SQL Saturday
Power BI Workshop

Amy Nicholson
@amykatenicho

Andrew Fryer
@deepfat

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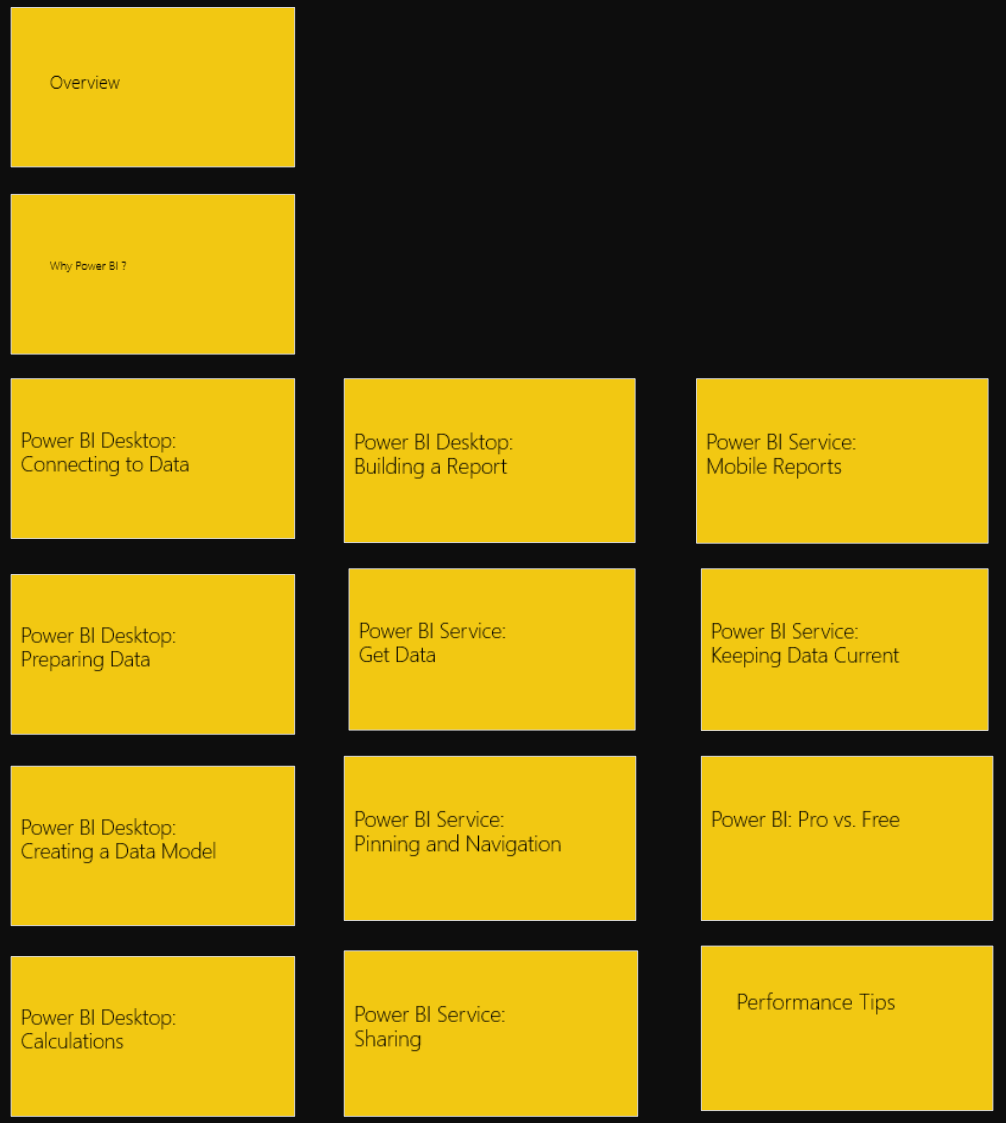


Overview

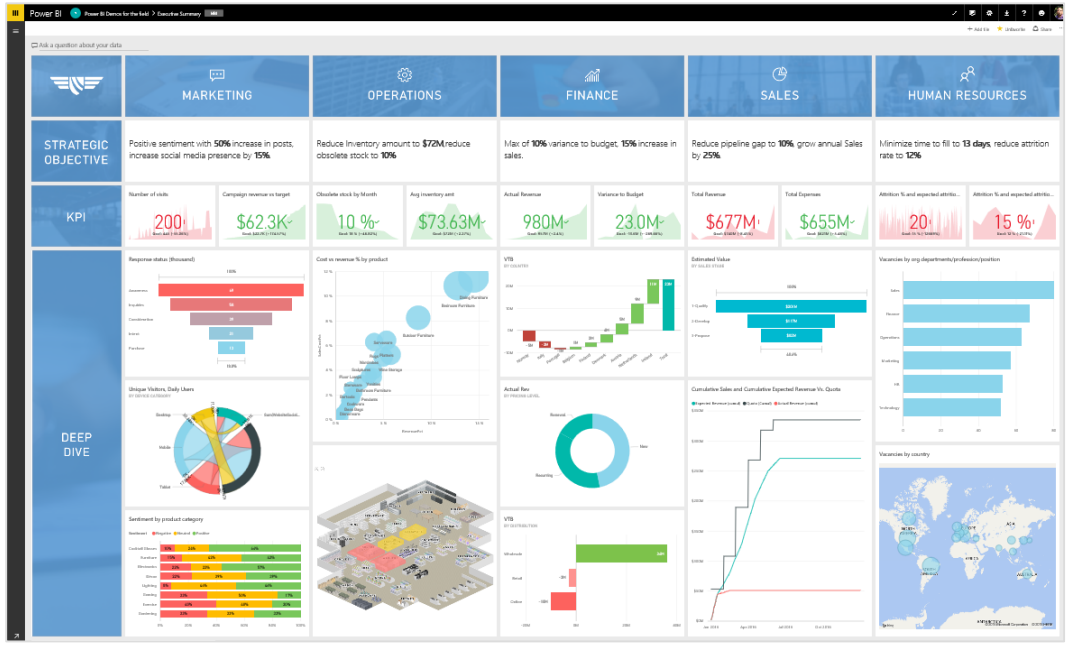
Common challenges for BI IT Professionals

Management of BI systems	Time spent on setup and management of BI systems. Ongoing hardware acquisitions and maintenance to meet SLAs
Variety of data sources	Complexity of connecting to on-premise and cloud (SaaS) data sources
Managing data in the cloud	Security, privacy and data refresh concerns for moving data into the cloud
Integration with existing environment	Cost and time involved in integration of solution into existing environment. Extensibility of system
Keeping data current	Complexity of refreshing data from variety of data sources, increased demand for real-time data
Ease of use and adoption	Ease of adoption by business and IT orgs. Time spent on creating reports and visualizations

Connecting any user, in any business, anywhere, with their data

Power BI

- Industry-leading SaaS service
  - 5 seconds to sign up, 5 minutes to WOW
- Large Power BI ecosystem
  - ISVs, SIs and partners creating unparalleled momentum
- Integrated across Microsoft products
  - Customers benefit from integration with other Microsoft products



Key benefits and differentiators of Power BI for IT

- Fast deployment with a hybrid solution, ease of maintenance and 99.9% uptime SLA
- Live connection to your data sources, on-premises and in the cloud
- Keep your data secure, use groups to manage access and sharing
- Integrated with familiar Microsoft products, utilizes infrastructure, scale & availability in Azure & O365
- Open APIs for integration and new scenarios, e.g. real-time insights from devices
- Content delivery (dashboards, reports, models) for ease of consumption across your organizations

Power BI Overview

Power BI

Data sources

- **Cloud-based SaaS solutions**
  e.g. Marketo, Salesforce, Quickbooks, Google Analytics, ...
- **On-premises data**
  e.g. Analysis Services, SQL Server
- **Organizational content packs**
  Corporate data sources or external data services
- **Azure services**
  Azure SQL, Stream Analytics...
- **Excel and CSV files**
  Workbook data, flat files
- **Power BI Desktop files**
  Data from files, databases, Azure, Online Services, and other sources

Power BI Service

- Content packs
- Live dashboards
- Visualizations
- Reports
- Datasets
- Data refresh

Natural language query

Sharing & collaboration

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Power BI Service

- Content packs
- Live dashboards
- Visualizations
- Reports
- Datasets
- Data refresh

Natural language query

Sharing & collaboration

Power BI Desktop

Prepare → Explore → Report → Share

Power BI Platform

</> embed, extend, integrate

Why Power BI ?

IT challenges

Management of BI systems

Variety of data sources

Managing data in the cloud

Integration with existing environment

Keeping data current

Ease of use and adoption

Faster time to solution and ease of management

- Power BI is a Software as a Service (SaaS) BI solution
  - No need to setup your own hardware
  - 99.9% uptime SLA
  - Grows with your needs for number of users and data volumes
  - Ease of maintenance with automatic updates
- Realize the benefits of a SaaS-based BI solution without moving your data to the cloud
- More time to focus on business needs and creating better solutions for end users
- Power BI will meet your security and compliance requirements
  - Use Azure Conditional Access policies for secure access
  - Manage users, groups, admins (in O365 admin portal)
  - View and search audit logs (in O365 Security and Compliance portal)
  - View usage metrics
  - Specify tenant settings – what features are available in your organization

IT challenges

Management of BI systems

Variety of data sources

Managing data in the cloud

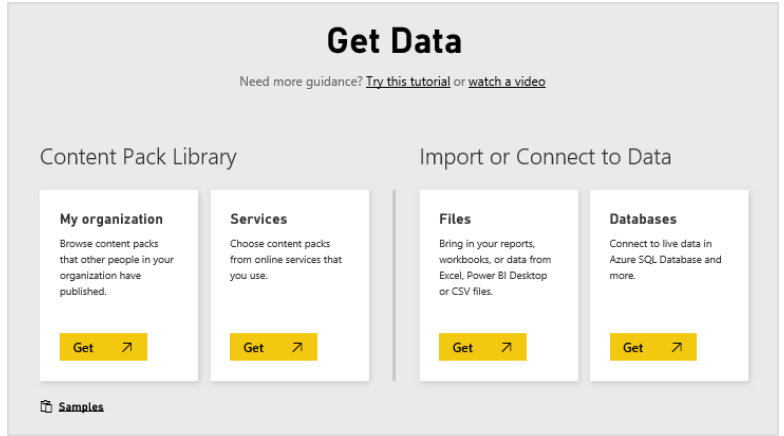
Integration with existing environment

Keeping data current

Ease of use and adoption

Built-in connectivity to all of your data

- Lowered IT investment in ETL infrastructure
- Data from services
  - Content packs for SaaS services that you already use
  - Growing number of supported SaaS solutions
- Data from databases
  - Cloud: Azure SQL Database, Azure SQL Data Warehouse, Spark on HDInsight
  - On-premise: SQL Server Analysis Services tabular or multi-dimensional, SQL Server, SAP HANA, Oracle, Teradata (Gateway required)
- Data from your organization
  - Content published by others in your org
- Data from files
  - Import data from Excel, Power BI Desktop, or CSV files
  - Connect (upload), manage and view Excel in Power BI
- Solution templates
  - Quickly provision end-to-end, enterprise solutions



IT challenges

- **Management of BI systems**
- **Variety of data sources**
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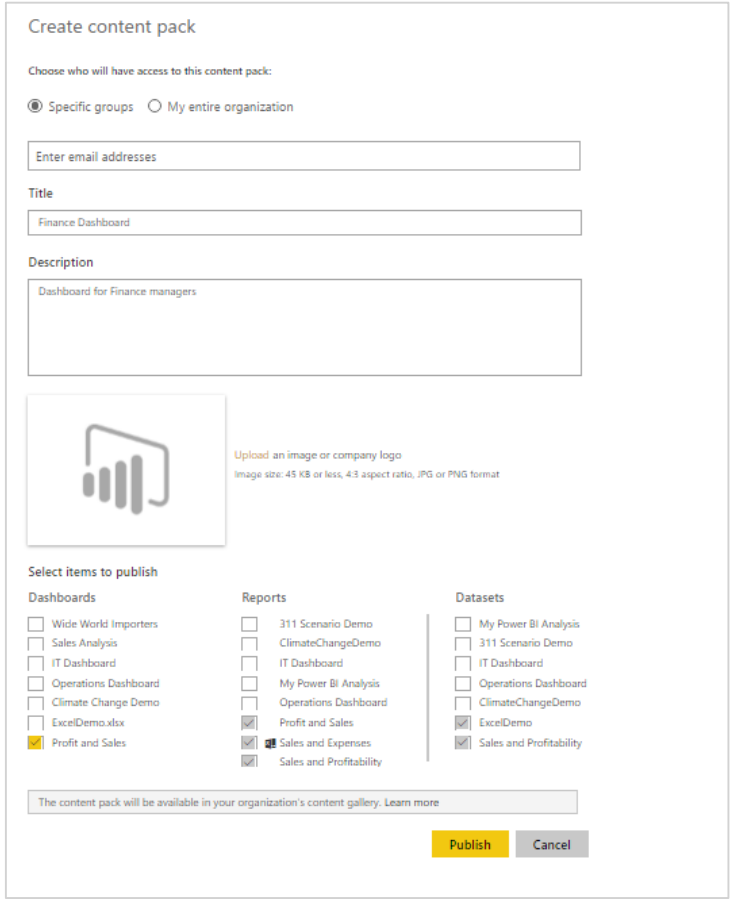
- **Integration with existing environment**
- **Keeping data current**
- **Ease of use and adoption**

Create organizational content packs

- IT can work with the business analysts to create content packs for an organization
- Content packs include
  - pre-built dashboards
  - reports
  - pre-defined data models
- IT can focus on providing authoritative datasets to analysts and end users, instead of developing reports
- Sample content packs for industry related scenarios are provided



IT challenges

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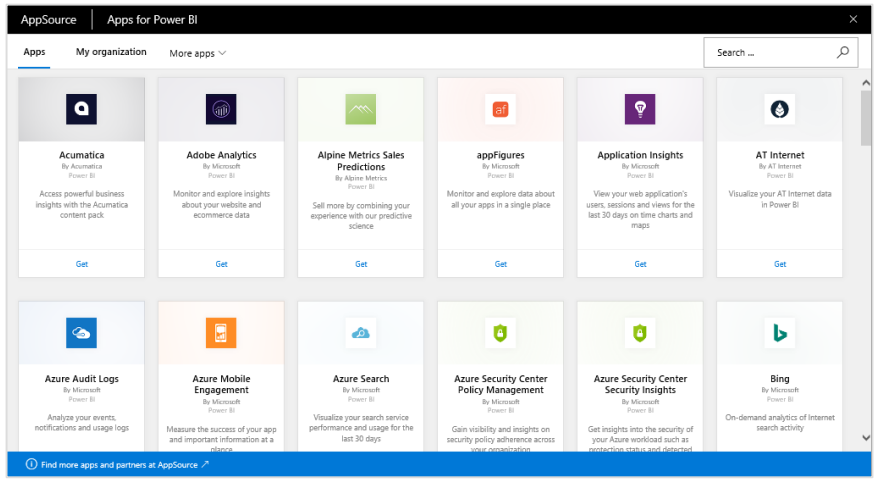
Get instant value from your cloud data sources

- No need to build connectors or develop data extraction processes for your SaaS solutions
- Business can quickly start with solution-specific content packs which include
  - pre-configured dashboards
  - reports
  - data models
- Users can explore data with fast data processing
- Automatic data refresh is built-in



Please refer to powerbi.com for latest list of SaaS partners

IT challenges

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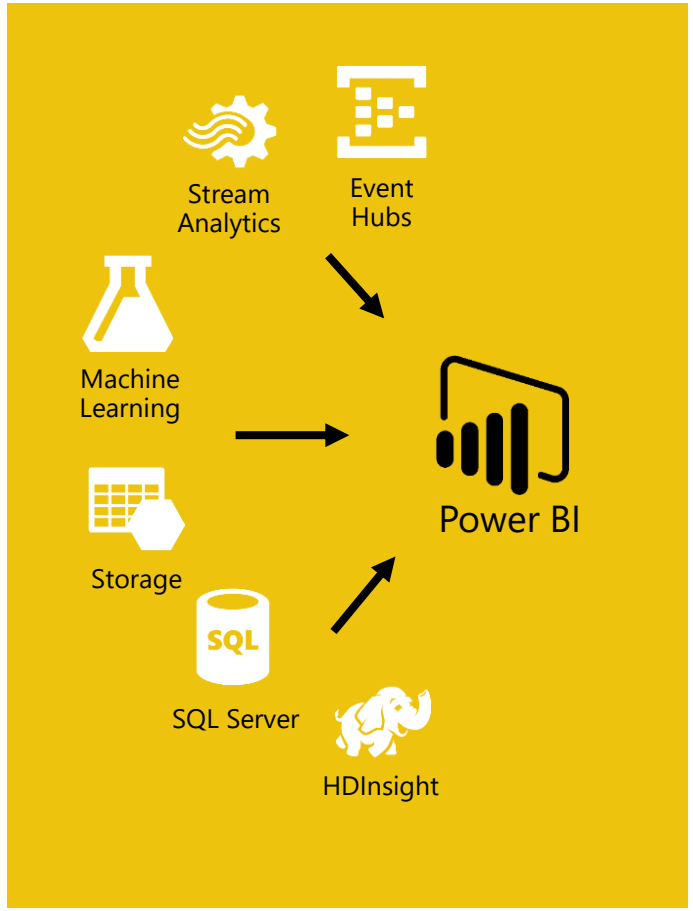
Consume structured/unstructured data using other Azure services

- Connect directly to data from Azure services, including
  - Azure SQL Database
  - Azure SQL Data Warehouse
  - Spark on HDInsight
- Push live, streaming data from Azure Stream Analytics with built-in destination for Power BI for real-time dashboards at any scale
- Integration with other Azure services, including Azure ML, opens up new scenarios, without writing thousands of lines of code



IT challenges

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- **Variety of data sources**
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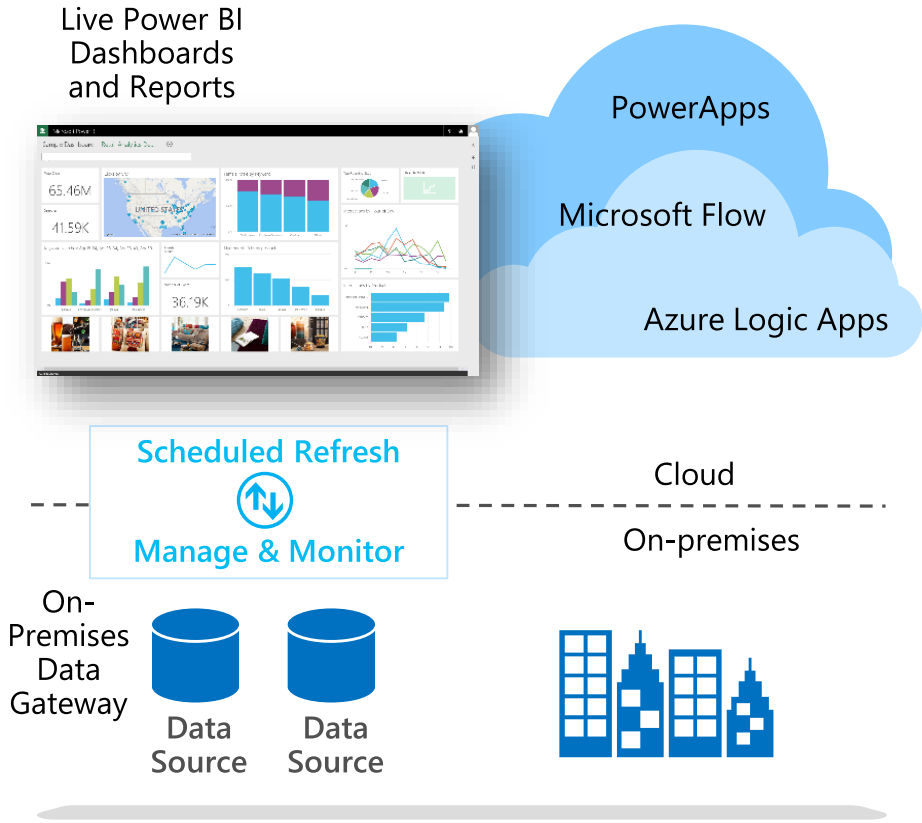
Live connectivity to your on-premises data

- Connect live to your existing on-premises data sources:
  - Analysis Services (tabular and multidimensional)
  - SQL Server
  - SAP HANA
  - Oracle
  - Teradata
- Requires On-Premises Data Gateway
- Role-based and row-level data security
- Data remains on-premise, only query is stored in Power BI



IT challenges

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- **Variety of data sources**
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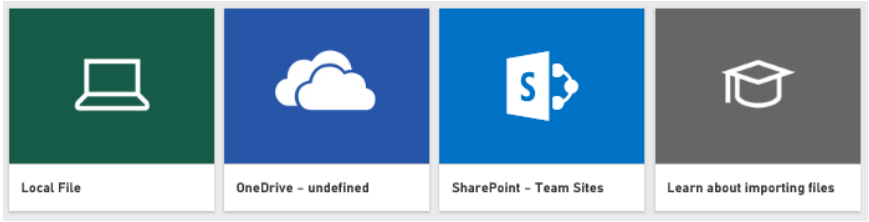
Connect to data from your files

- Import data into Power BI from files
  - Microsoft Excel (xlxs or xlsm)
  - Power BI Desktop (pbix)
  - Comma Separated Value (csv)
- Files can be located on
  - Local machine
  - OneDrive Business or Personal
  - SharePoint Team Sites
- Two ways to use Excel files
  - Import into Power BI
  - Connect (upload), manage and view in Power BI
- Any changes to a file in OneDrive or SharePoint are synced automatically (hourly)
- Data and reports from Power BI Desktop files



IT challenges

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- **Variety of data sources**
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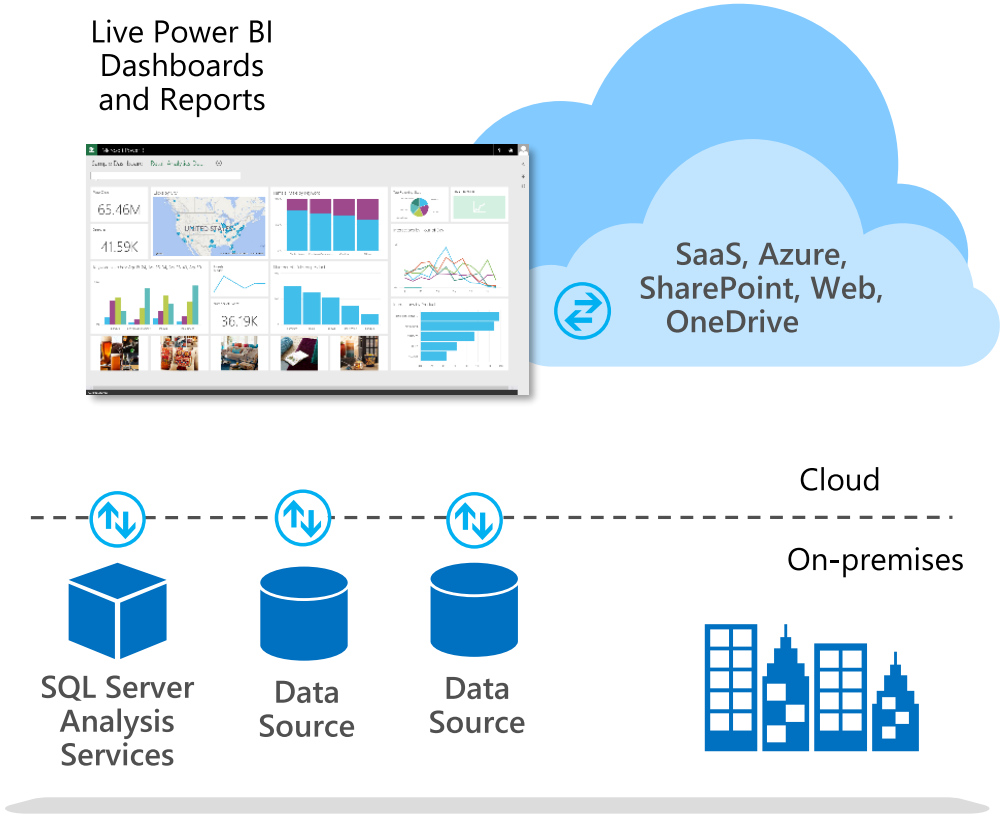
Keep your data where it is and connect securely

- Faster time to insight with a hybrid BI solution
- Cloud data sources
  - SaaS sources
  - Azure – SQL, DW, Blob, Table, HDInsight, Marketplace
  - SharePoint, web sources, OData
  - OneDrive
- On-premise data sources
  - SQL Server, Teradata, Oracle, DB2, MySQL, PostgreSQL, Sybase, SAP HANA, Access, Custom SQL, Custom ODBC Drivers
  - SQL Server Analysis Services (tabular and multi-dimensional)
  - Files/folder, SharePoint on-premises



IT challenges

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Embed, extend, and integrate with the Power BI Platform

- Application developers can embed Power BI tiles and reports as an IFrame into an app, such as a mobile app or web app.
- Use the REST API to push data directly from your application into Power BI
- Programmatically access Power BI resources (datasets, tables, schemas)
- Secure access to Power BI service using Azure Active Directory and OAuth 2.0 authentication
- Create your own custom visuals from the published open source visuals and the provided framework

IT challenges

- **Management of BI systems**
- **Variety of data sources**
- **Managing data in the cloud**
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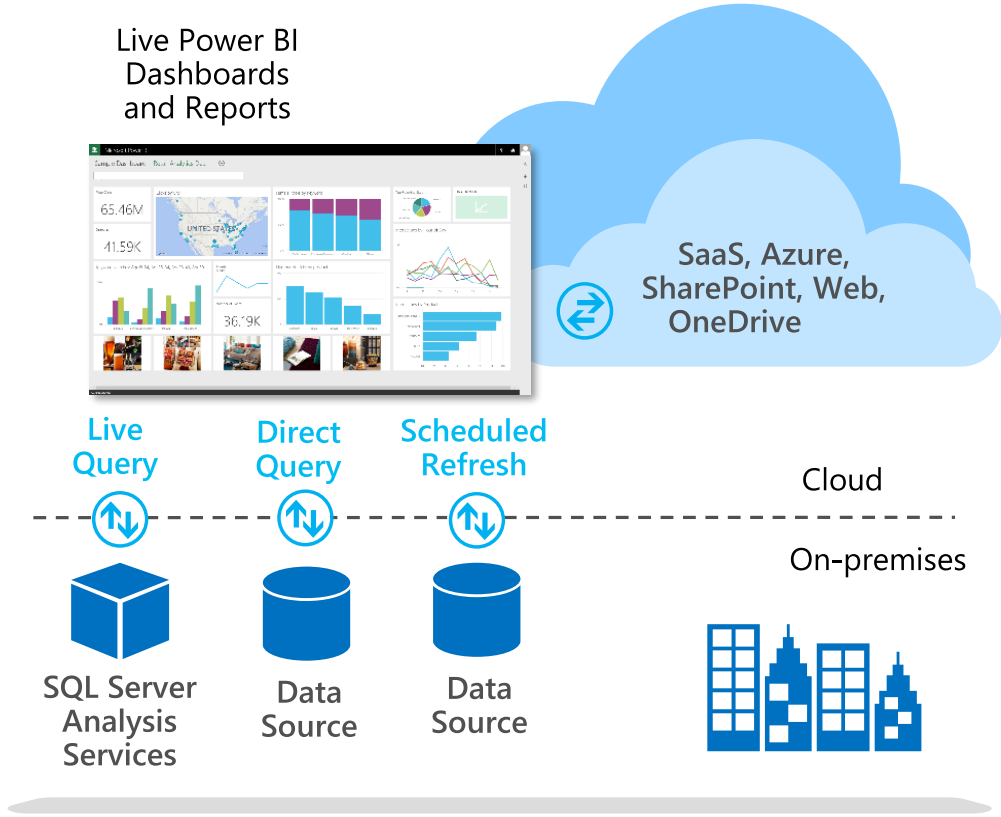
Keep your data current

- Access and refresh the data via
  - Direct Query (Azure SQL, DW and Spark HDInsight)
  - Import (with scheduled refresh)
  - REST APIs to stream data
- Refresh on-premise data with
  - Power BI Personal Gateway
  - On-Premises Data Gateway



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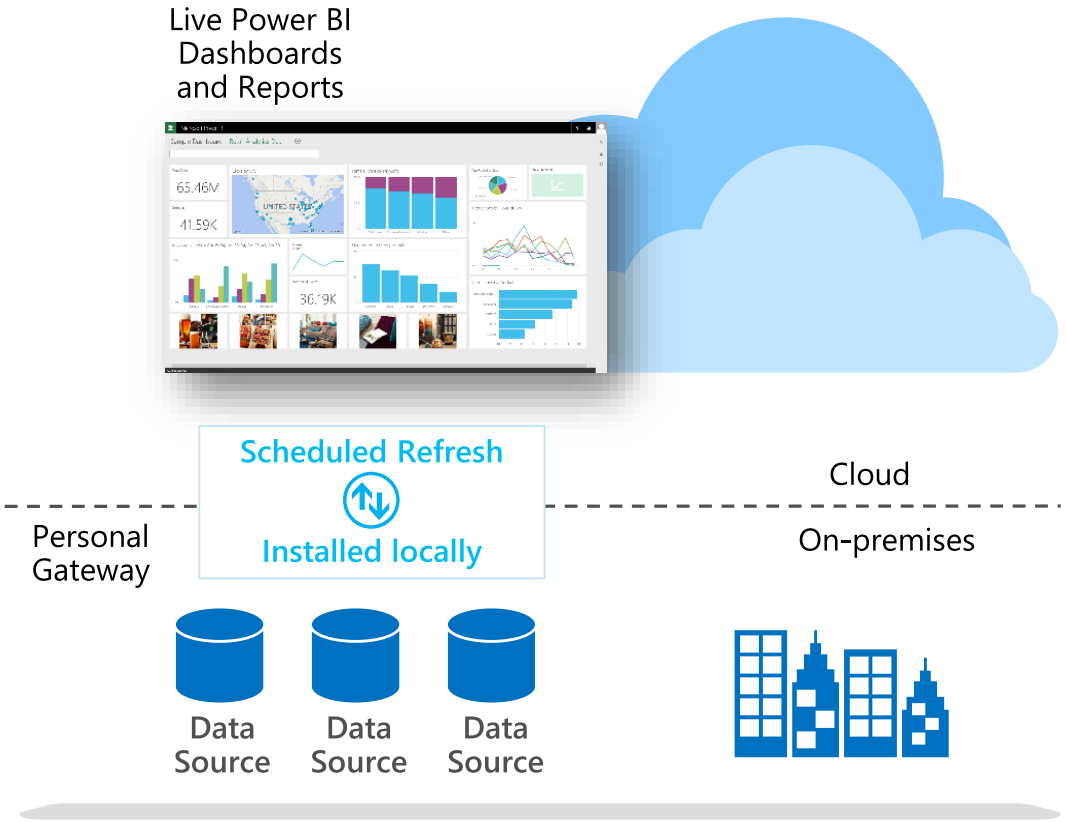
Scheduled refresh with Power BI Personal Gateway

- Personal Gateway empowers the business analyst to securely and easily refresh on-premise data
- Self-service data refresh - no help from IT required
- Easy & simple to use - lightweight one-click installer
- One Personal Gateway per user
- Runs either as a service or an app
- Import of data with scheduled refresh



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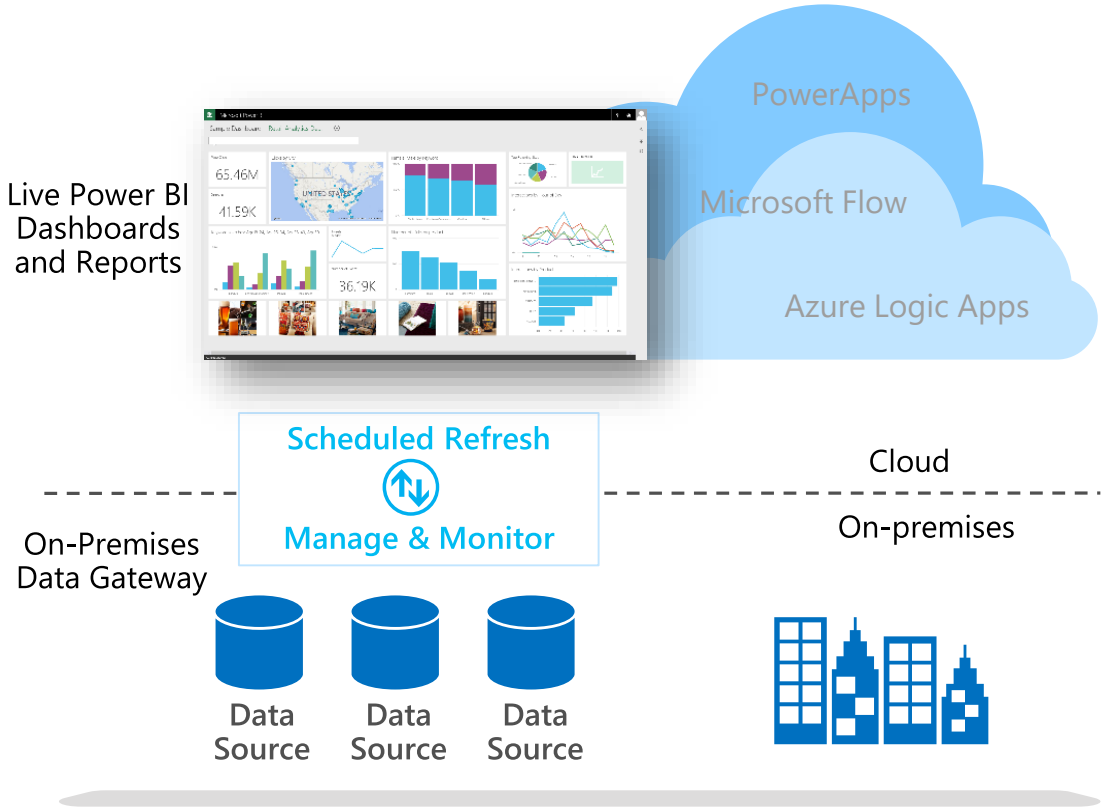
Centralized data refresh with On-Premises Data Gateway

- IT departments can deploy and manage on-premise data access centrally
- BI governance: IT can monitor and audit usage
- Live, interactive query to on-premises data sources (e.g. SQL Server) and scheduled refresh
- One gateway for multiple cloud services and experiences: Power BI, PowerApps, Microsoft Flow, Azure Logic Apps
- Gateway recovery and restore features built-in



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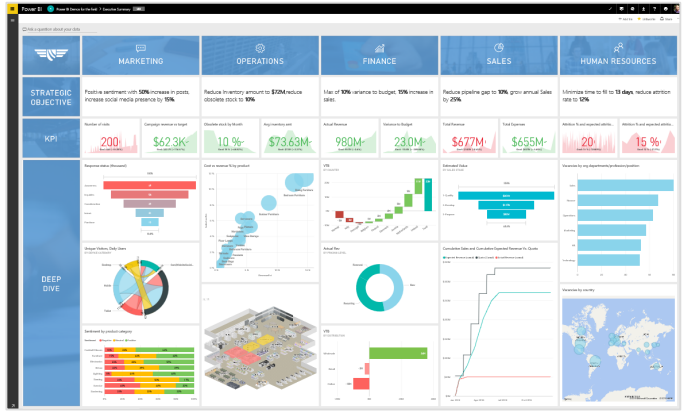
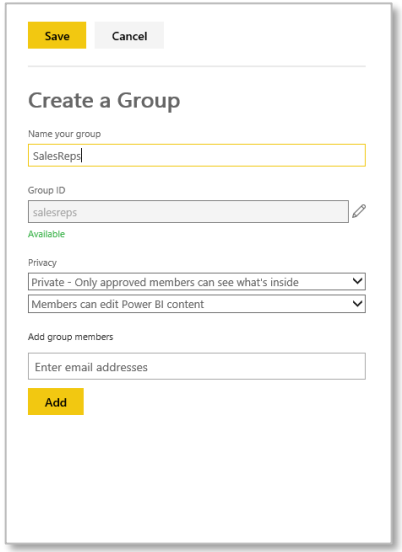
Easy to use and drive adoption

- Easy to use
  - For end users: intuitive and interactive dashboards and reports
  - For BI analysts: familiar tools to create data models and reports
  - For IT: Administering Power BI tenants, users, and groups is the same as in Office 365
- Easy to share
  - End users can easily share dashboards and reports, inside and outside the organization
  - Collaborate with others in a group workspace
  - Create content packs and publish them to your organization

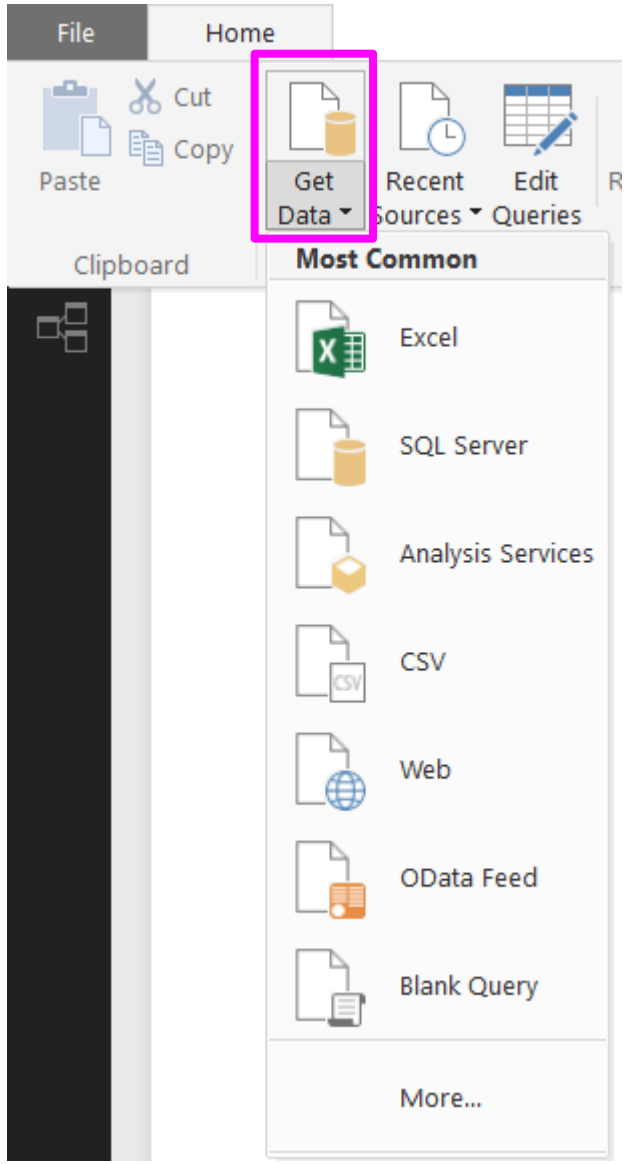




Power BI Desktop: Connecting to Data

Power BI Desktop

Connecting to Data



- The "Get Data" option allows the definition of **connections** to data sources and the **selection of entities and columns**
- **Authentication** options can be specified including **credential types** such as Windows or others
- Data can be **imported in-memory** or be **accessed live** for some data sources
- **Each selected entity will become a query** that can be **further enhanced** to meet business requirements

Power BI Desktop

Connecting to Data

Data sources available through Power BI Desktop (not all listed)

File	Database	Azure	Online Services		Other
• Excel • Text / CSV • XML • JSON • Folder • Sharepoint Folder	• SQL Server **(DQ)** • Access • SQL Server Analysis Services **(LQ)** • Oracle **(DQ)** • IBM DB2 • MySQL • PostgreSQL • Sybase • Teradata **(DQ)** • SAP HANA **(DQ)** • IBM Informix database[1] • SAP BW • Amazon Redshift[1] • Impala[1] • Snowflake[1]	• SQL Database **(DQ)** • SQL Data Warehouse **(DQ)** • Marketplace • HDInsight • Blob Storage • Table Storage • HDInsight Spark[1] • DocumentDB[1] • Data Lake[1]	• SharePoint Online List • Dynamics 365 • PowerApps • Facebook • Salesforce Objects • Salesforce Reports • Google Analytics • appFigures[1] • Azure Enterprise[1] • comScore Digital Analytix[1] • GitHub[1] • MailChimp[1] • Marketo[1] • Dynamics 365 for Financials[1] • MixPanel[1] • Planview Enterprise[1] • Projectplace[1] • QuickBooks Online[1]	• SparkPost[1] • Smartsheet • SQL Sentry[1] • Stripe[1] • SweetIQ[1] • Troux[1] • Twilio[1] • tyGraph[1] • Visual Studio Team Services[1] • Webtrends[1] • ZenDesk[1]	• Web • SharePoint List • OData Feed • Hadoop File (HDFS) • Active Directory • Microsoft Exchange • ODBC • OLE DB • R Script • Spark[1] • Blank Query [1] In Beta

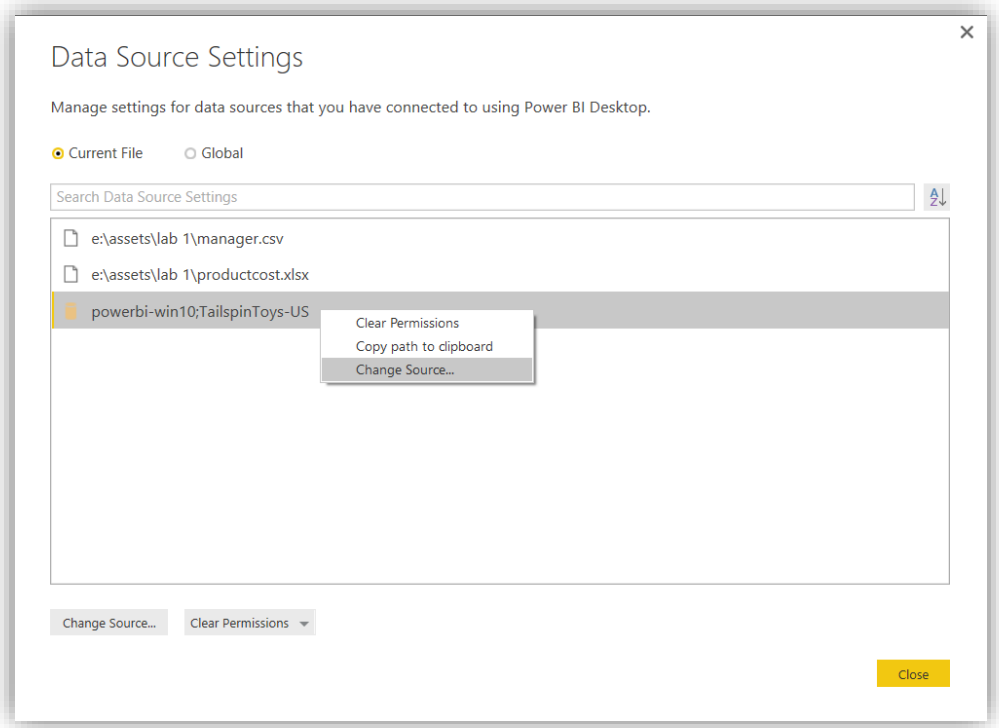
- The available data sources are **constantly evolving**
- Some of them support **Direct Query (DQ)**. No data is imported but **cannot mix import modes or data sources**
- There are also some **limitations on the transformations** that can be done **with DQ**

Power BI Desktop

Connecting to Data

Changing connections

- Once **connections** are established, you can easily **change** them
- For instance change from Test to Production Environment
- Go to File -> Options and Settings -> Data Source Settings
- Specified **credentials can be cleared**
- The scope can be current file or previous created connections



Power BI Desktop: Preparing Data

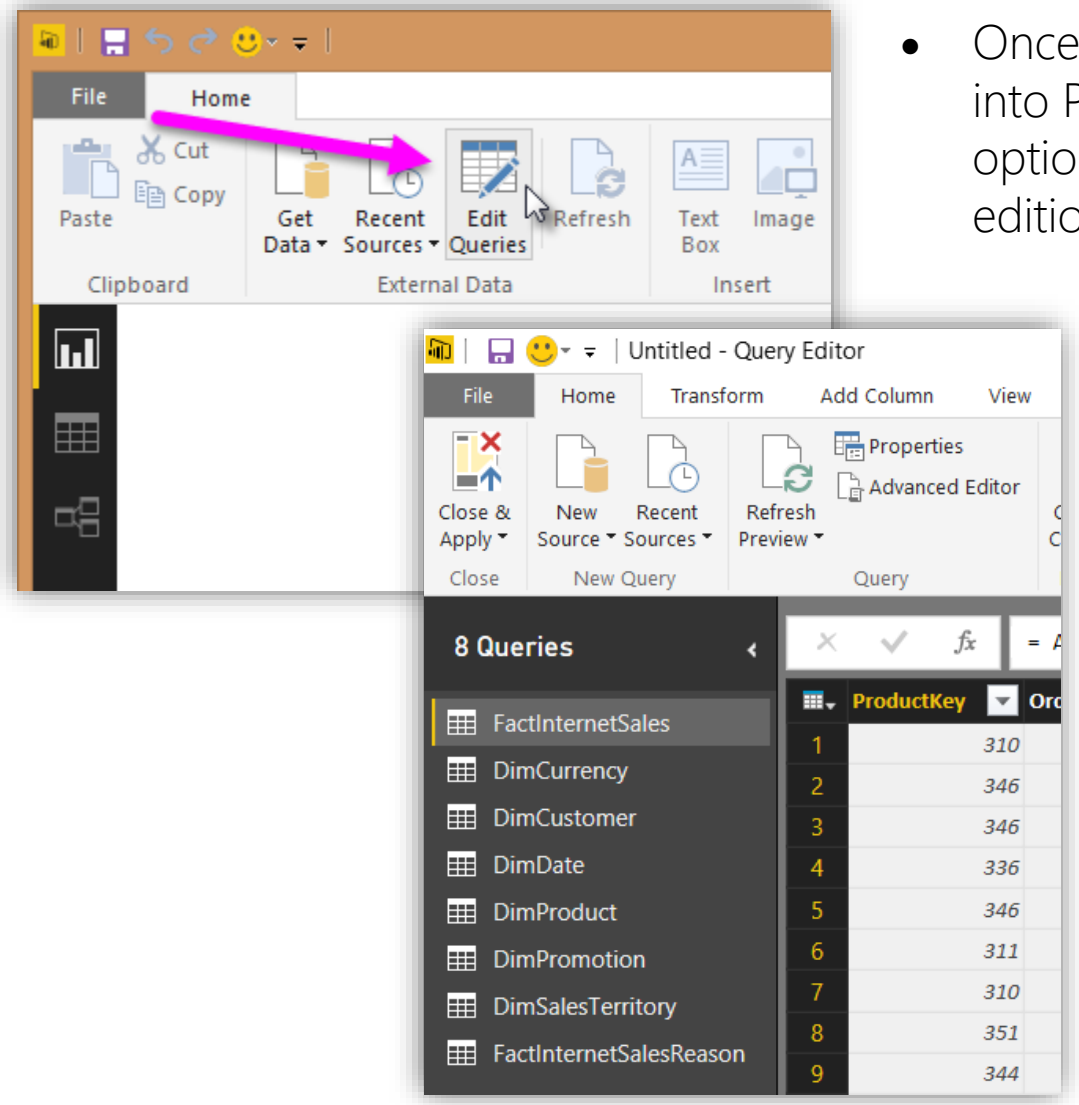
Power BI Desktop

Shaping Data

- Shaping is the act of **transforming** the data to meet our **business requirements**
- Apply **data cleaning operations** and correct/remove errors
- **Rename the data** so it is more meaningful
- **Combine data** from different data sources in a single table
- Create **personal** (reusable) **views** of the data
- A set of **out-of-the box transformations** are available to help
- A **programming language** is available for addressing more complex use-cases
- **Source data is not changed**, all the transformations are applied on the Desktop engine

Power BI Desktop

Query Editor



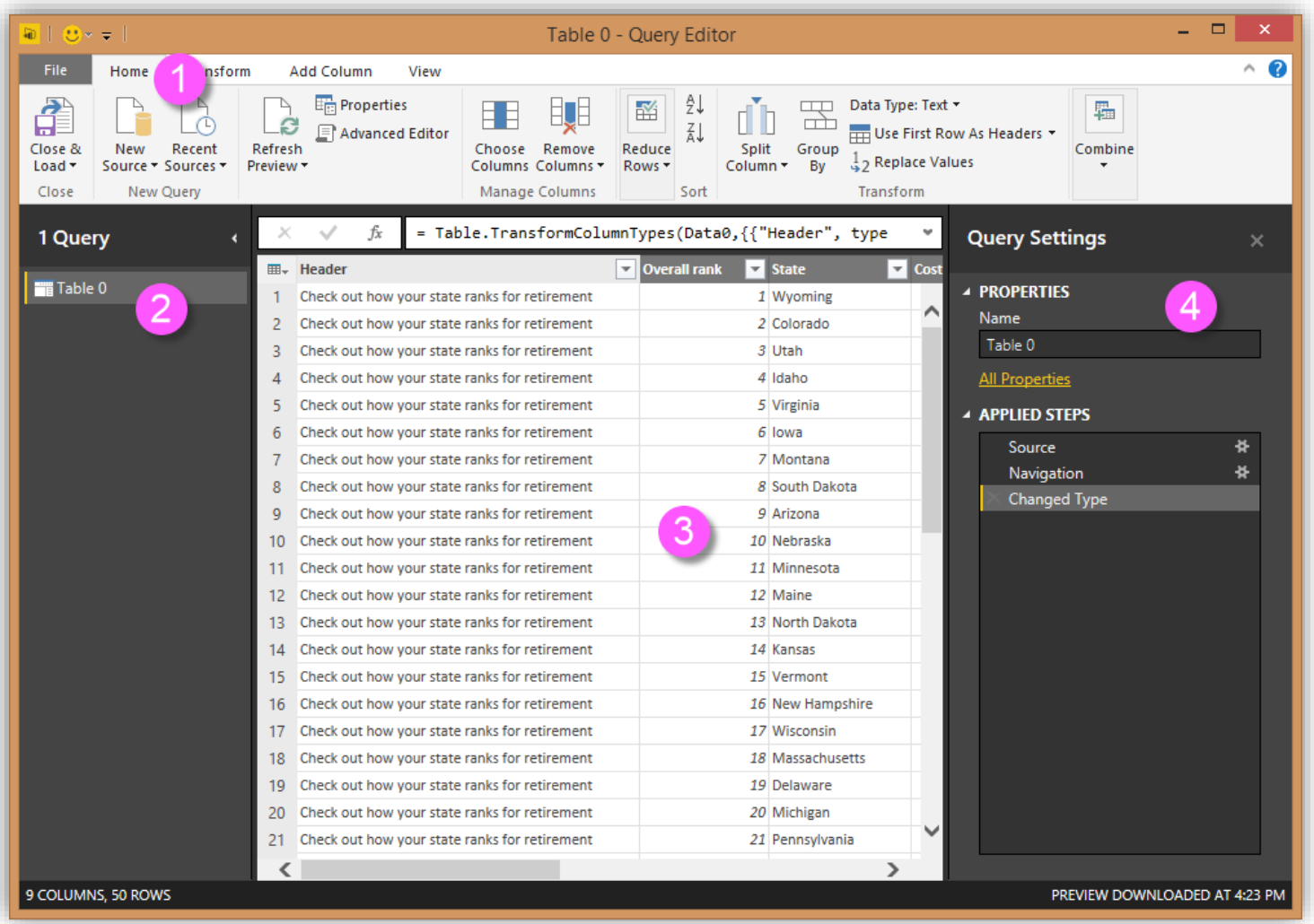
- Once the data is loaded or referenced into Power BI Desktop, the **"Edit Queries"** option in the "Home" ribbon allows the edition of the imported entities

- **Each entity** that was loaded from each data source will generate a **separate query**

- **Transformations** are applied **per-entity**, although it is possible to combine them.

