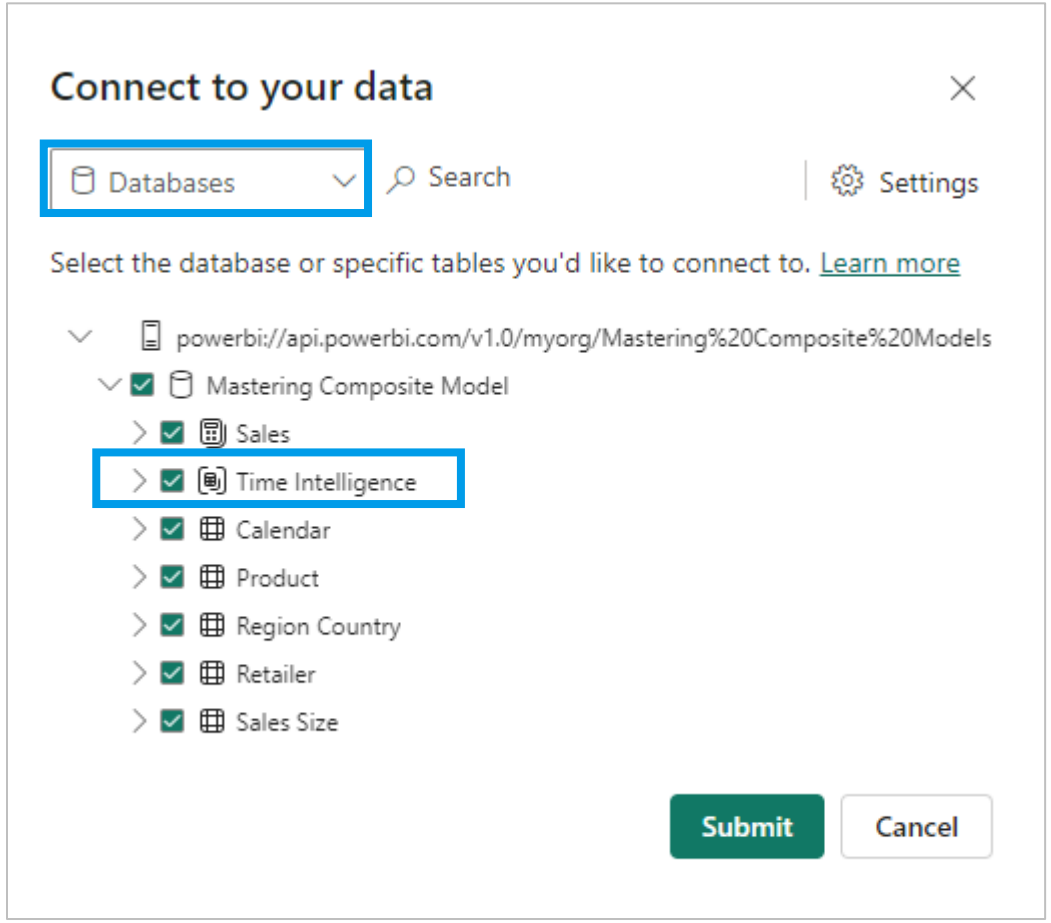
https://www.linkedin.com/feed/update/urn:li:activity:7331027969357824000/