Power BI Desktop

Query Editor

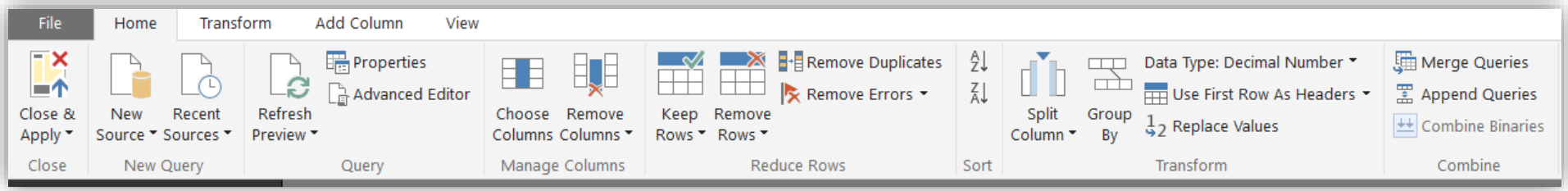


1 Query Ribbon 2 The Left Pane 3 The Center Pane 4 The Query Settings Pane

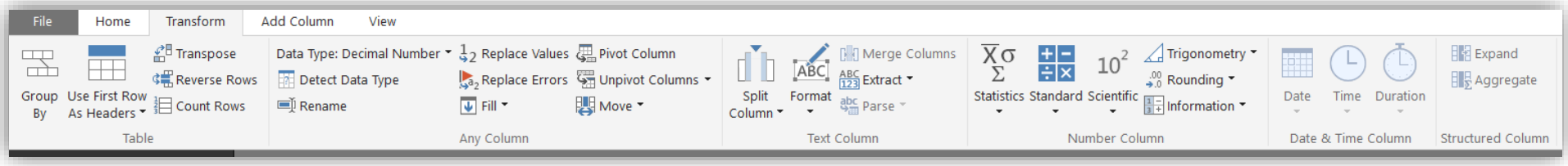
Power BI Desktop

Query Editor - Query Ribbon

- The **"Home"** tab contains the common query tasks including the combination of queries



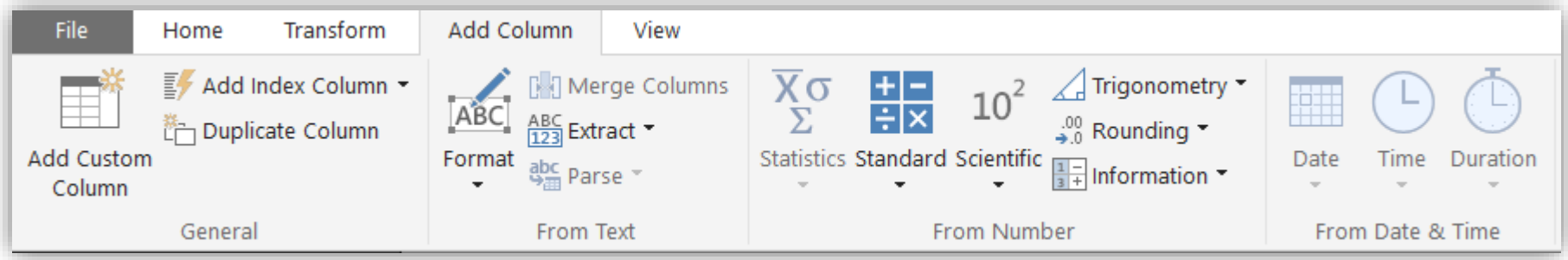
- The **"Transform"** tab provides access to **common data transformation tasks**, such as adding or removing columns, changing data types, splitting columns, and other data-driven tasks



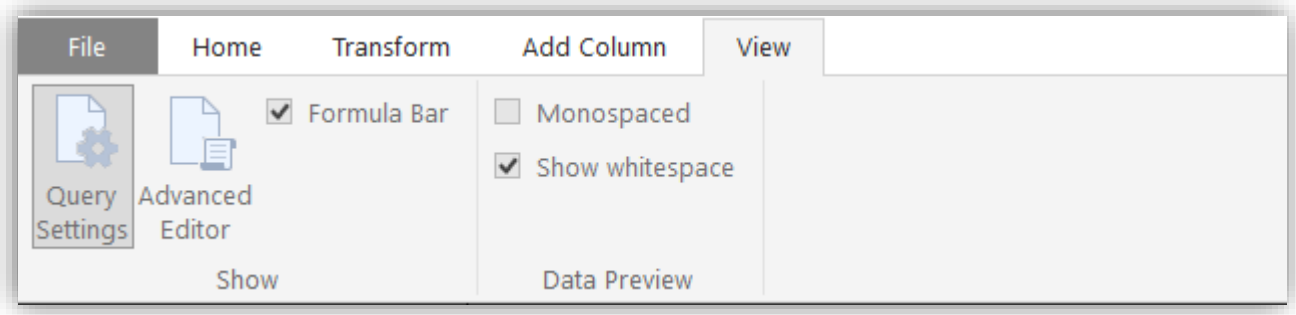
Power BI Desktop

Query Editor - Query Ribbon

- The "Add Column" tab provides additional tasks associated with columns such as formatting column data, adding custom columns or invoking functions



- The "View" tab provides access to query settings and the Advanced Editor where we can develop our own data transformation scripts.



Power BI Desktop

Shaping Data

Available Data Transformations – Advanced Editor

- **Advanced Editor**
  - Every transformation generates code automatically
  - For more advanced scenarios
  - OOB transformations will cover more than 90% of the cases

Power BI Desktop: Creating a Data Model

Power BI Desktop

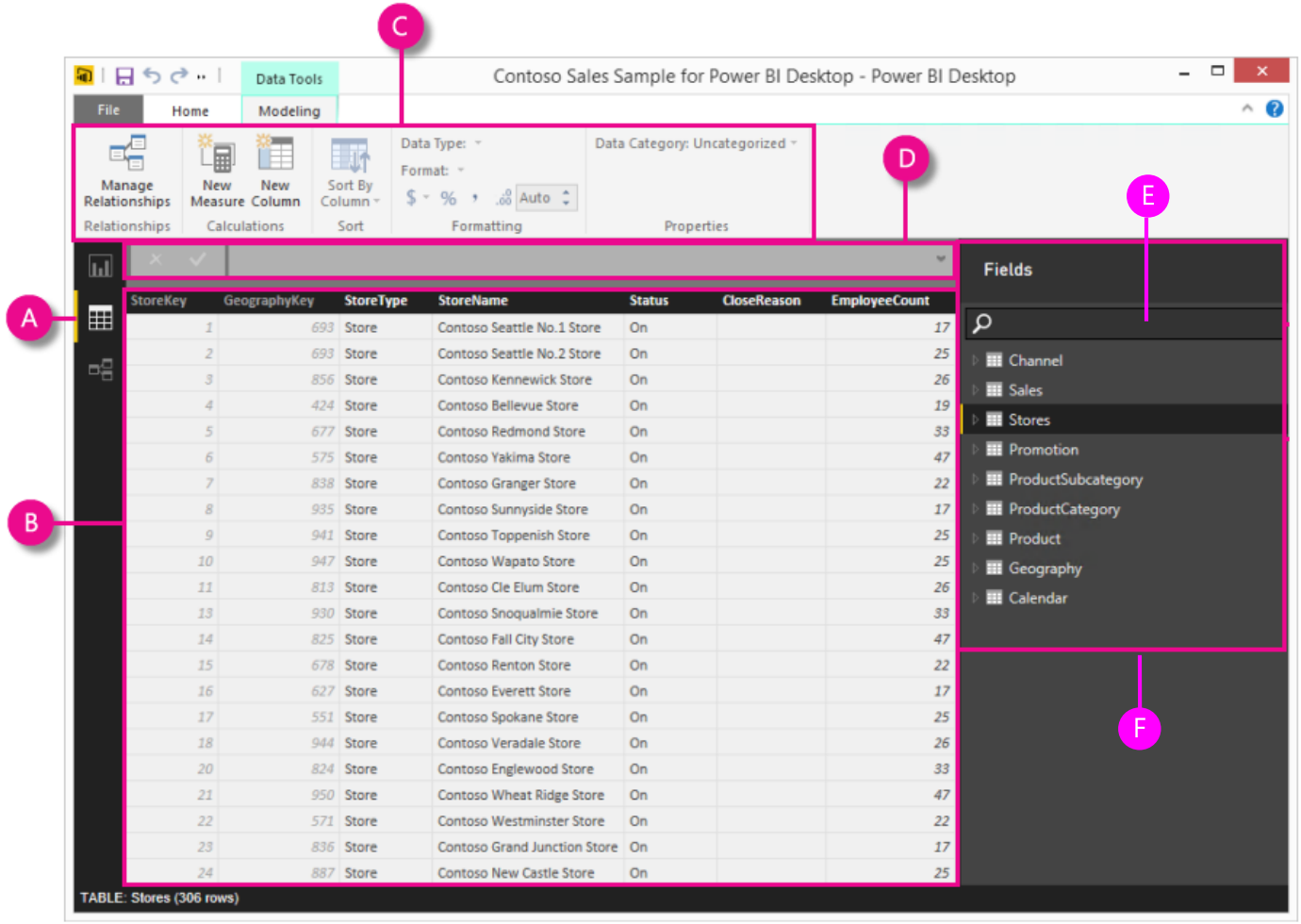
Creating a Data Model

- **After data connections** were created and **data was shaped** according to business requirements, we start **modeling** it
- **Relationships** between the extracted tables can be established to allow filtering
- **Calculations** can be created for **additional context** or for implementing **business metrics** or even **key performance indicators**
- Data can be **categorized**, **typed** and **formatted**
- **Custom sorting** can be implemented for the attributes

Power BI Desktop

Creating a Data Model

Data View

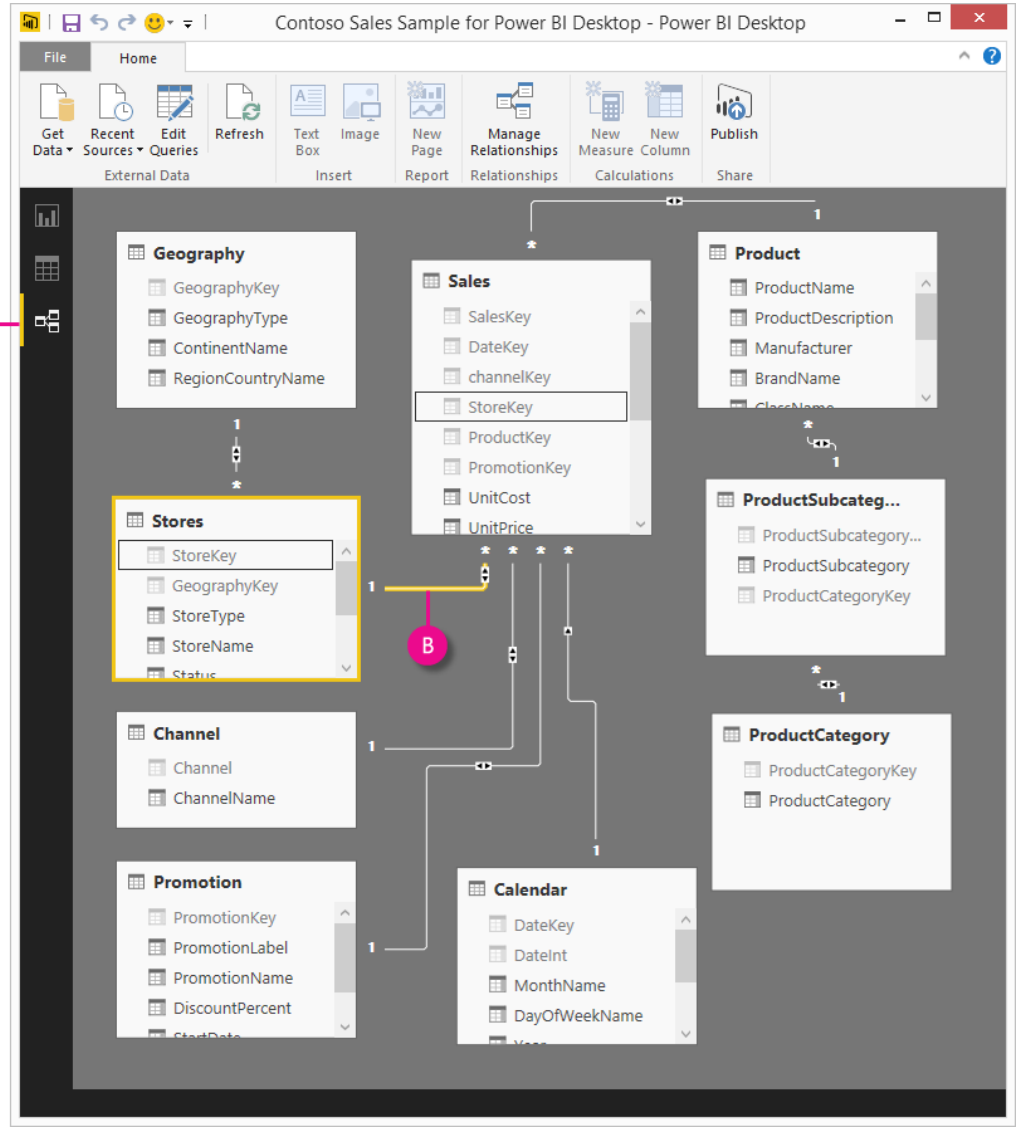


- **A** Data View icon
- **B** **Data Grid** – Shows the data for the selected table
- **C** **Modeling Ribbon** – Manage relationships, calculations, data types, formats and categorization
- **D** **Formula bar** – DAX formulas for calculations
- **E** **Search** – Search for tables or column names
- **F** **Fields List** – Select a table or column to view in the Data Grid

Power BI Desktop

Creating a Data Model

Relationship View



A **Relationship View icon** – Shows the relationships in the model. Here you can create relationships or view them.

B **Relationship** – You can **hover** your cursor over a **relationship** to show the columns used.

Double-click on a relationship to open it in the **Edit** Relationship dialog box

In the example, Sales and Stores have a relationship via StoreKey

Power BI Desktop

Creating a Data Model

Relationships

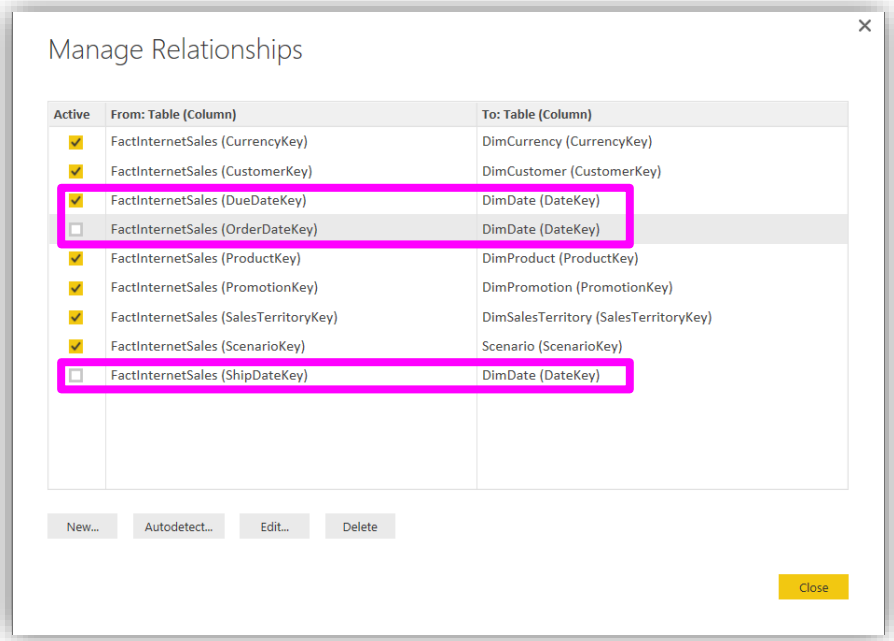
- They **connect two tables** allowing filtering and calculations that leverage columns from both. **No need to flatten!**
- They are based on a **single column** from **each table.** One table acts as a lookup table and the other as a referencing table
- The **datatypes** for the columns **do not have to be the same**
- Relationships can be **created manually** or **automatically inferred** by the tool
- **More than one relationship can exist** between two tables

Power BI Desktop

Creating a Data Model

Relationships – Active and Inactive

- It is possible to **control what relationship is active** via the **Manage Relationships** window



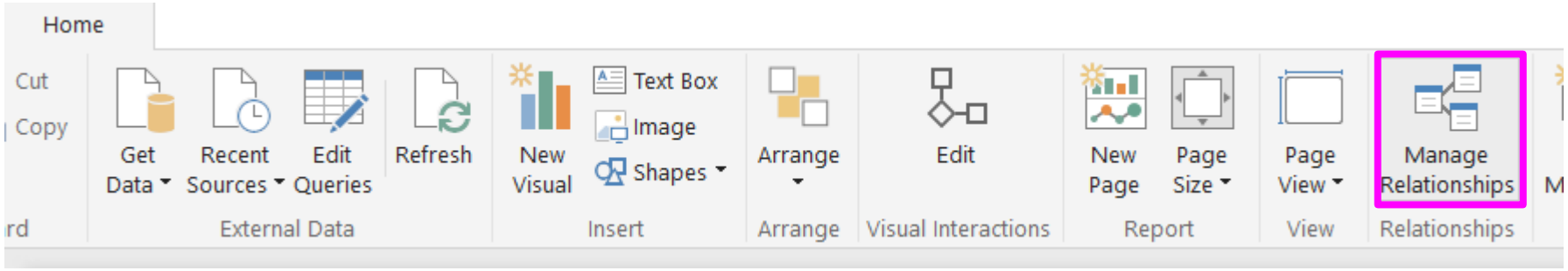
- It is also possible to use **DAX to activate a relationship** in a calculation or **import the lookup table more than once**.

Power BI Desktop

Creating a Data Model

Relationships – Creation

- Relationships can be created manually via the **Manage Relationships** tab.



- Or by dragging-and-dropping in the Relationship Viewer

- There is also an **auto-detect** feature where Power BI desktop will rely on **column names and data types** (or constraints defined in the data source) to detect relationships.

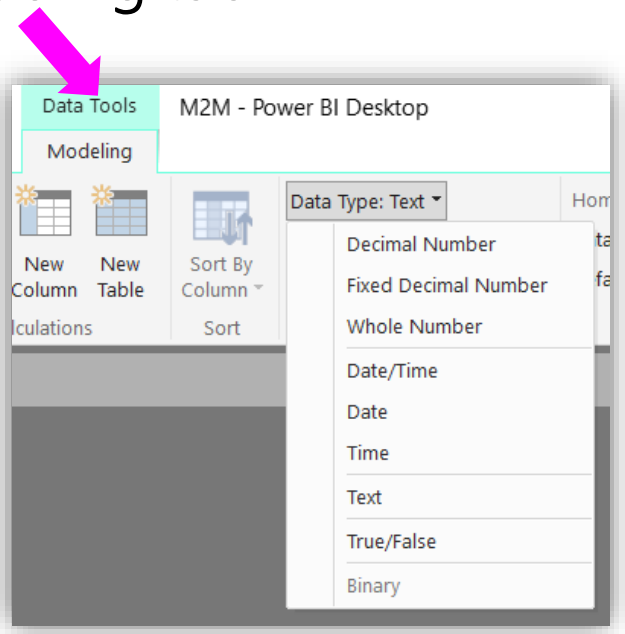
Power BI Desktop

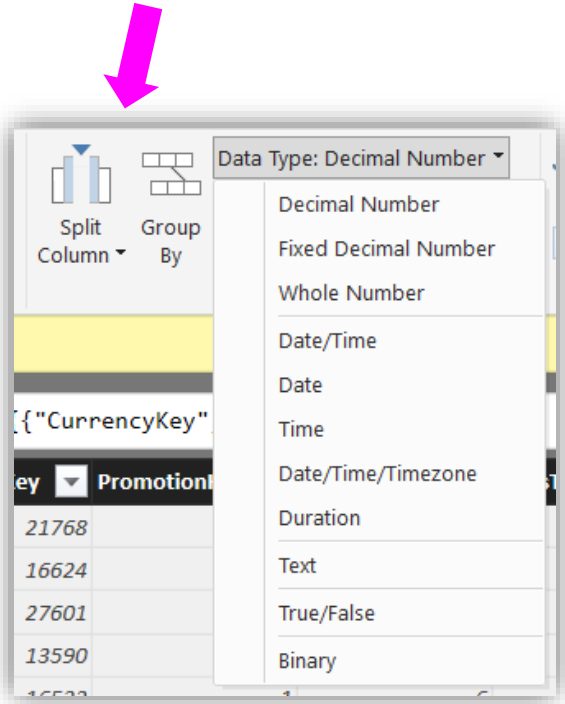
Creating a Data Model

Data Types

- Power BI Desktop **optimizes data types automatically** when loading the data for more efficient storage, calculations and data visualization

- Data types **can be set** both at the **Query Editor** and in the **Modeling tab**





Power BI Desktop

Creating a Data Model

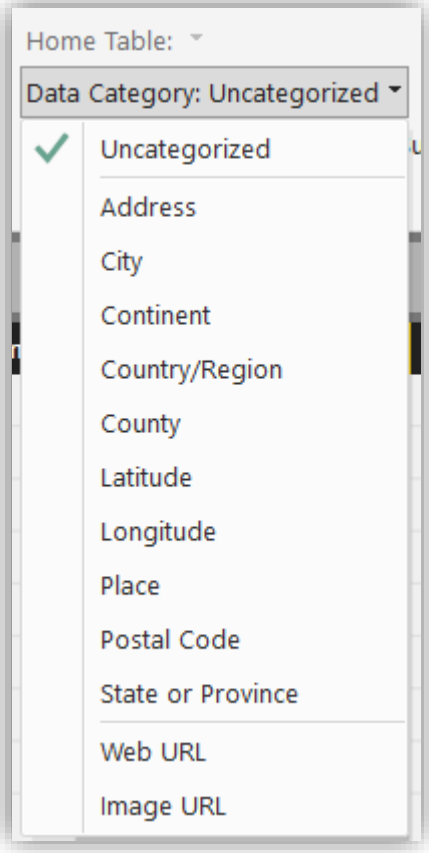
Data Categorization

- Categorizing fields is **relevant** for **geographical** fields or for **image** or **URL** fields

GeoCode	Sales Amoun
AL	$ 10,175,870.00
AR	$ 4,351,530.00
AZ	$ 6,114,241.00
CA	$ 6,688,589.00
KY	$ 53,832,611.00

Am I seeing country sales or US states' sales?

Is AL, Albania or Alabama? Or, is AR, Argentina or Arkansas?



- In the modeling tab a field can be classified at a certain **geographical** granularity or as an **image that comes from an URL** or a text field which is actually an **URL**.

- Power BI desktop will **render data based on this categorization**

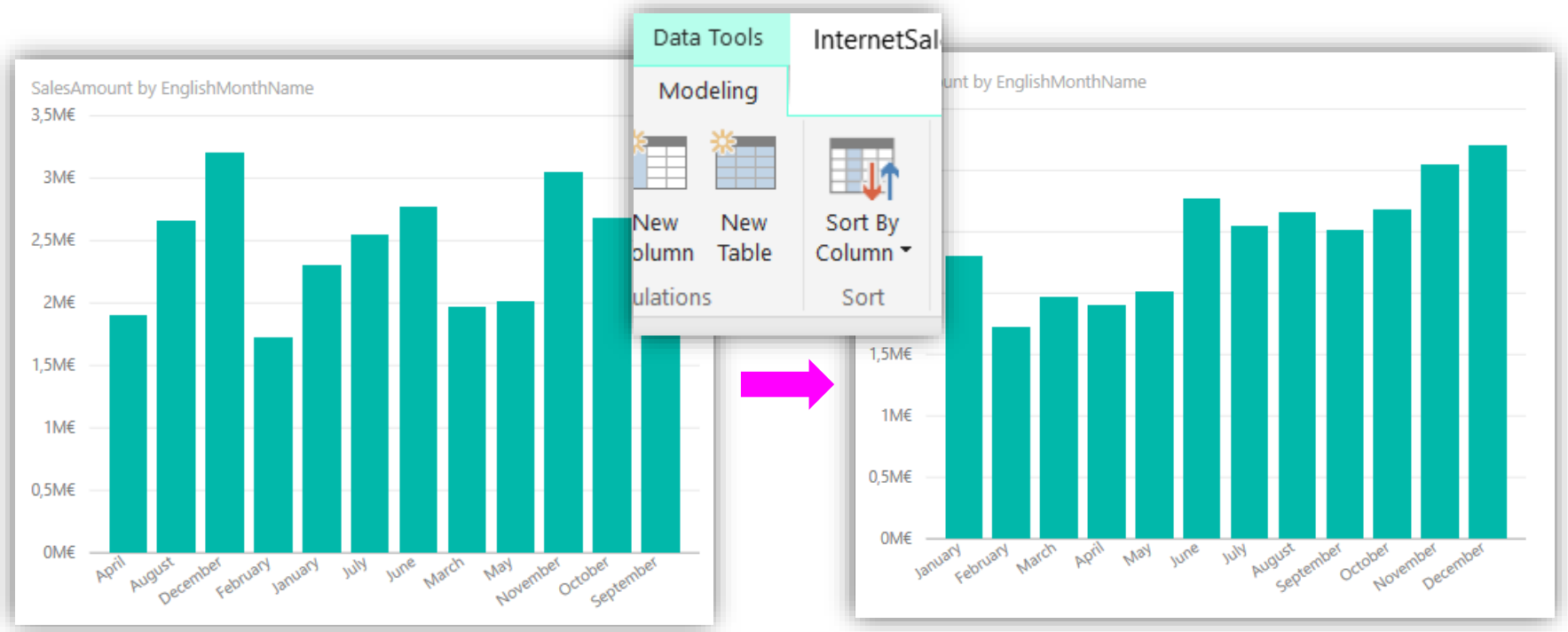
Power BI Desktop

Creating a Data Model

Sorting by Column

- By **default**, Power BI desktop will **sort** data in a column based on the **alphabet**

- It is possible to **use a separate column to determine sorting**

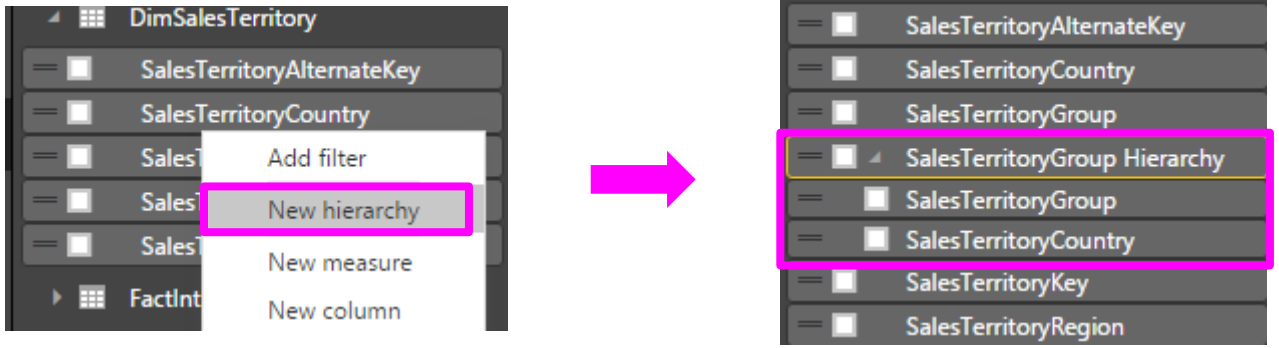


Power BI Desktop

Creating a Data Model

Hierarchies

- Can be created in the Data View



- They must use attributes from a single entity
- Can be **used in the different visualizations, allowing drilling**
- Imported **Power Pivot models** or connected to **SSAS models with hierarchies** are also usable.

Power BI Desktop: Calculations

Power BI Desktop

Calculations

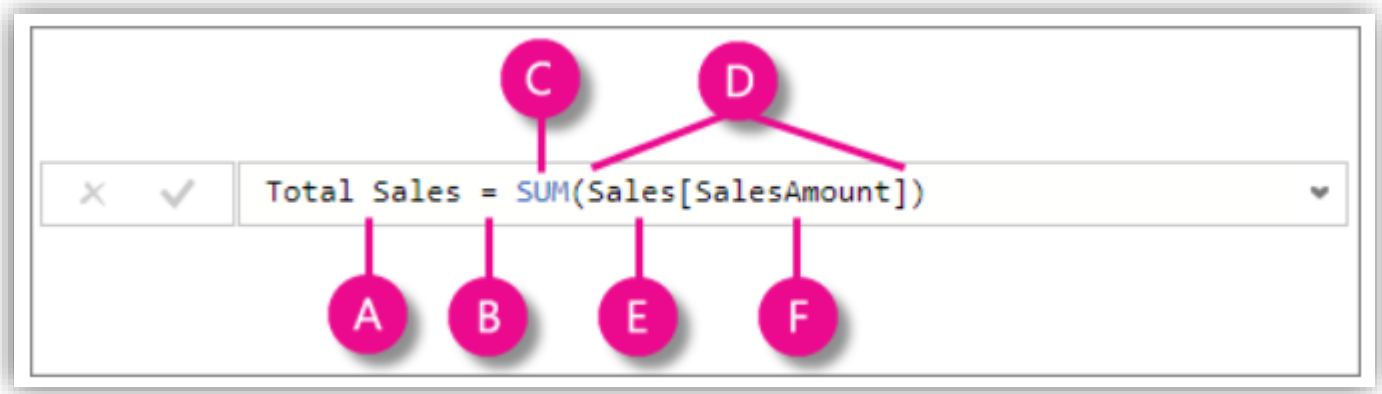
DAX Basics

- **Excel like Language** that allows the **extension** of the model with additional business logic
- Ideal for **complex calculations** such as time intelligence, growth formulas, ratios and more complex KPIs
- **Business rules** can be **materialized at the row level (Calculated Column)** or can **be calculated on-the-fly (Measures)**
- Certain capabilities **might overlap with Formula Language**

Power BI Desktop

Calculations

DAX Basics - Syntax



- A An expression always **starts with the name of the calculation**
- B **The equal sign** indicates the **beginning of the formula**
- C **A function or a combination of functions** is applied which will **return a value**
- D **The arguments of the function** (can be a reference to columns or additional functions)
- E **The table** that is being referenced
- F **The column** that is being referenced for the specified table

Power BI Desktop

Calculations

DAX Basics - Functions

- A function always **references a column or a table**. Filters can be added to filter context of evaluation

- A function **always returns a value or a table**. When a table is returned, further functions should be applied to obtain a value

```
Total Sales Amount Current = CALCULATE(SUM(FactInternetSales[SalesAmount]);FILTER(DimCustomer;DimCustomer[NumberCarsOwned]<3))
```

- Several **time intelligence** functions exist out of the box

```
Total Sales Amount = CALCULATE([Total Sales Amount Current];DATESYTD(DimDate[FullDateAlternateKey]))
```

- Some **Excel functions** are also valid (like MONTH, FLOOR…)

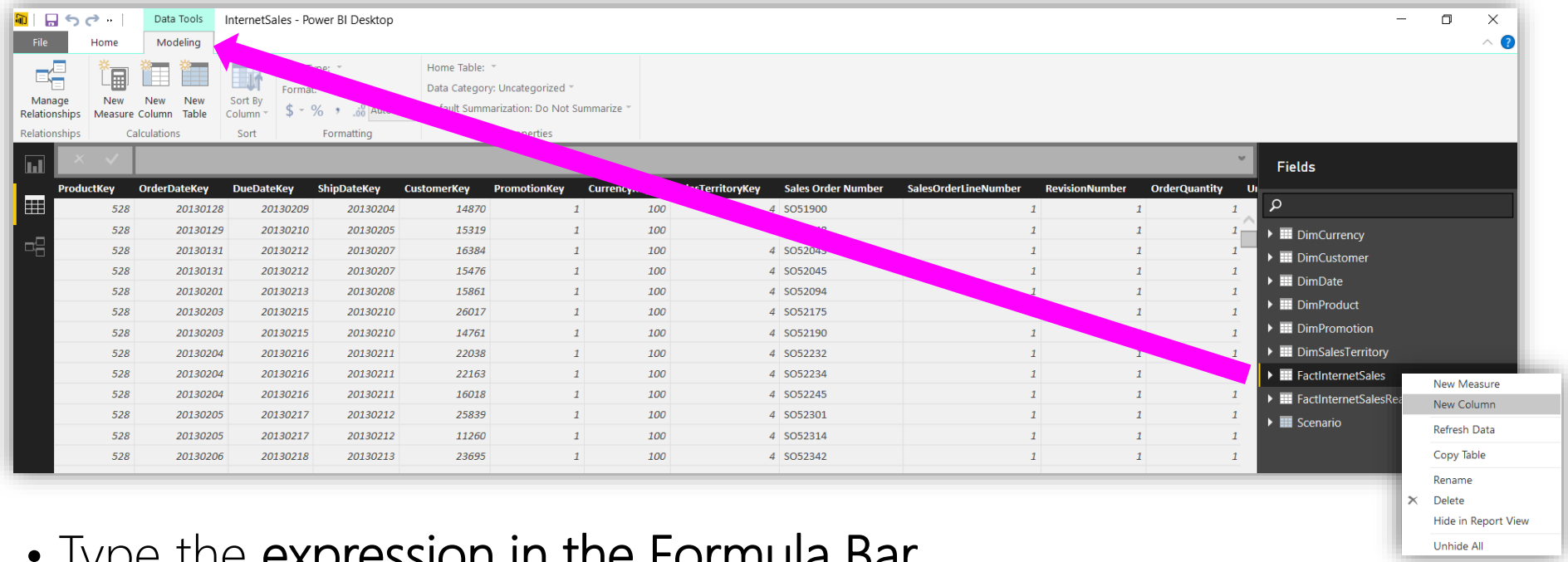
- **Full reference** of available functions here: https://msdn.microsoft.com/en-us/library/ee634396.aspx

Power BI Desktop

Calculations

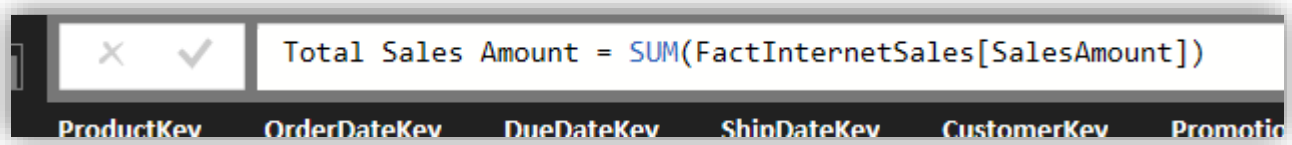
DAX Basics – Creating Calculations

- Select the **Data View** and then the **Modeling tab for the target table** (or with the table contextual menu)



ProductKey	OrderDateKey	DueDateKey	ShipDateKey	CustomerKey	PromotionKey	Currency	TerritoryKey	Sales Order Number	SalesOrderLineNumber	RevisionNumber	OrderQuantity
528	20130128	20130209	20130204	14870	1	100	4	SO51900	1	1	1
528	20130129	20130210	20130205	15319	1	100			1	1	1
528	20130131	20130212	20130207	16384	1	100	4	SO52045	1	1	1
528	20130131	20130212	20130207	15476	1	100	4	SO52045	1	1	1
528	20130201	20130213	20130208	15861	1	100	4	SO52094	1	1	1
528	20130203	20130215	20130210	26017	1	100	4	SO52175		1	1
528	20130203	20130215	20130210	14761	1	100	4	SO52190	1		1
528	20130204	20130216	20130211	22038	1	100	4	SO52232	1	1	1
528	20130204	20130216	20130211	22163	1	100	4	SO52234	1	1	1
528	20130204	20130216	20130211	16018	1	100	4	SO52245	1	1	1
528	20130205	20130217	20130212	25839	1	100	4	SO52301	1	1	1
528	20130205	20130217	20130212	11260	1	100	4	SO52314	1	1	1
528	20130206	20130218	20130213	23695	1	100	4	SO52342	1	1	1

- Type the **expression in the Formula Bar**



Power BI Desktop

Calculations

Measures

- Measures are **calculated when they are used** in a particular visualization
- And they **can also be calculated on a row-by-row** basis
- They can be **implicit** – an aggregation of a field with "Default Summarization" different from "Do Not Summarize"

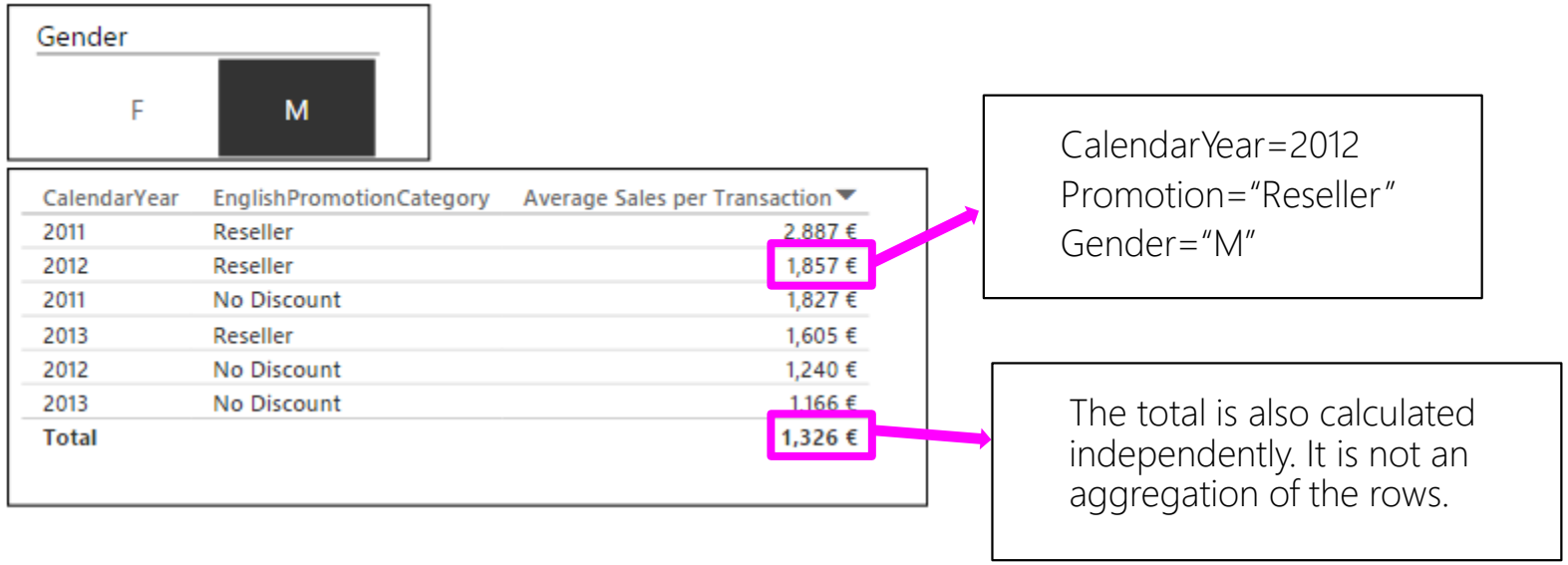
- They can be **explicit**, where they are the result of a DAX expression. You cannot control the aggregation for this type.

Power BI Desktop

Calculations

Measures

- They can (and should) be **referenced from other measures** – this is a best practice
- Measures are **evaluated for each cell** they appear in (Filter Context)

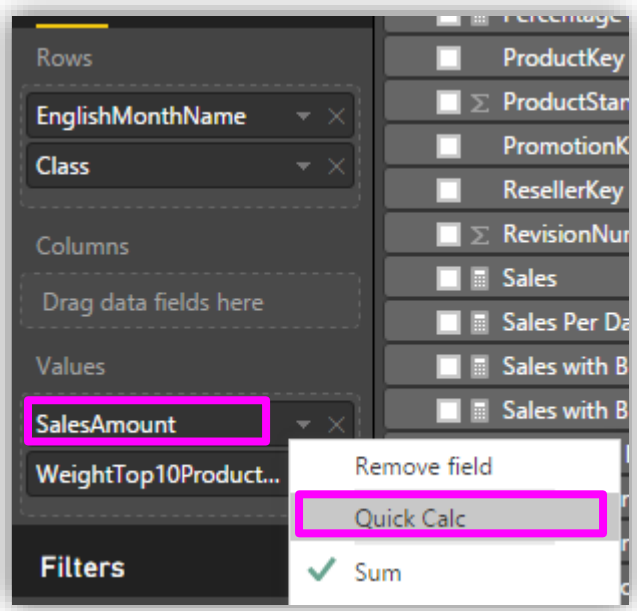


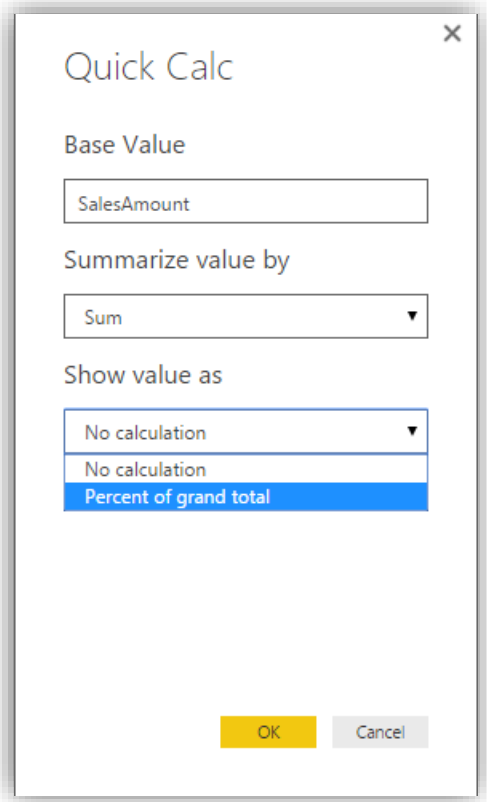
Power BI Desktop

Calculations

Quick Calcs

- **Out-of-the-box calculations** that can be applied without coding
- Accessible **via field well**, you can change how a measure is displayed





Power BI Desktop

Calculations

Advanced Calculations

- **CALCULATE(<measure expression>, <filter1>, <filter2>, …)** allows us to change the filter context

```
No Discount Sales =
CALCULATE (
    SUM ( FactResellerSales[SalesAmount] ),
    DimPromotion[EnglishPromotionName] = "No Discount"
)
```

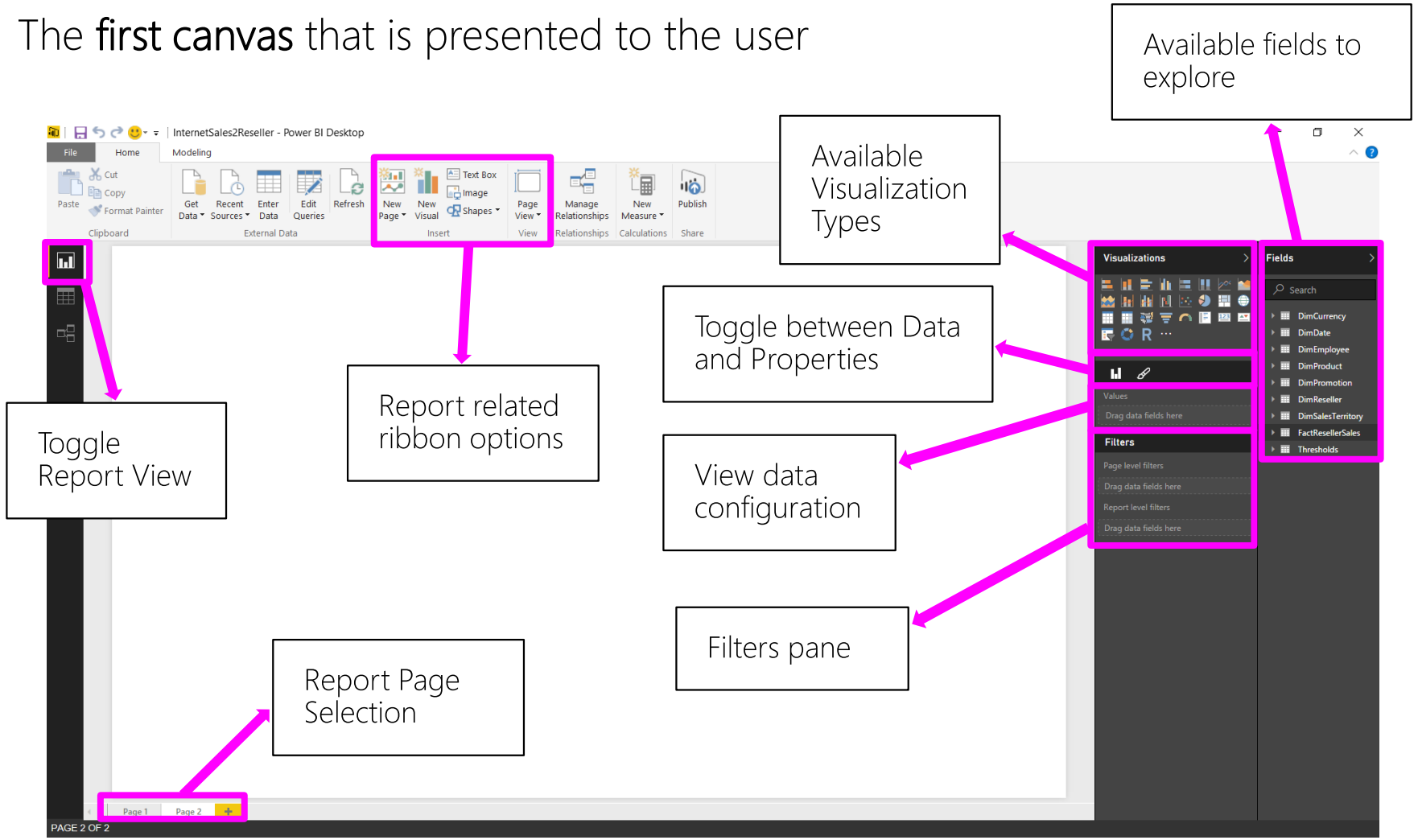
CalendarYear	EnglishPromotionCategory	No Discount Sales	SalesAmount
2011	No Discount	15,772,060 €	15,772,060 €
2011	Reseller		516,381 €
2012	No Discount	26,609,942 €	26,609,942 €
2012	Reseller		1,311,727 €
2013	No Discount	32,645,904 €	32,645,904 €
2013	Reseller		3,594,579 €
Total		**75,027,907 €**	**80,450,596 €**

Power BI Desktop: Building a Report

Power BI Desktop

Report View

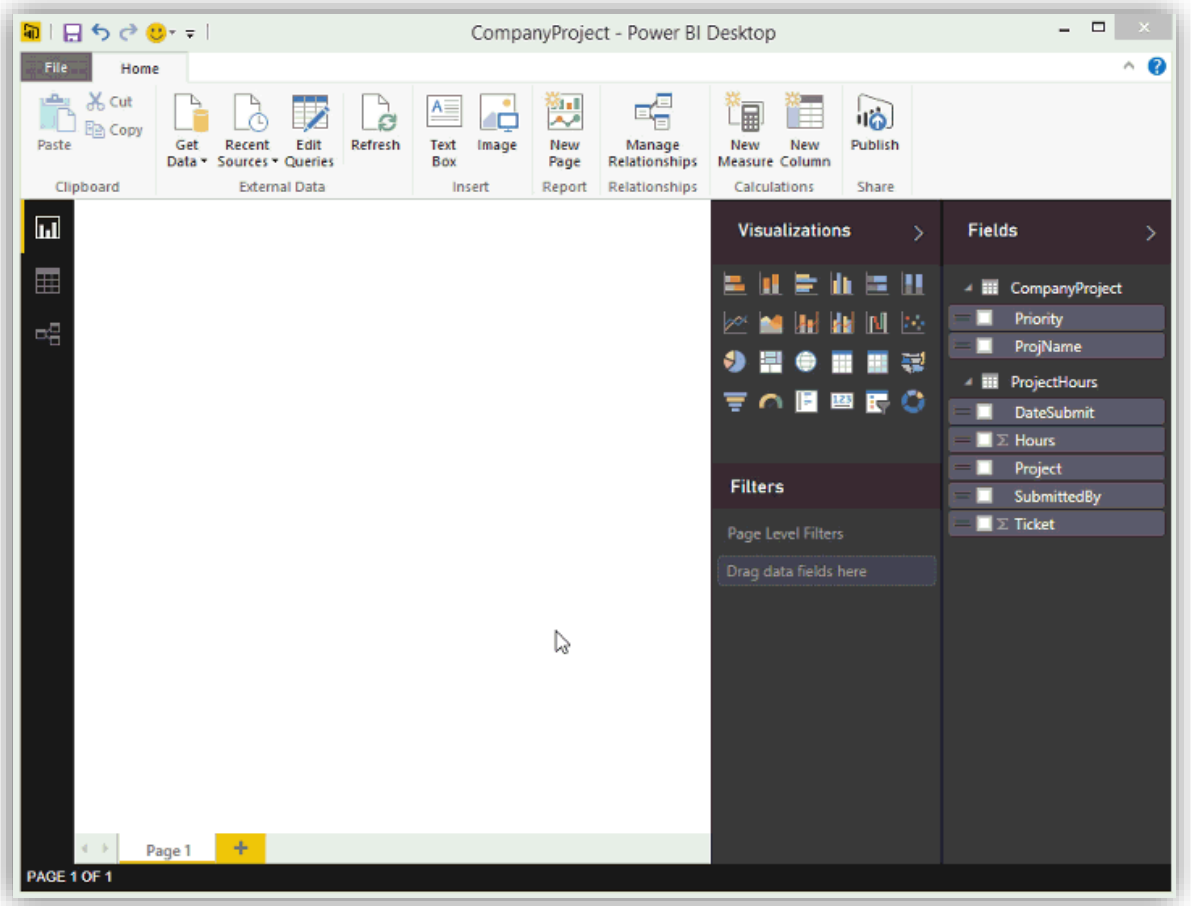
- The **first canvas** that is presented to the user



Power BI Desktop

Report View

- Use drag-and-drop and search to build your analysis like a pivot table in Excel



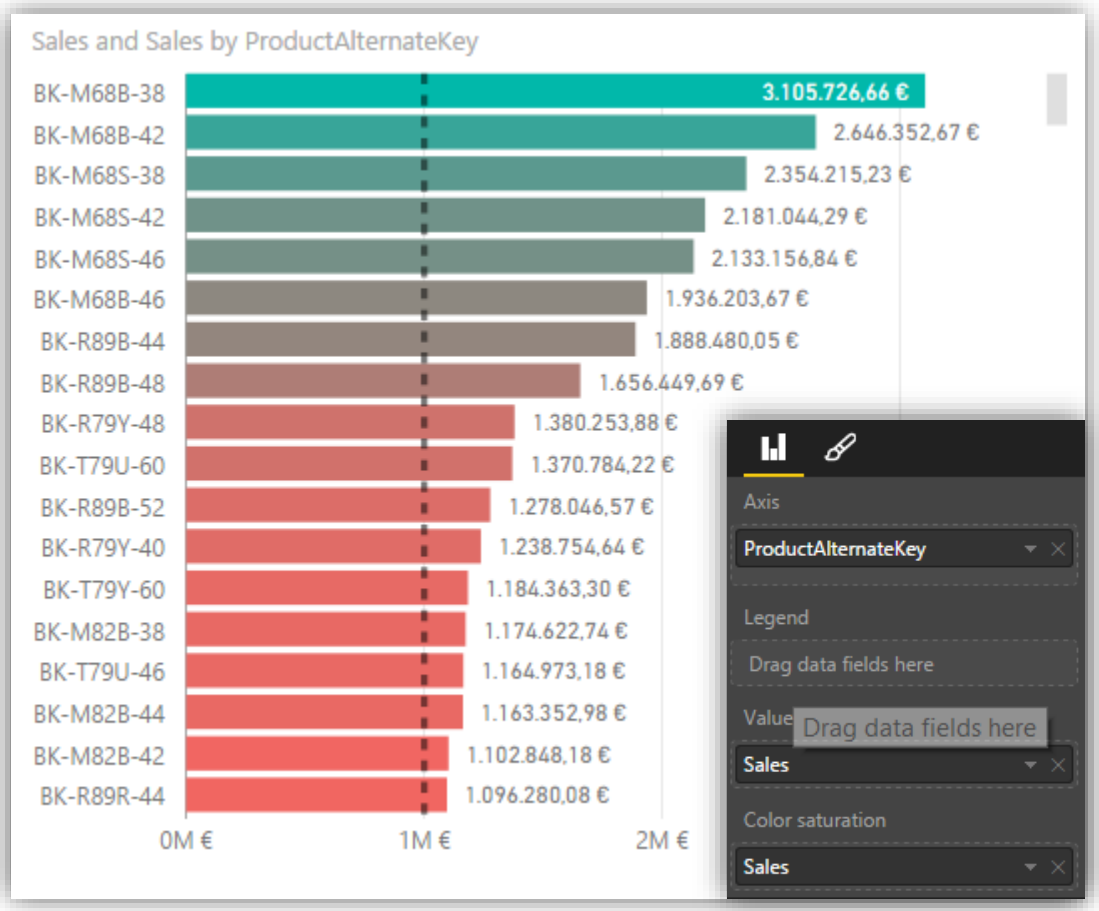
Power BI Desktop

Building a Report - Visualisations

- **Several visualizations exist** out-of-the box and developed by 3rd party
- Choose the one that **best conveys your message**
- New visualizations are **released frequently**
- **Change easily** between visualizations
- Each visualization has its **own data settings and properties**
- **Fine control on display settings**

Power BI Desktop

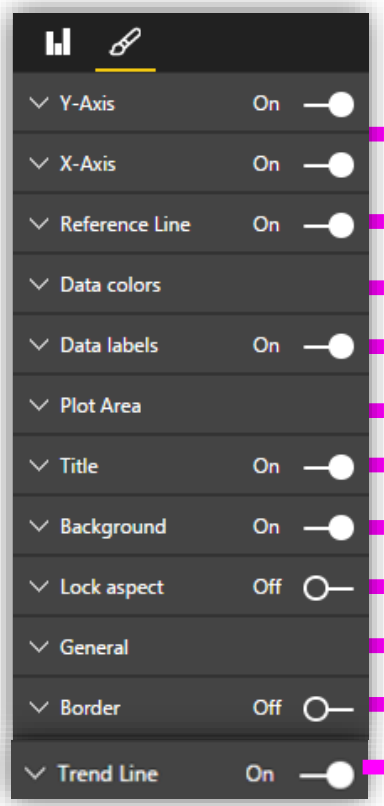
Visualisations - Clustered Bar Chart



- Allows several items on Axis to enable drill
- Legend will cluster many values per Axis item
- Value will provide the size of the bar
- Color Saturation allows a third dimension on the data

Power BI Desktop

Visualisations - Properties

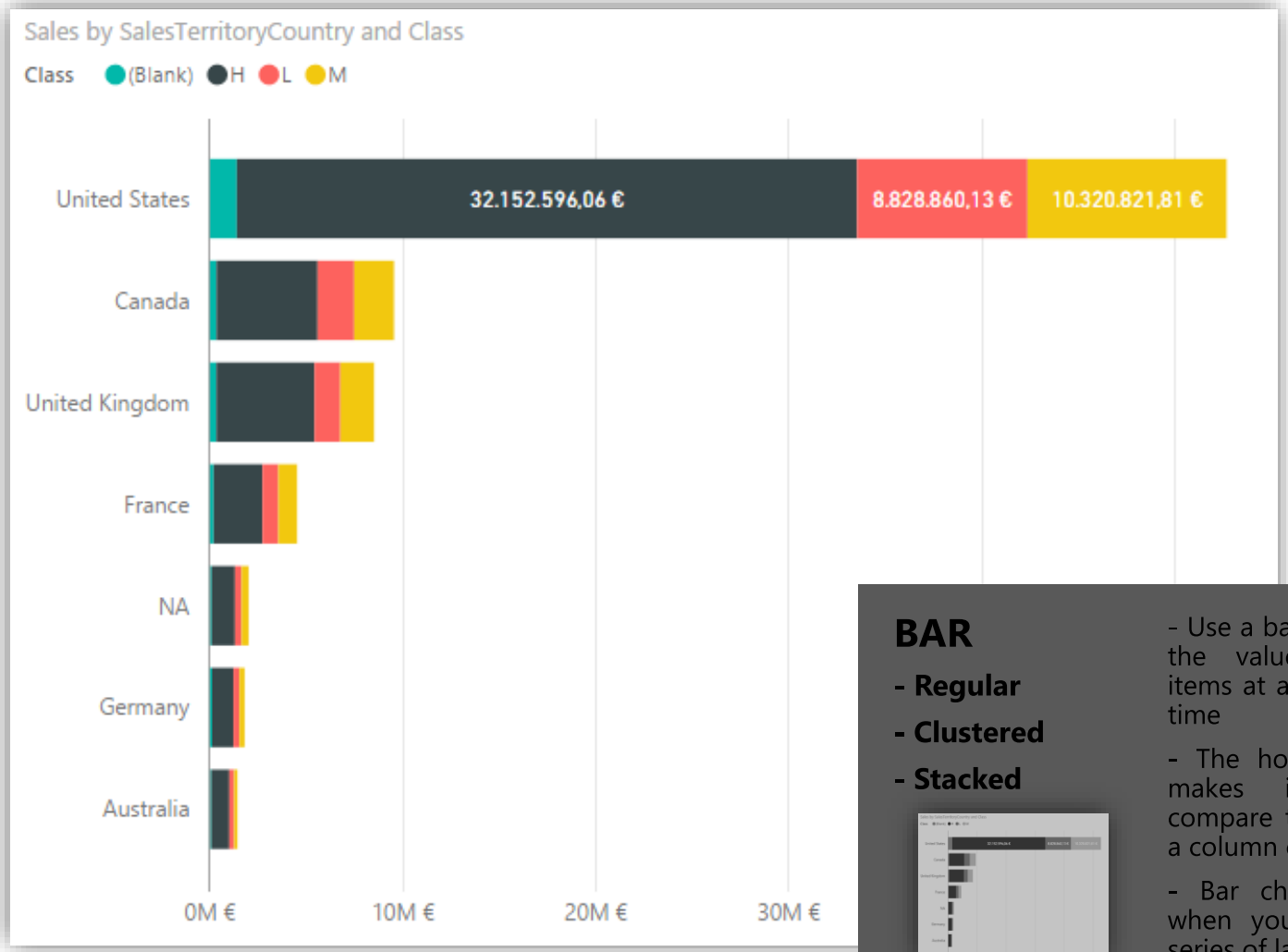


- Enables the X/Y-Axis, control alignment, title and color and scale (Y - linear/log)
- Enables a reference line for a particular value and with formatting options
- Granular control on the color of each axis occurrence
- Display the values associated to a series. Control the unit, color and font
- Plot area formatting, namely define an image as background
- Enable the title and format it
- Enable a background color and define transparency
- Lock the current aspect
- Pixel level control of placement and size
- Enable a border and control its color
- Enable a trend line

* Properties might vary, depending on visualization.

Power BI Desktop

Visualisations - Stacked Bar Chart



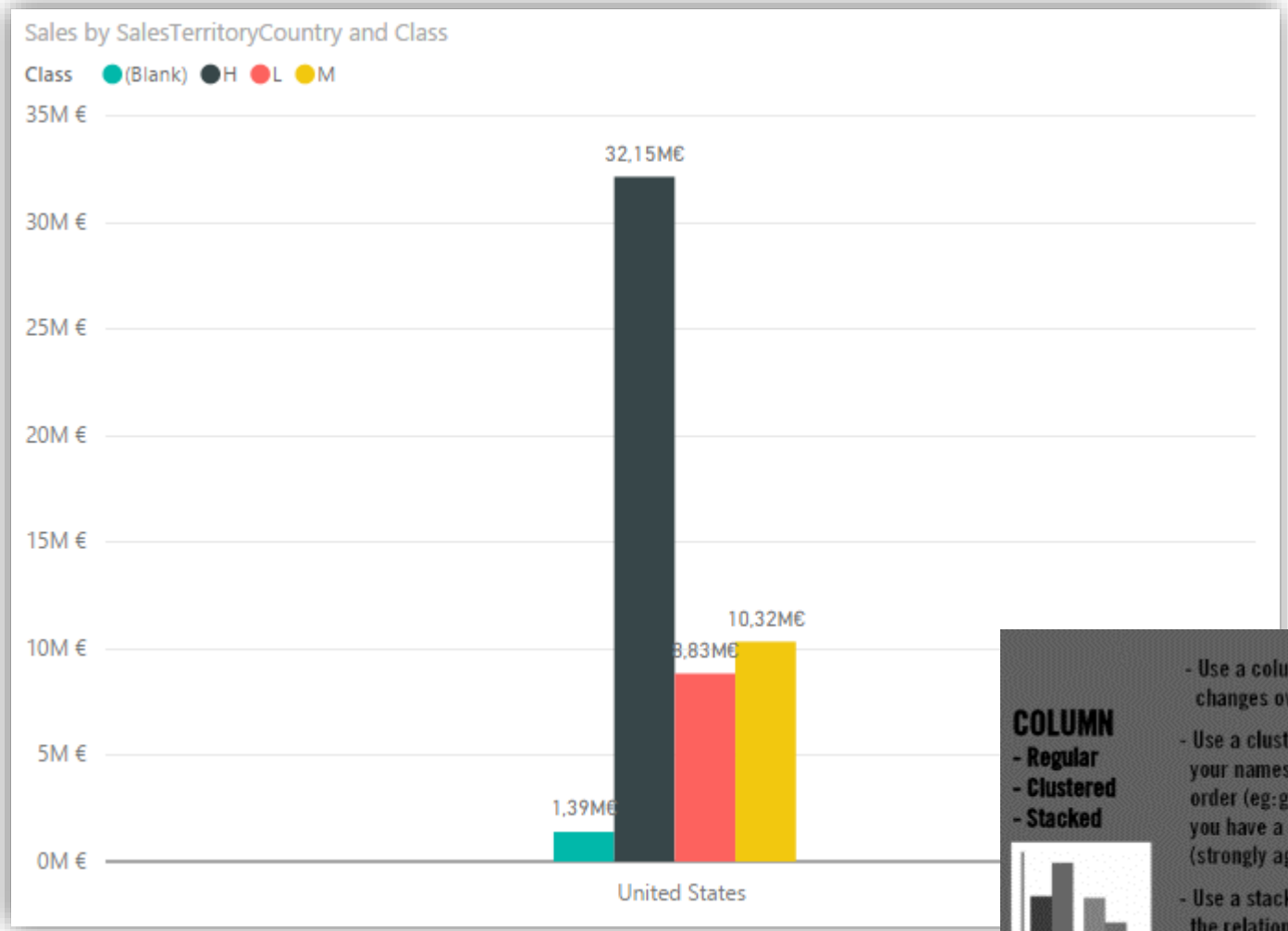
BAR

- **Regular**
- **Clustered**
- **Stacked**

- Use a bar chart to show the values of several items at a single point in time
- The horizontal format makes it easier to compare the values than a column chart
- Bar charts are good when you have a long series of labels

Power BI Desktop

Visualisations - Clustered Column Chart

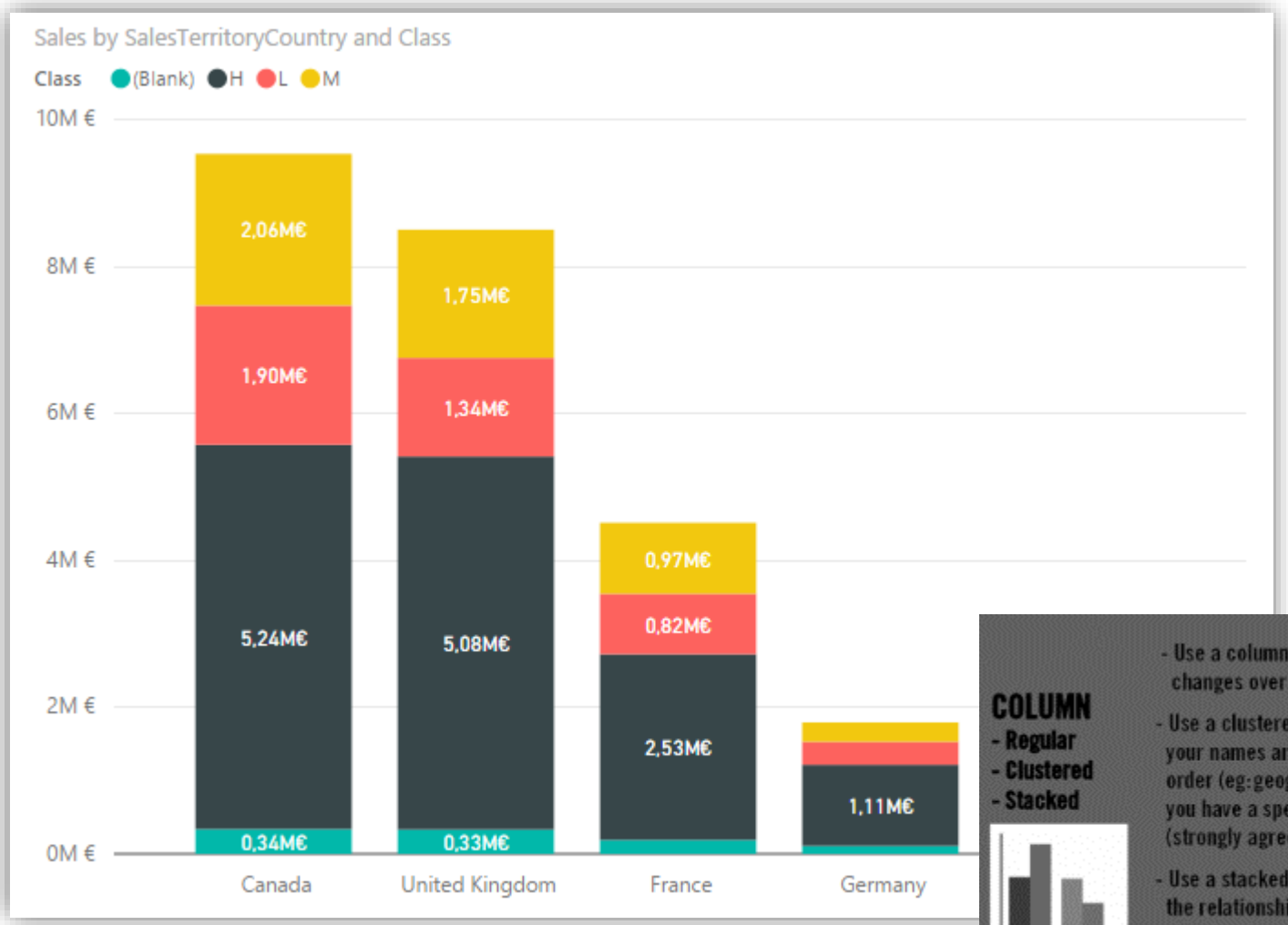


COLUMN
- Regular
- Clustered
- Stacked

- Use a column chart to show data changes over time.
- Use a clustered column chart when your names are not in any specific order (eg:geographic names) or when you have a specific scale arrangement (strongly agree, agree,etc)
- Use a stacked column chart to show the relationship of individual items to the whole.

Power BI Desktop

Visualisations - Stacked Column Chart



COLUMN
- Regular
- Clustered
- Stacked

- Use a column chart to show data changes over time.
- Use a clustered column chart when your names are not in any specific order (eg:geographic names) or when you have a specific scale arrangement (strongly agree, agree,etc)
- Use a stacked column chart to show the relationship of individual items to the whole.

Power BI Desktop

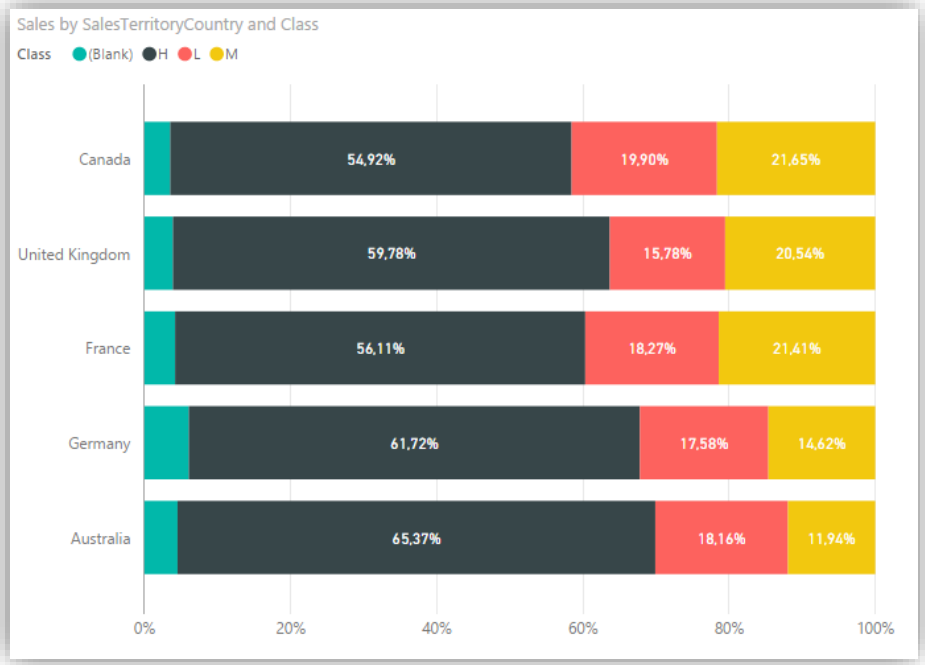
Prepare

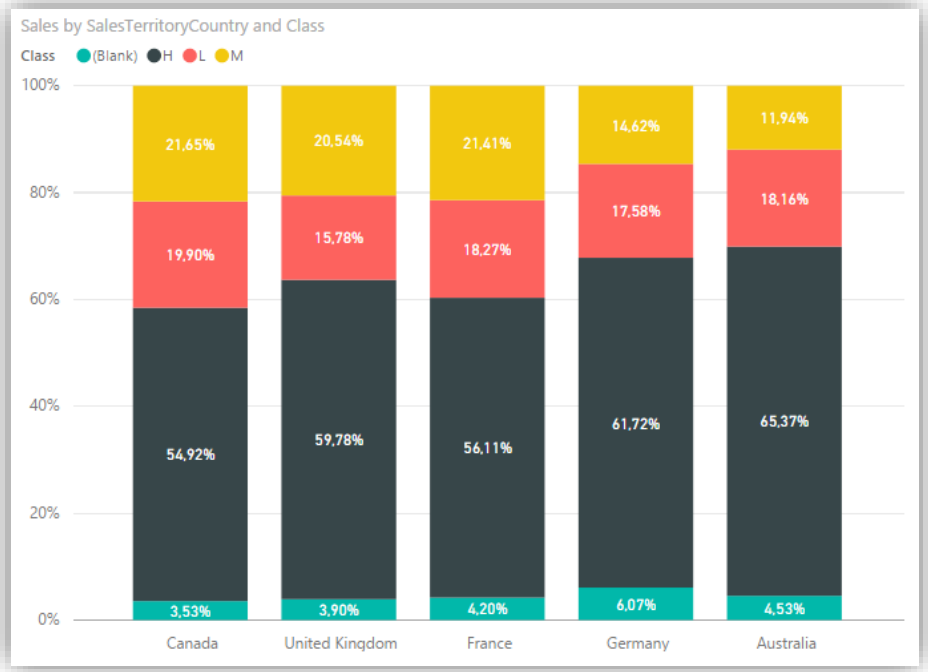
Explore

Report

Share & collaborate

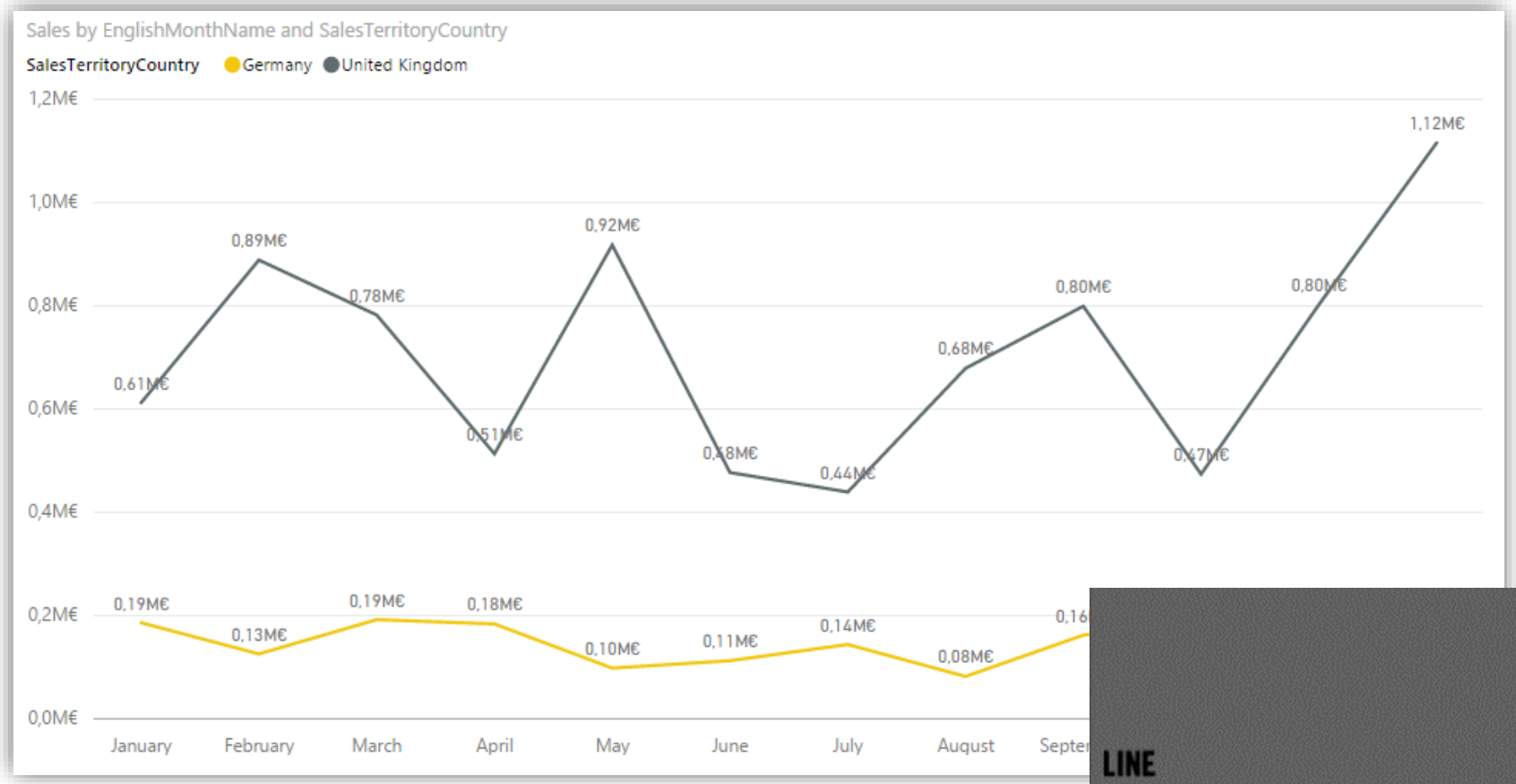
Visualisations - 100% Stacked Bar and Column Chart





Power BI Desktop

Visualisations - Line Chart

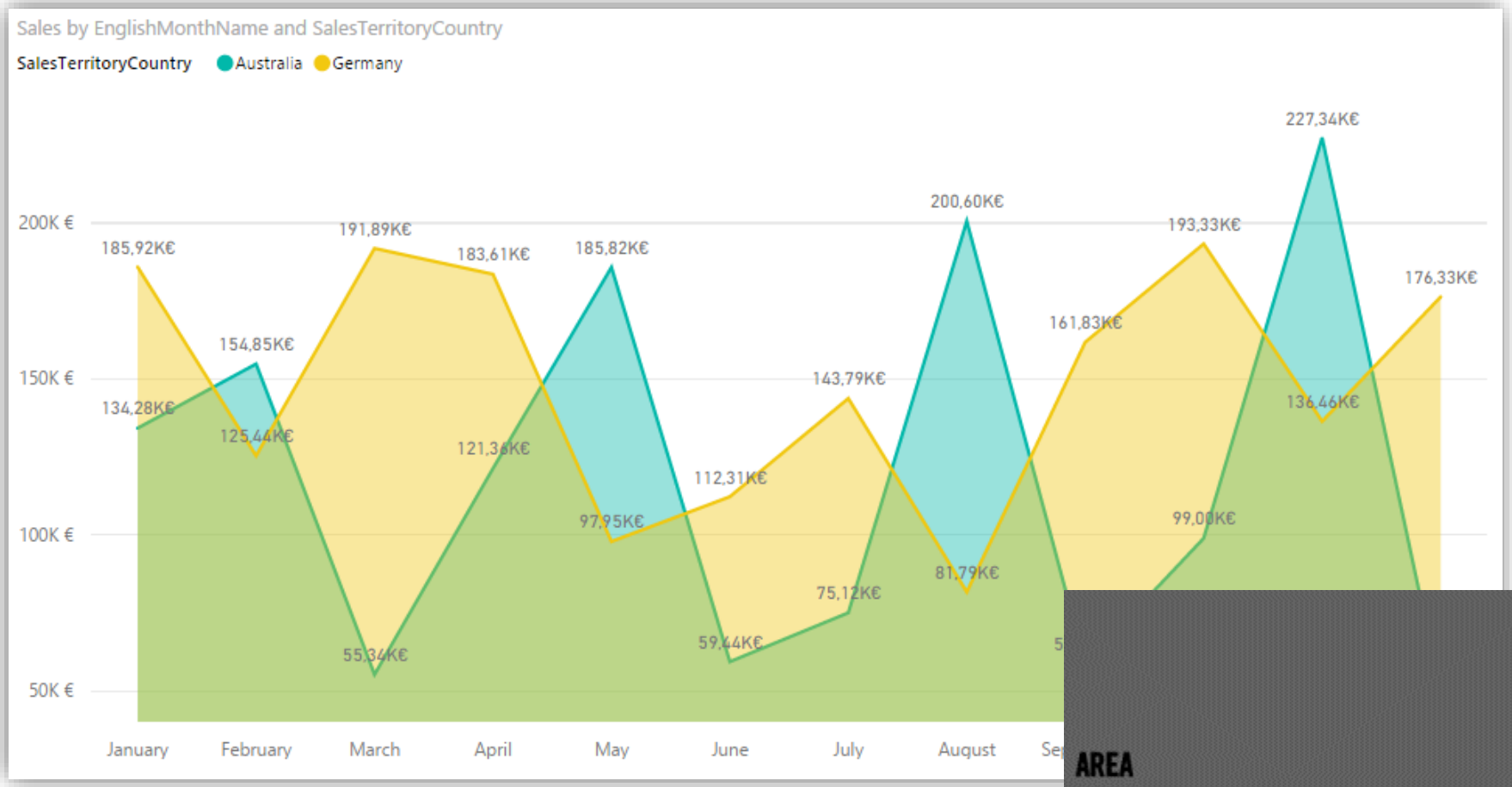


LINE

- Use a line chart rather than a column chart to emphasize trends rather than the amount of change.

Power BI Desktop

Visualisations - Area Chart

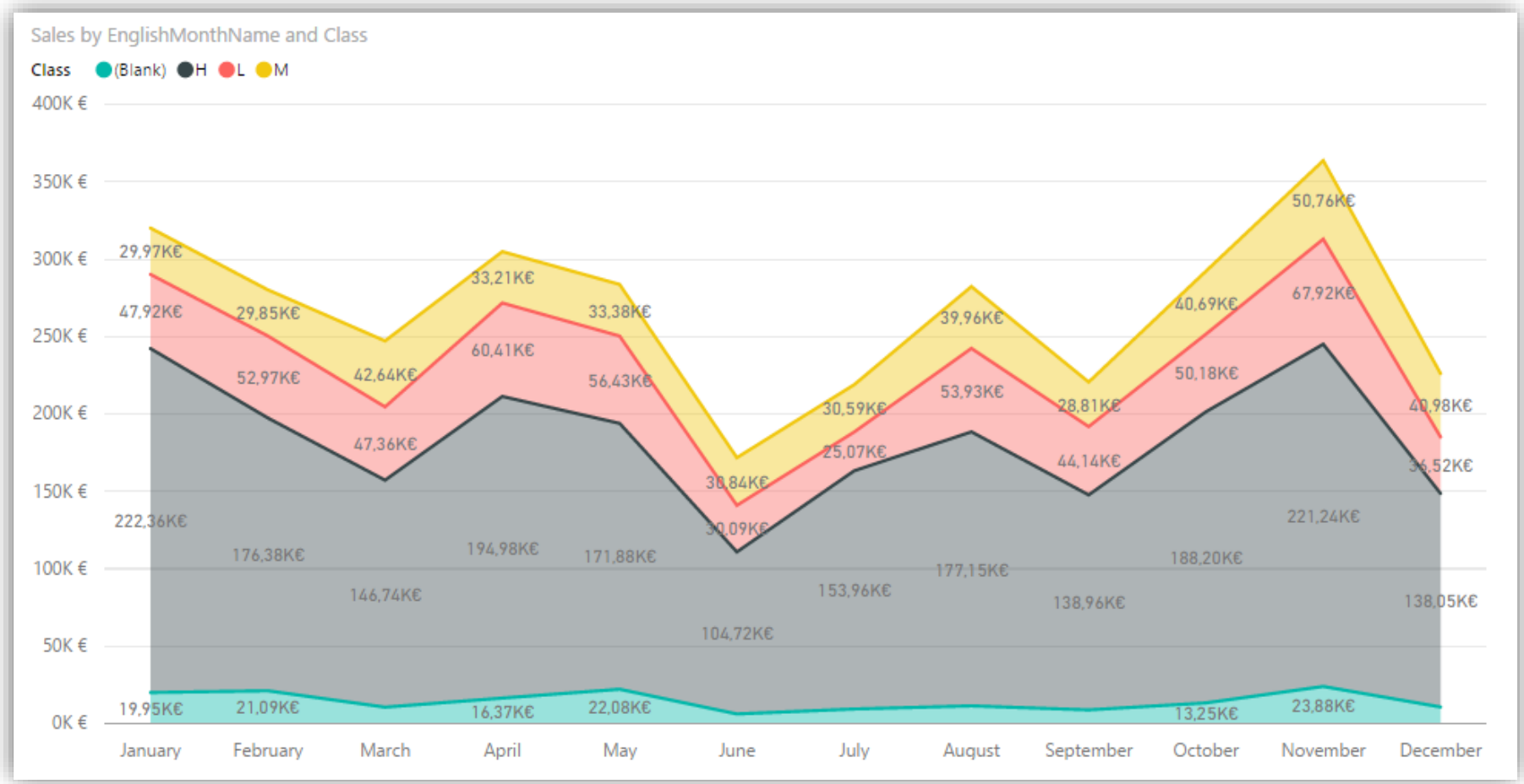


AREA

- Use an area chart rather than a stacked column chart when you want to highlight how each of the values change over time.

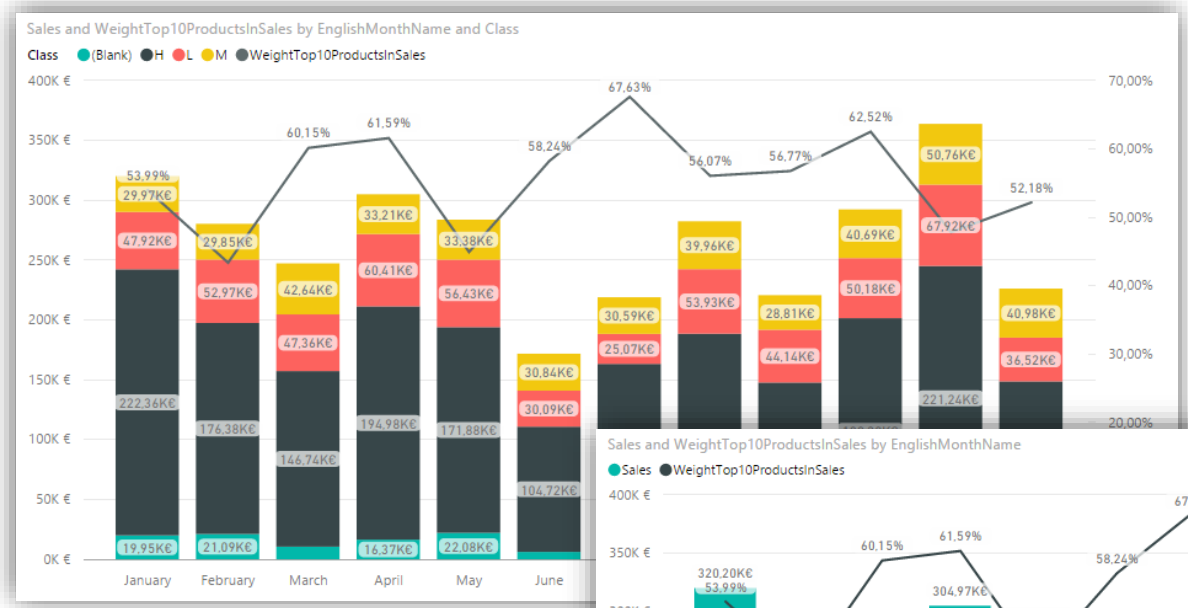
Power BI Desktop

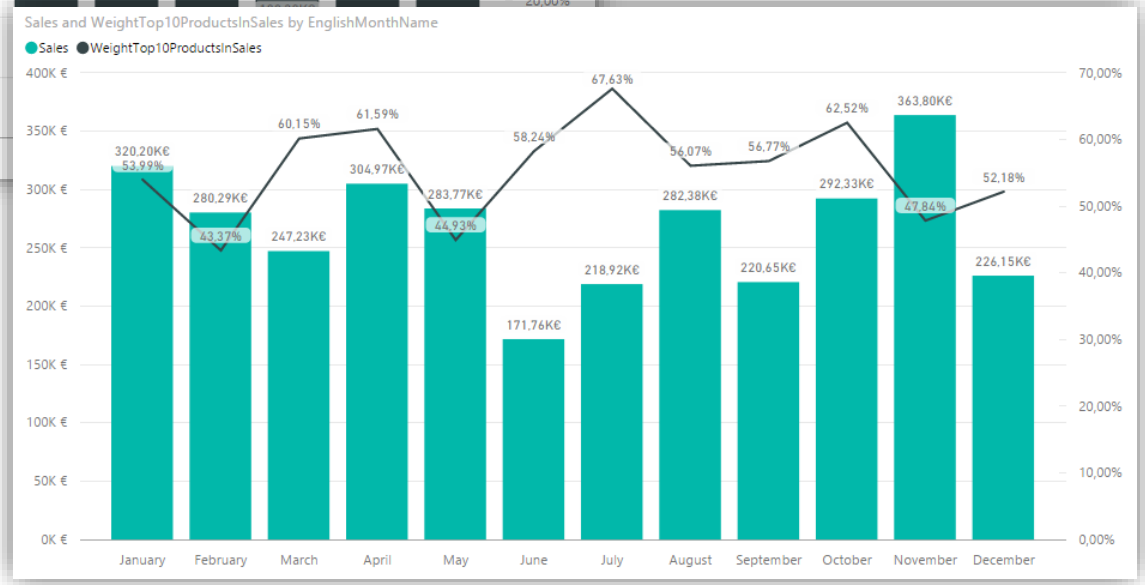
Visualisations – Stacked Area Chart



Power BI Desktop

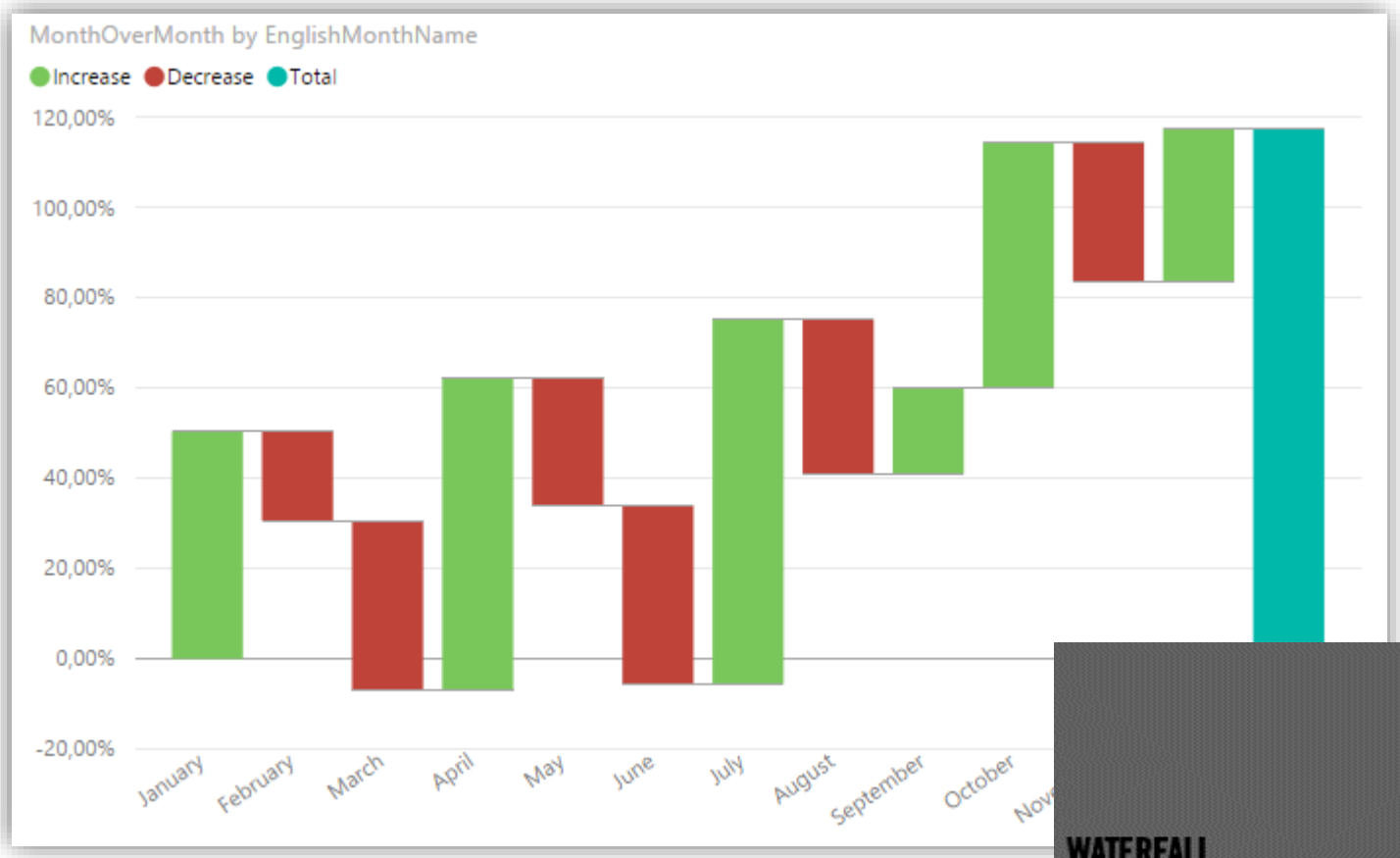
Visualisations – Stacked and Clustered Bar and Line Area Chart