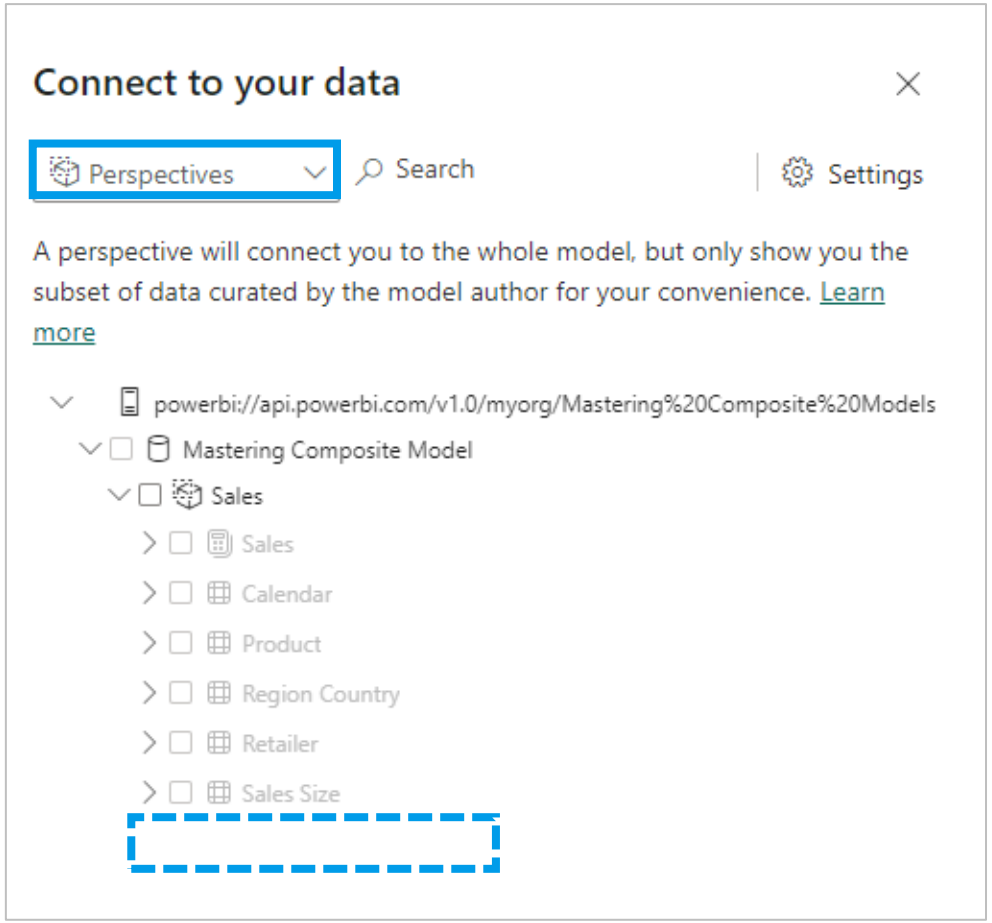
twoday academy

Demo

twoday academy

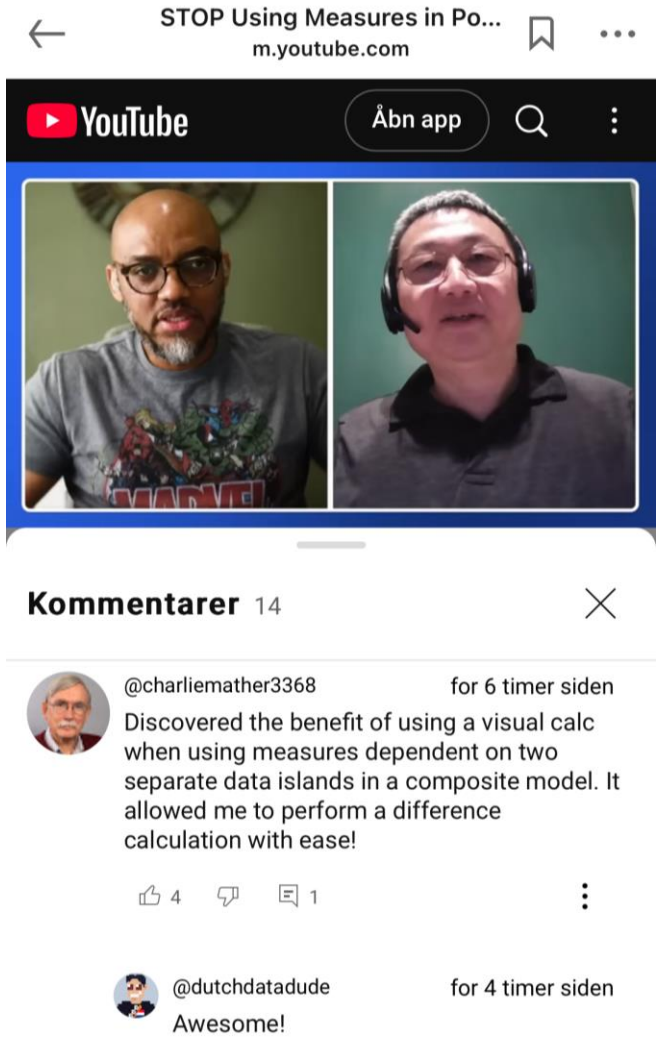
Consideration …
Create perspectives to exclude calculation group when create composite





twoday academy

“Have you tried Visual Calculations?”