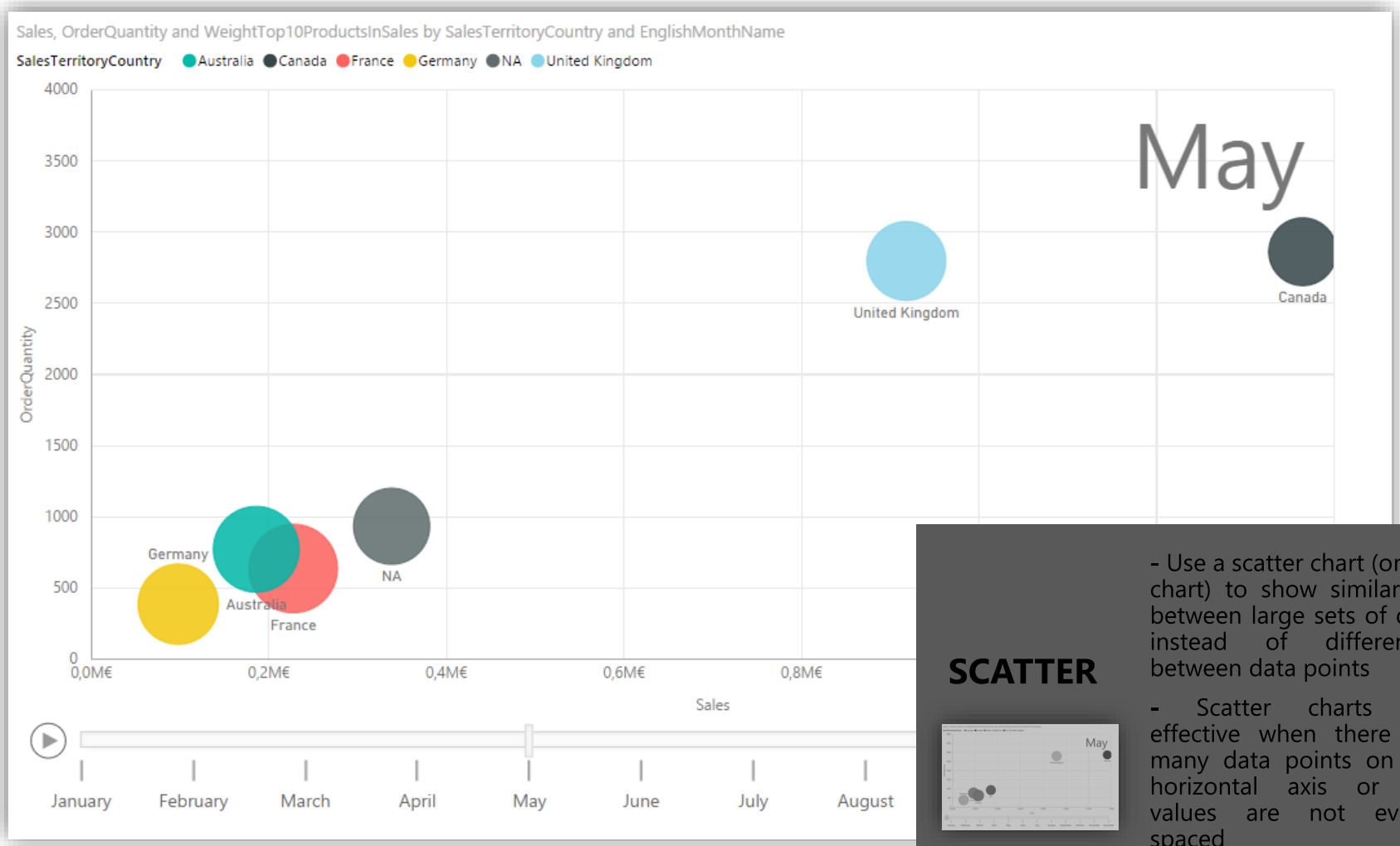
Power BI Desktop

Visualisations – Waterfall Chart



Power BI Desktop

Visualisations – Scatter Chart

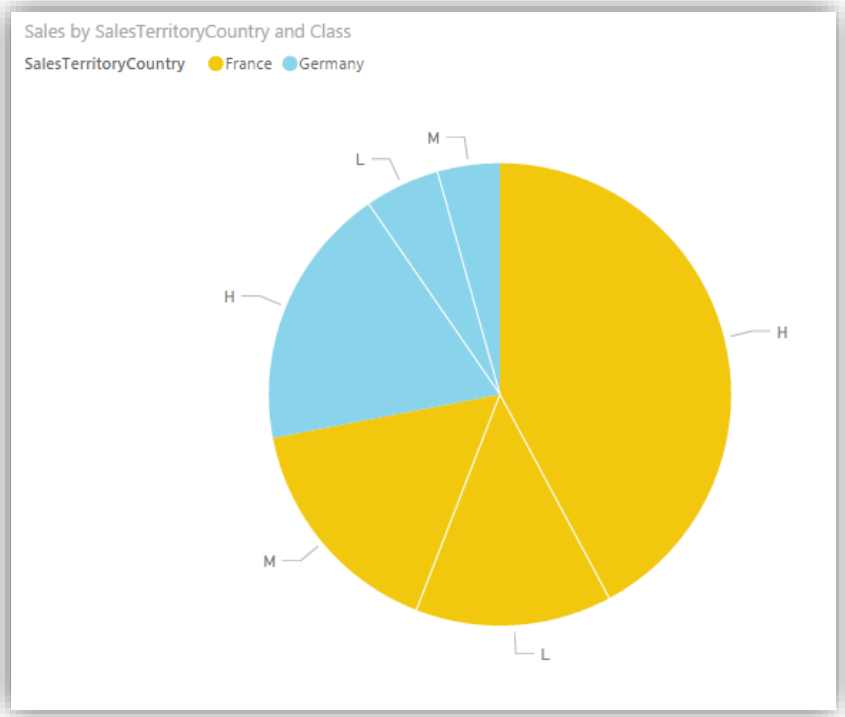


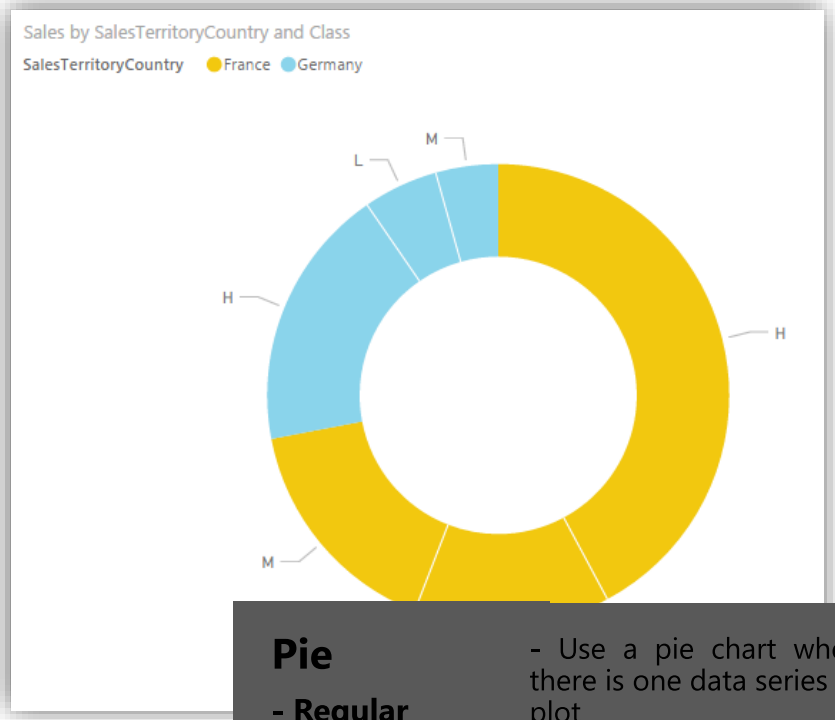
SCATTER

- Use a scatter chart (or X Y chart) to show similarities between large sets of data instead of differences between data points
- Scatter charts are effective when there are many data points on the horizontal axis or the values are not evenly spaced

Power BI Desktop

Visualisations – Pie and Donut Chart

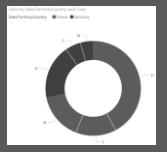




Pie

- Regular

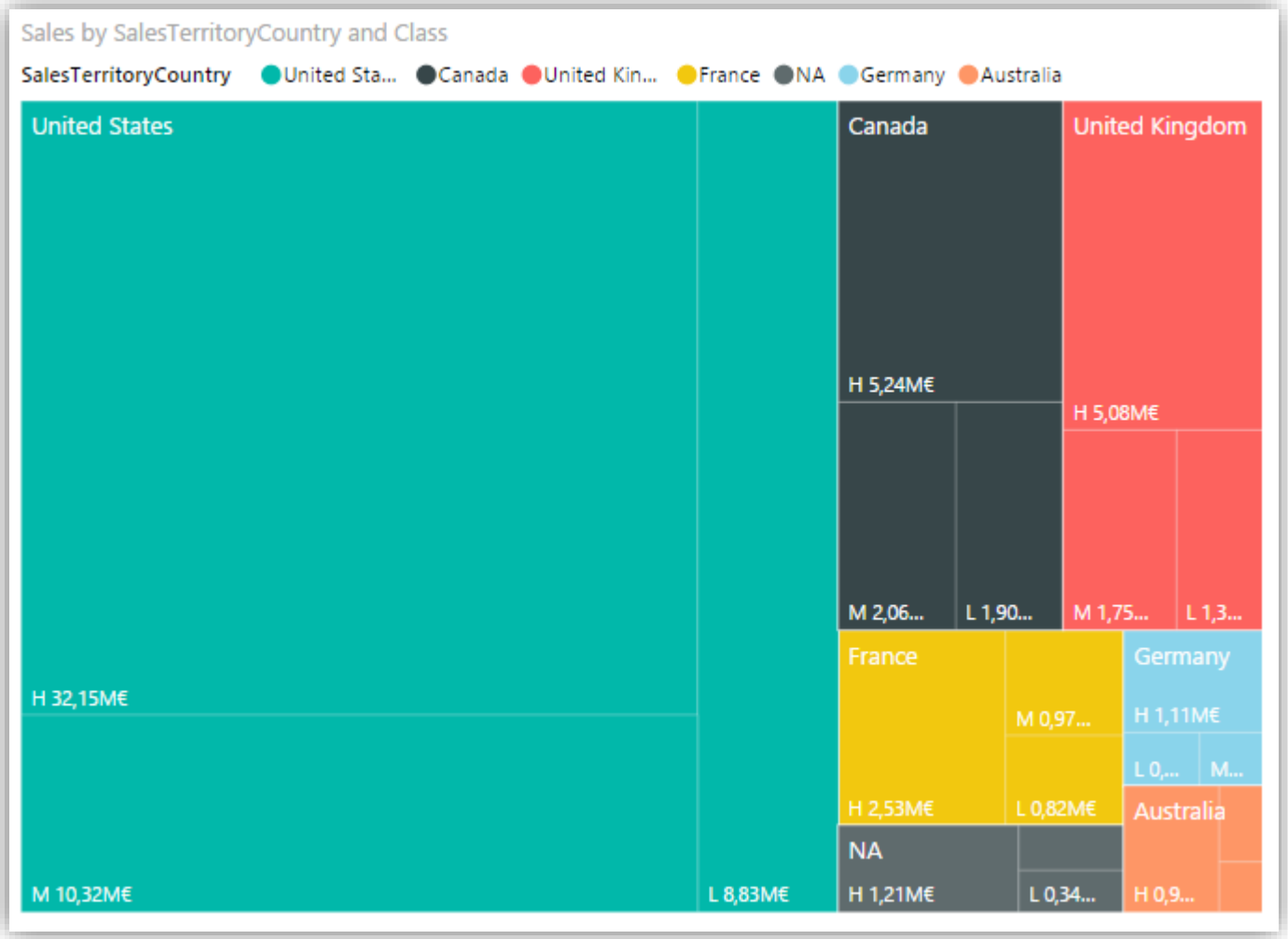
- Donut



- Use a pie chart when there is one data series to plot
- Pie charts show composition (how categories represent parts of the whole)

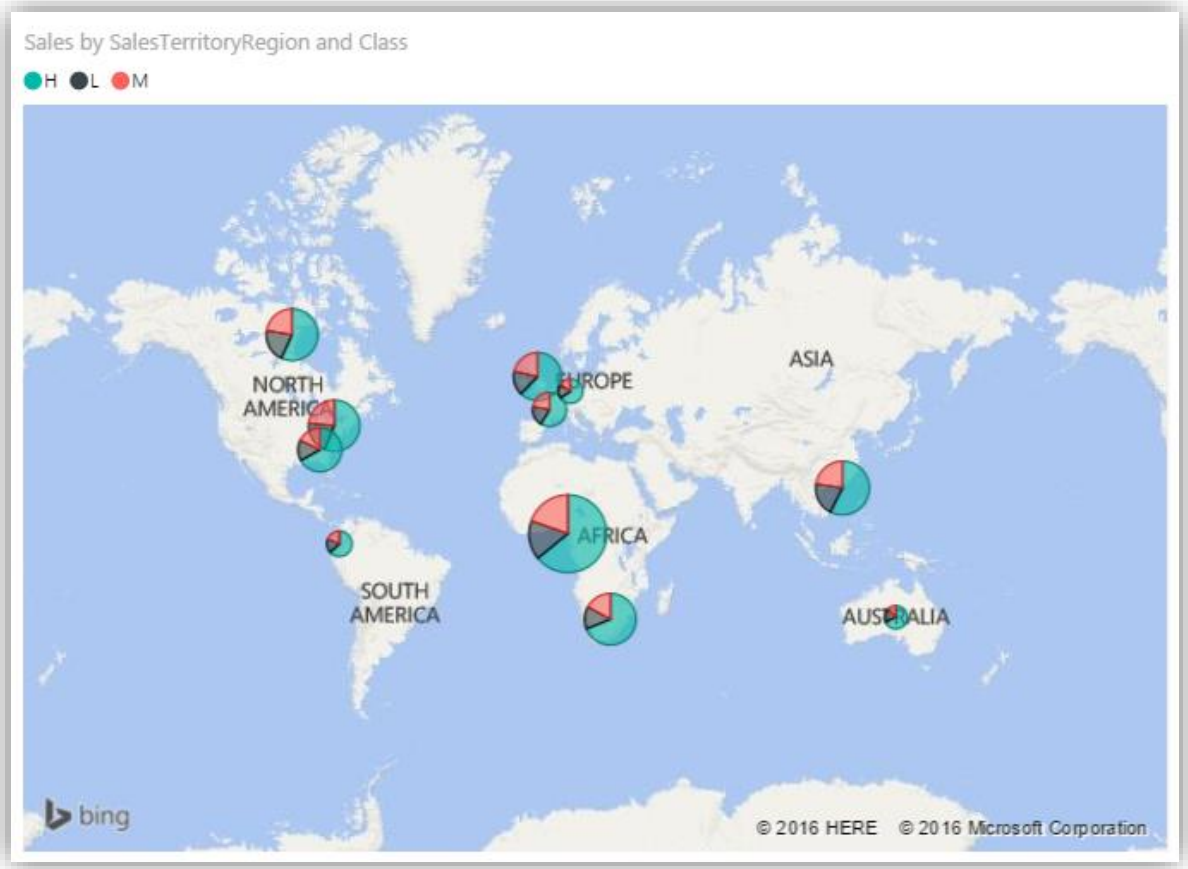
Power BI Desktop

Visualisations – Treemap Chart



Power BI Desktop

Visualisations – Map Chart



- Plotting data requires **internet connection**
- **Bing** is used to return the location
- **Latitude** and **Longitude** can be used, but…
- **Location names** are also mapped automatically
- **Combine attributes** for increased accuracy and use **data categories**

Power BI Desktop

Prepare

Explore

Report

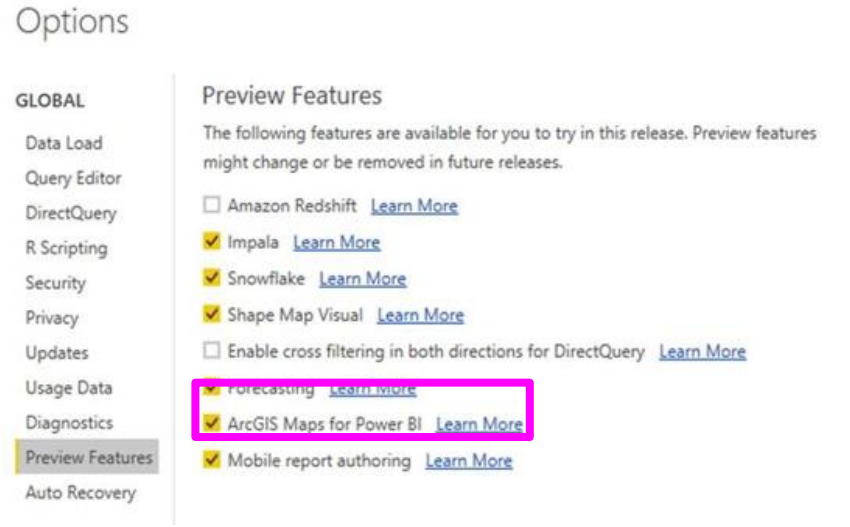
Share & collaborate

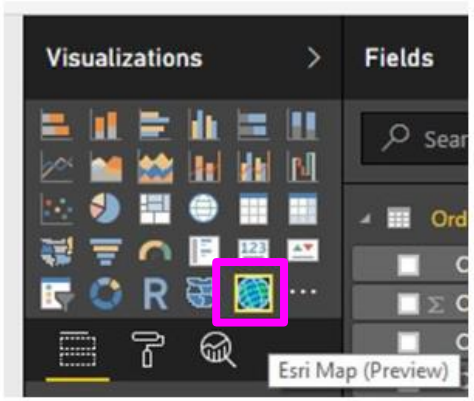
Visualisations – Filled Map Chart

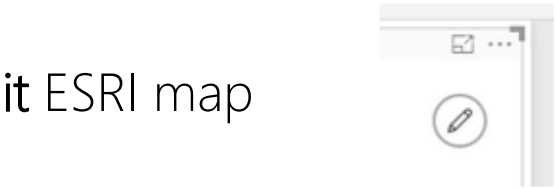
Power BI Desktop

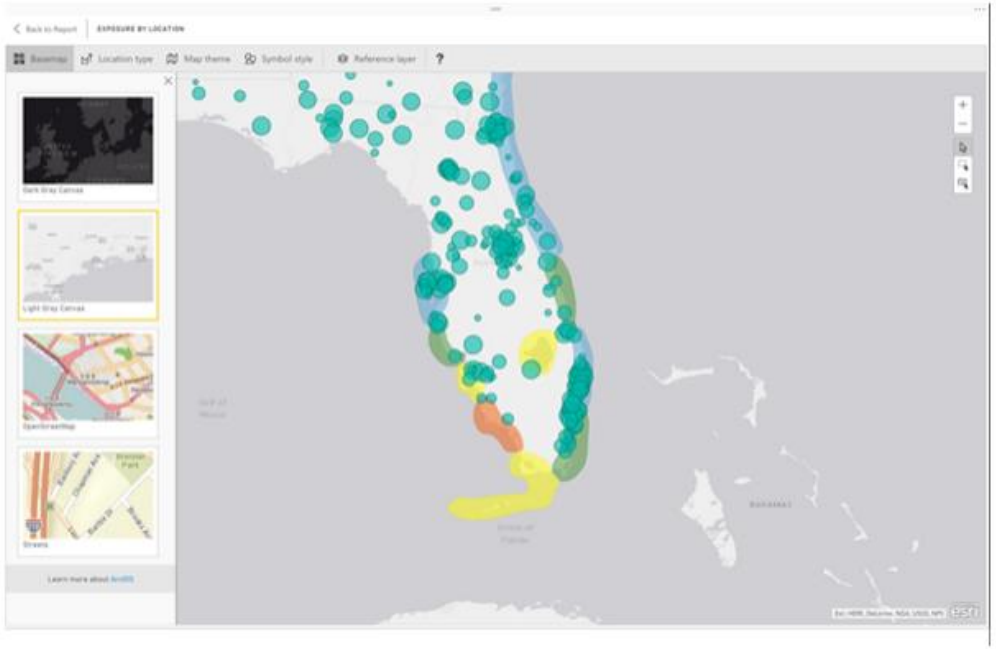
Visualisations – ArcGIS Maps (Preview)

- Use **ArcGIS Maps** for Power BI visual
- To start using this **preview feature**, turn on ArcGIS Maps for Power BI
- **ESRI map icon** on the visualization pane
- **Edit** ESRI map







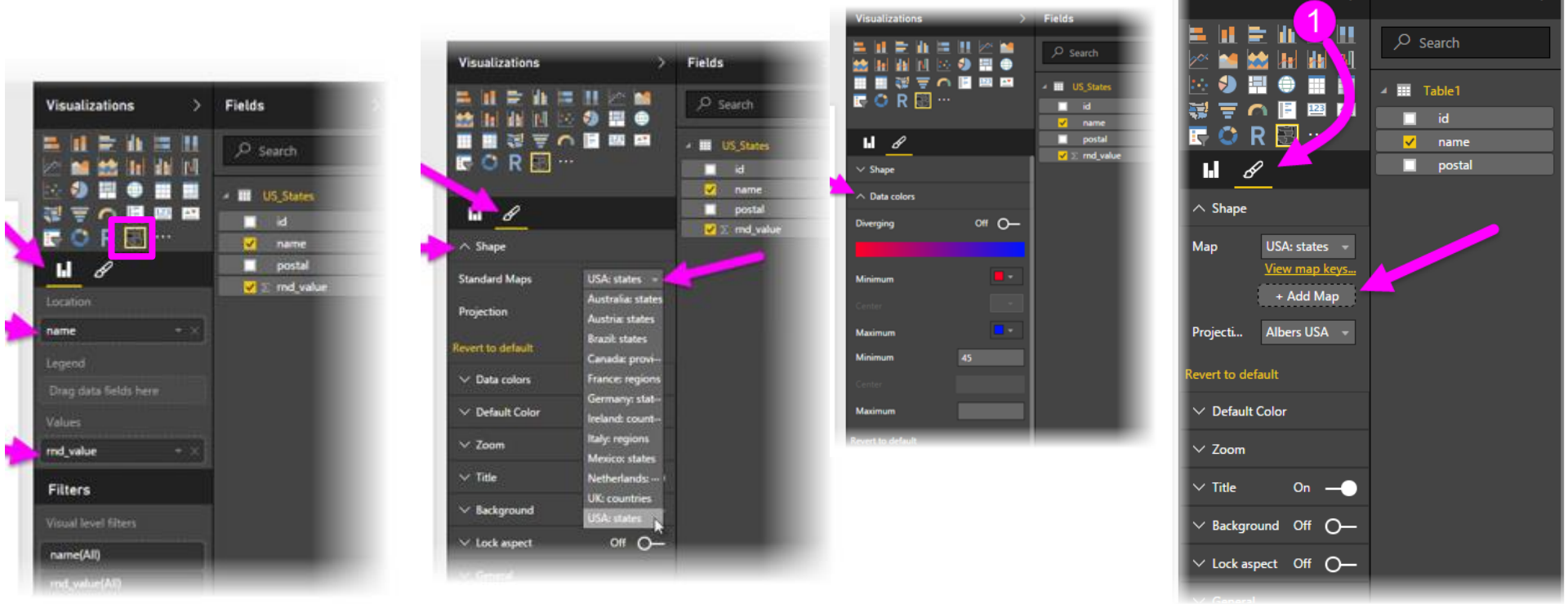


Power BI Desktop

Visualisations – Shape Maps (Preview)

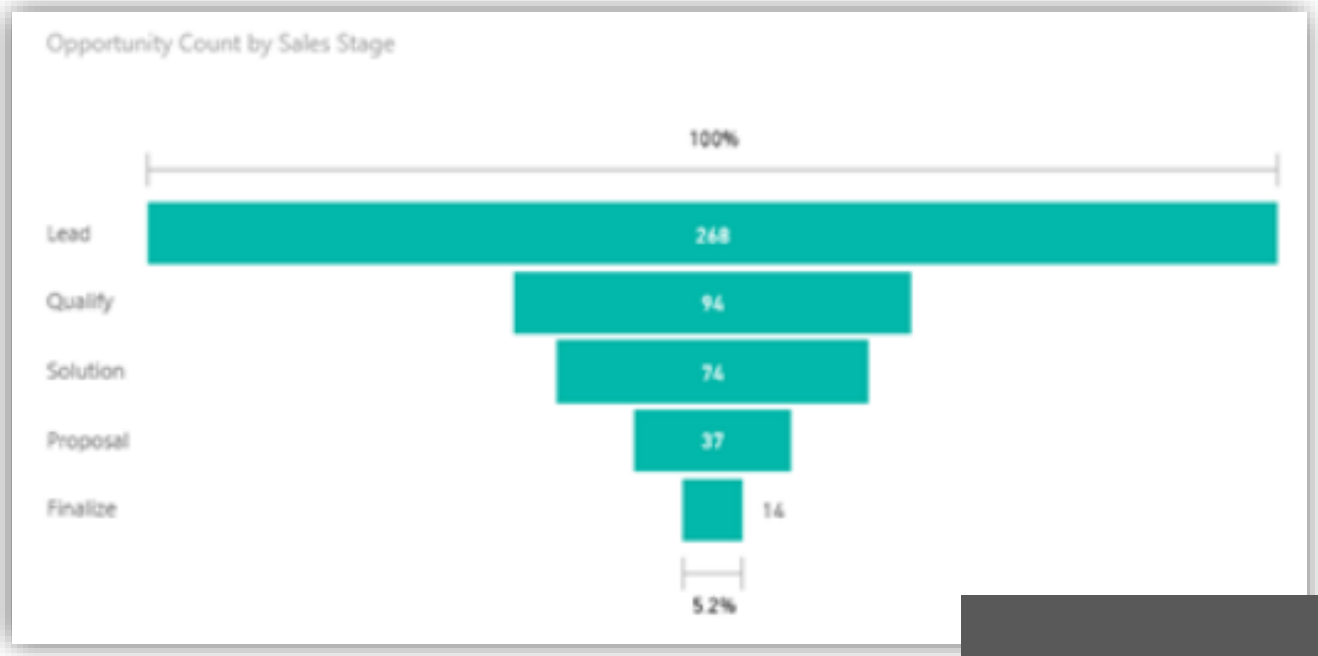
Visualizations – Shape Maps (Preview)

- **Shows relative comparisons of regions** on a map by by coloring them differently
- Based on **ESRI/TopoJSON** maps
- Supports **custom maps**

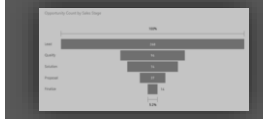


Power BI Desktop

Visualisations – Funnel Chart



FUNNEL



- Use a funnel chart to show completion of steps in a scenario

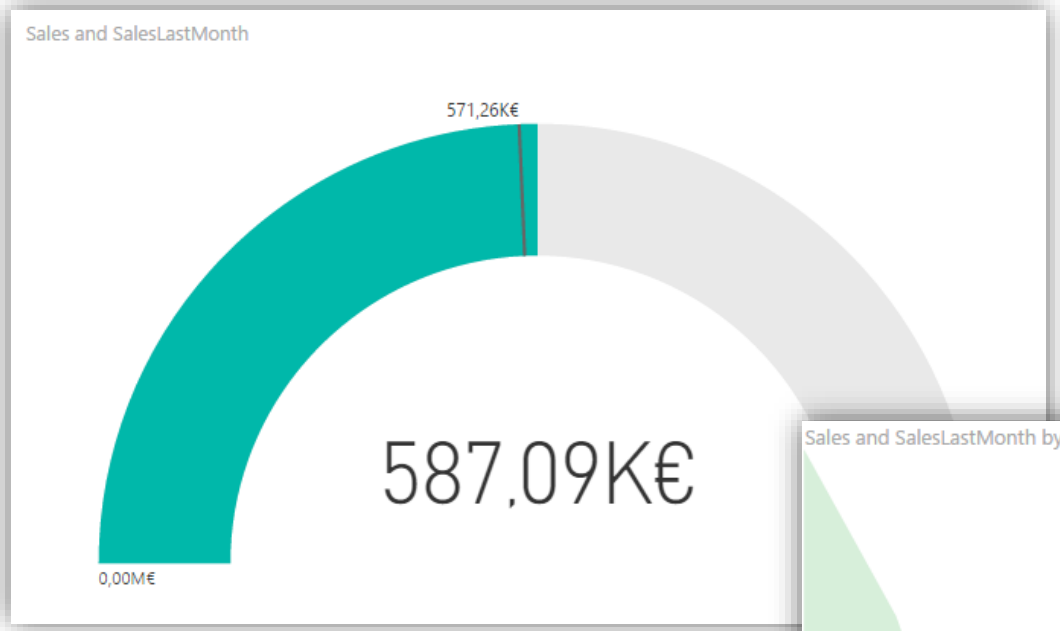
Power BI Desktop

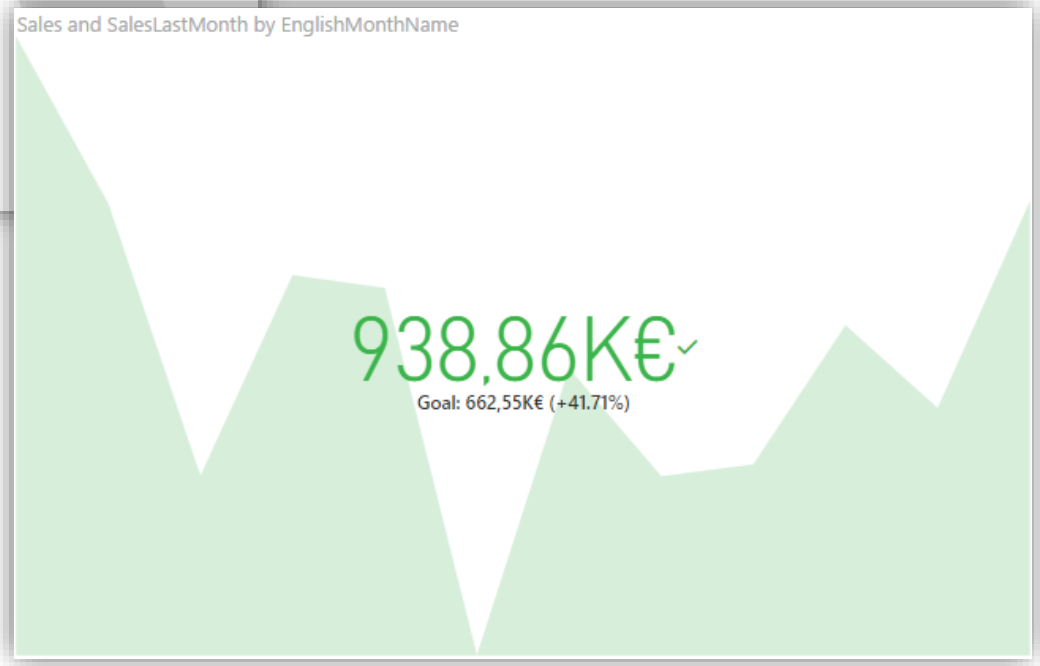
Visualisations – Card and Multi-Row Card

January EnglishMonthName	H Class	2.102.125,2... Sales	2.068.846,72 € No Discount Sales
January EnglishMonthName	L Class	735.199,95 € Sales	685.600,30 € No Discount Sales
January EnglishMonthName	M Class	642.080,61 € Sales	639.508,70 € No Discount Sales
February EnglishMonthName	H Class	1.717.849,5... Sales	1.548.025,29 € No Discount Sales
February EnglishMonthName	L Class	547.882,23 € Sales	448.408,13 € No Discount Sales
February EnglishMonthName	M Class	518.169,22 € Sales	504.668,76 € No Discount Sales

Power BI Desktop

Visualisations – Gauge and KPI

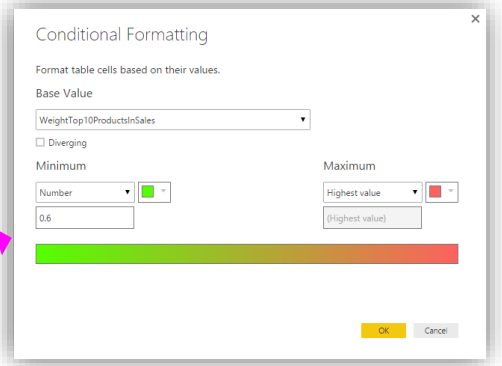




Power BI Desktop

Visualisations – Table and Matrix

EnglishMonthName	Class	SalesAmount	WeightTop10ProductsInSales
January	H	2.102.125,21 €	65,52%
January	L	735.199,95 €	71,66%
January	M	642.080,61 €	73,64%
February	H	1.717.849,59 €	68,43%
February	L	547.882,23 €	75,70%
February	M	518.169,22 €	75,29%
March	H	936.948,43 €	75,63%
March	L	446.138,05 €	85,63%
March	M	355.768,79 €	79,35%
April	H	1.780.784,31 €	69,91%
April	L	641.542,42 €	78,40%
April	M	546.528,63 €	
May	H	1.266.668,79 €	
May	L	447.153,48 €	
May	M	396.751,50 €	
June	H	688.540,50 €	
June	L	345.109,65 €	
June	M	249.192,93 €	
July	H	1.392.831,15 €	
July	L	536.661,11 €	
July	M	408.107,53 €	
August	H	872.069,71 €	
August	L	350.380,86 €	
August	M	302.157,31 €	
September	H	1.013.474,18 €	
September	L	425.944,96 €	
September	M	363.425,17 €	
October	H	1.622.190,91 €	
Total		**27.277.726,52 €**	



CalendarYear	EnglishMonthName		H	L	M	Total
2010	December	4.570,82 €	283.596,31 €	108.293,68 €	92.867,77 €	**489.328,58 €**
	Total	**4.570,82 €**	**283.596,31 €**	**108.293,68 €**	**92.867,77 €**	**489.328,58 €**
2011	January	10.631,77 €	1.159.704,49 €	208.097,33 €	159.974,72 €	**1.538.408,31 €**
	March	13.910,01 €	1.471.696,18 €	301.821,20 €	223.190,69 €	**2.010.618,07 €**
	May	25.499,10 €	2.971.225,31 €	561.045,25 €	469.310,68 €	**4.027.080,34 €**
	July	2.240,55 €	475.011,94 €	133.443,50 €	102.420,70 €	**713.116,69 €**
	August	14.408,47 €	2.507.113,37 €	459.961,16 €	374.586,34 €	**3.356.069,34 €**
	September	5.429,03 €	578.710,86 €	171.901,41 €	126.858,64 €	**882.899,94 €**
	October	15.065,01 €	1.678.510,24 €	325.358,26 €	250.183,21 €	**2.269.116,71 €**
	November	11.387,62 €	570.485,66 €	223.571,39 €	196.359,10 €	**1.001.803,77 €**
	December	83.649,37 €	1.322.947,62 €	542.480,16 €	444.612,38 €	**2.393.689,53 €**
	Total	**182.220,93 €**	**12.735.405,67 €**	**2.927.679,67 €**	**2.347.496,45 €**	**18.192.802,71 €**
2012	January	121.784,94 €	2.102.125,21 €	735.199,95 €	642.080,61 €	**3.601.190,71 €**
	February	101.458,16 €	1.717.849,59 €	547.882,23 €	518.169,22 €	**2.885.359,20 €**
	March	63.298,93 €	936.948,43 €	446.138,05 €	355.768,79 €	**1.802.154,21 €**
	April	84.960,97 €	1.780.784,31 €	641.542,42 €	546.528,63 €	**3.053.816,33 €**
	May	74.639,45 €	1.266.668,79 €	447.153,48 €	396.751,50 €	**2.185.213,21 €**
	June	34.698,76 €	688.540,50 €	345.109,65 €	249.192,93 €	**1.317.541,83 €**
	July	47.246,81 €	1.392.831,15 €	536.661,11 €	408.107,53 €	**2.384.846,59 €**
	August	39.347,20 €	872.069,71 €	350.380,86 €	302.157,31 €	**1.563.955,08 €**
	September	62.434,12 €	1.013.474,18 €	425.944,96 €	363.425,17 €	**1.865.278,43 €**
	October	87.949,43 €	1.622.190,91 €	634.480,97 €	536.131,37 €	**2.880.752,68 €**
	November	73.681,53 €	1.112.970,12 €	440.499,00 €	360.722,06 €	**1.987.872,71 €**
	December	124.404,70 €	1.419.305,44 €	386.350,14 €	735.590,26 €	**2.665.650,54 €**
	Total	**915.905,01 €**	**15.925.758,34 €**	**5.937.342,81 €**	**5.414.625,37 €**	**28.193.631,53 €**
2013	Januarv	201.762.89 €	2.422.361.16 €	589.742.93 €	999.104.53 €	**4.212.971.51 €**

Power BI Desktop

Prepare

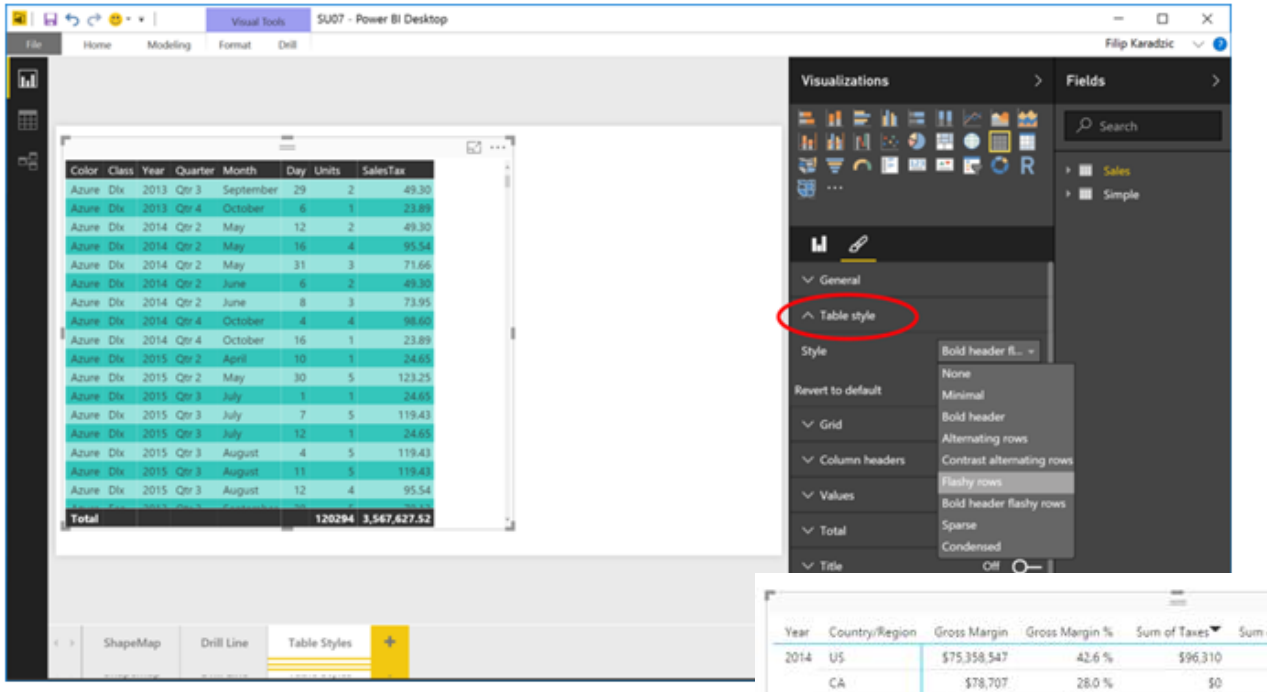
Explore

Report

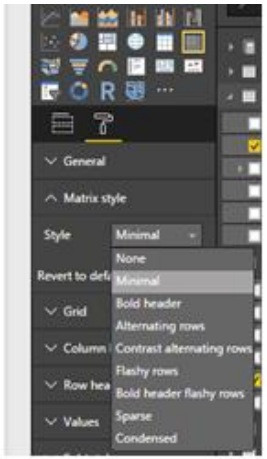
Share & collaborate

Visualisations – Table and Matrix

- Contains **predefined styles** for Table and Matrix

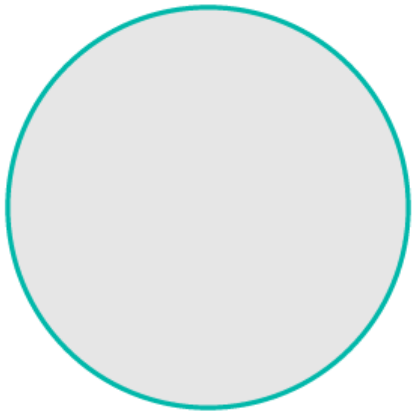


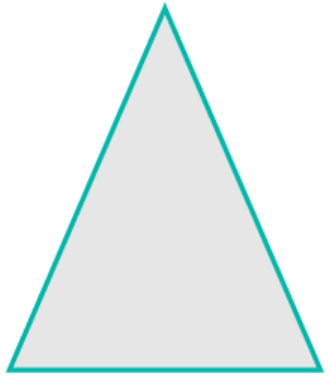
Year	Country/Region	Gross Margin	Gross Margin %	Sum of Taxes	Sum of Travel Expenses	Sum of Third Party Costs
2014	US	$75,358,547	42.6 %	$96,310	$10,813,376	$55,050,762
	CA	$78,707	28.0 %	$0	$3,507	$185,312
	GB	$148,447	115.0 %	$0	($2,458)	($21,840)
	Total	$75,585,701	42.7 %	$96,310	$10,814,425	$55,214,234
2013	CA	$1,426	0.3 %	$0	$90,927	$338,218
	US	$18,217,724	32.2 %	$0	$3,167,727	$24,677,416
	Total	$18,219,150	31.9 %	$0	$3,258,655	$25,015,634
Total		$93,804,852	40.1 %	$96,310	$14,073,079	$80,229,868

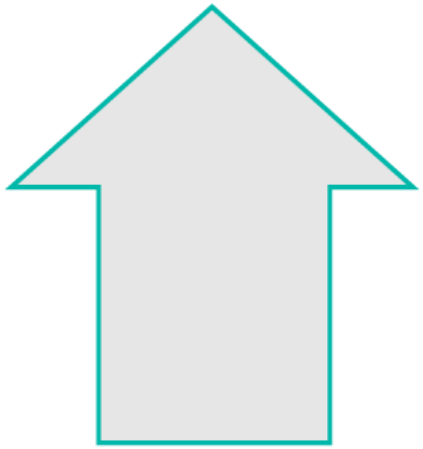


Power BI Desktop

Visualisations – Textboxes, Images and Shapes



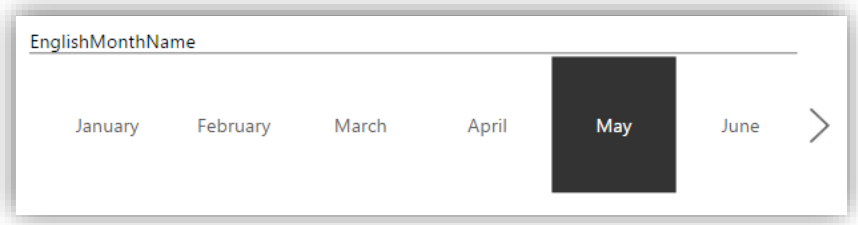


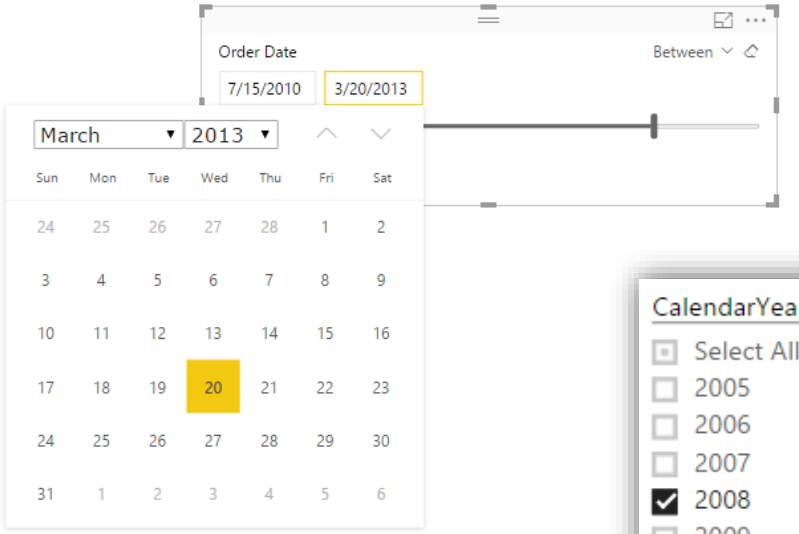


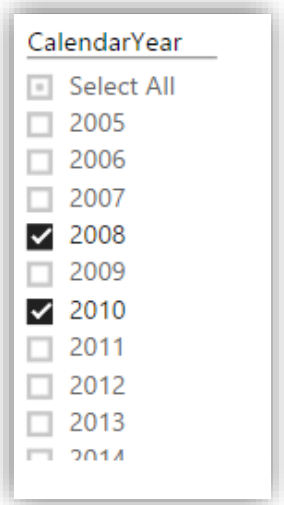
Power BI Desktop

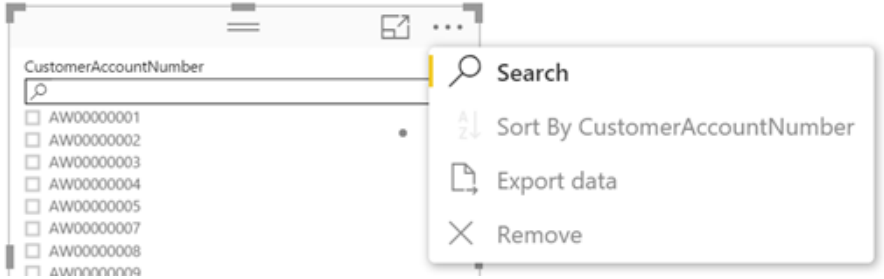
Visualisations – Slicers

- Filter data on multiple visualizations (similar to Excel slicers)
- Allow **Select All**
- **Multi** and **Single selection**
- Special slicers for **date field**
- Slicers are **searchable**





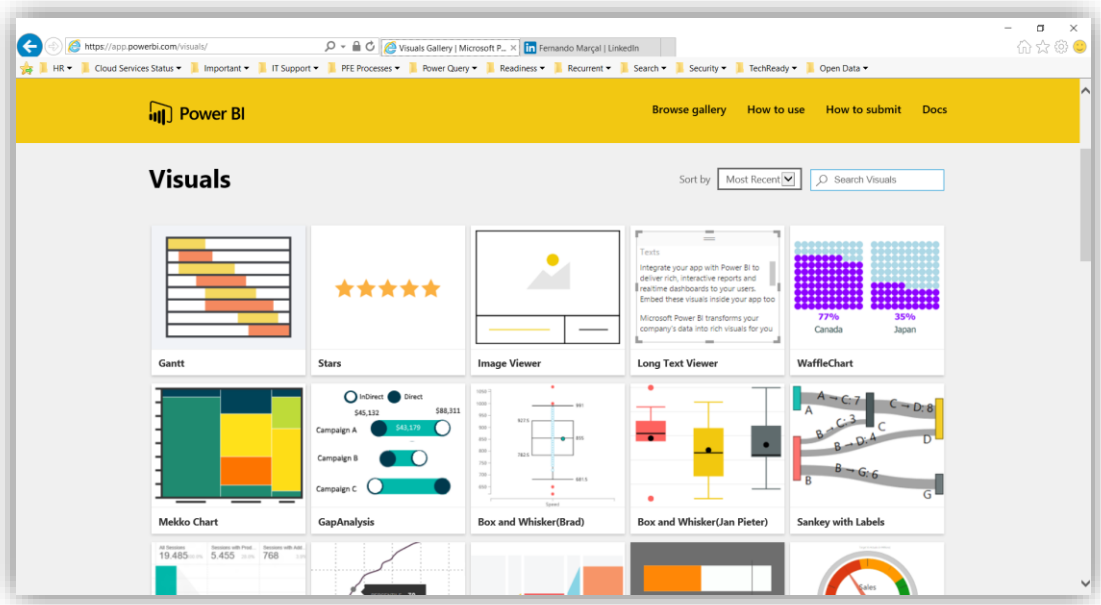




Power BI Desktop

Visualisations – Custom Visualisations

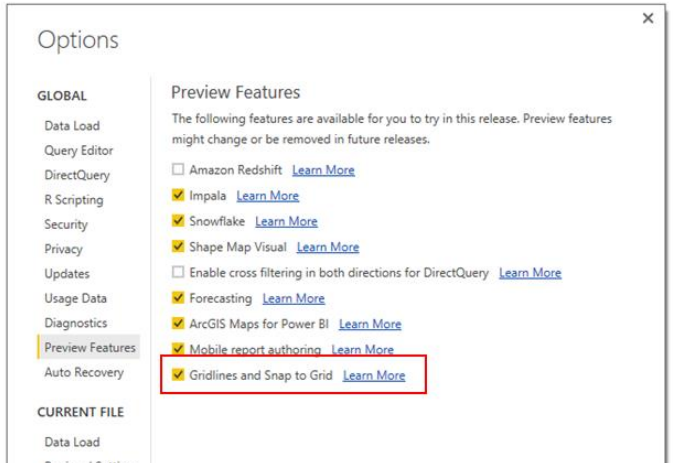
- We enabled 3rd party, or you, to **build your own Visuals**
- After you build them, **you can use them or you can share with the community**
- If you share, we will do a quality check and make it **available at** https://app.powerbi.com/visuals/

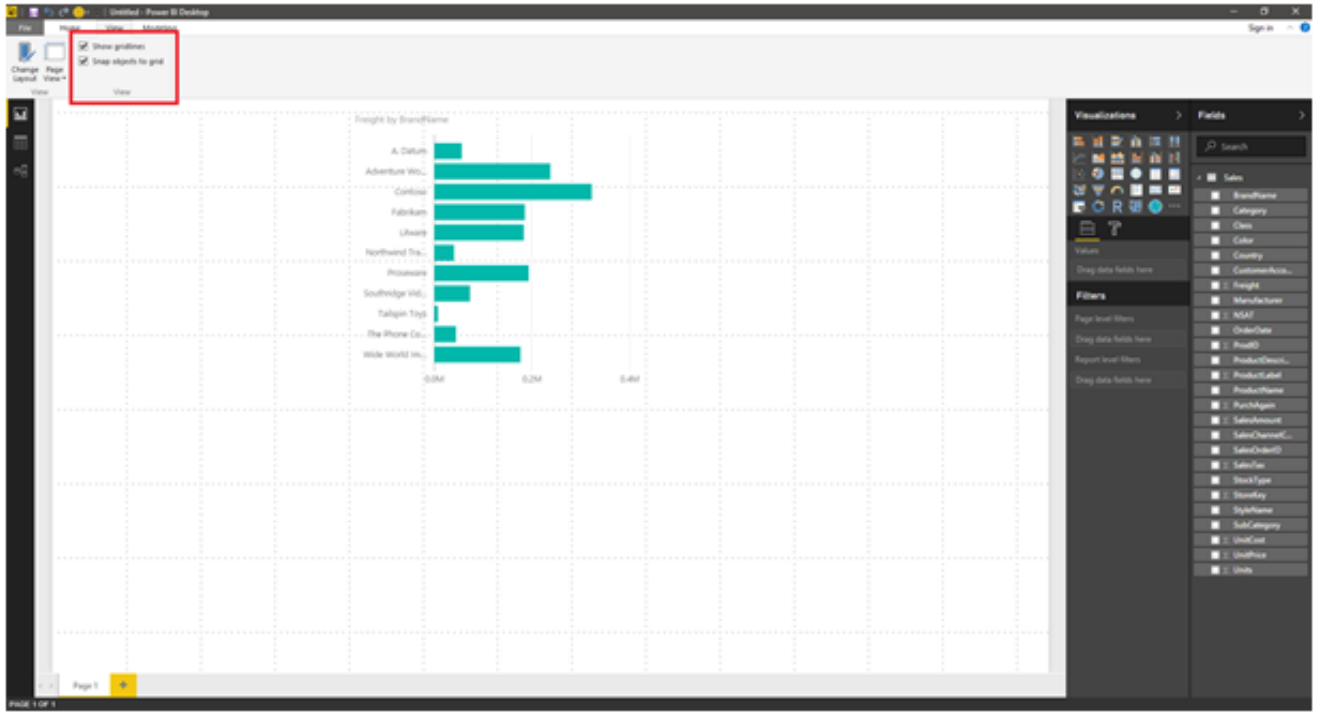


Power BI Desktop

Report gridlines and snap to grid (Preview)

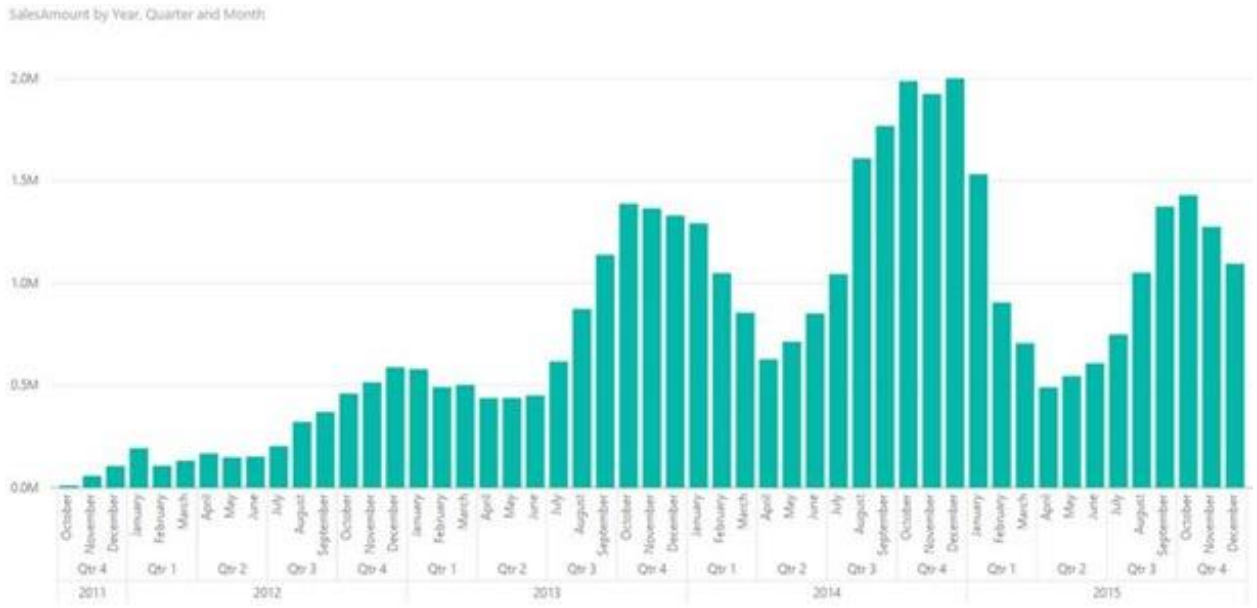
- **Enable gridlines** on your report canvas while authoring
- **Snap** to gridlines



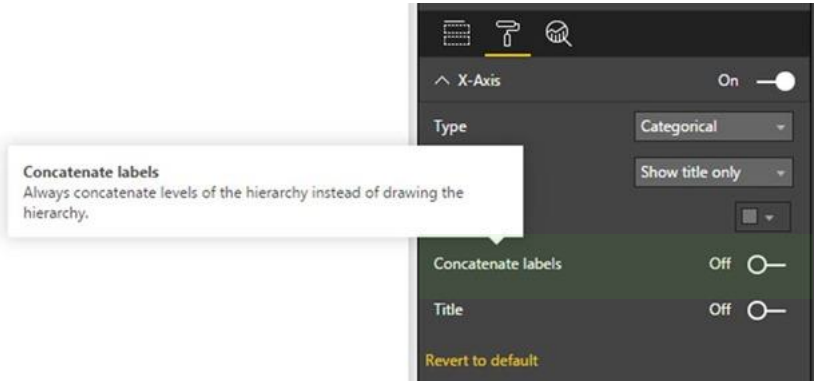


Power BI Desktop

Visualisations – Hierarchichical Axis



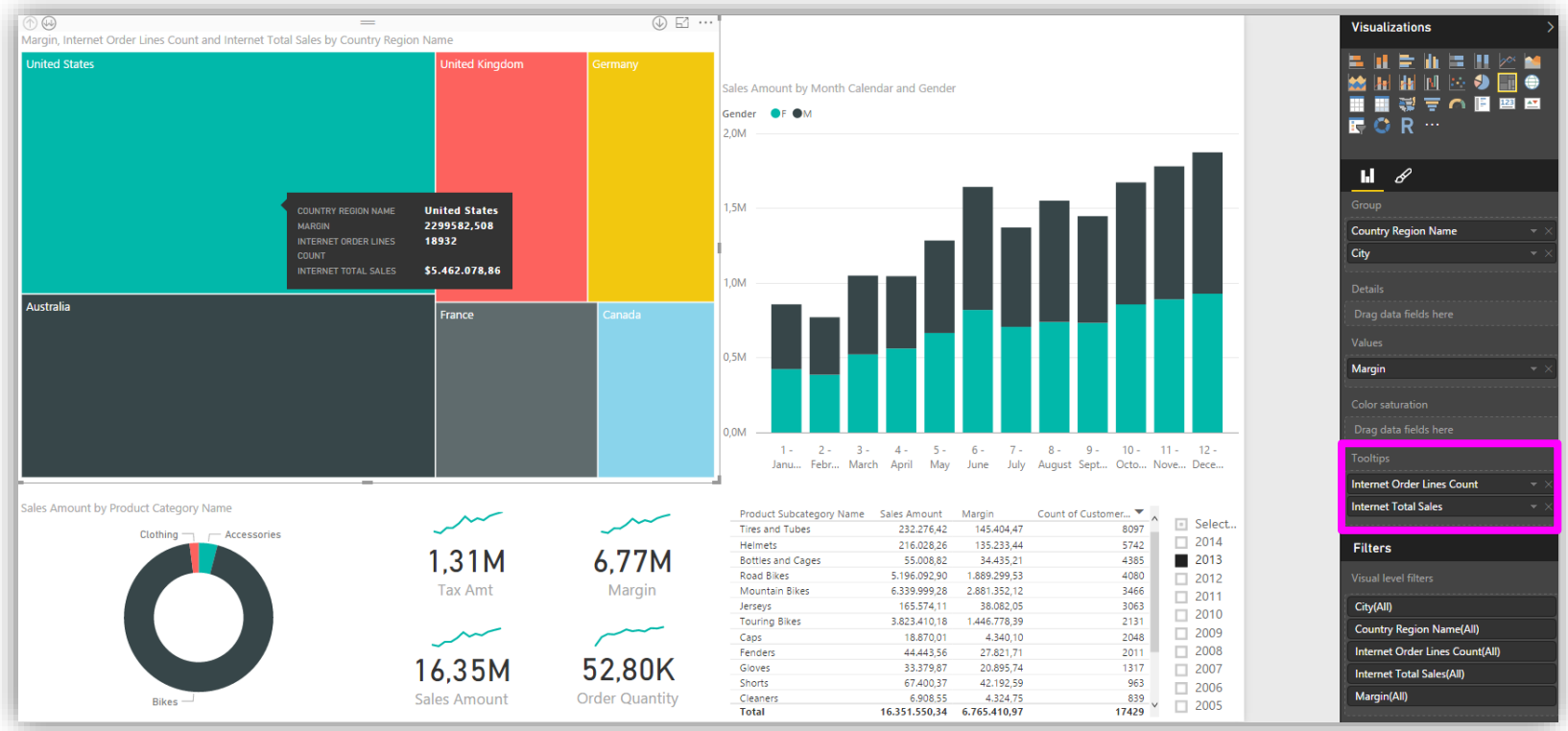
You can use hierarchical labels by turning off the label concatenation experience in the formatting pane



Power BI Desktop

Tooltips

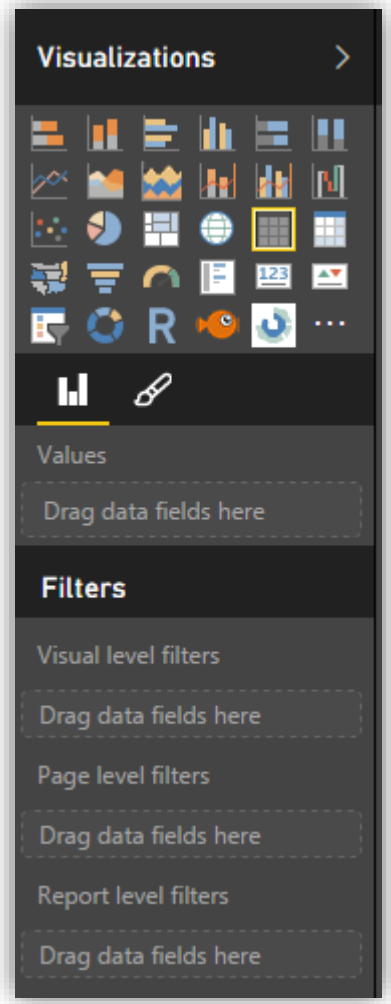
- Provide **additional context when hovering** over a series in a visualization
- They are customizable but only Measures or aggregations can be shown



Power BI Desktop

Report Filtering

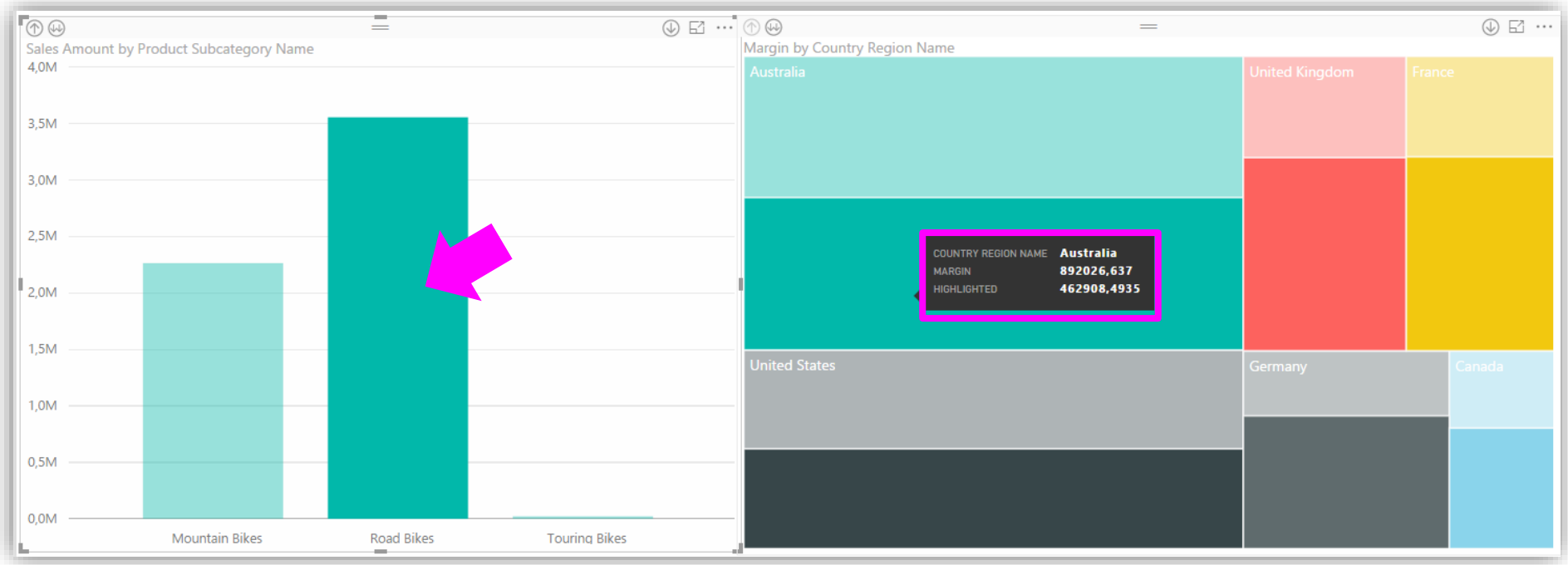
- Filters can be applied at three different levels:
- **Visual** – The filter only applies to the current visualization
- **Page** – The filter applies for every visualization on the page
- **Report** – The filter applies for every visualization for every page in the report (file)



Power BI Desktop

Cross-Filtering and Cross-Highlighting

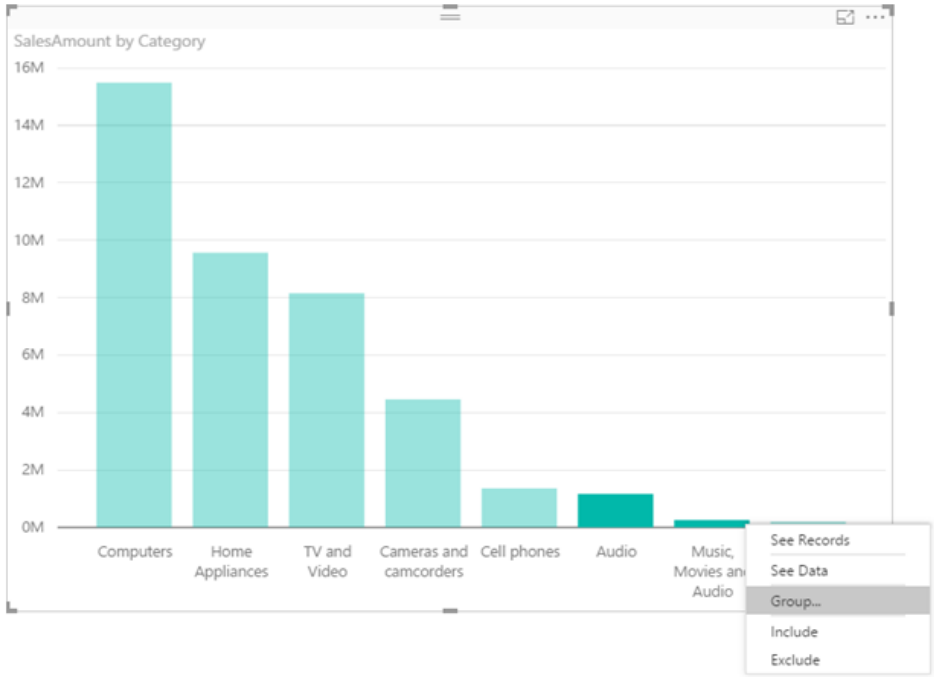
- **Clicking a** visualization **element**, filters other visualizations
- A **tooltip** displays the **highlighted portion** and the **total**
- Click an **empty space to clear the filter**



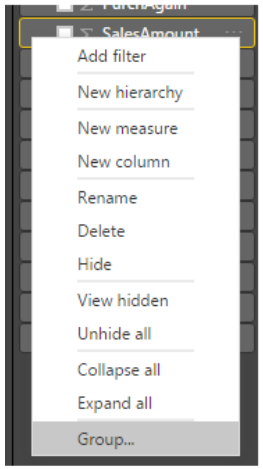
Power BI Desktop

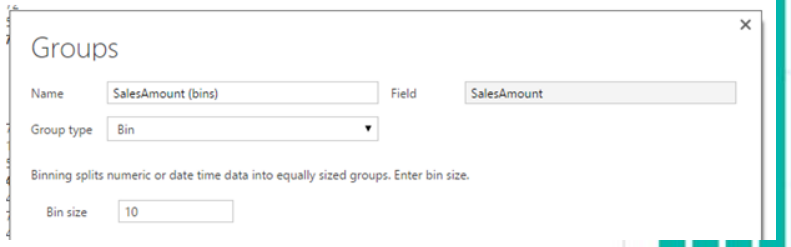
Grouping and Binning

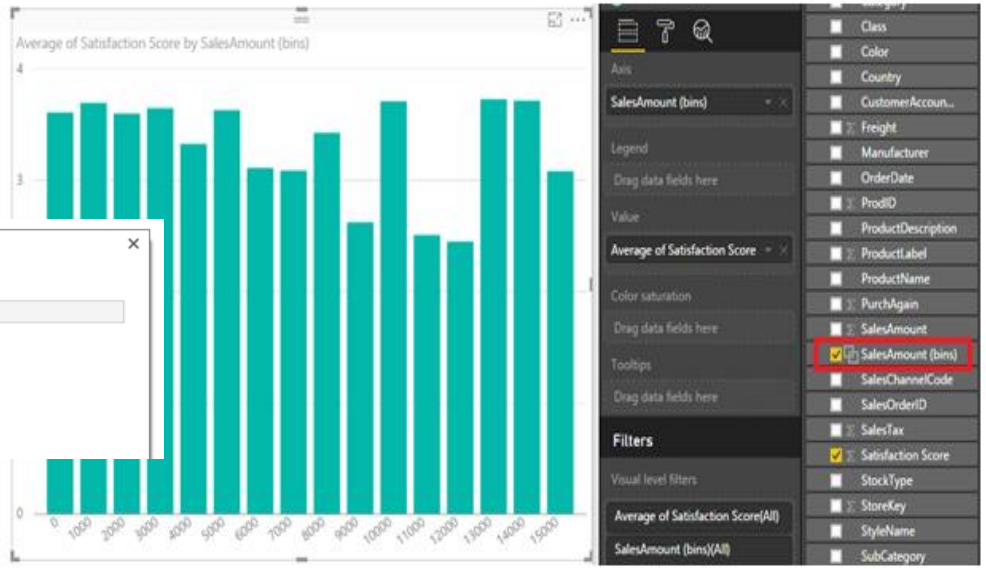
- **Group** up points on your visual to easily explore and analyze related categories



- **Bin** on numerical and time fields to create data categories



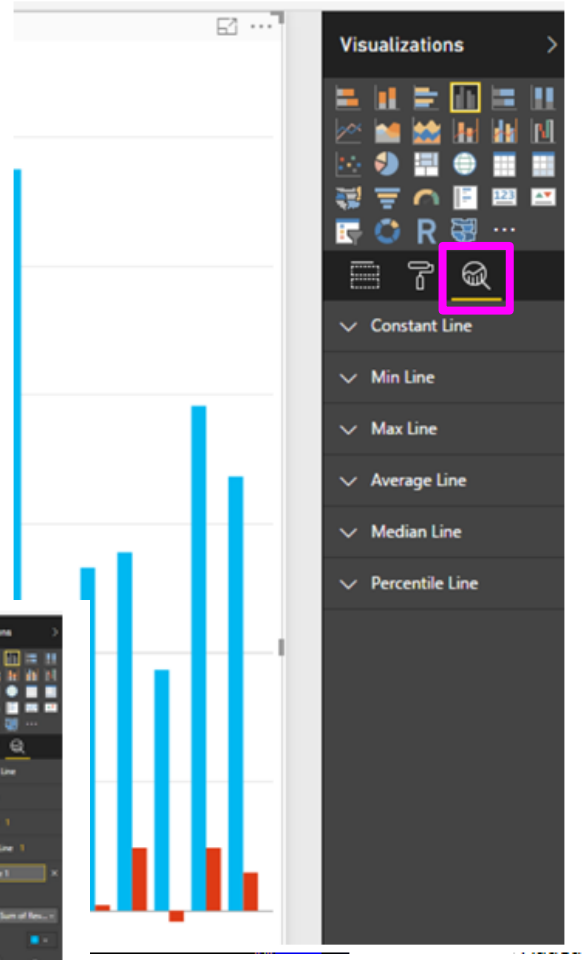


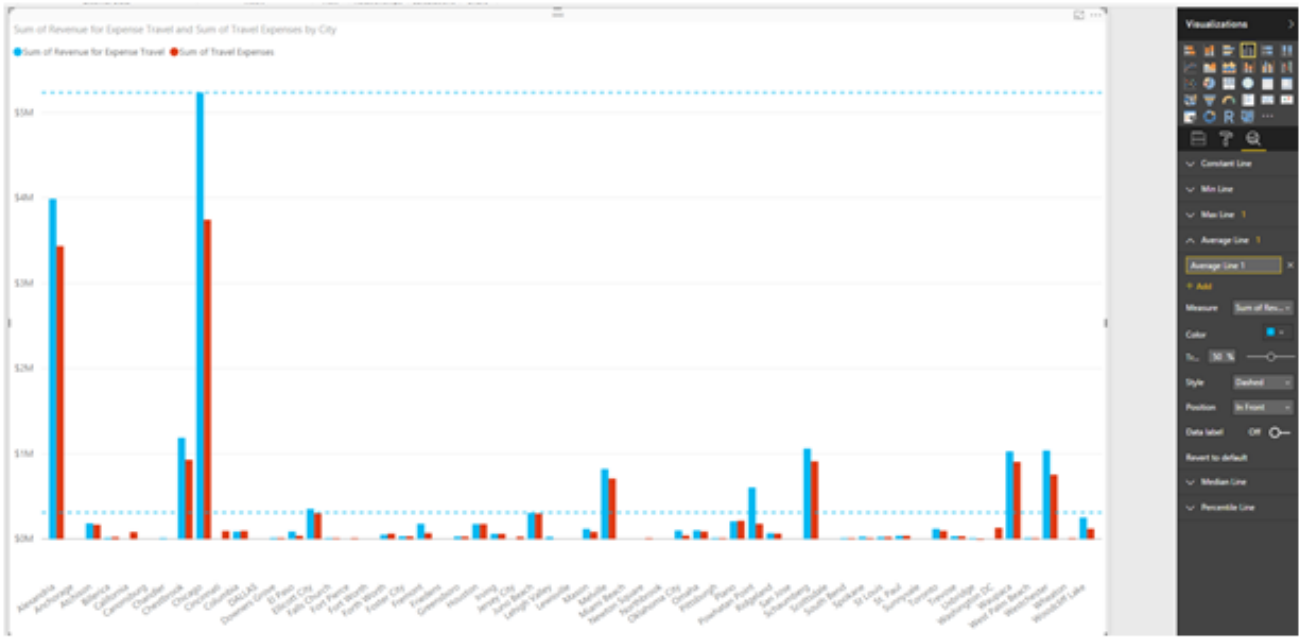


Power BI Desktop

Analytics Pane

- **Analytics pane** will be the central location for all analytical features
- Add dynamic reference lines and trend lines on charts
- **More** analytical features will be added in future

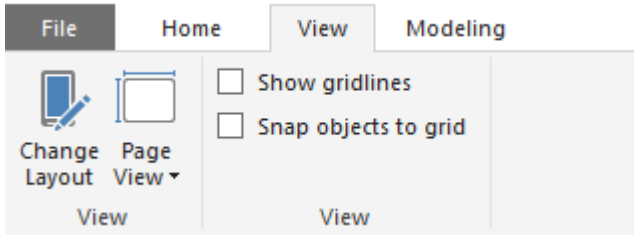


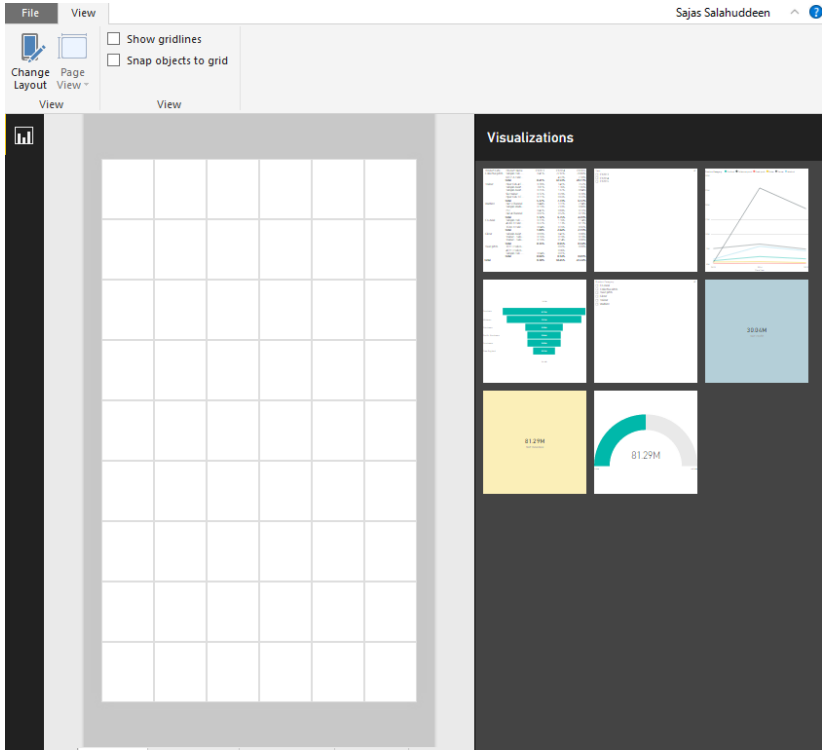


Power BI Desktop

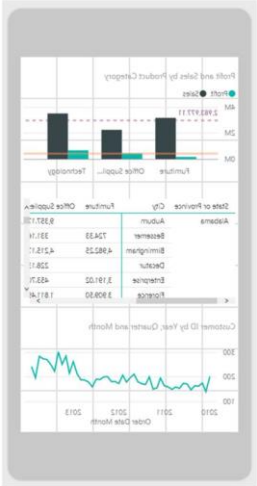
Mobile Report Layout

- Create report **layouts specific to mobile** devices





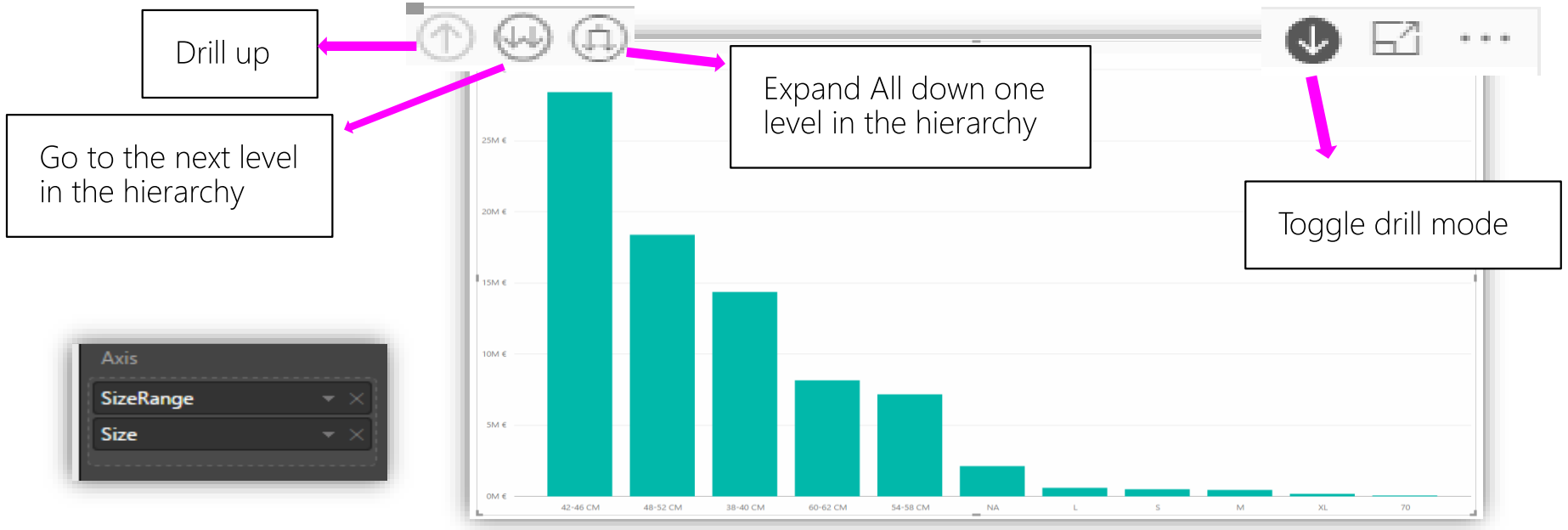
- After publishing, anyone who views this report on their **Power BI mobile app will see the phone layout** of the report



Power BI Desktop

Drill Down and Up

- It is possible to **navigate across attributes** if they are stacked on a particular area of a visualization (down/up/across)
- Those attributes don't have to be **natural hierarchies**, all of them can be mixed.

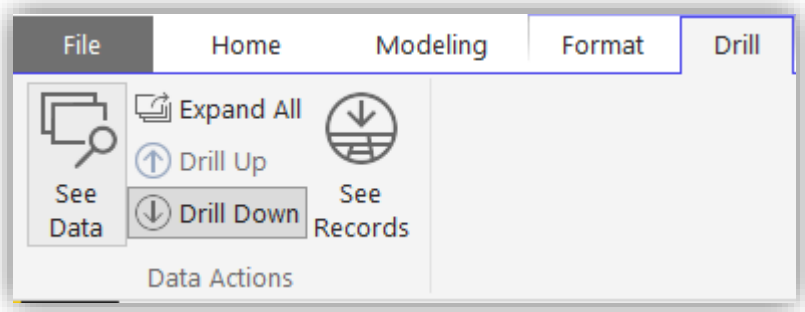


- Drill features works on bar and line charts

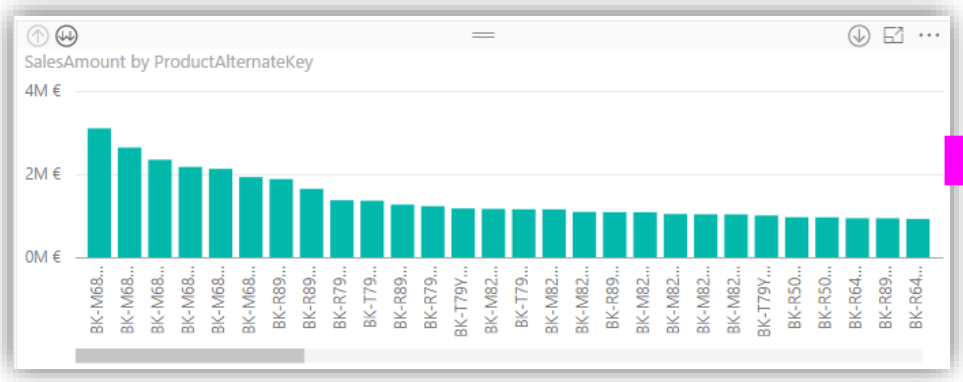
Power BI Desktop

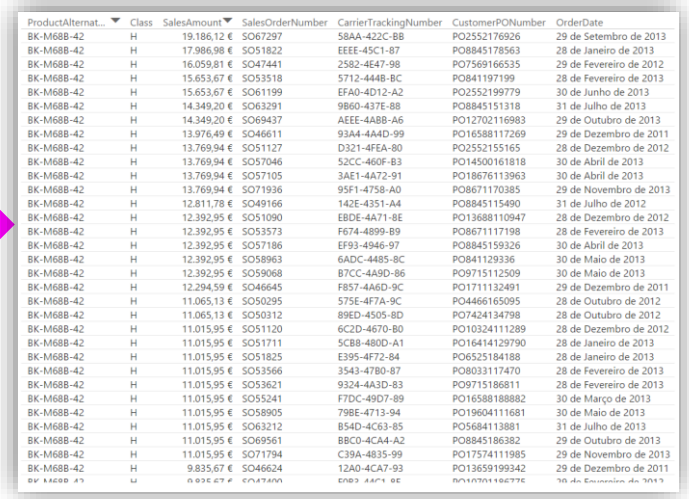
Drill to Records

- Drill **ribbon** allows controlling of **drilling operations**



- **See records** drills-through detail, for a clicked data point, and **See Data** displays data also in tabular format

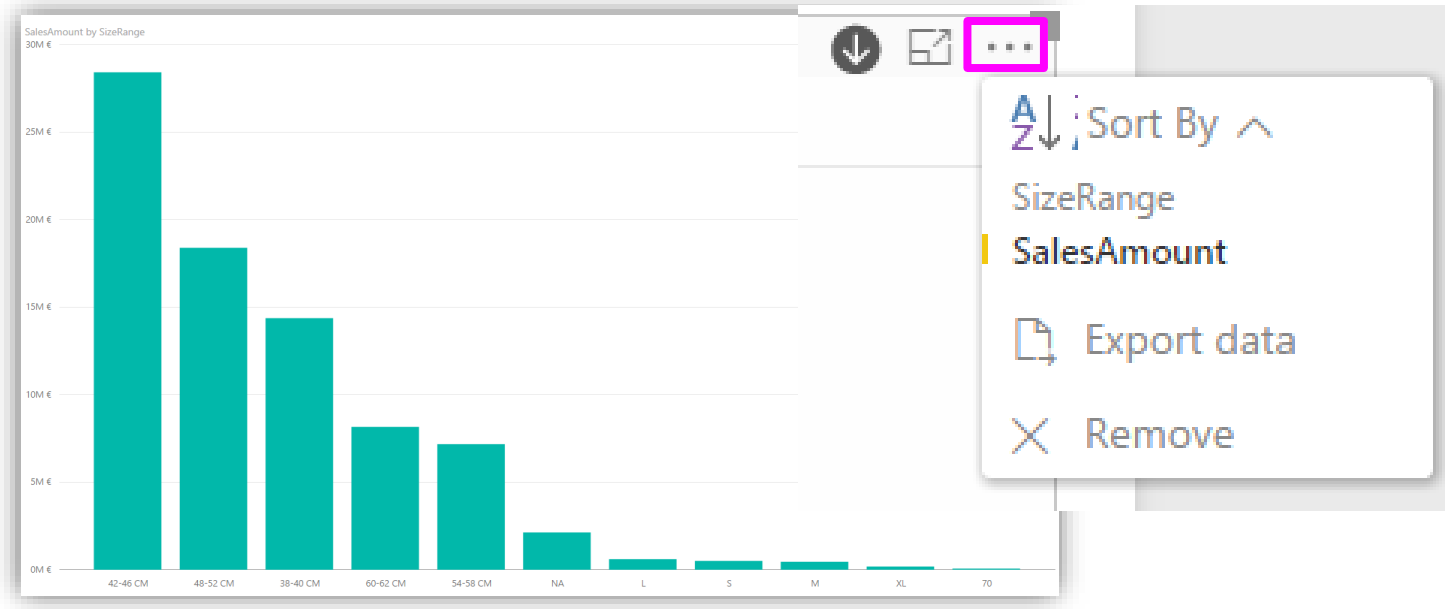




Power BI Desktop

Sorting

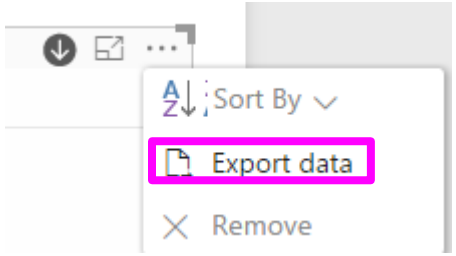
- It is possible to **sort** data according to **numeric values** or to **data categories**, for each **visualization**
- For categories, the order that is used is either **alphabetical** (or **numerical**) or the **custom sort** order
- Data can be presented **ascending** or **descending**



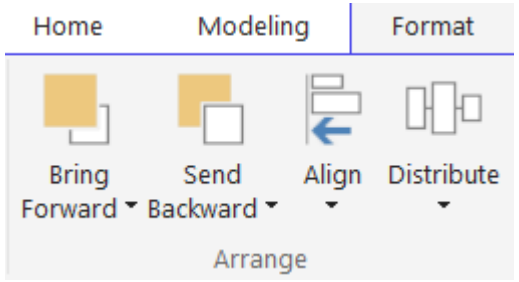
Power BI Desktop

Other Reporting Features

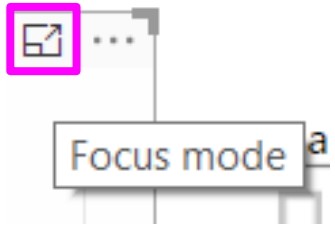
- **Data** for a visualization can be **exported** as .csv file



- **Alignment** and **Depth** can be controlled



- **Focus mode** pops-up the visualization



- It is possible to **overlay** visualizations

Power BI Service:
Get Data

Power BI Service

- **Get Data**
- **Pinning and Navigation**
- **Keeping Data Current**
- **Q&A and Quick Insights**
- **Sharing**
- **Connect from Excel**
- **Mobile Reports**

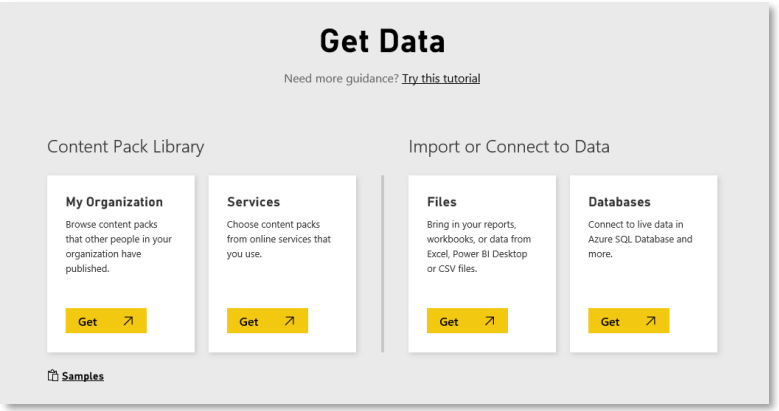
Get Data

Connect to Data

- You can start by **connecting to data directly in the service**, without going into Desktop or Excel first.

↗ Get Data

- Data can come from
  - your Organization
  - SaaS Services
  - an Excel or a Power BI Desktop File
  - Other data sources



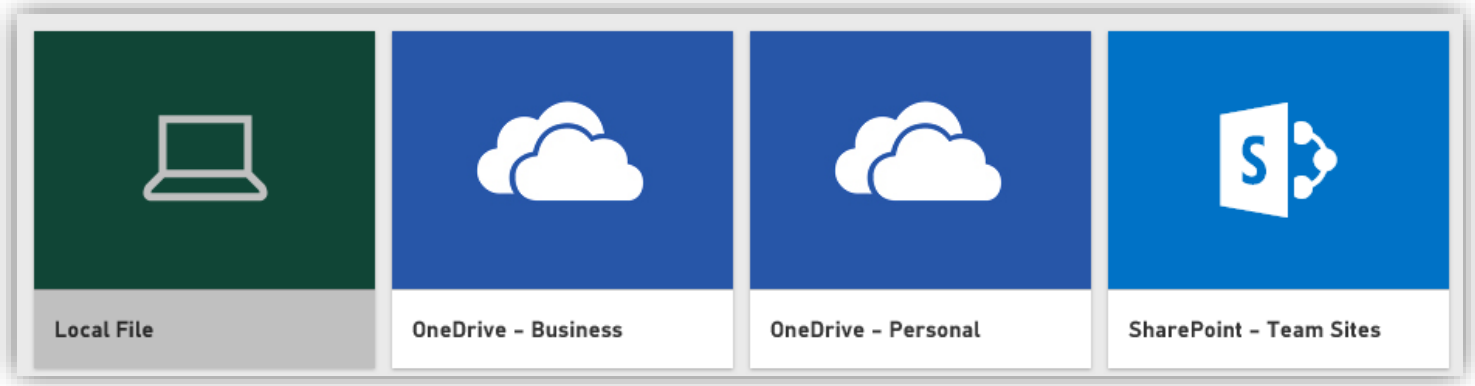
- Once connected, a **dataset** and associated **reports** and **dashboards** will be available.

- The **data sources available in the Desktop are not the same** that are available directly from the service, but a **.pbix file is a valid source**

Get Data

Import or Connect to Data - Files

- When you select the **File** option **data can come from on-prem or cloud**



- **Excel** (.xlsx, xlsm) – import the **file or the Data Model**
- **Power BI Desktop** – the model and the visualizations are imported into the service
- **.csv file** – data should be comma separated and have a header
- **Replacements** must have the **same name**

Power BI Service

- **Get Data**
- **Pinning and Navigation**
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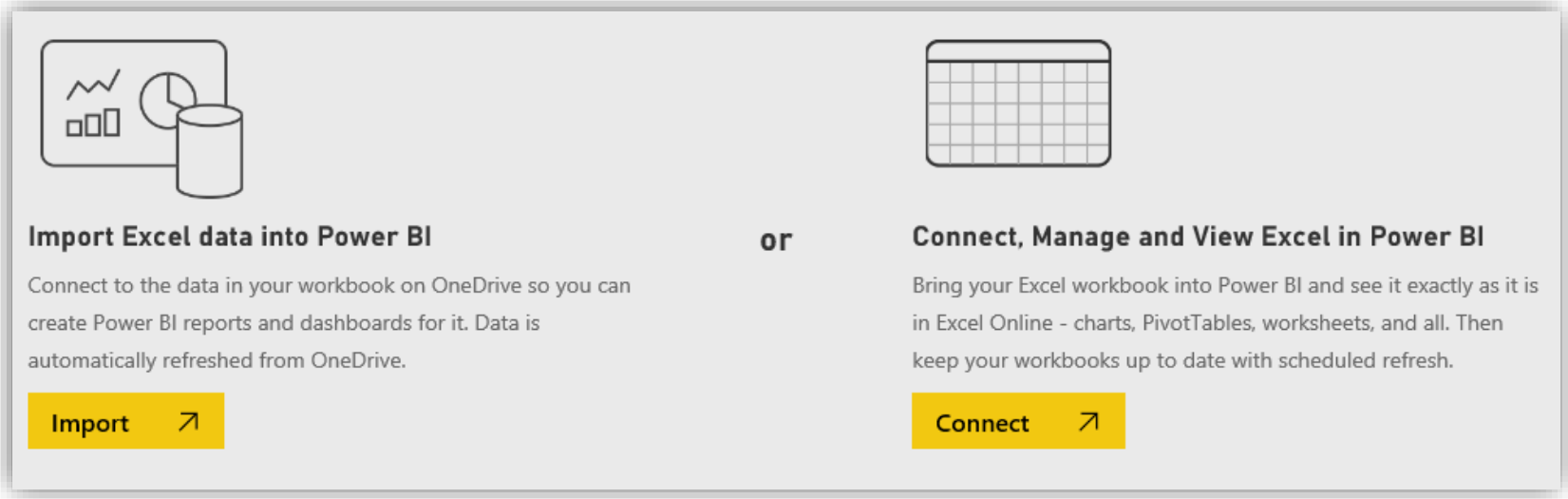
Get Data

Import or Connect to Data - Files

- When you connect to Excel, there are two options



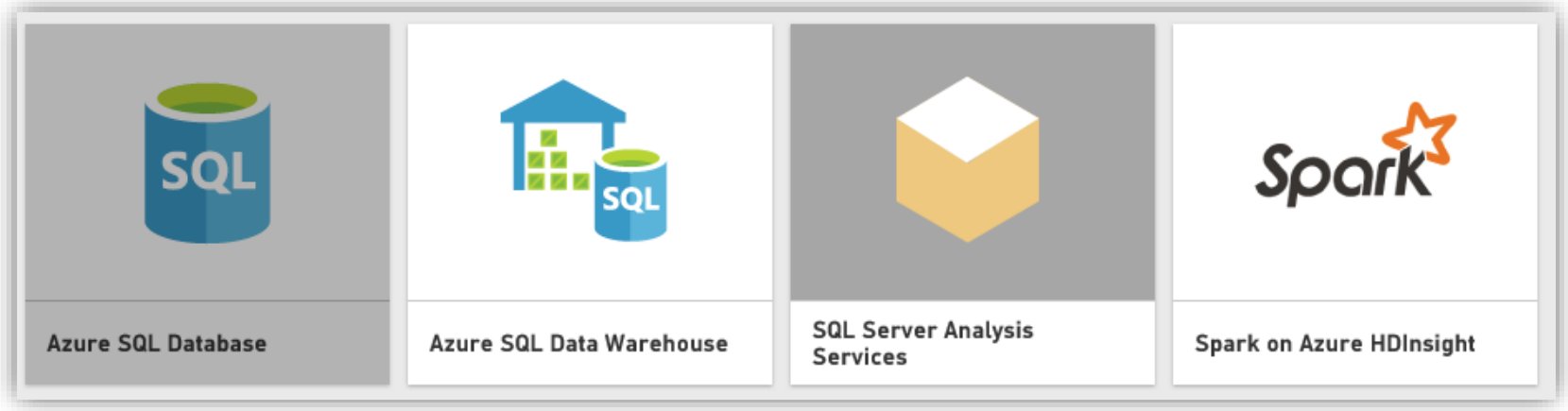
- The **first expects a Data Model** in the file
- The **second** will allow you to **see the Excel file inside of Power BI** and even **edit it** and use **parts of it for dashboards** (OD4B or Sharepoint, only)
- Updates will reflect automatically in Power BI (~1h) (for Excel and Desktop)

Power BI Service

- Get Data
- Pinning and Navigation
- Keeping Data Current
- Q&A and Quick Insights
- Sharing
- Connect from Excel
- Mobile Reports

Get Data

Import or Connect to Data - Databases



- Data can live in **the cloud or on-prem (SSAS)**
- **Access to the data is live** (DirectQuery) every interaction starts a query on the backend (data is always updated)
- For access to **SSAS data on-prem**, an **Enterprise Gateway** has to be set up
- More live sources are expected in the future.

Power BI Service

- **Get Data**
- **Pinning and Navigation**
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- **Q&A and Quick Insights**
- **Sharing**
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- **Mobile Reports**

Get Data

Content Pack Library – My Organization

- Similar to Service content Packs, they contain elements like datasets, reports, dashboards and even Excel files
- Can be **shared** with **specific teams** (groups) or with the **entire organization**
- A **dedicated library** exists to display them which **follows permissions** and is **searchable**
- **Analytical elements are read-only** but **can be extended**. At that time, a **personal copy** is generated.
- **Updates** to the source content pack will not overwrite the personal copy
- Only the **creator controls content and data refresh scheduling**
- Except for SSAS as a source and Cloud Secured Models**, all users see the same data**

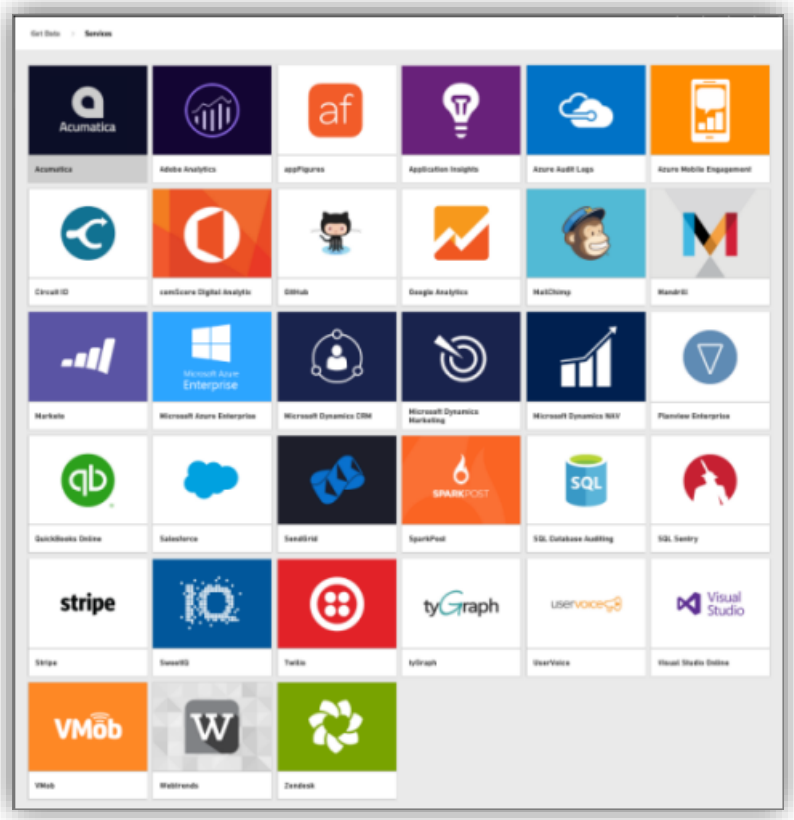
Power BI Service

- **Get Data**
- **Pinning and Navigation**
- **Keeping Data Current**
- **Q&A and Quick Insights**
- **Sharing**
- **Connect from Excel**
- **Mobile Reports**

Get Data

Content Pack Library - Services

- Data can come from 3rd party SaaS services as **content packs**
- These content packs contain a **dataset**, **reports** and **dashboards**
- Data shown depends on **credentials provided** (depends on service as well)
- **More than fifty** already exist and more will be **added frequently**
- Data is **curated by the provider**
- You are not limited to the existing reports and dashboards.