Visual Calculations

- Defined on a visual
- “Visible context”
- Computed at query execution
- Can refer to visual structure

```
// DAX Query
DEFINE
    COLUMN '__SQDSOVisualCalcs'[Diff] =
        (/* USER DAX BEGIN */
[Revenue ACT] - [Budget ACT]
/* USER DAX END */)
```

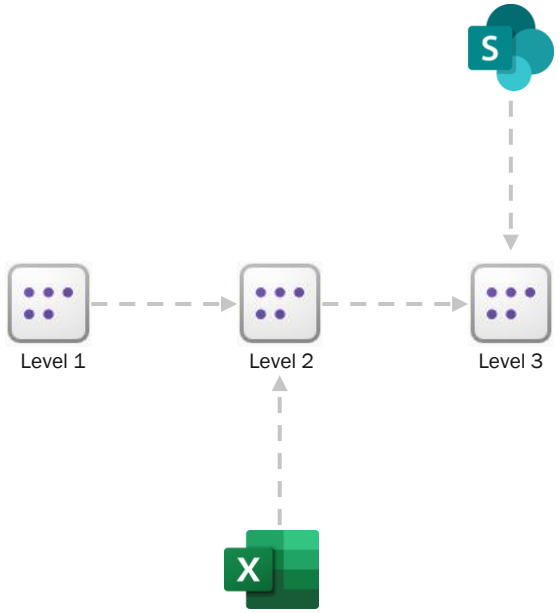
```
VAR __SQDSOVisualCalcsInput =
    SELECTCOLUMNS(
        KEEPFILTERS(
            SELECTCOLUMNS(
                __SQDSOCore,
                "Name", 'Time Intelligence'[Name],
                "Ordinal", 'Time Intelligence'[Ordinal],
                "IsSQDSOGrandTotalRowTotal", [IsSQDSOGrandTotalRowTotal],
                "Revenue_ACT", [Revenue_ACT],
                "Budget_ACT", [Budget_ACT]
            )
        ),
        "Name", [Name],
        "Ordinal", [Ordinal],
        "IsSQDSOGrandTotalRowTotal", [IsSQDSOGrandTotalRowTotal],
        "Revenue ACT", [Revenue_ACT],
        "Budget ACT", [Budget_ACT]
    )

TABLE '__SQDSOVisualCalcs' =
    __SQDSOVisualCalcsInput
    WITH VISUAL SHAPE
        AXIS Rows
            GROUP
                [Name],
                [Ordinal]
                TOTAL [IsSQDSOGrandTotalRowTotal]
            ORDER BY
                [Ordinal] ASC,
                [Name] ASC
        DENSIFY "IsDensifiedRow"

VAR __SQDSORemoveEmptyDensified =
    FILTER(
        KEEPFILTERS('__SQDSOVisualCalcs'),
        OR(
            NOT('__SQDSOVisualCalcs'[IsDensifiedRow]),
            NOT(ISBLANK('__SQDSOVisualCalcs'[Diff]))
        )
    )

VAR __DSOCore =
    SELECTCOLUMNS(
        KEEPFILTERS(
            FILTER(
                KEEPFILTERS(__SQDSORemoveEmptyDensified),
                '__SQDSOVisualCalcs'[IsSQDSOGrandTotalRowTotal] = FALSE
            )
        ),
        "'__SQDSOVisualCalcs'[Name]", '__SQDSOVisualCalcs'[Name],
        "'__SQDSOVisualCalcs'[Revenue ACT]", '__SQDSOVisualCalcs'[Revenue ACT],
        "'__SQDSOVisualCalcs'[Budget ACT]", '__SQDSOVisualCalcs'[Budget ACT],
        "'__SQDSOVisualCalcs'[Diff]", '__SQDSOVisualCalcs'[Diff],
        "'__SQDSOVisualCalcs'[Ordinal]", '__SQDSOVisualCalcs'[Ordinal]
    )

VAR __DSOPrimaryWindowed =
    TOPN(501, __DSOCore, '__SQDSOVisualCalcs'[Ordinal], 1, '__SQDSOVisualCalcs'[Name], 1)

EVALUATE
    __DSOPrimaryWindowed

ORDER BY
    '__SQDSOVisualCalcs'[Ordinal], '__SQDSOVisualCalcs'[Name]
```

twoday academy

A Dream in a Dream in A Dream 🤯

The maximum length of a chain of models is three.