Power BI Service: Pinning and Navigation

Power BI Service

- Get Data
- **Pinning and Navigation**
- Keeping Data Current
- Q&A and Quick Insights
- Sharing
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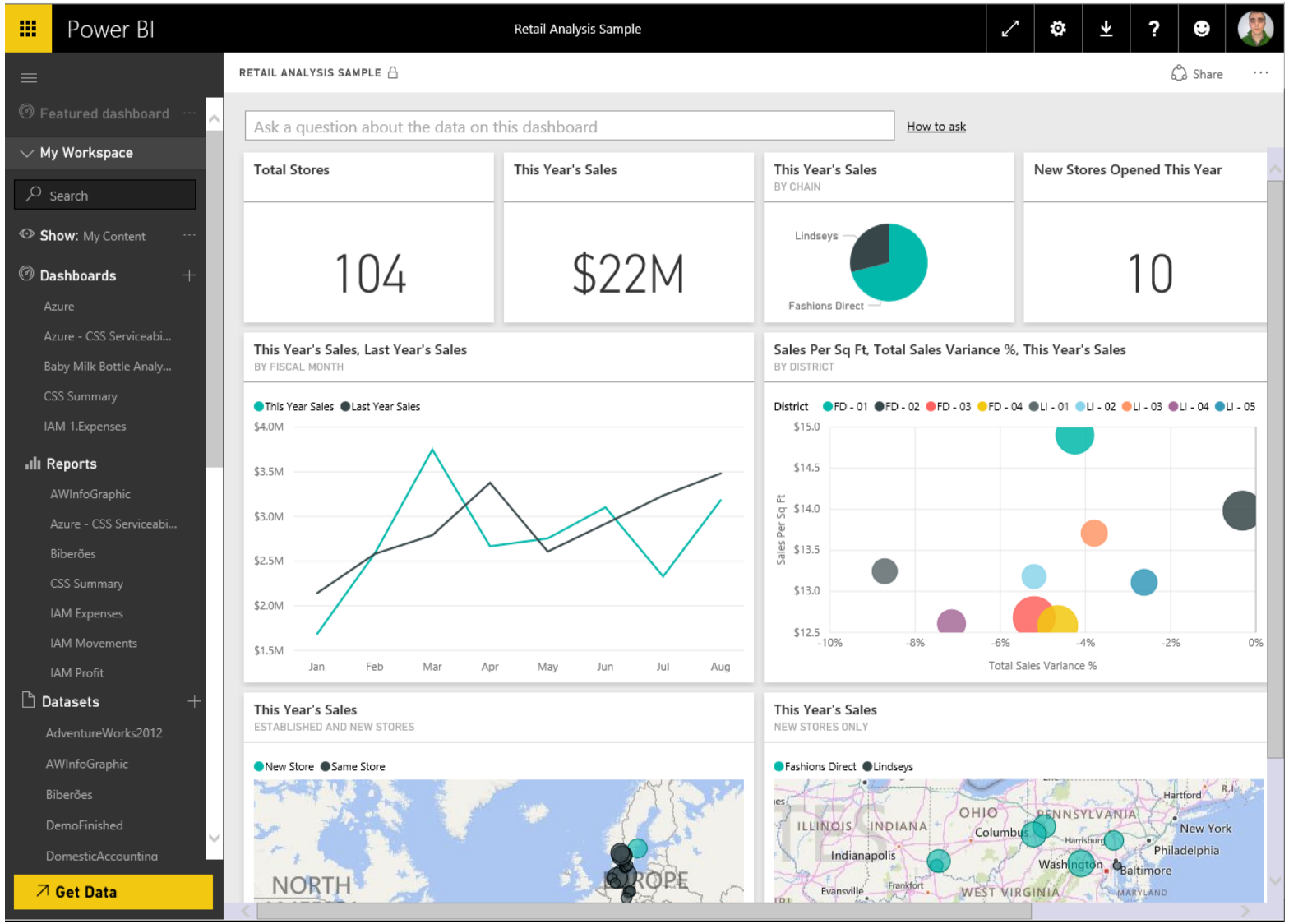
- Mobile Reports

Pinning and Navigation

Workspace



Power BI Service

- Get Data
- **Pinning and Navigation**
- Keeping Data Current
- Q&A and Quick Insights
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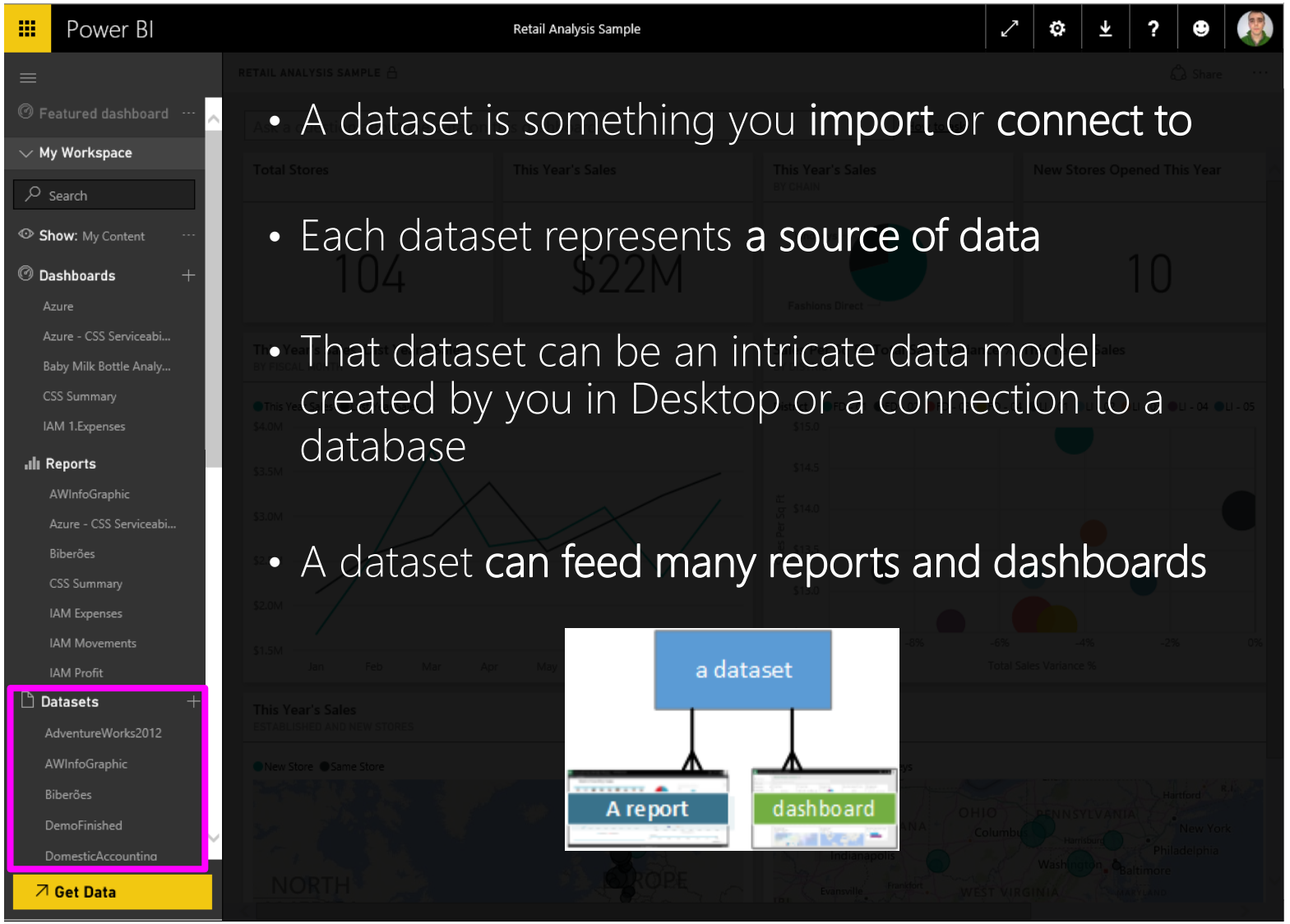
- Mobile Reports

Pinning and Navigation

Dataset



Power BI Service

- Get Data
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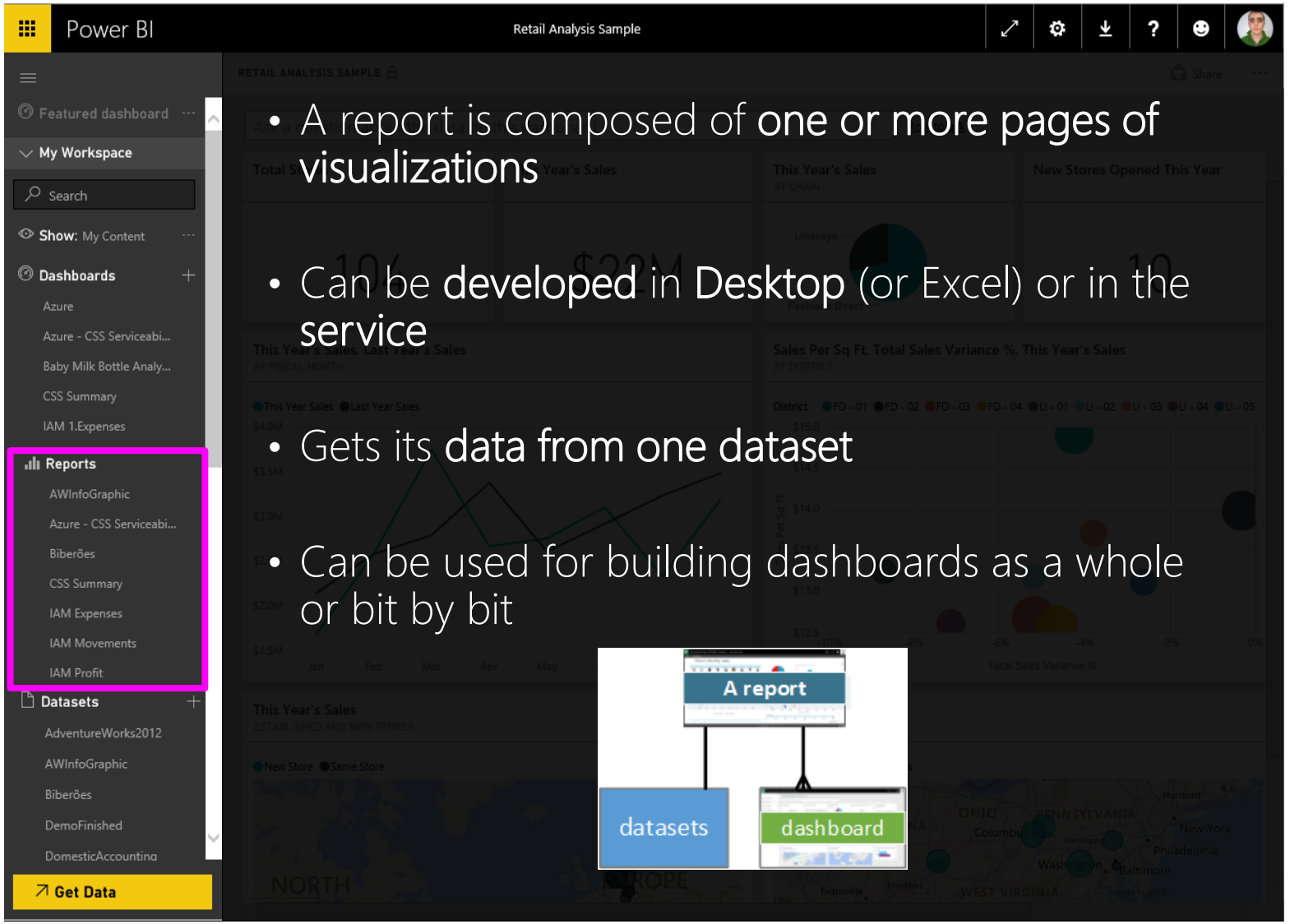
Pinning and Navigation

Report



Power BI Service

- Get Data
- **Pinning and Navigation**
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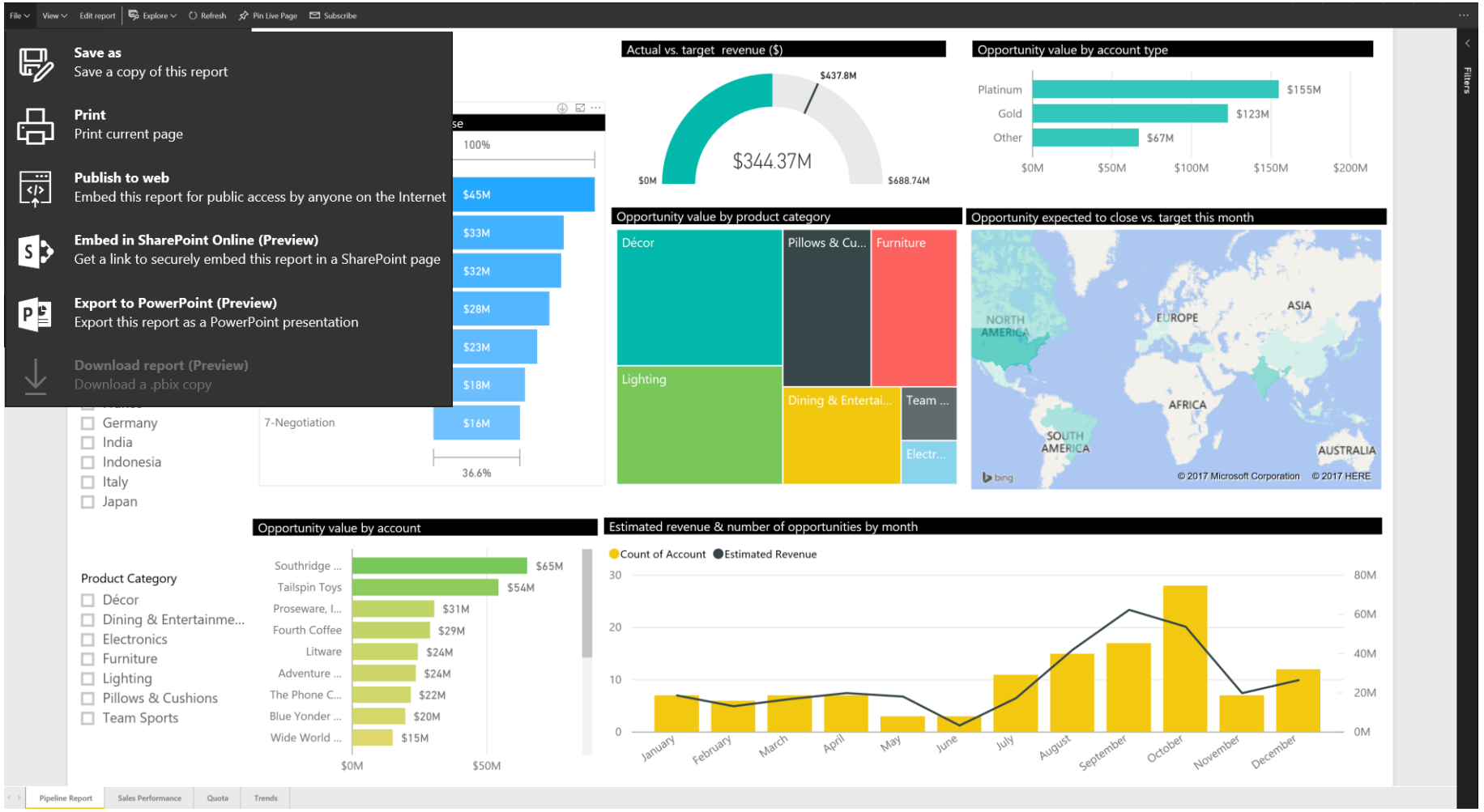
Pinning and Navigation

Report



Power BI Service

- Get Data
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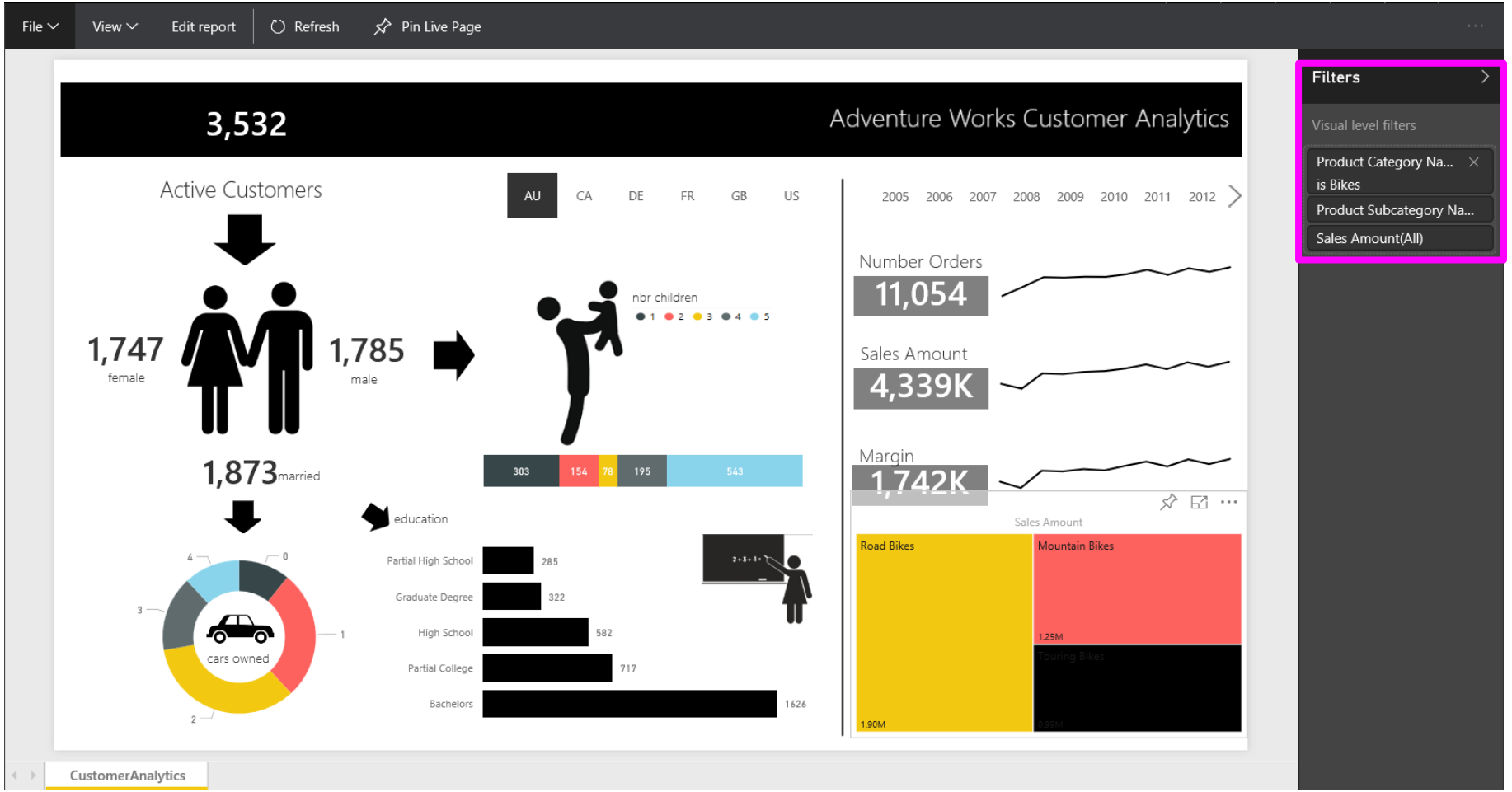
Pinning and Navigation

Report



Power BI Service

- Get Data
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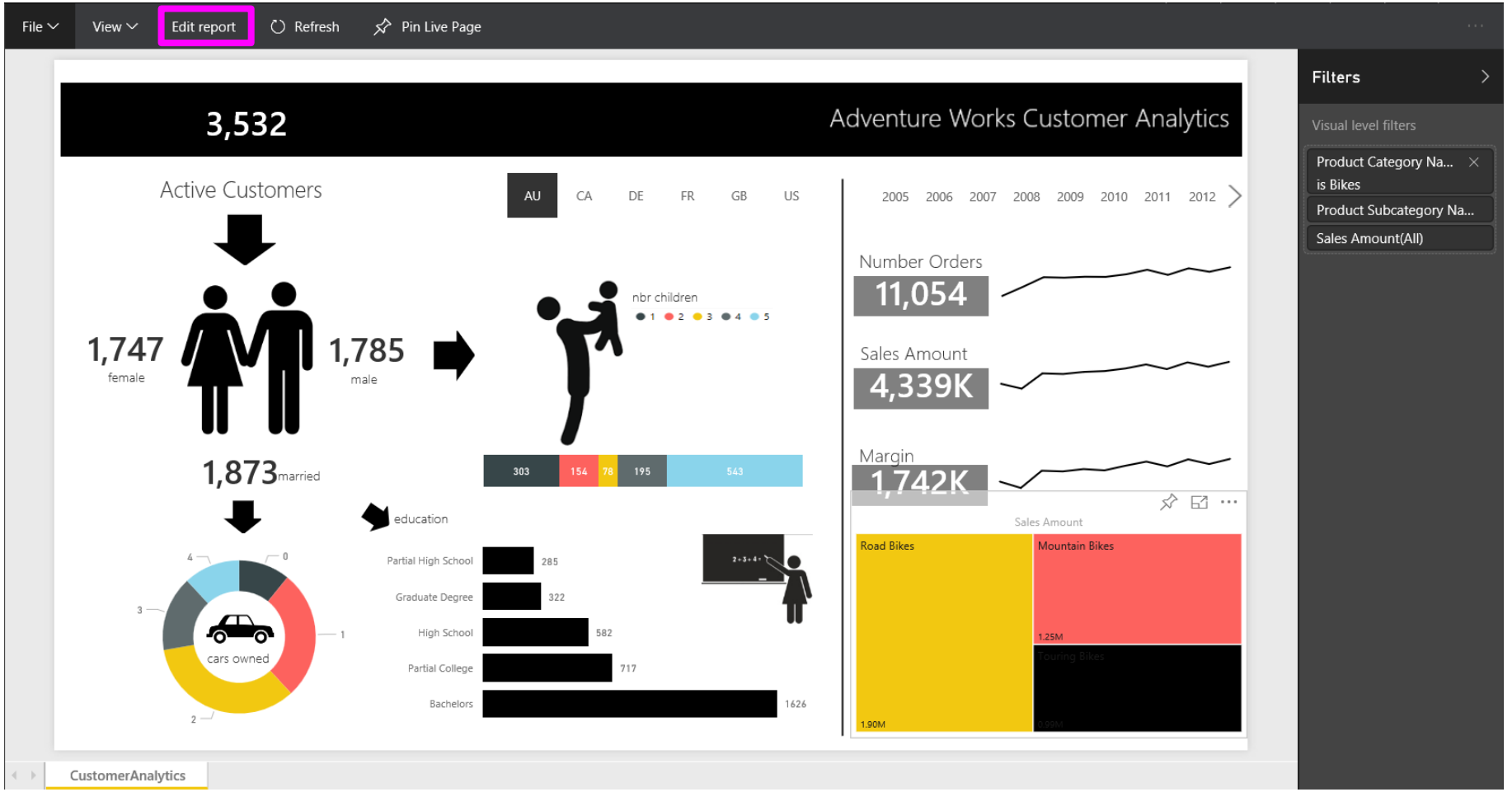
Pinning and Navigation

Report



Power BI Service

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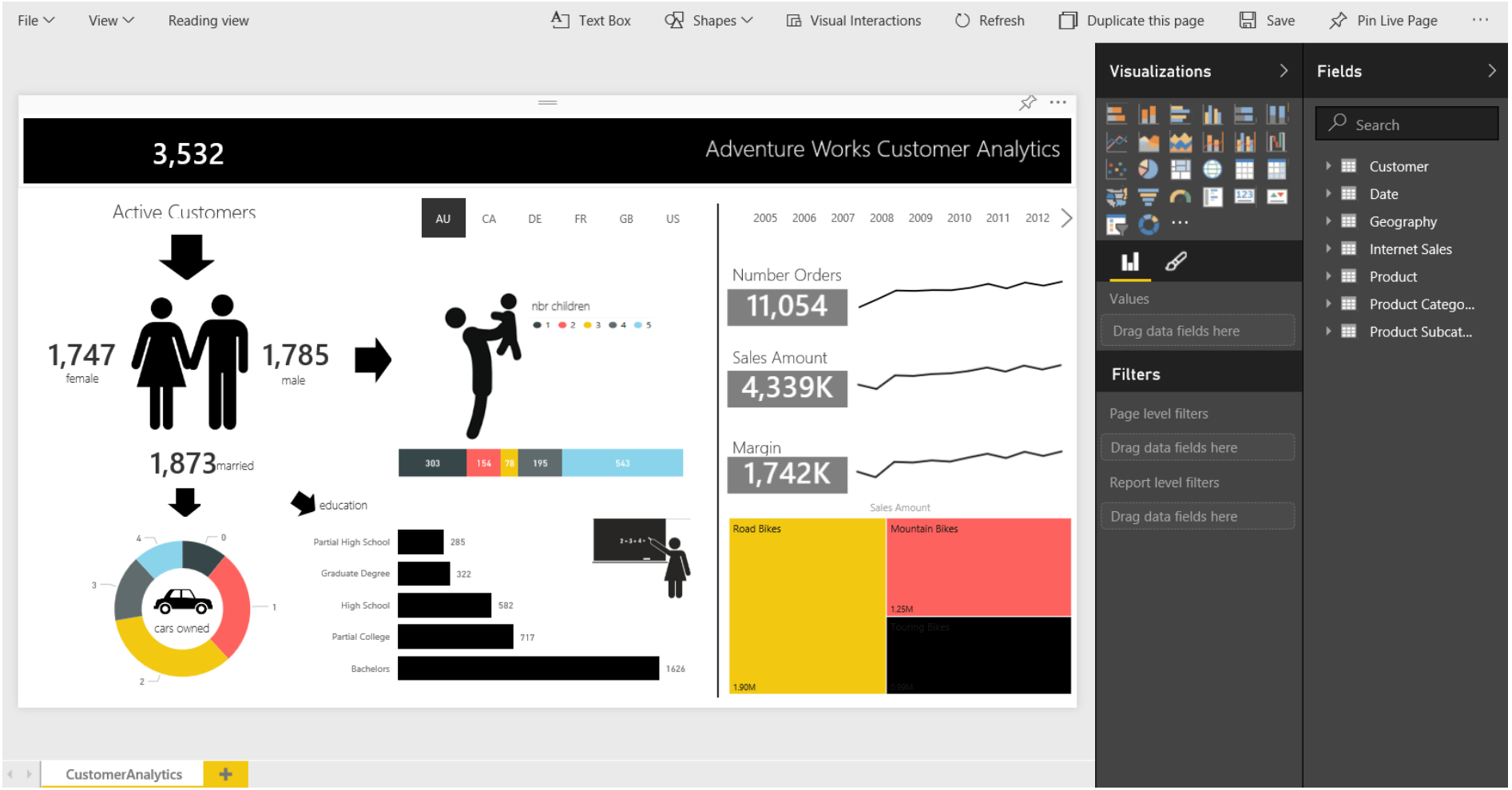
Pinning and Navigation

Report – Editing View



Power BI Service

- Get Data
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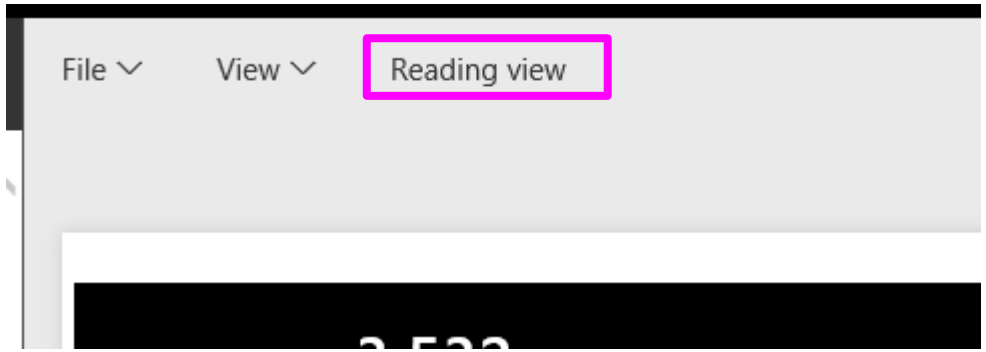
Pinning and Navigation

Report – Editing View

- It is possible to **alter** an existing report page or to **create** new pages in Editing View
- Similar reporting functionality to Power BI Desktop
- Can also use **Custom Visualizations**
- In the end a **Save** has to be done to commit the changes
- Click "Reading View" to return to that mode



Power BI Service

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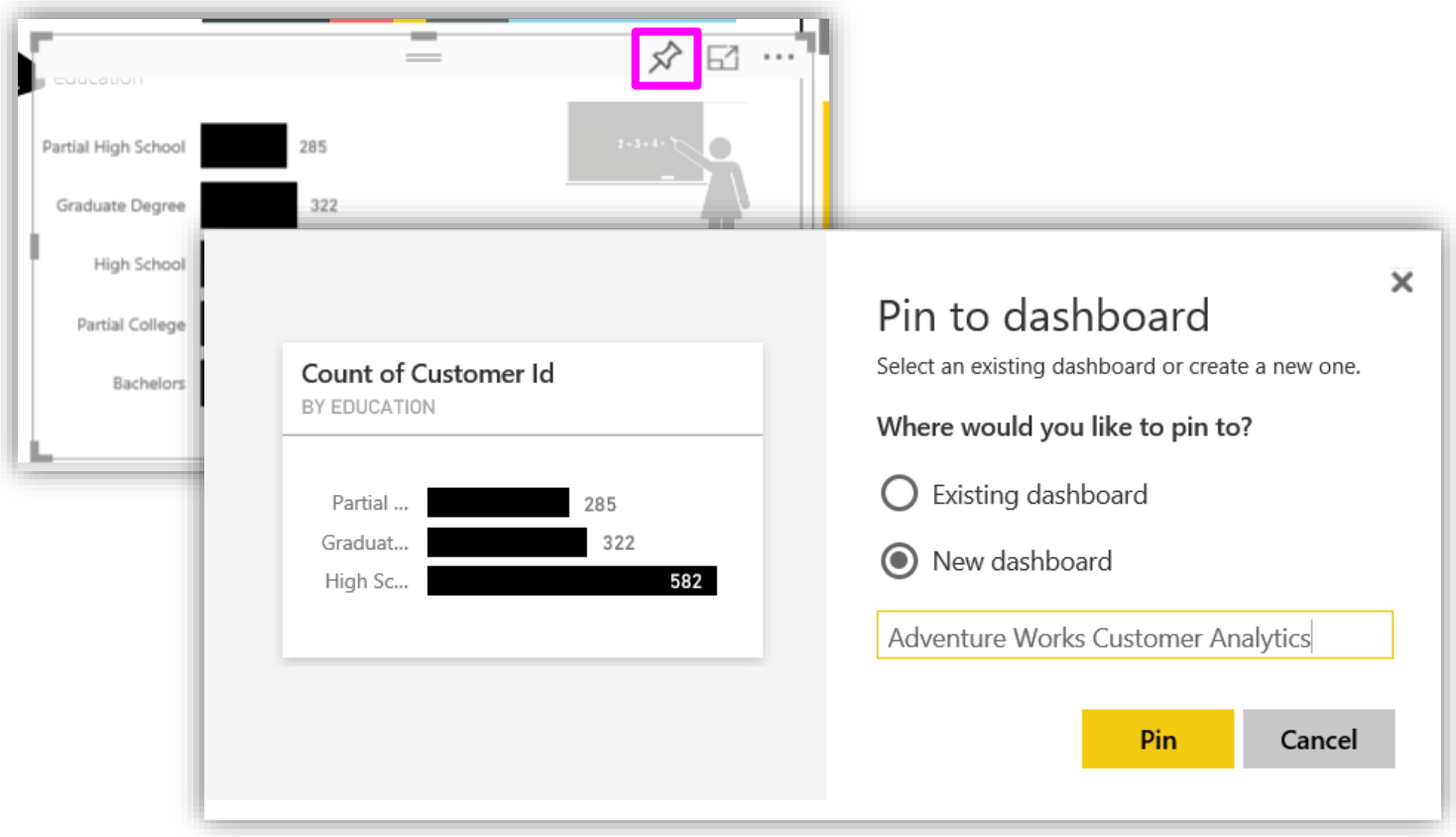
Pinning and Navigation

Report - Pinning

- **Individual visualizations** can be pinned to dashboards as **tiles**



Power BI Service

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Pinning and Navigation

Report - Pinning

- **Entire pages** can be pinned to dashboards

- They become **live tiles** and can be interacted with straight from the dashboard with the same interactivity as in Reading View
- When a change happens in this report, the **changes are synchronized to the dashboard**
- This **does not happen with individual visualizations**

Power BI Service

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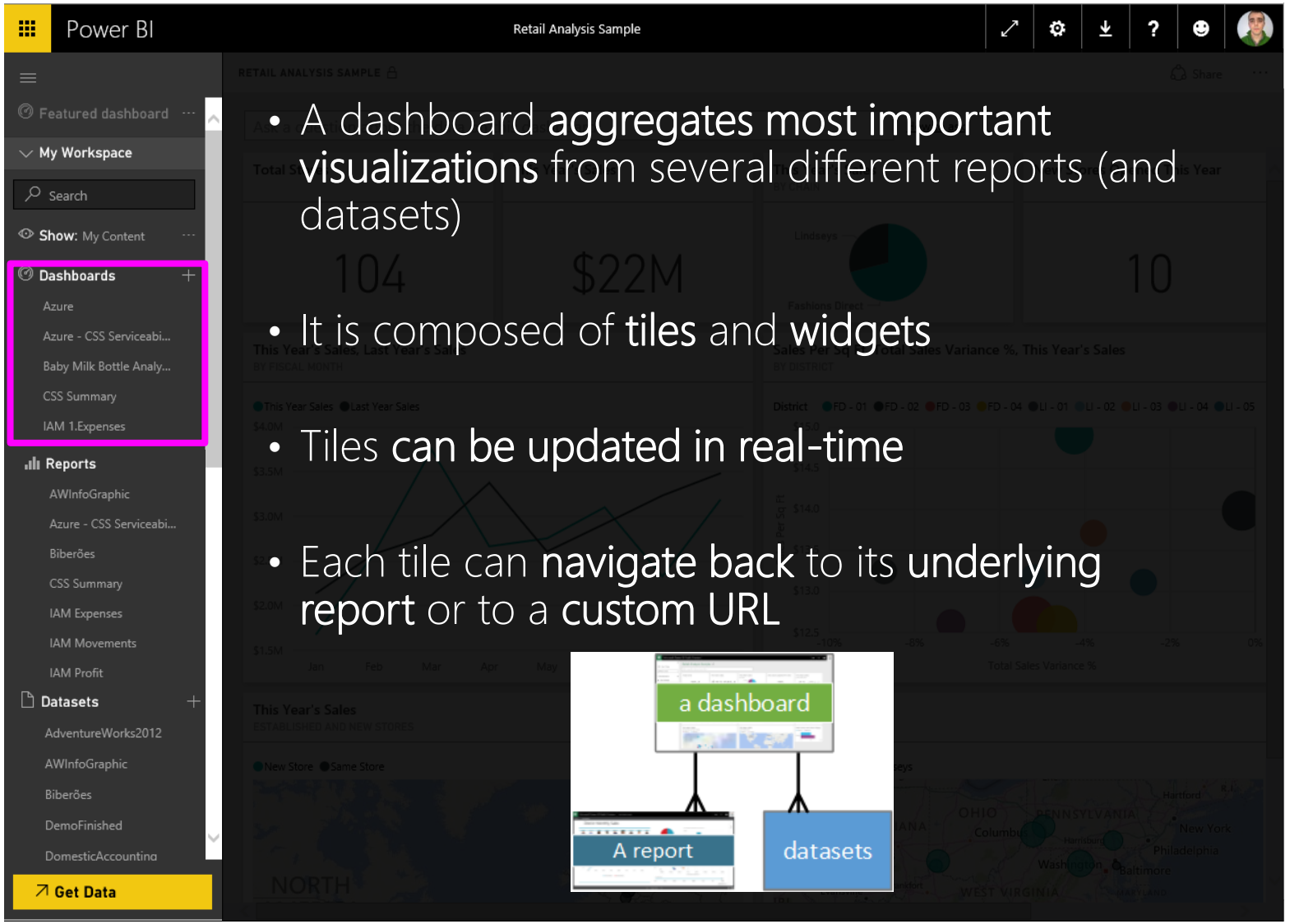
Pinning and Navigation

Dashboard



Power BI Service

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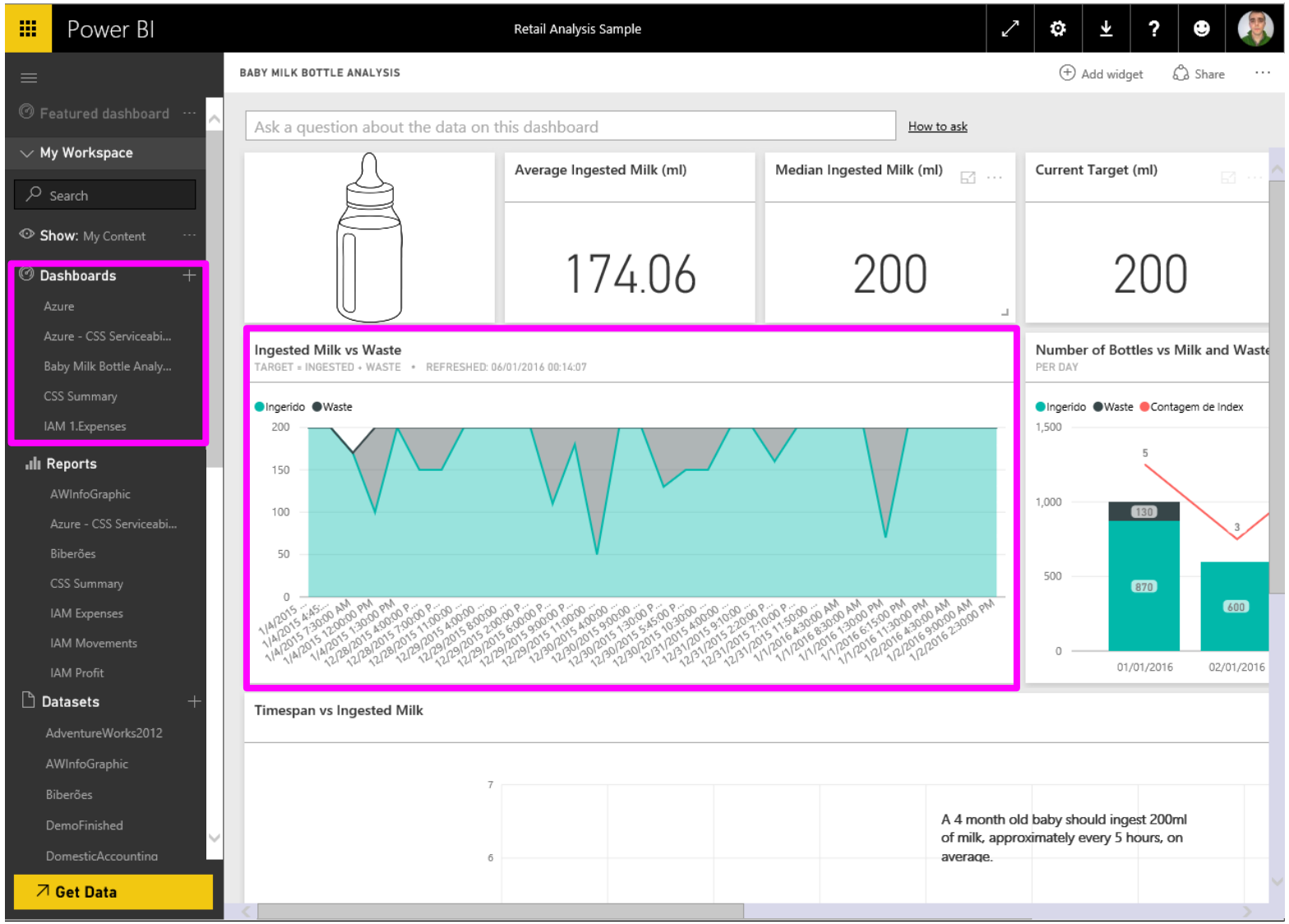
Pinning and Navigation

Dashboard - Tiles



Power BI Service

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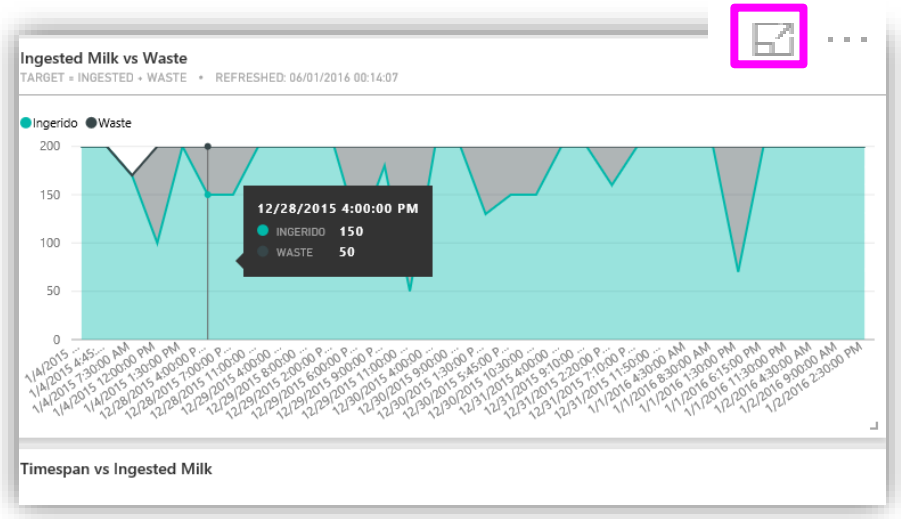
Pinning and Navigation

Dashboard - Tiles

- A tile can display a **tooltip**
- And can be open in **Focus Mode** maximizing it this way



- Interactivity is more limited than in reports except if a **Live Page** was pinned – in that case is the same

Power BI Service

- Get Data
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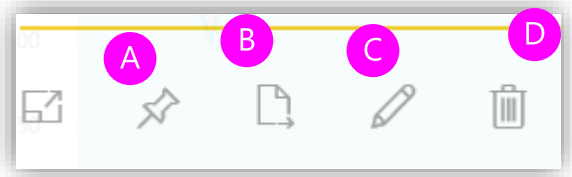
Pinning and Navigation

Dashboard - Tiles

- Additional options exist



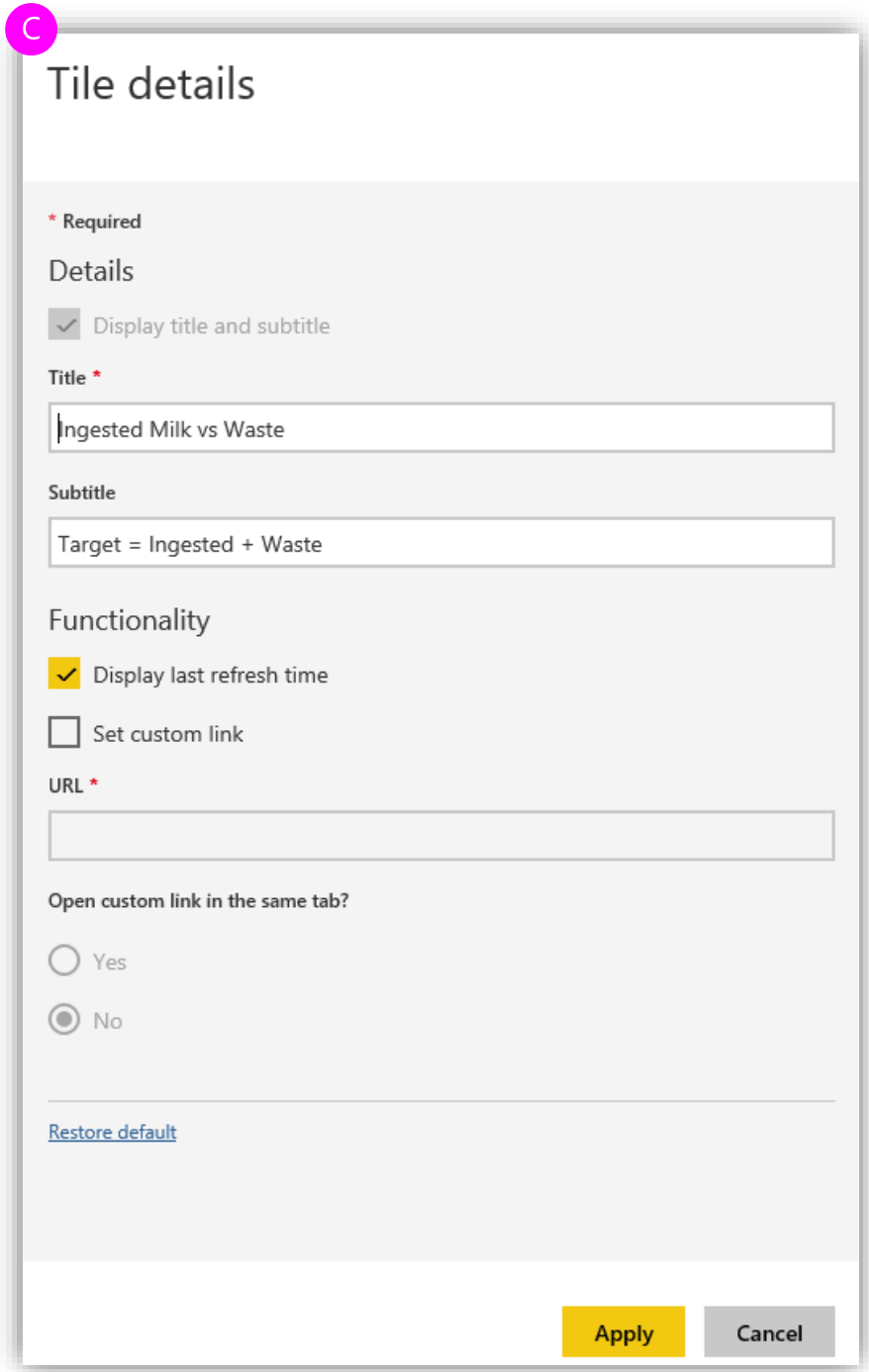
A Pin the tile to another dashboard

B Export its data as .csv file

C Edit Tile Details

D Delete Tile

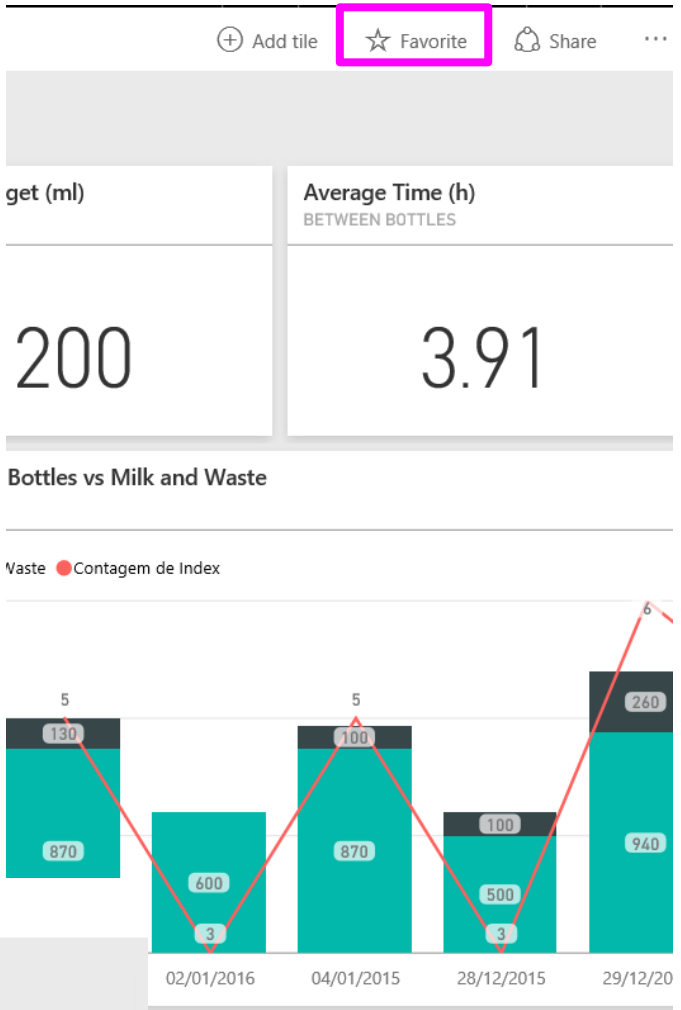
C

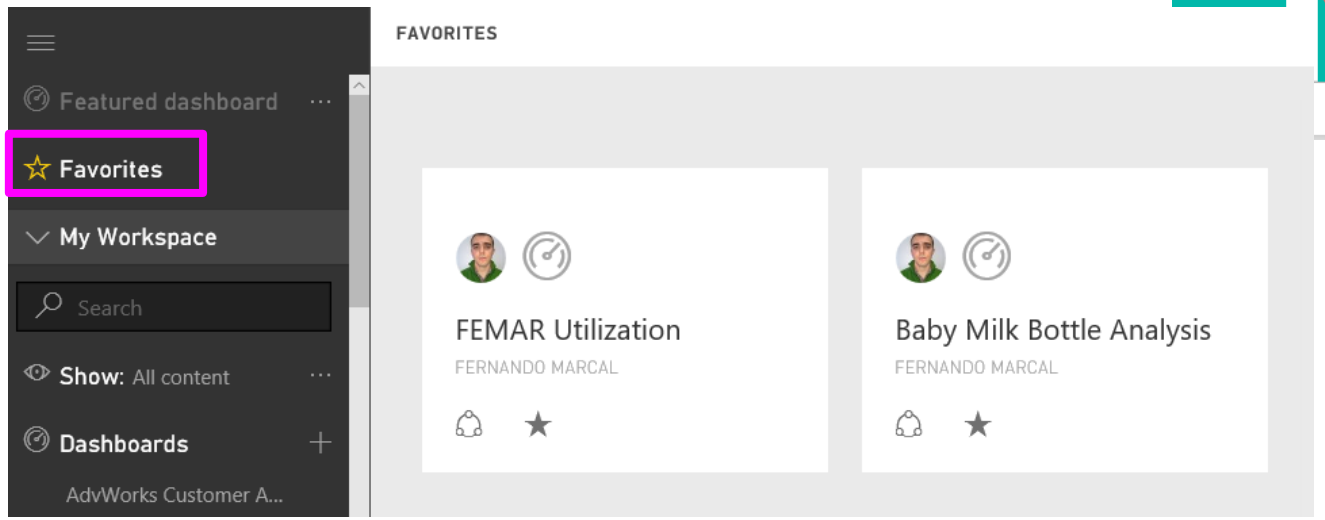


Pinning and Navigation

Dashboard - Favorites

- The most **relevant dashboards** can be defined as favorites
- They will appear in a **dedicated area**
- Work **across groups**
- **Fully synchronized across platforms** – can set or view from mobile app and Power BI Service





Power BI Service

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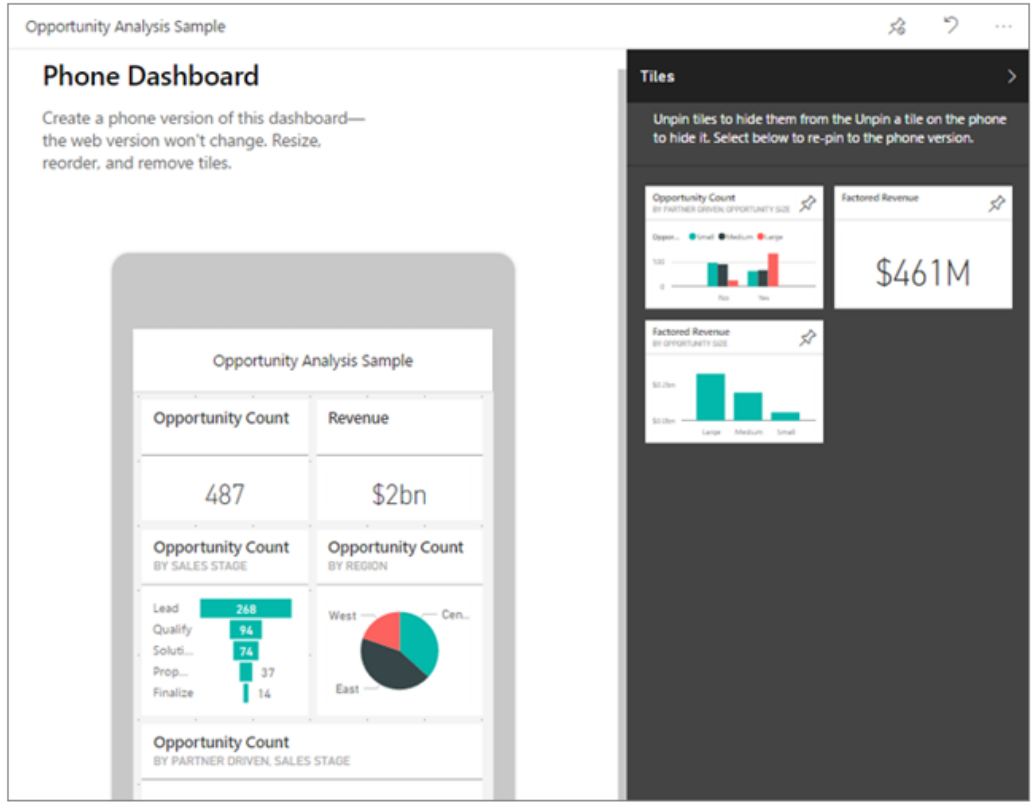
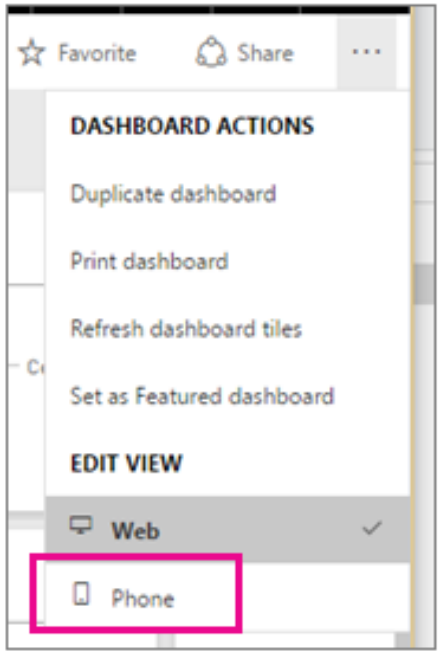
Pinning and Navigation

Dashboard – Phone View

- Create a **customized view** of any dashboard that you own specifically **for phones**
- **Drag, resize, pin/unpin** tiles to the phone view





Power BI Service

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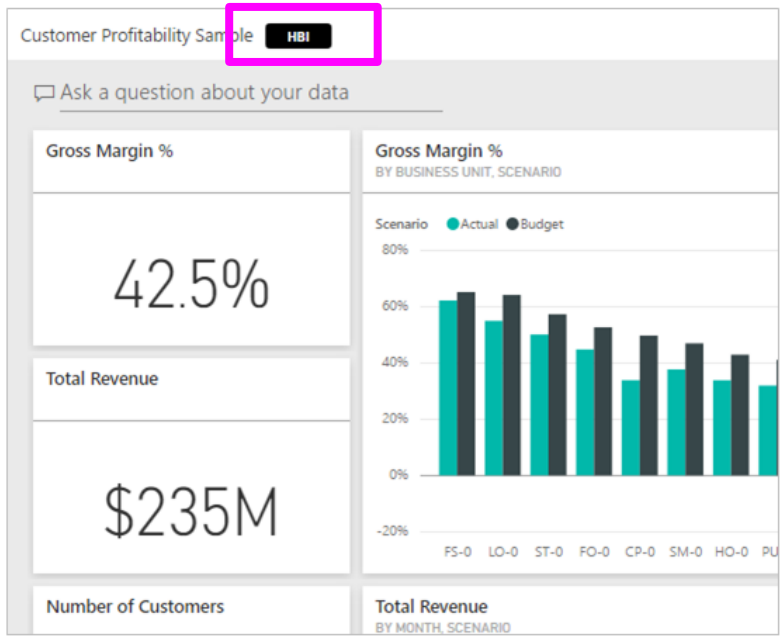
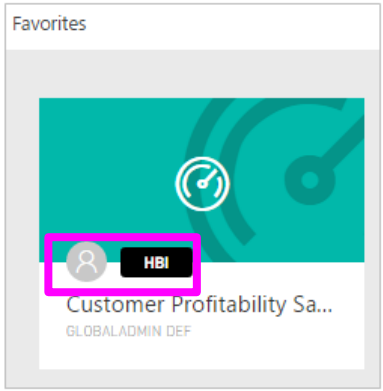
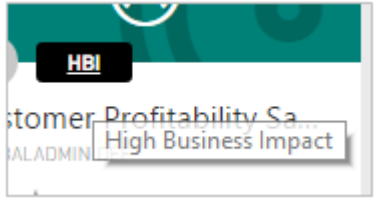
Pinning and Navigation

Dashboard – Data Classification

- **Raise awareness** of those viewing your dashboards about the **level of security** that should be used
- **Tag your dashboards** with classifications defined by your company's IT
- Tags show up **next to the dashboard name**
- **Hover over tag** to view full name of classification



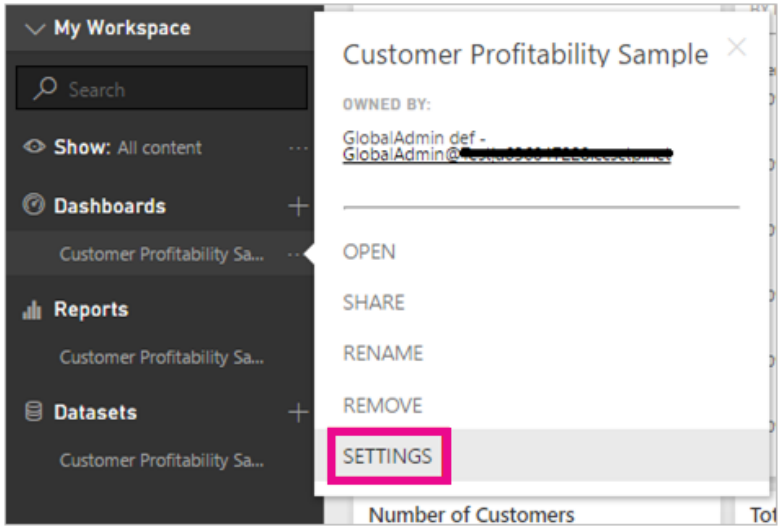


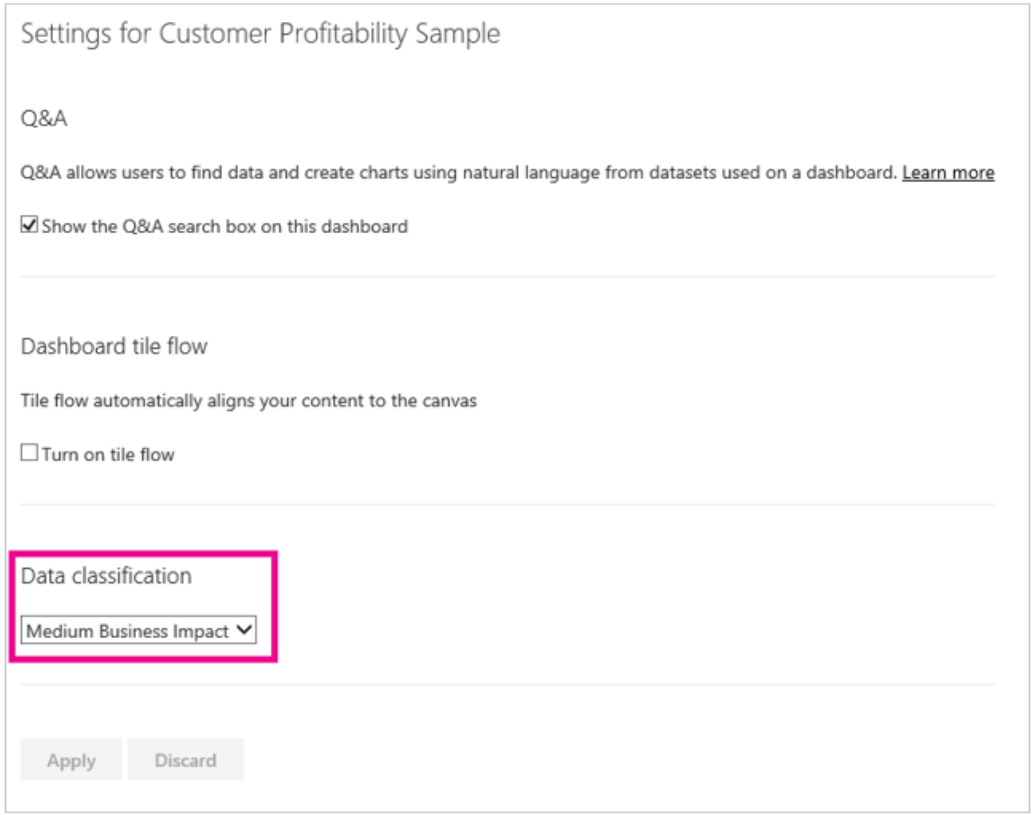


Pinning and Navigation

Dashboard – Data Classification

- All dashboards start out with a **default classification type**
- Dashboard **owner can change** the classification

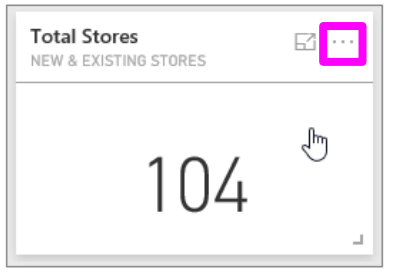


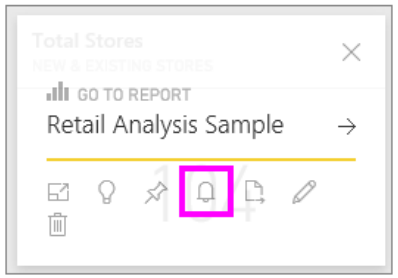


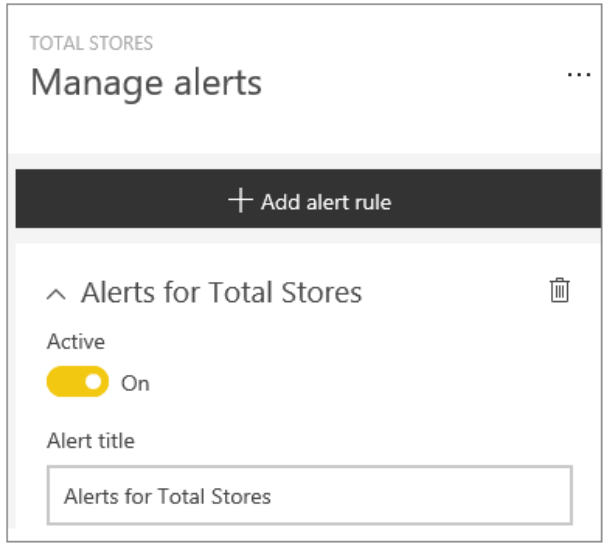
Pinning and Navigation

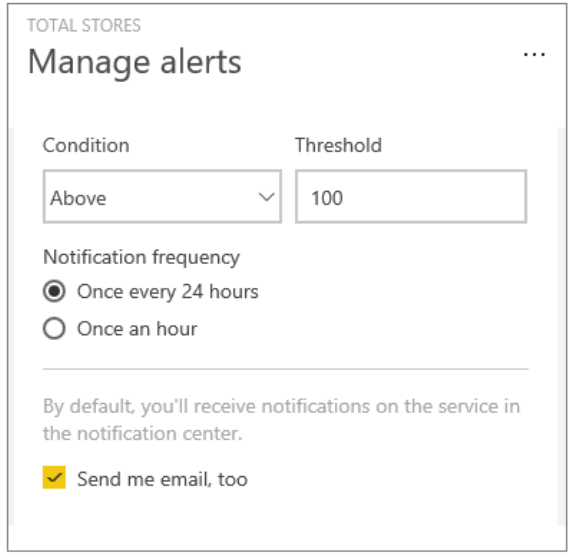
Dashboard – Data driven alerts

- **Get notifications** when a metric on your dashboard exceeds a set threshold
- Alerts work for **numeric tiles** featuring cards and gauges
- **Fully synchronized** across platforms – set and view alerts in mobile app and Power BI Service.









Power BI Service

- Get Data
- **Pinning and Navigation**
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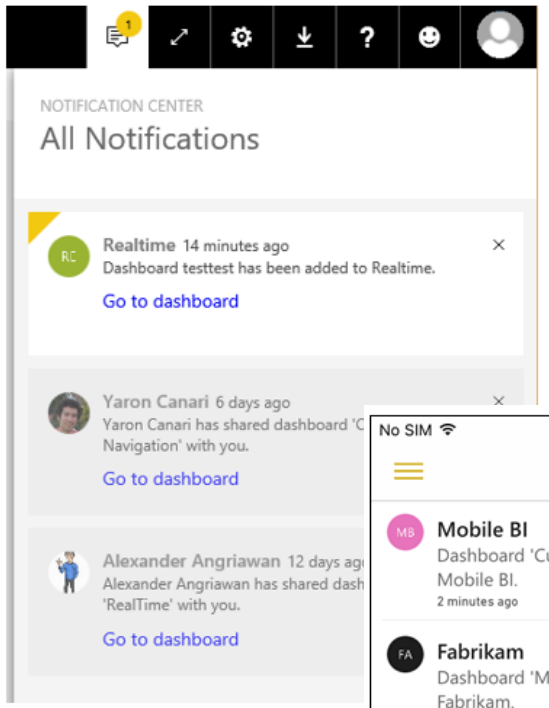
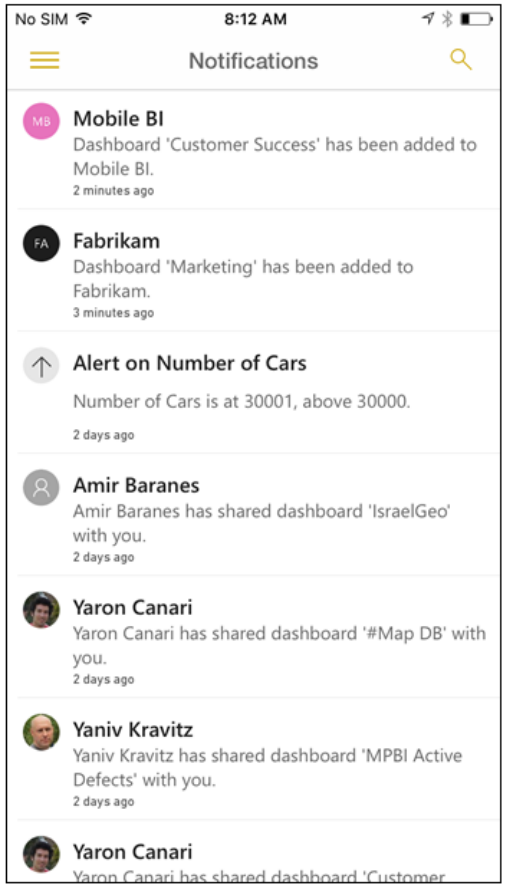
Pinning and Navigation

Power BI Notification Center

- **Important information** related to your Power BI experience in **one place**
- Notification on **all platforms** – web (Power BI Service) and mobile app
- Includes **data driven alerts**

.





Power BI Service: Sharing

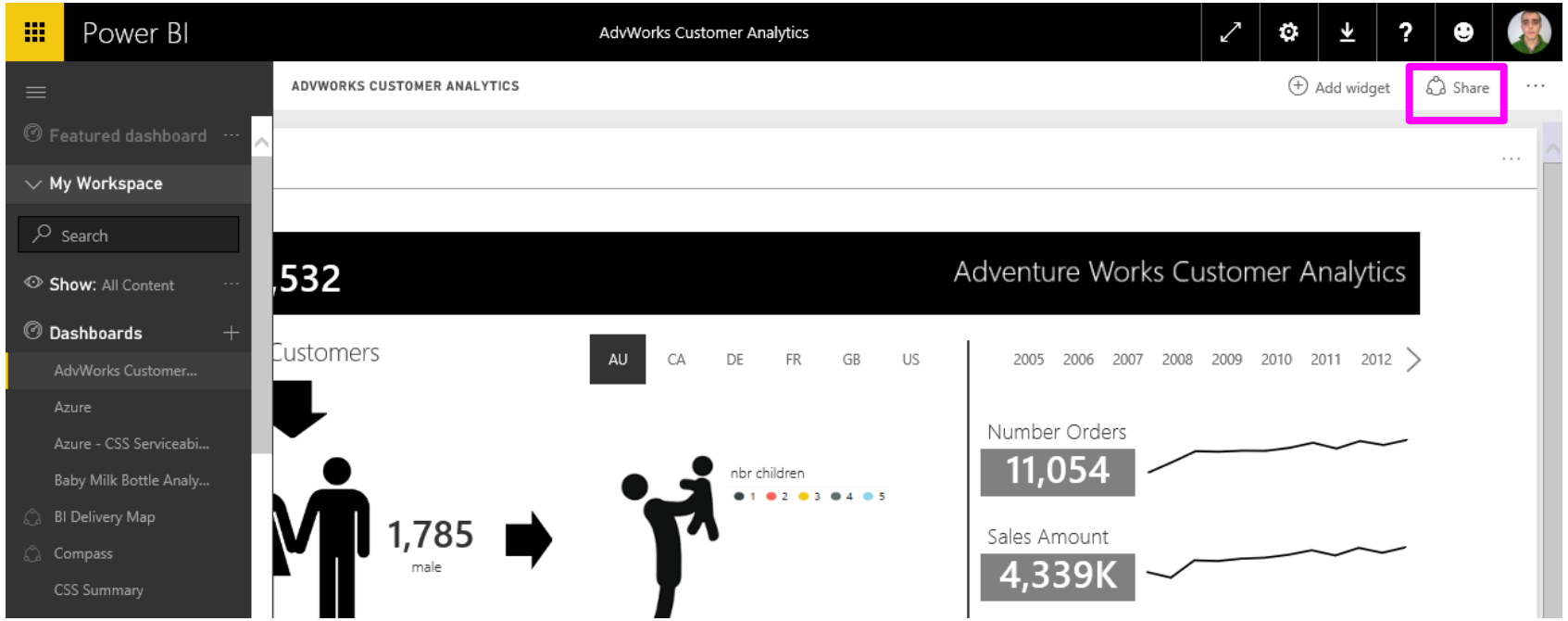
Power BI Service

- Get Data
- Pinning and Navigation
- Keeping Data Current
- Q&A and Quick Insights
- **Sharing**
- Connect from Excel
- Mobile Reports

Sharing

Peer-to-peer/Peer-to-distribution group

- It is possible to **share dashboards** and **underlying reports** with colleagues **inside and outside** of your organization
- The **share happens at the dashboard level** and each recipient gets an additional dashboard and reports in their **My Workspace**



Power BI Service

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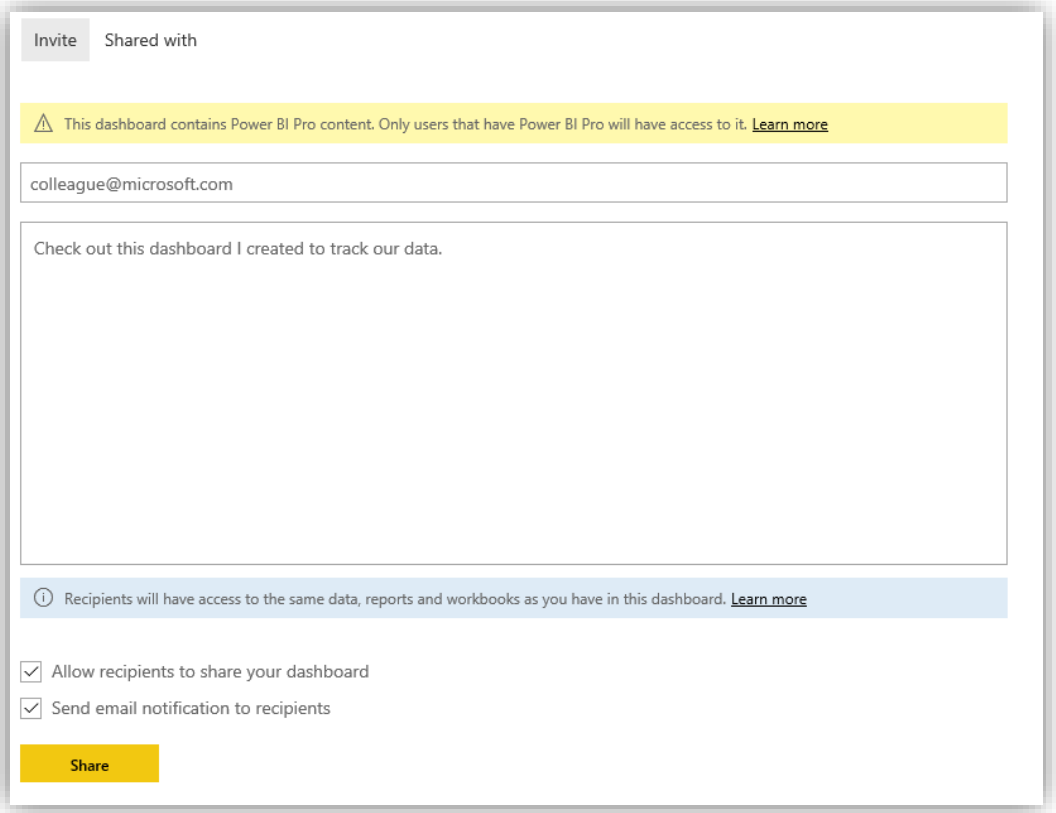
Sharing

Peer-to-peer/Peer-to-distribution group

- Recipient e-mail can be a **distribution group** (if using O365 for email)
- Can **control if recipients can re-share**
- Recipients get an **e-mail with a link** (lasts one month)
- A shared dashboard appears with the symbol 



Sharing

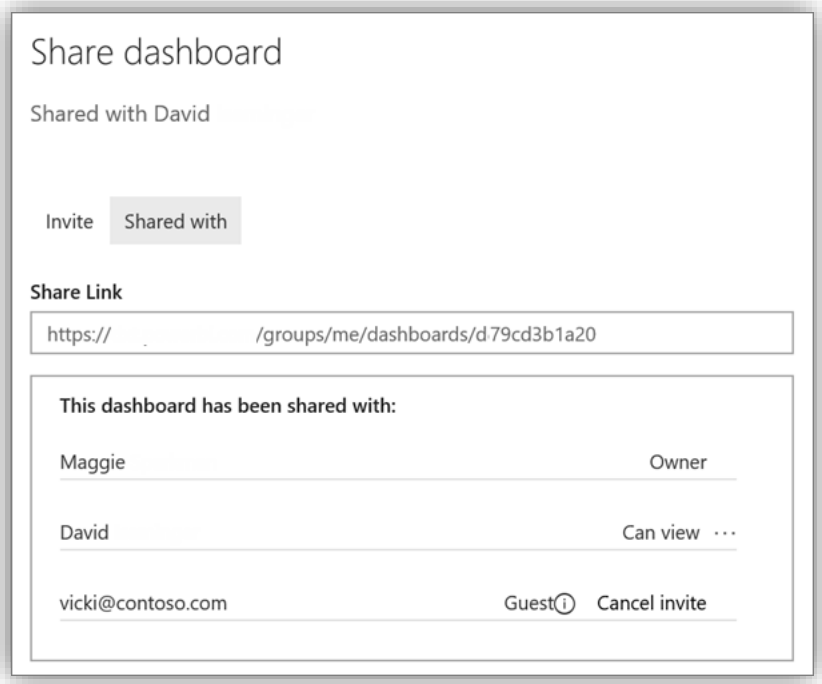
Peer-to-peer/Peer-to-distribution group

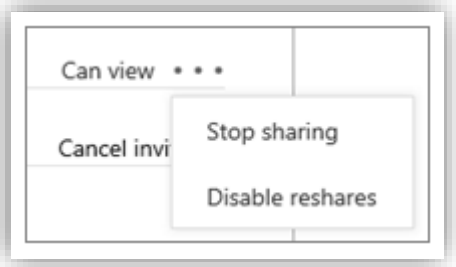
- Recipients can **see the dashboard** and **interact with reports in Reading View**
- **Changes** made by the **owner** are **available for everyone** when saved
- **No one can see the dataset**
- When re-sharing is enabled, users outside the organization can also share if their domain is registered in your tenant.
- If users already have access to a dashboard, they can **access it directly via the dashboard's URL**
- **Users outside the organization** have to **bookmark the URL,** it will not appear in their My Workspace

Sharing

Peer-to-peer/Peer-to-distribution group

- It is possible to see with **whom** the dashboard is **currently shared** and **revoke re-sharing** rights individually
- People outside the organization are listed as **Guest**

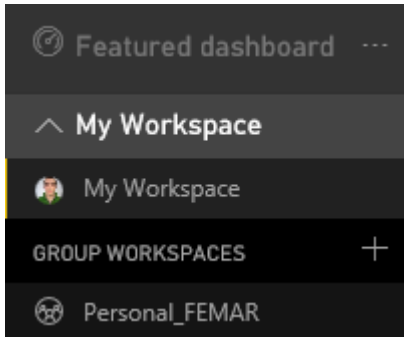




Sharing

Group Share

- Groups in Power BI are **O365 groups** and can be used in other services such as OneDrive or Exchange (have their own space and e-mail).
- AADSync can be used to **sync on-premises AD groups** with O365 groups
- A group has its **own workspace** with its own Datasets, Reports and Dashboards
- A user has **one My Workspace** but can have **access to several Group Workspaces**



Sharing

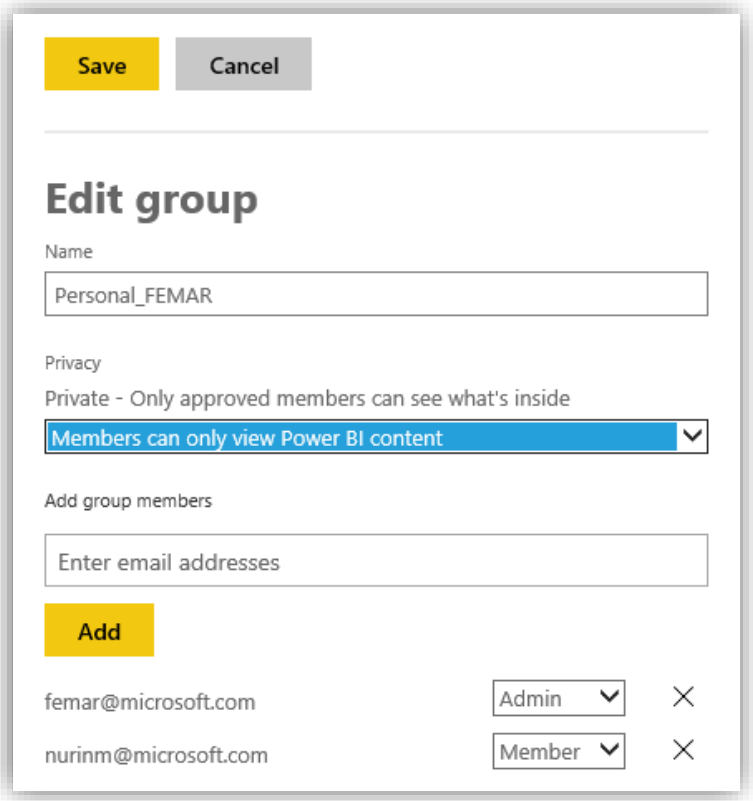
Group Share

- Members of the group can either have **Can Only View** or **Can Edit** permissions
- **Can Only View** allows the users to see all of the **dashboards and reports** that belong to that group. Access is **read-only**
- **Can Edit** allows the users to see and edit all of the content
- A dashboard in a Group can also be **shared with another peer directly** via the peer-to-peer method.
- A group workspace allows **several people to take ownership** of a certain set of content
- It also **allows the content to be organized** according to your governance rules (department, business area)

Sharing

Group Share

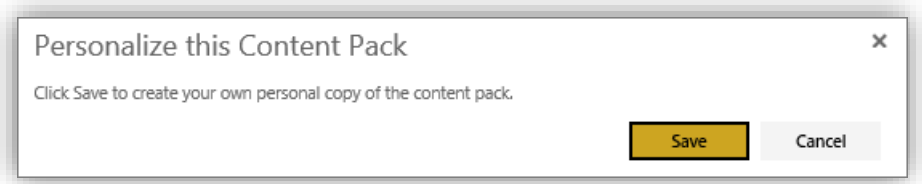
- Members with **Admin** can manage access to the group
- **Access is set** to either View or Edit for **everyone** in the group (except Admins)



Sharing

Organizational Content Packs

- **Distribute to a large audience** a set of dashboards, reports and datasets
- Users can **subscribe** to the Pack **via the Get Data** experience
- **Access** to the content is **read-only**, but users can **customize by creating a copy** of their own



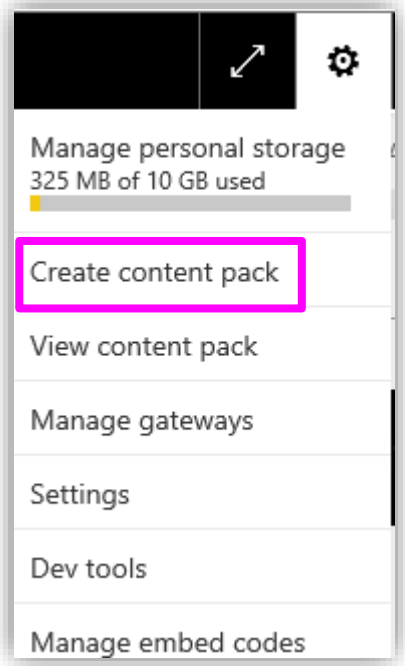
- **Schedule refresh** is set by author
- Can be used in conjunction with **Groups**
- **Can be edited** after creation

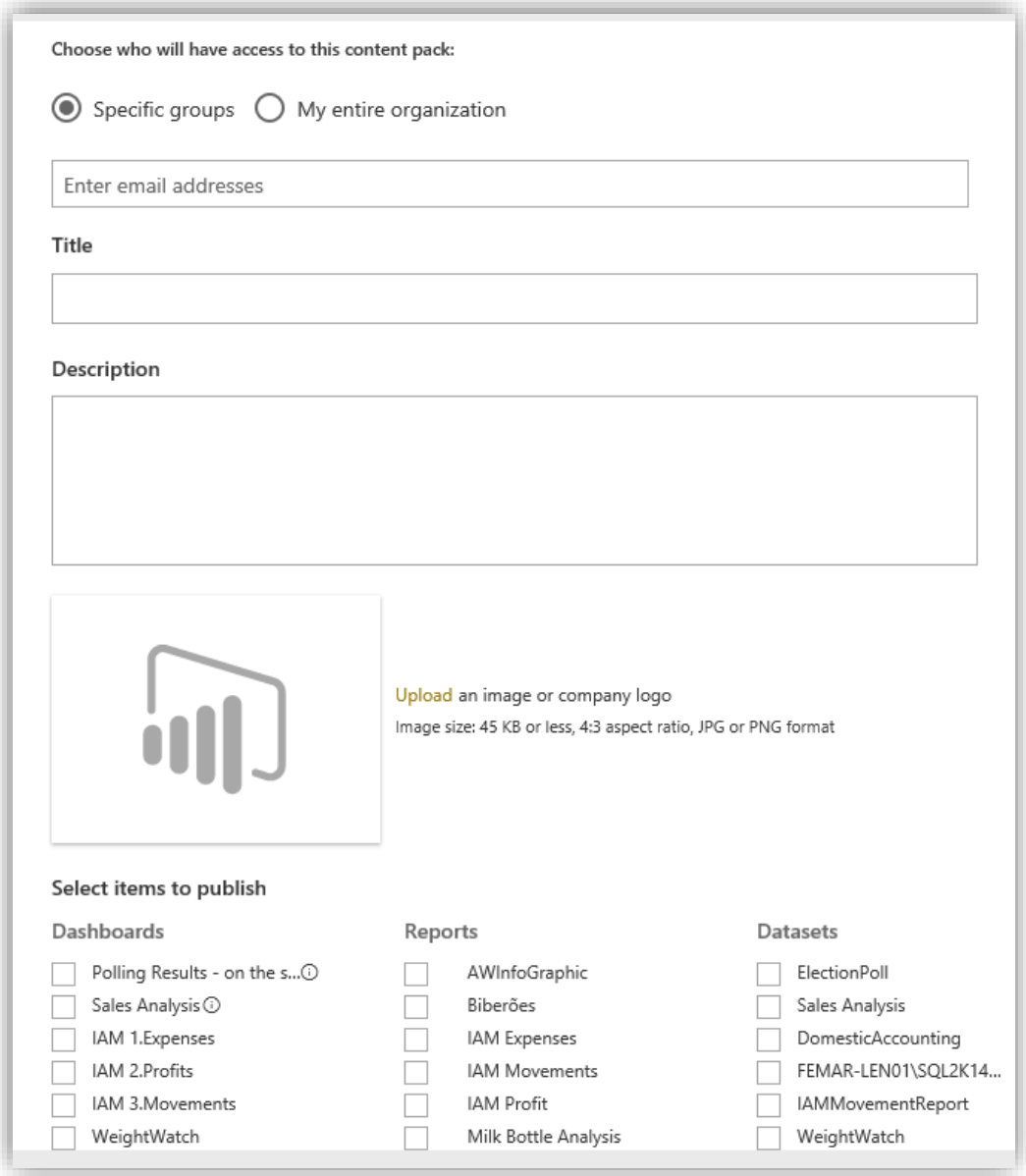
Power BI Service

- Get Data
- Pinning and Navigation
- Keeping Data Current
- Q&A and Quick Insights
- **Sharing**
- Connect from Excel
- Mobile Reports

Sharing

Organizational Content Packs

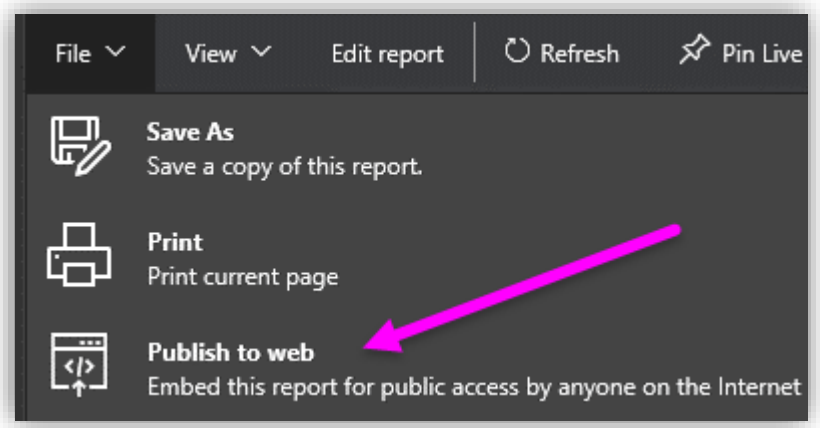




Sharing

Public Share

- **Embed interactive visualizations online** such as blog posts, websites or social media
- Visuals can be edited, updated, refreshed or un-shared after publishing
- Sharing starts on a report



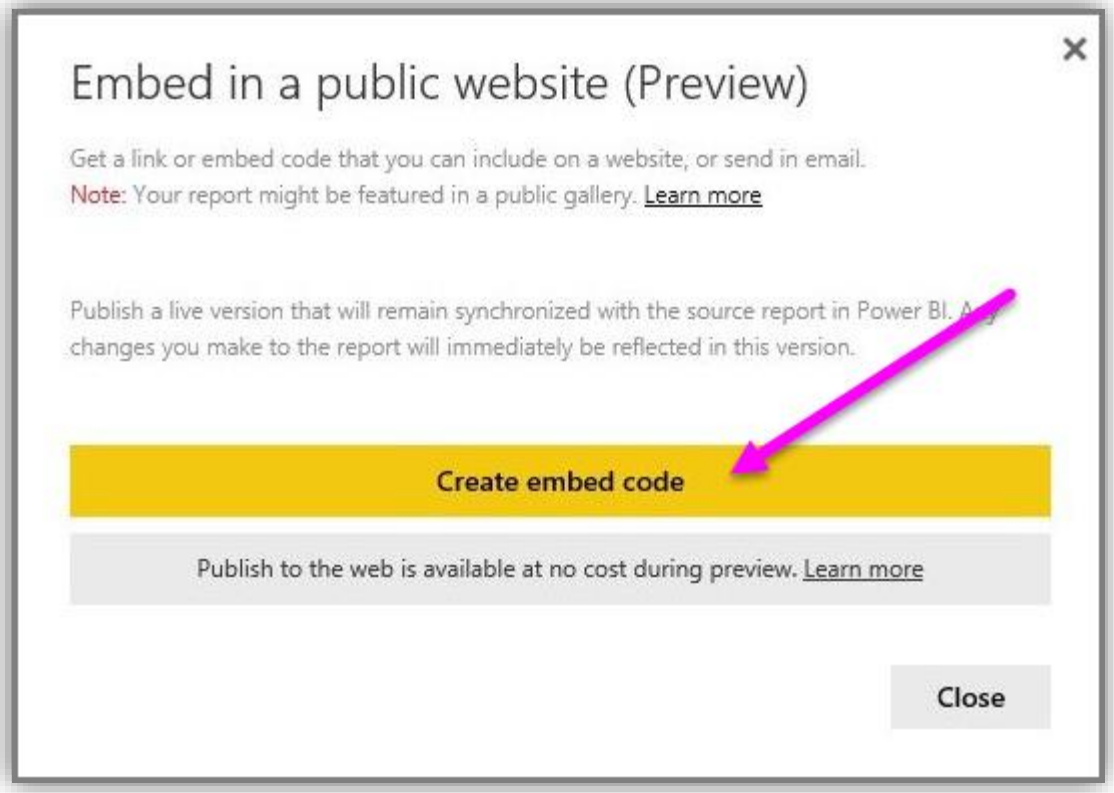
Power BI Service

- Get Data
- Pinning and Navigation
- Keeping Data Current
- Q&A and Quick Insights
- **Sharing**
- Connect from Excel
- Mobile Reports

Sharing

Public Share

- A link and html code will be generated



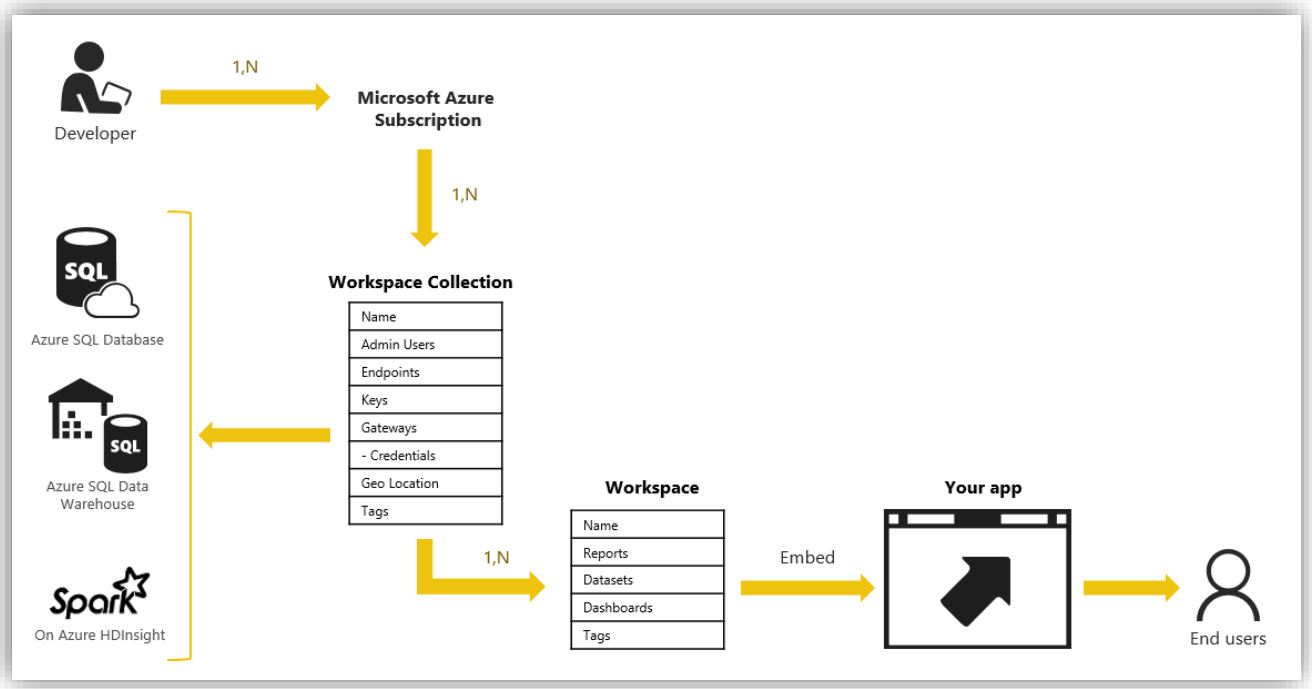
Power BI Service

- Get Data
- Pinning and Navigation
- Keeping Data Current
- Q&A and Quick Insights
- **Sharing**
- Connect from Excel
- Mobile Reports

Sharing

Power BI Embbeded

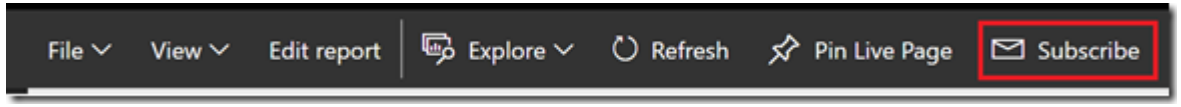
- Is a new **Azure service** that allows the inclusion of Power BI **visualizations** inside of **custom desktop or mobile apps** (through iframe)
- Users of the **application** don't need to be Power BI users (pricing is per rendering)

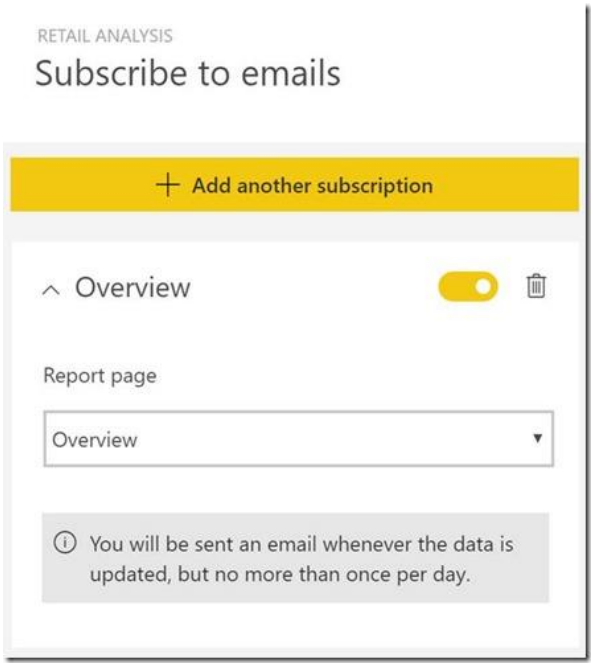


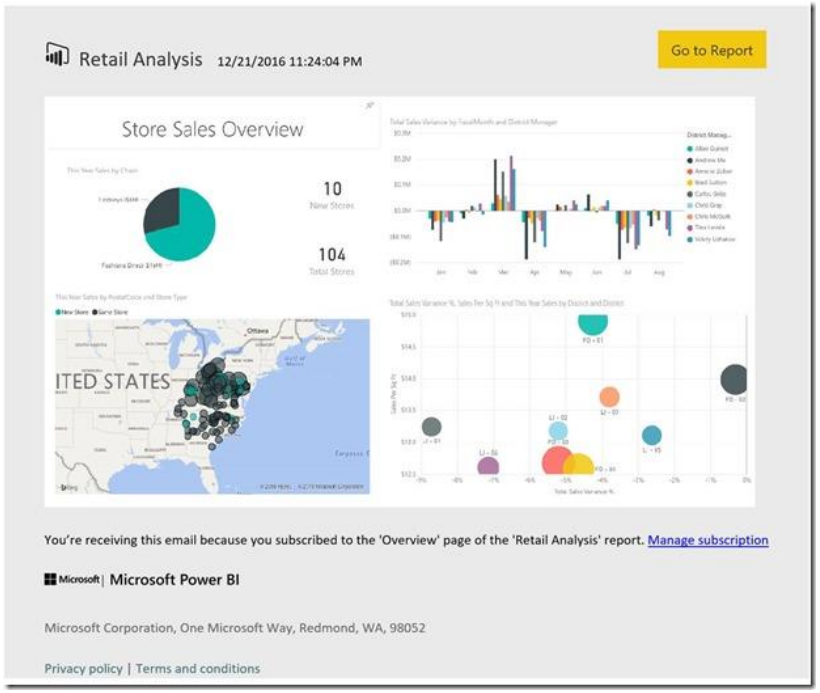
Sharing

E-mail subscriptions

- With Power BI **e-mail subscriptions**, you can quickly subscribe to emails of the report pages that matter most.
- Once subscribed, Power BI will regularly **send screenshots** of that report page directly to your inbox whenever the **data changes**.