Extending beyond the chain length of three isn't supported and results in errors.

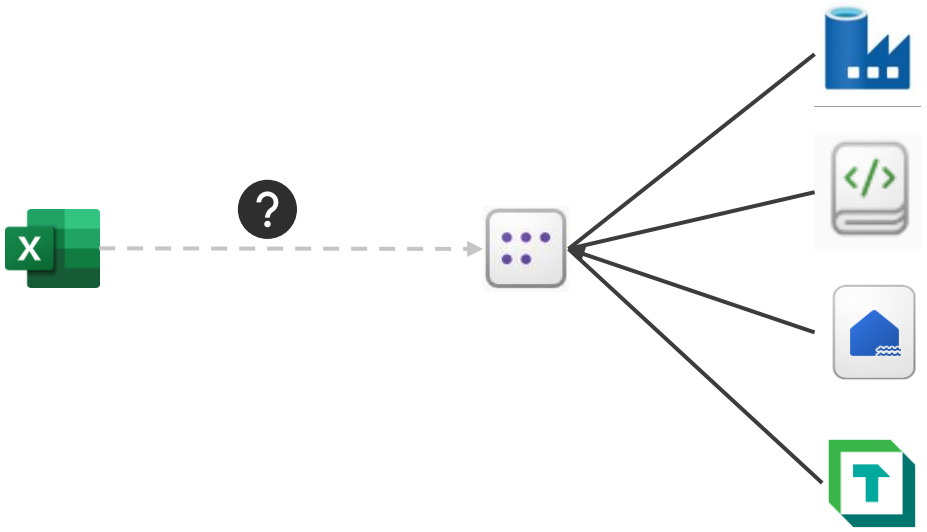


twoday academy

Who owns the data?

- Who owns the semantic model?
- Who supports it?
- Do you have an agreed data contract?
- Would enterprise modelers even accept integrating an important Excel-file into an enterprise setup?

Business:
I want to solve my business problems today

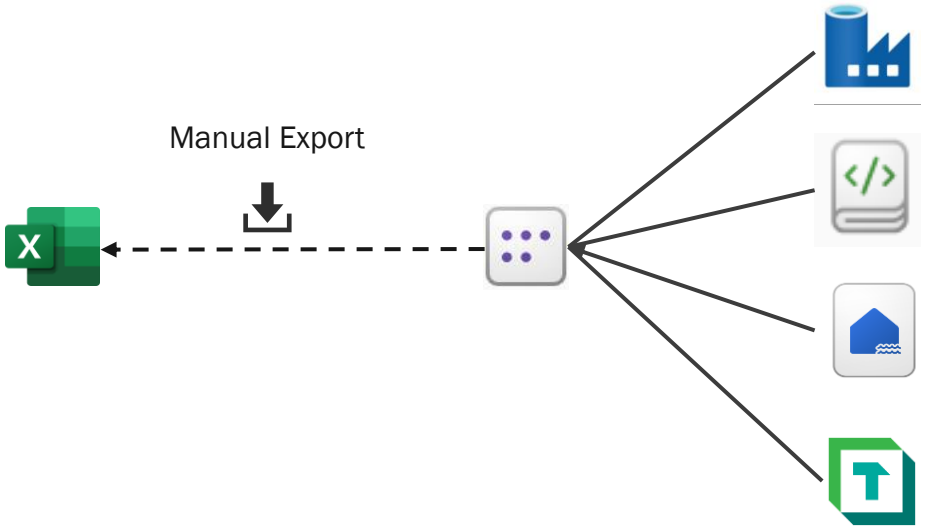


IT / Enterprise:
Do it the right way with best performance and validated numbers

twoday academy

Well then – I will **Export your Enterprise data to Excel** and continue my work to solve my business problems

Business:
I want to solve my business problems today

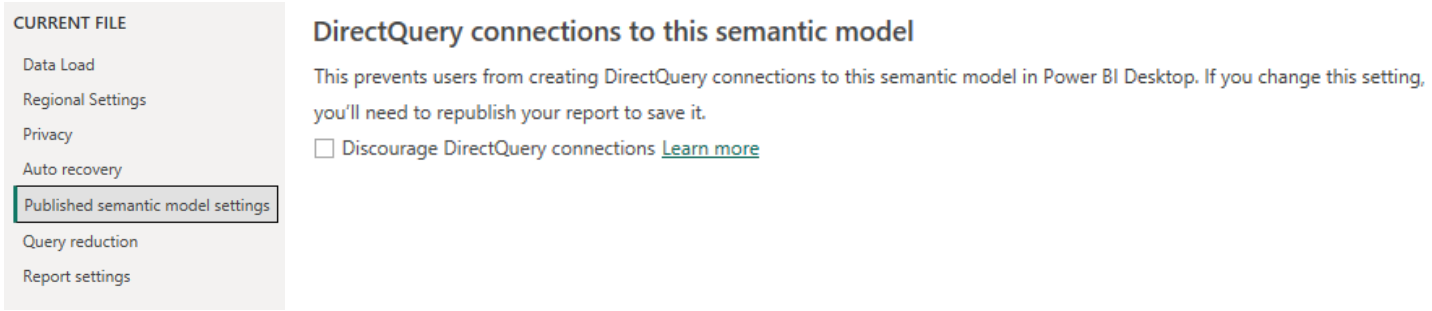


IT / Enterprise:
Do it the right way with best performance and validated numbers

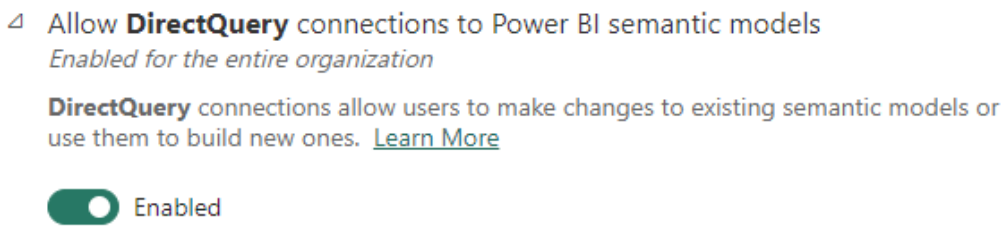
twoday academy

I’m from IT or Enterprise team: How can I **disable** this?