Power BI Service: Mobile Reports

Mobile Reports

Mobile Apps – Platforms

- Apps are available for **iPad**, **iPhone**, **Apple Watch**, **Android** and **Windows** Devices

- **Features may vary across platforms** but tend to be the same in the future

- The mobile apps can also to be used with **SQL Server 2016 Mobile Reports and KPIs** and require no Power BI licensing

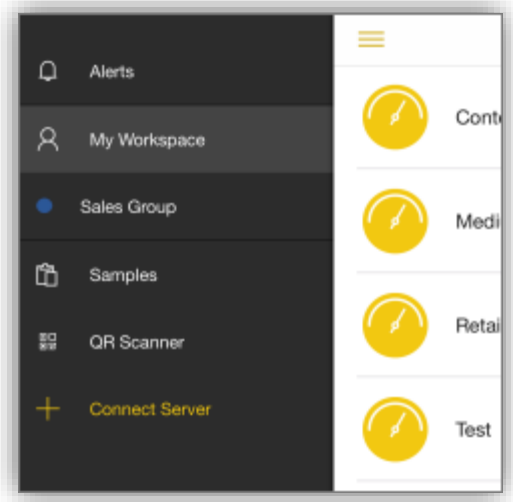
Power BI Service

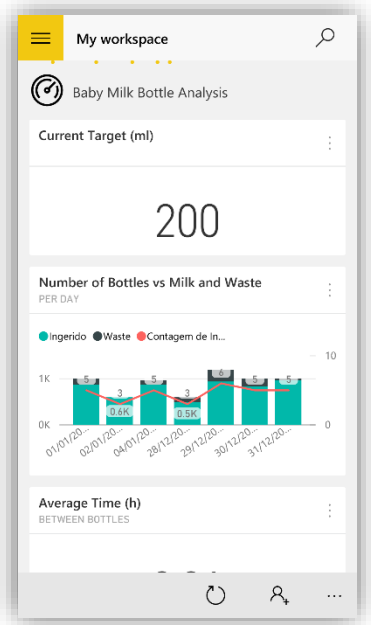
- Get Data
- Pinning and Navigation
- Keeping Data Current
- Q&A and Quick Insights
- Sharing
- Connect from Excel
- **Mobile Reports**

Mobile Reports

Mobile Apps – Dashboards

- **Interact** with dashboards in **your workspace** or **groups'**
- When the dashboard is open it displays a series of tiles and **supports real-time**
- **Flip it** to display the entire dashboard and **pinch** to zoom





Power BI Service

- Get Data
- Pinning and Navigation
- Keeping Data Current
- Q&A and Quick Insights
- Sharing
- Connect from Excel
- **Mobile Reports**

Mobile Reports

Mobile Apps – Offline

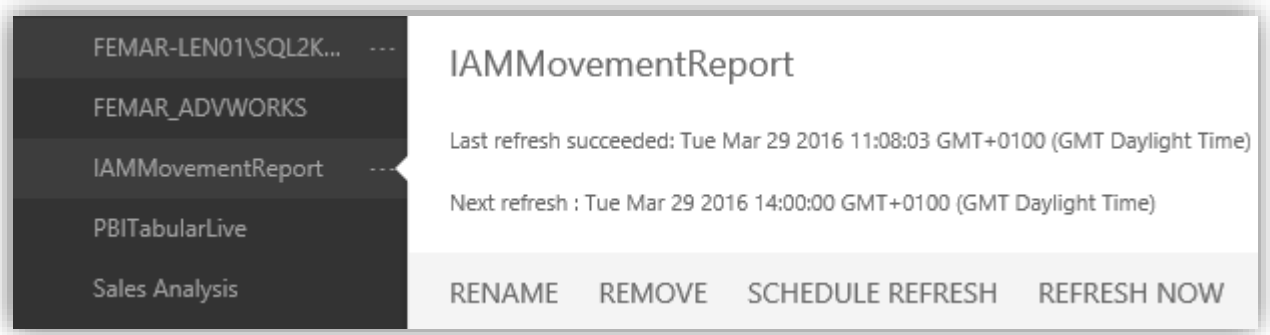
- While you are offline you can access **all of your dashboard in My Workspace**
- You can also access any **previously accessed dashboards**
- You have read-only access to **reports previously accessed, but no interactivity**
- **Visual queues for available content** exist for ease of use
- **Power BI refreshes the data automatically every two hours** on the device (can be turned off). The **cache lasts indefinitely**.
- 250 MB limit for data offline
- Whole Excel workbooks are not available

Power BI Service: Keeping Data Current

Keeping Data Current

Data Refresh

- When a **dataset** is created in Power BI it might have several **data sources**



- When you refresh data in Power BI, you're updating data in the dataset with new data coming from data sources
- Some data sources might be **live or self-updateable**
- **Refresh Now** performs the operation immediately based on the definition of the data sources

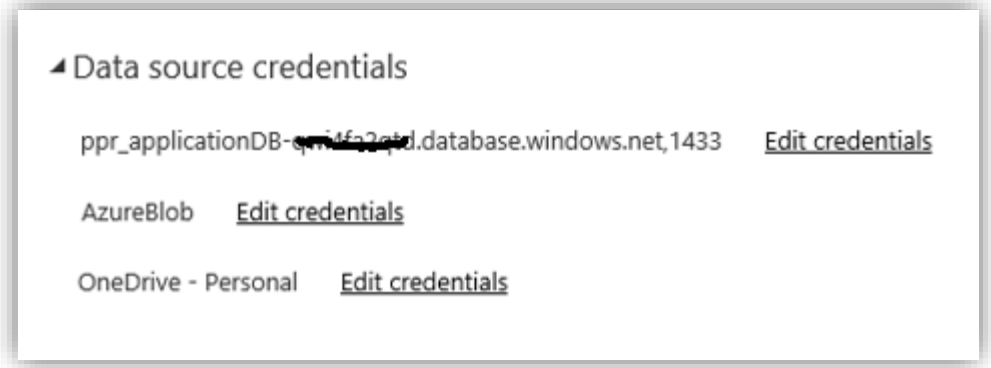
Power BI Service

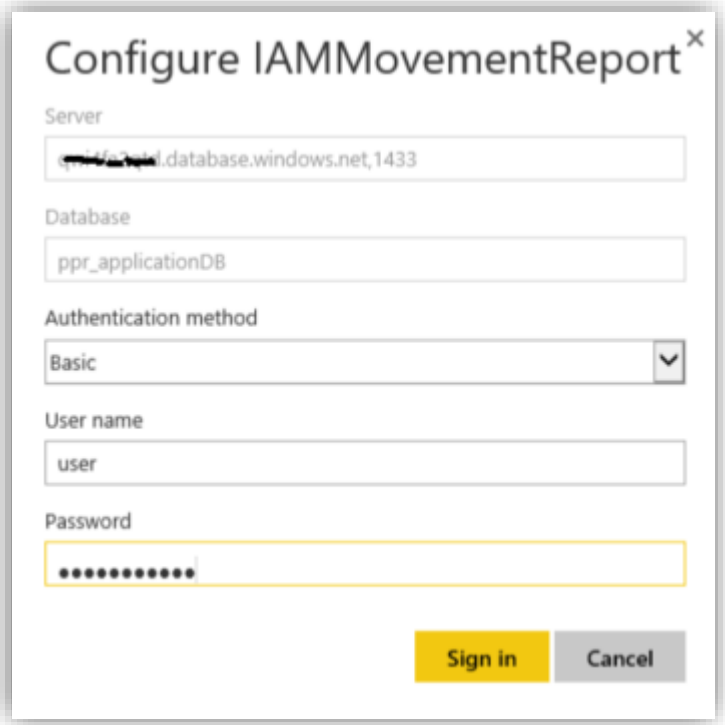
- Get Data
- Pinning and Navigation
- **Keeping Data Current**
- Q&A and Quick Insights
- Sharing
- Connect from Excel
- Mobile Reports

Keeping Data Current

Data Refresh

- The **Scheduled Refresh** option allows configuration of **credentials** and schedule

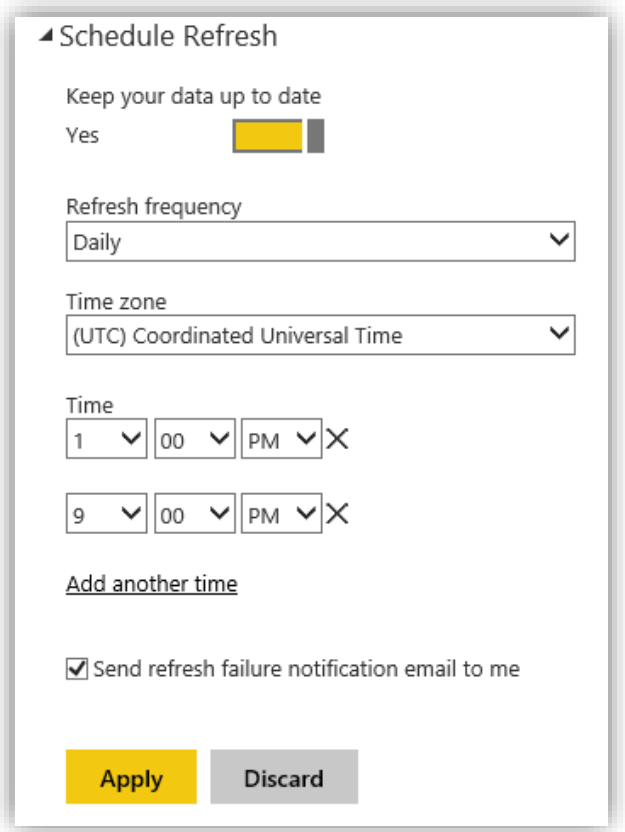


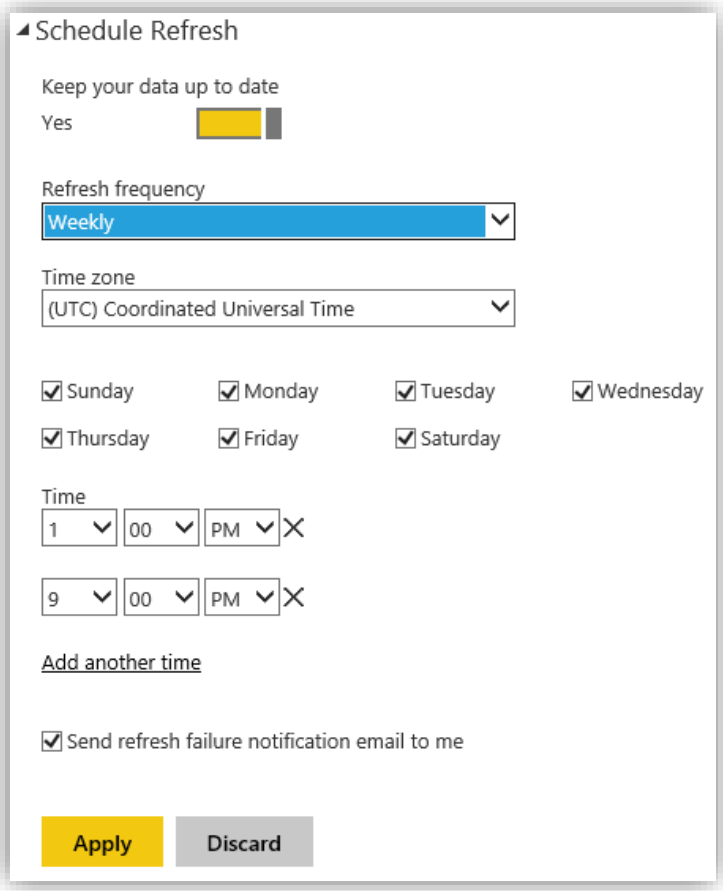


Keeping Data Current

Data Refresh

- The **Scheduled Refresh** option allows configuration of credentials and **schedule**





Power BI Service


Get Data


Pinning and Navigation


Keeping Data Current


Q&A and Quick Insights


Sharing


Connect from Excel


Mobile Reports

Keeping Data Current

Data Refresh – Data Source Types

- **Automatic Refresh** – no user configuration necessary
  - **Content packs from SaaS providers** – typically once a day
  - **Files loaded from OneDrive/Sharepoint Online** – happens every hour (can be overridden)
- **Live with Direct Query** – Data is always in sync with the data source. No schedule can be defined
  - SQL Azure Database
  - SQL Azure Data Warehouse
  - Spark on HDInsight
  - SSAS (Multidimensional and Tabular) – requires a Gateway and allows row-level-security
- **Real-time data coming from Power BI API or Microsoft Stream Analytics**
- **Refreshable Data Sources** – a schedule can be defined in Power BI service
  - SQL Azure Database
  - SQL Server On-Premises – requires a Gateway
  - File stored in OneDrive
  - …

Power BI: Pro vs. Free

Power BI portfolio

Power BI Desktop	Power BI Free	Power BI Pro	Power BI Premium
Licensed by user	Licensed by user	Licensed by user	Licensed by capacity
Free report authoring and ad-hoc data exploration	Quick, easy-to-use self-service analytics for **personal use**	Quick, easy-to-use **self-service** analytics for users requiring **collaboration**, dashboard sharing, ad hoc analysis, and report publishing	An add-on to **Power BI Pro** for projects requiring **large scale data**, demanding **performance**, and the ability to distribute content without requiring per user licensing

Power BI user license tiers

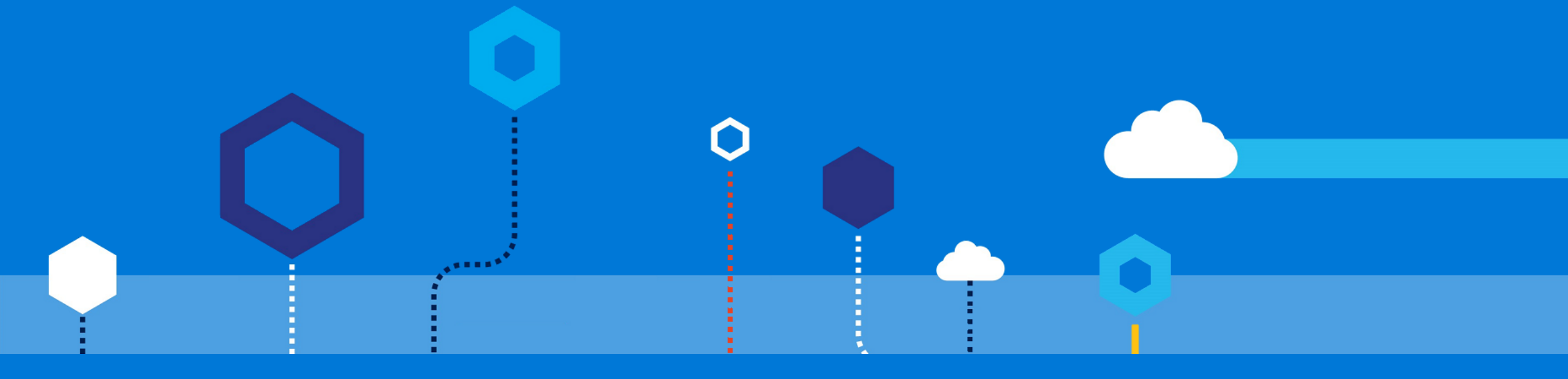
	Free	Pro ($10/user/month)
Connect to 70+ data sources	✓	✓
Peer-to-peer sharing	✗	✓
Enterprise distribution		
Apps	✗	✓
Email subscriptions	✗	✓
Embed APIs and controls	✗	✓
Collaboration		
Group workspaces	✗	✓
Analyze in Excel, analyze in Power BI Desktop	✗	✓

Performance Tips

Power BI Solution Scenarios

- Cloud Model
- Live Connect to Analysis Services
- DirectQuery
  - Azure SQL DB
  - Azure SQL DW

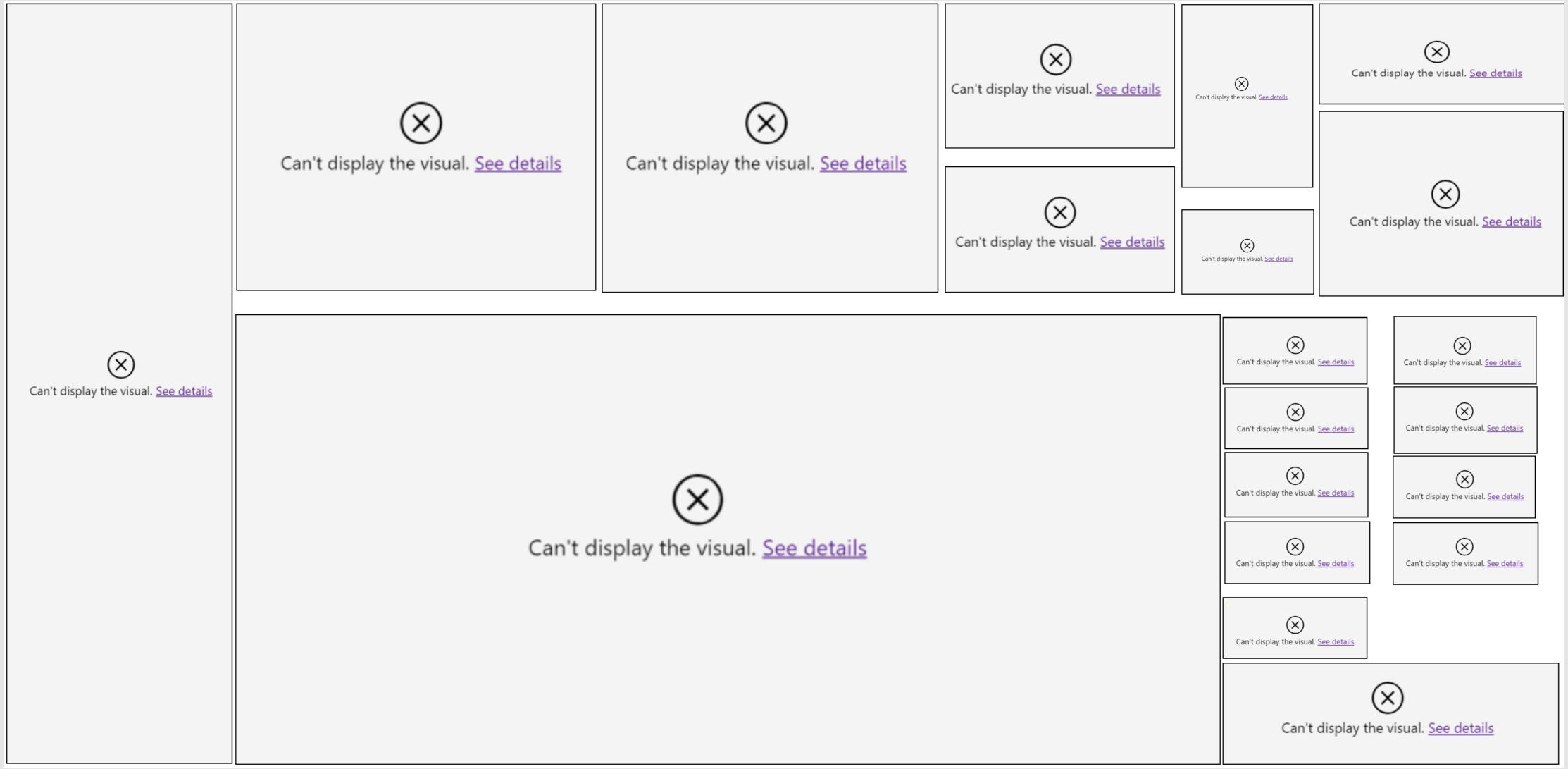
Power BI on SQL DW



Power BI Report

Power BI Report

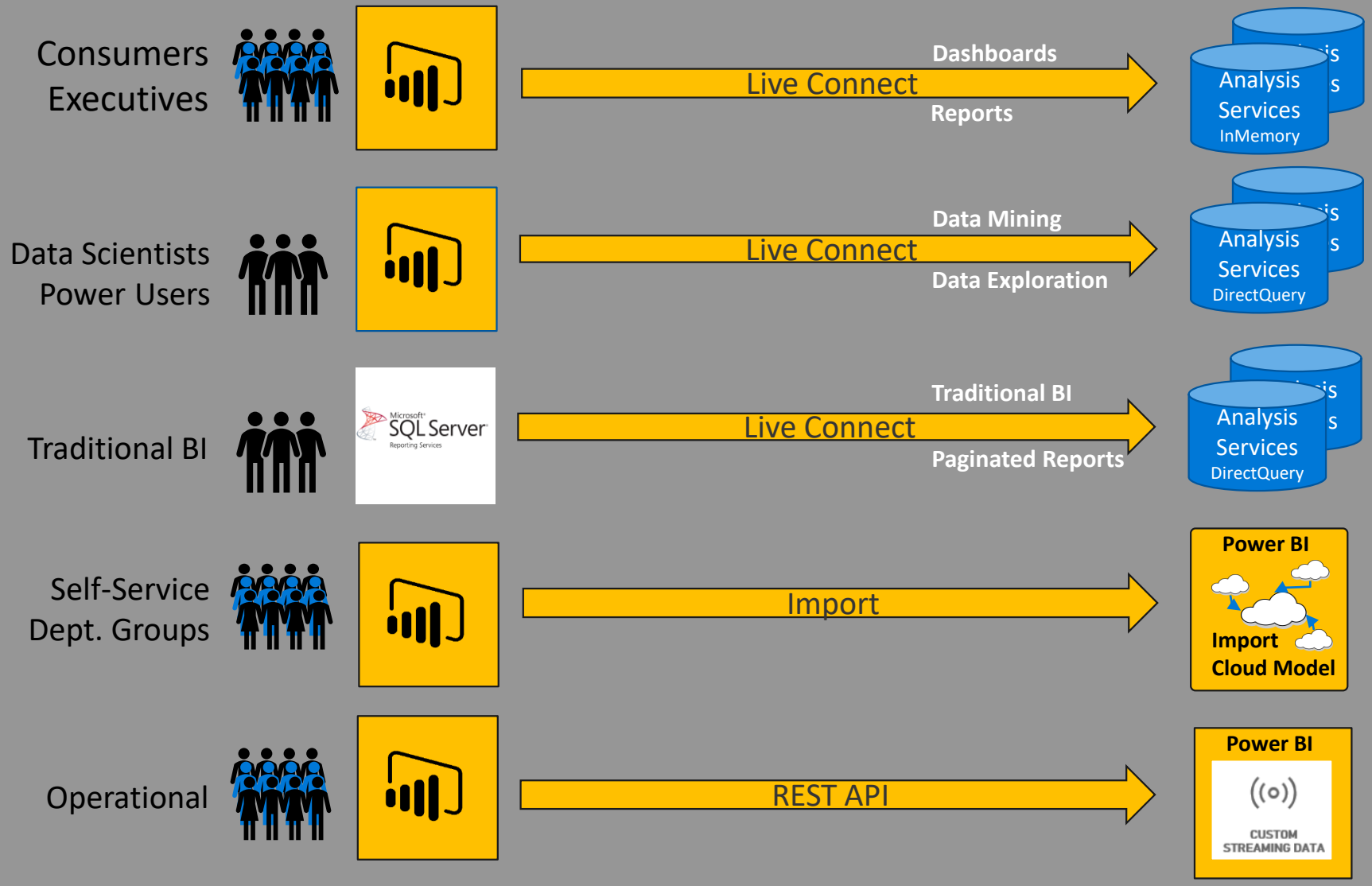
Power BI Report



SQL DW Concurrency

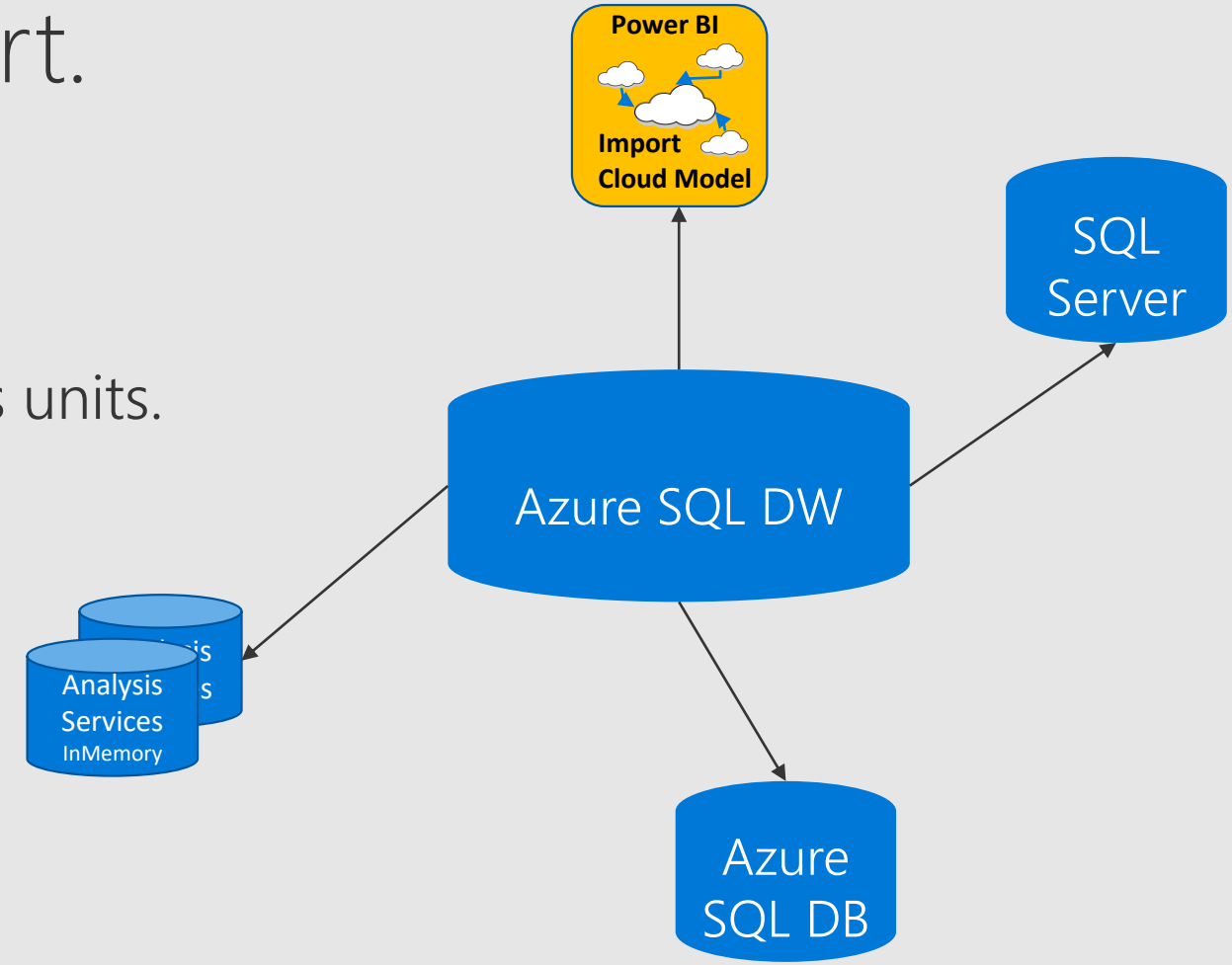
DWU	Max Concurrent Queries	Concurrency Slots
DW100	4	4
DW200	8	8
DW300	12	12
DW400	16	16
DW500	20	20
DW600	24	24
DW1000	32	40
DW1200	32	48
DW1500	32	60
DW2000	32	80
DW3000	32	120
DW6000	32	240

Data Access Pattern : Personas

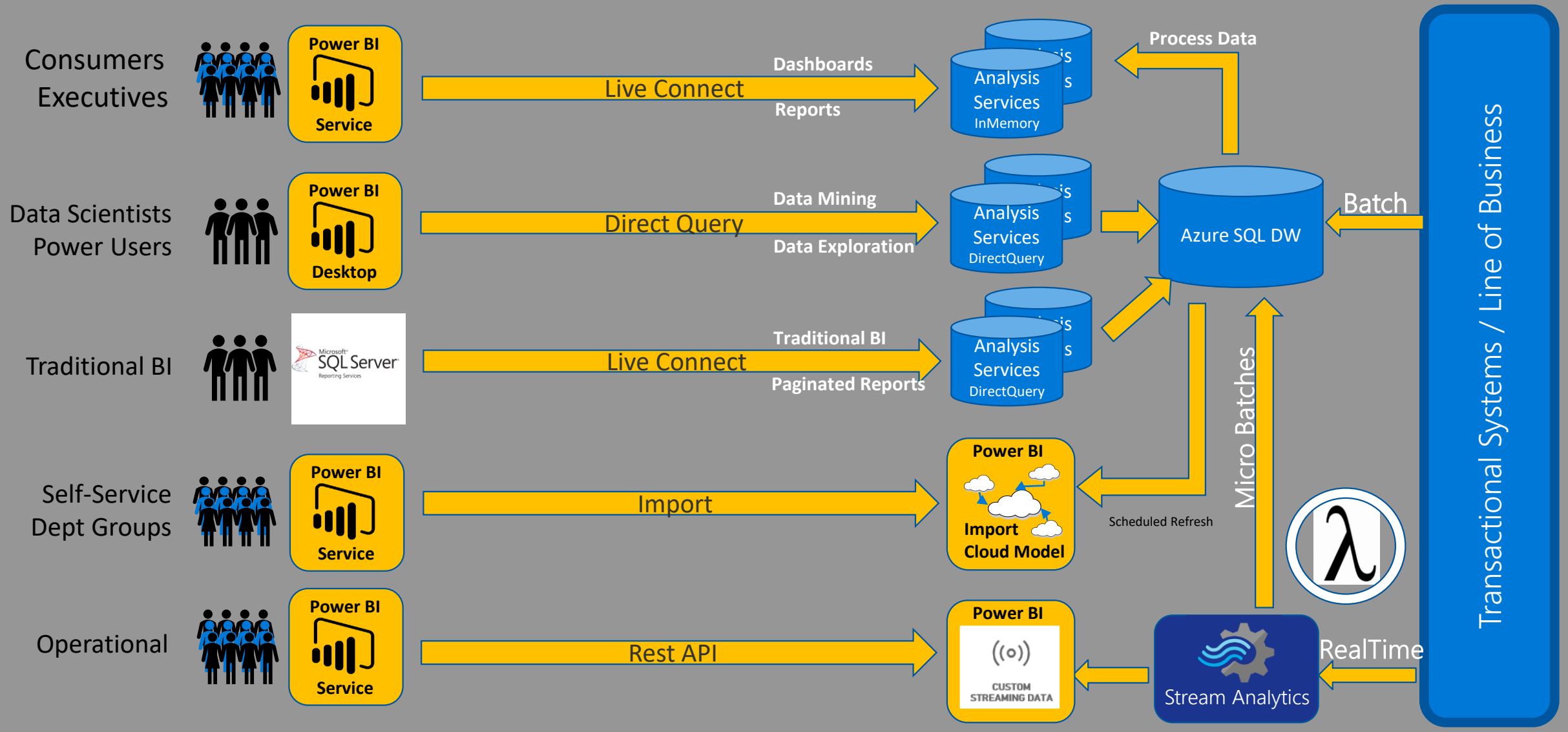


Hub and Spoke Architecture

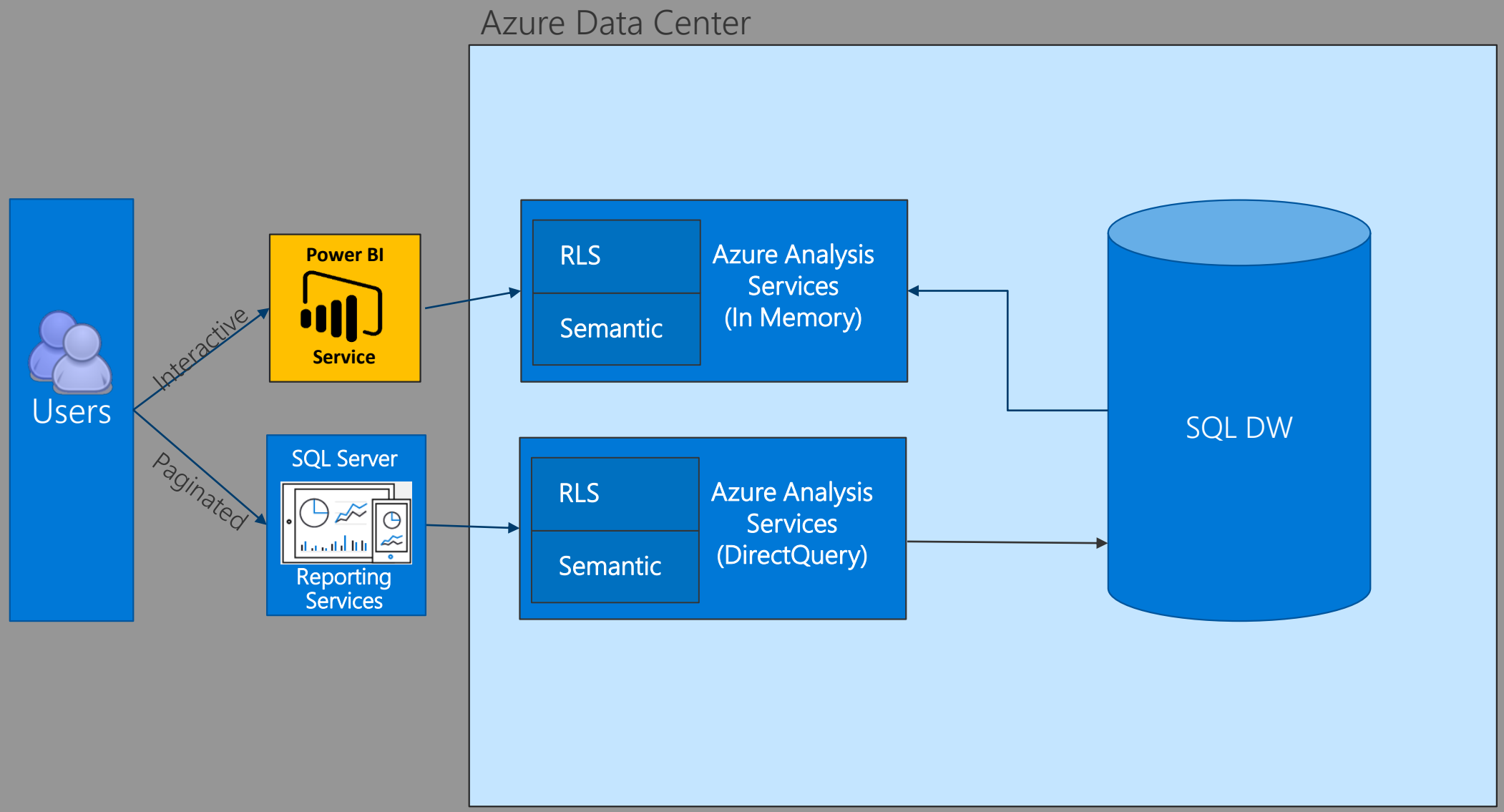
- Data Warehouse for Massive processing
- Spoke for Reporting Mart.
  - Quick Point Queries
  - Pre-summarized aggregations
  - Data Subset (Hot Data)
  - Multiple Spokes for different business units.



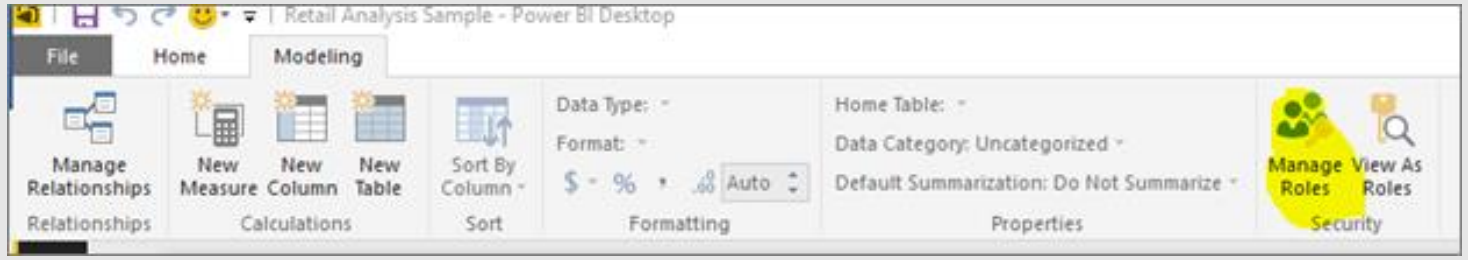
Data Access Pattern : Personas

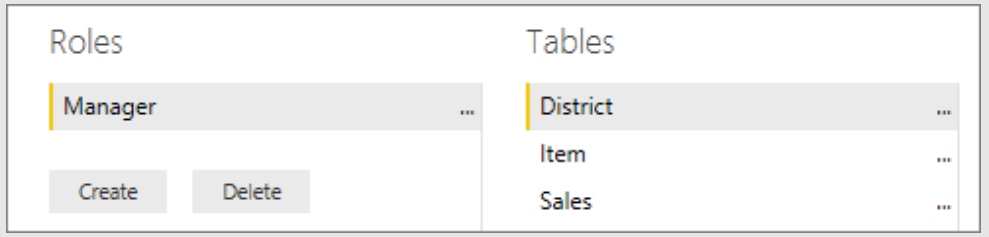


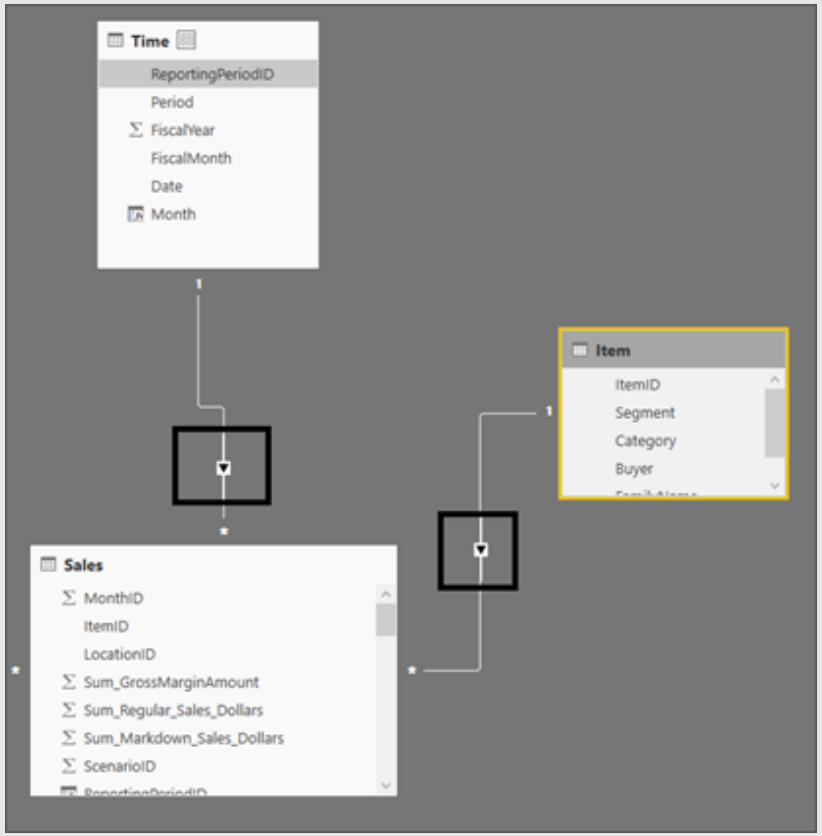
Architectural Blueprint

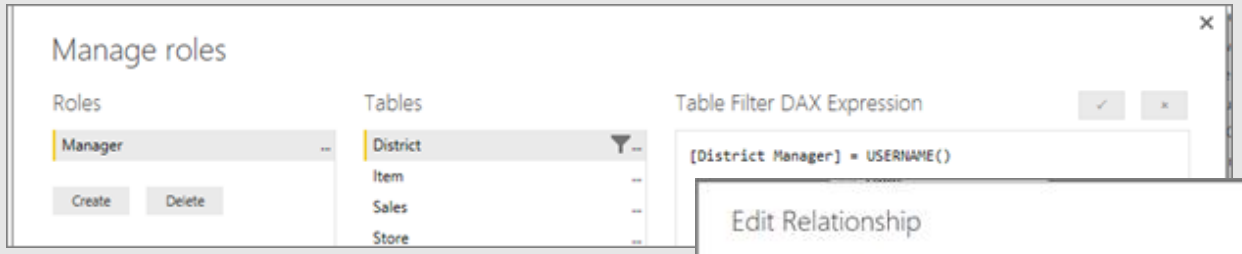


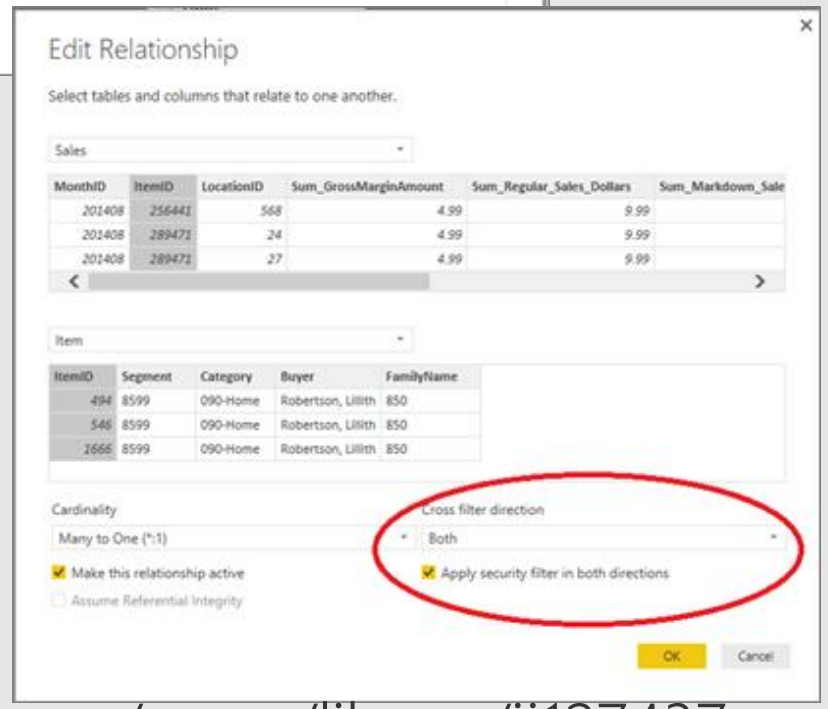
Role Level Security







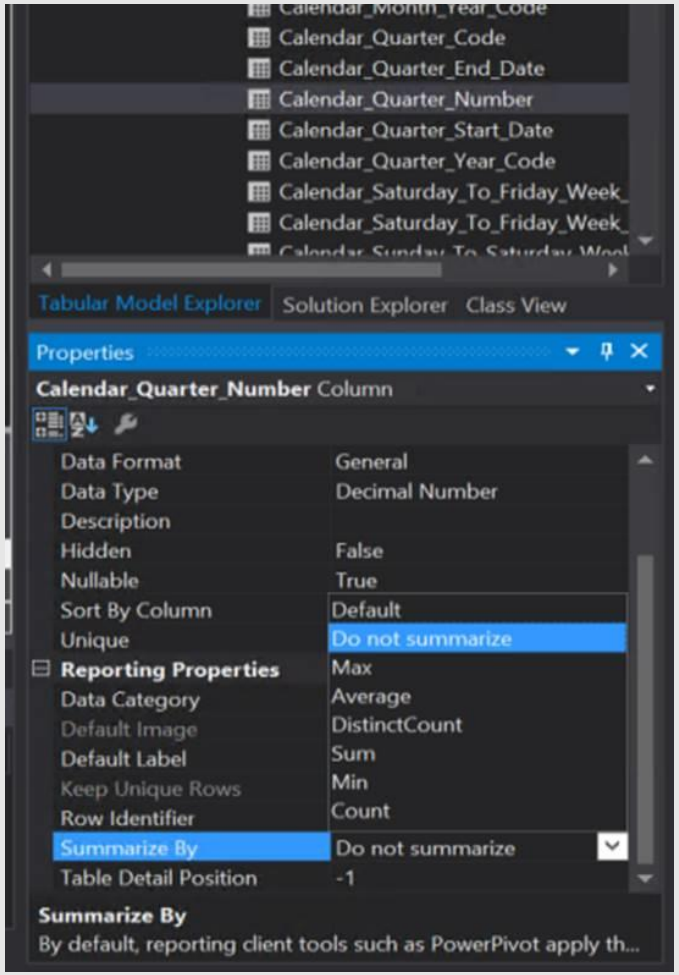




https://msdn.microsoft.com/en-us/library/jj127437.aspx

In Memory Performance Tips

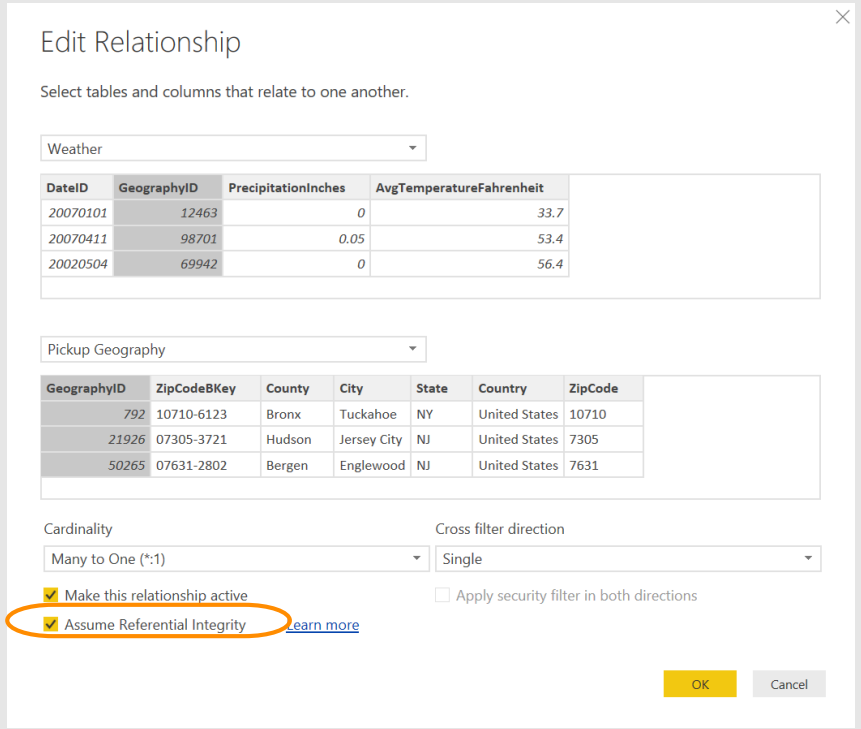
- Inefficient DAX
  - Column with numeric values treated as a Measure.
    - Eg. Data such as Year is not a Measure
  - Set Implicit Measures to “Do Not Summarize” in AS
  - Can also be set in Power BI, but recommended to do at AS Model level



Direct Query Performance Tips

- Use Inner Joins
  - Power BI : Assume Referential Integrity
  - Analysis Services : relyOnReferentialIntegrity: true

Power BI



Analysis Services

*Direct Query Whitepaper for Analysis Services


Microsoft