[Individual model]
Power BI Desktop settings before publishing

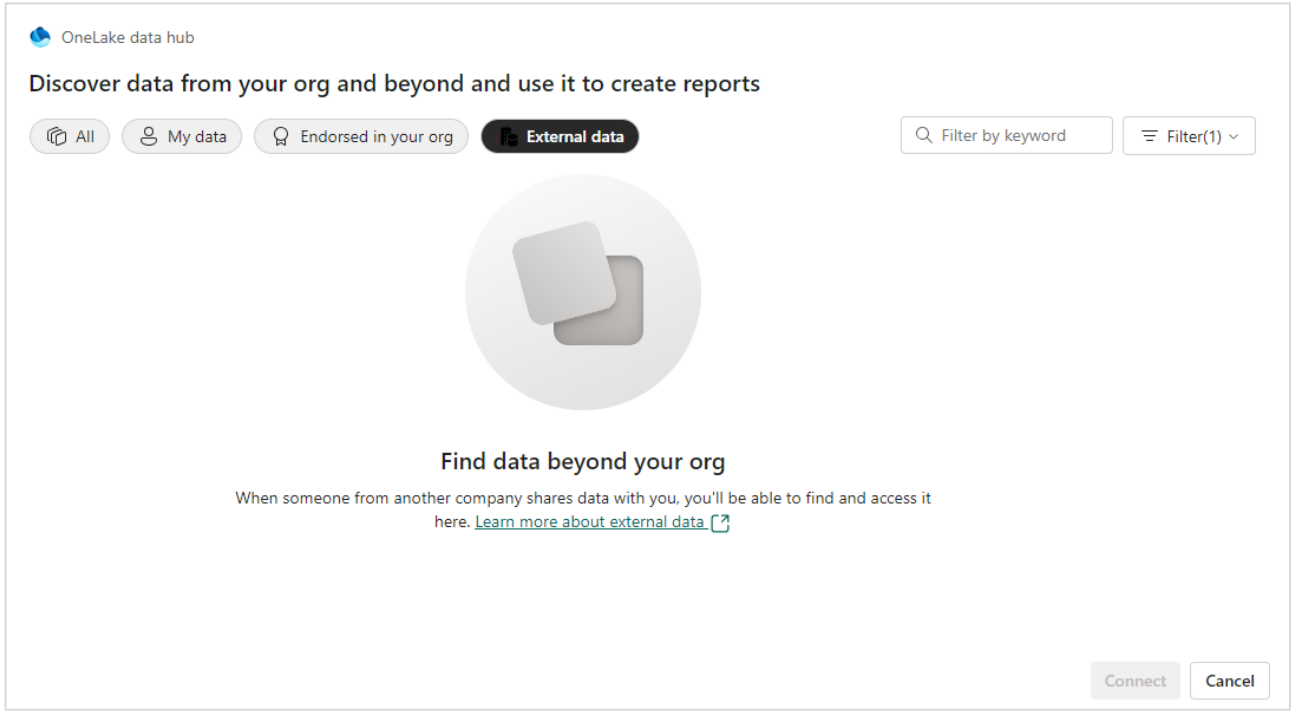


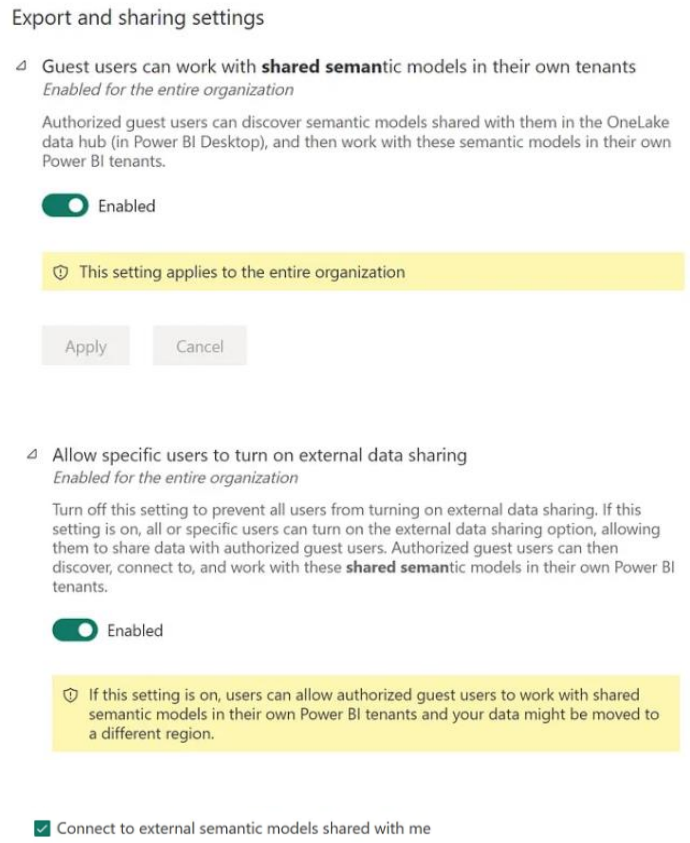
[Tenant]
Admin Portal in Tenant Settings



twoday academy

What about sharing semantic models to **external** partners?





External Semantic Model Sharing – Jon Vöge: https://medium.com/microsoft-power-bi/how-to-share-fabric-power-bi-semantic-models-with-external-users-16ab8bf8e14e

twoday academy

Summary of Considerations for Composite Models

- ⚠ **Choose the right storage mode** for your need and whenever possible add to existing shared model and create live-connection*
- **Composite models are NOT for the enterprise team** to create and deliver large models with relationships
- **Composite models are for the business self-service** developers to provide **flexibility** at the edge (explore, ad-hoc, Pilot, POC, let's go fast and solve business problems today)
- Be aware of implications of composite models when using **calculation groups** and calculating measures between **remote** and **local** data source groups
- Calculation group with **format string expression** or measures with **dynamic format string** works only for **model measures in remote – even in live connection**
- Be aware of **security implications** of a query sent to remote model can **include data values from local** model
- Be aware of **performance** as composite models will not benefit from **visual caches** across reports as with live-connection, assume **referentially integrity** and **multiple query** types
- You should not use composite models with relationships that have **10,000 unique values or more**. For example, create relationship on year or month instead of date
- Be aware of **ownership** (read access to semantic model in Power BI workspace app vs. Org App in Fabric) and **avoid** creating **chain-on-chain-on-chain** models
- **Shared expressions** (parameters in Power Query), **Translations** and **RLS are not imported** from the remote model nor possible to add for remote model objects
- Consumers of a composite model see the results of the **OLS** rules that were applicable to the **author** of the composite model when they created the model
- **Potential break** connection to composite model if **renaming** semantic model or workspace (hard coded for name and not ID)
- For "I Want It All In One Page Dashboard" check **Metric Sets** for a more reuseable assets
- As default enabled, but based on your scenario you can **disable** it on individual semantic models or at tenant level (and in addition investigate **external** semantic models)
- **Naming convention "Local"** if duplicates and Enterprise team semantic model owner can utilize **Perspectives** to share subsets of model excl. remote calculation groups
- As with Live-connection, add **model documentation with INFO.VIEW** functions or **measure expression as description** field for self-service developers

***Tools for migrating report-level objects:**

- Notebooks in Fabric *(Michael Kovalsky's Semantic Link Labs)*
- Tabular Editor *(C# Scripts and copy M code from local model)*
- ALM Toolkit *(Compare and merge .bim)*

twoday academy

Roche's Maxim of Data Transformation:

> Data should be transformed
> as far upstream as possible, and
> as far downstream as necessary.

Credit and resources

- **Microsoft Learn Guidance Composite Model:** https://learn.microsoft.com/en-us/power-bi/guidance/composite-model-guidance
- **Microsoft Learn Composite Model:** https://learn.microsoft.com/en-us/power-bi/transform-model/desktop-composite-models#working-with-a-composite-model-based-on-a-semantic-model
- **Microsoft Learn Lifecycle Semantic Model:** https://learn.microsoft.com/en-us/power-bi/connect-data/desktop-report-lifecycle-datasets
- **Microsoft Learn Usage Scenario:** https://learn.microsoft.com/en-us/power-bi/guidance/powerbi-implementation-planning-usage-scenario-customizable-managed-self-service-bi
- **Data Modelling for Expert by Jeroen ter Heerd and Marc Lelijveld:** https://www.youtube.com/watch?v=3EWmkEdaA2U
- **Milestone in BI by SQLBI:** https://www.sqlbi.com/articles/new-composite-models-in-power-bi-a-milestone-in-business-intelligence/
- **Retail & Wholesale in Composite Models by SQLBI:** https://www.sqlbi.com/articles/introducing-wholesale-and-retail-execution-in-composite-models/
- **Direct Lake vs Import article by SQLBI:** https://www.sqlbi.com/blog/marco/2025/05/13/direct-lake-vs-import-vs-direct-lakeimport-fabric-semantic-models-may-2025/
- **Introducing Composite Models in Power BI SQL Day 2023 by Alberto Ferrari:** https://www.youtube.com/watch?v=6IxiywmOsio
- **External Semantic Model Sharing– Jon Vöge:** https://medium.com/microsoft-power-bi/how-to-share-fabric-power-bi-semantic-models-with-external-users-16ab8bf8e14e
- **Roche's Maxim of Data Transformation:** https://www.youtube.com/watch?v=0Alys79j81Q

David Kofod Hanna

LinkedIn Newsletter: https://www.linkedin.com/newsletters/7237000963331420162/

LinkedIn: https://www.linkedin.com/in/davidkofod/

GitHub: https://github.com/DKH-DK/Self-Service-Power-BI-Fabric

twoday academy