Power BI

Your instructor
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- 20 year experience in IT: SQL server/BI
- Several years' experience as BI/MI developer in Insurance Market
- Presently working as consultant
- Experienced trainer

About you!

- Name
- Role
- Experience with Power BI
- Expectation from this course

Our contract

- Class hours
- Breaks and lunch time
- Camera on
- Exercises
- Questions

Power Bi – day 1

- What is Power BI
- Get Data: Data sources
- Explore Power BI Desktop
  - Query Editor
    - Data Transformation
    - Merge files
  - Relationship
- Power BI visuals
  - Create and format
  - Create hierarchy

Power Bi – day 2

- Power Bi Visuals (continued)
- Dax:
  - new column,
  - new measure,
  - CALCULATE,
  - time intelligence -> date table

  - Role Level Security -> attribute members to roles

Power BI

Introduction

Introduction to Power BI

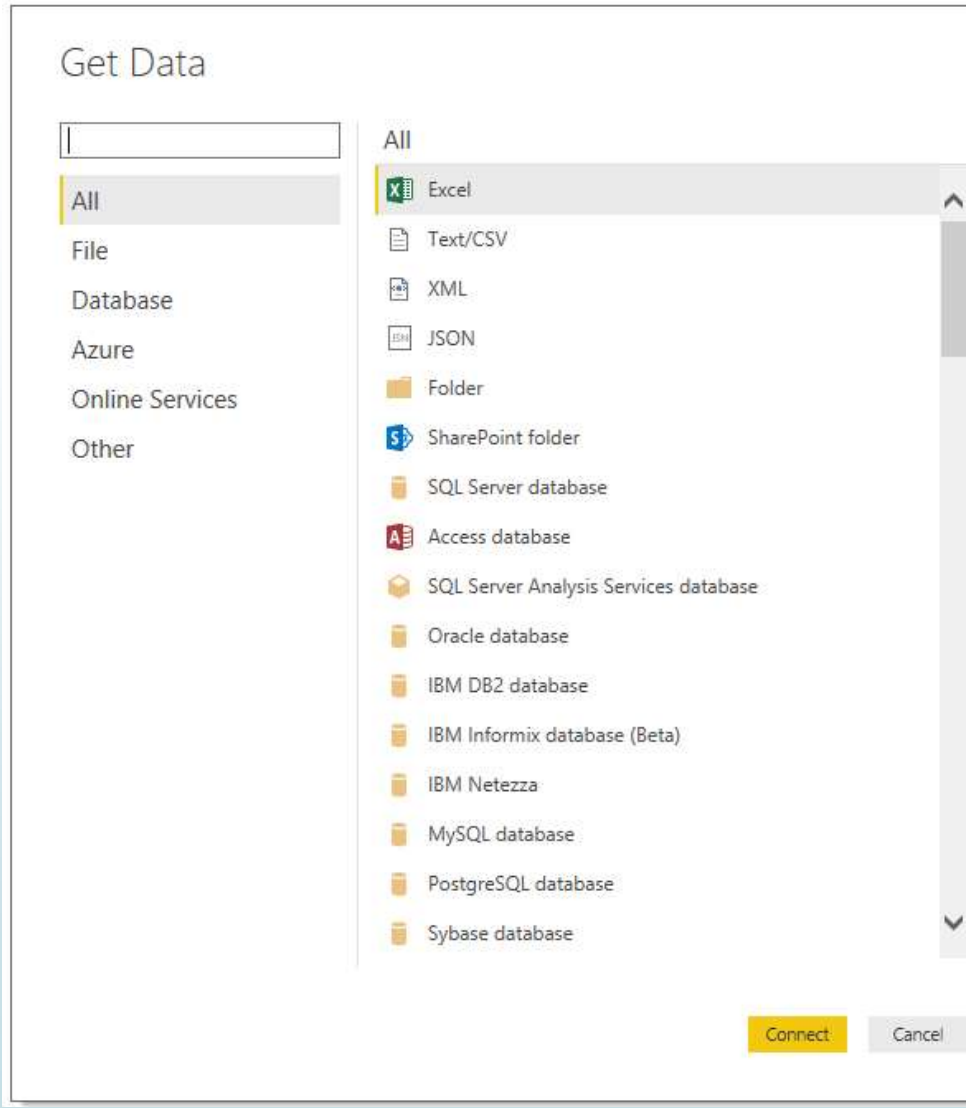
- What is Power BI
  - Microsoft Visualization tool – Released ~June 2015
  - Updated every month
- Power BI tools
  - Power Bi Desktop: download for free and install on local pc
  - Power Bi Services:
    - On line version: www.powerbi.com
    - Free – Pro -- Premium
  - Power Bi Mobile:
    - Complement to Power BI Services
    - Free download

Power BI

Power BI Desktop

Power BI Desktop

- Open a model
  - Open powerBi desktop = open model -> pbix file
- Get data
  - Get data into your model by using several possible data sources
  - Click on "get Data" in the menu
  - Select among several possible connections
  - Follow instructions
  - Select Load or Edit



Exercise

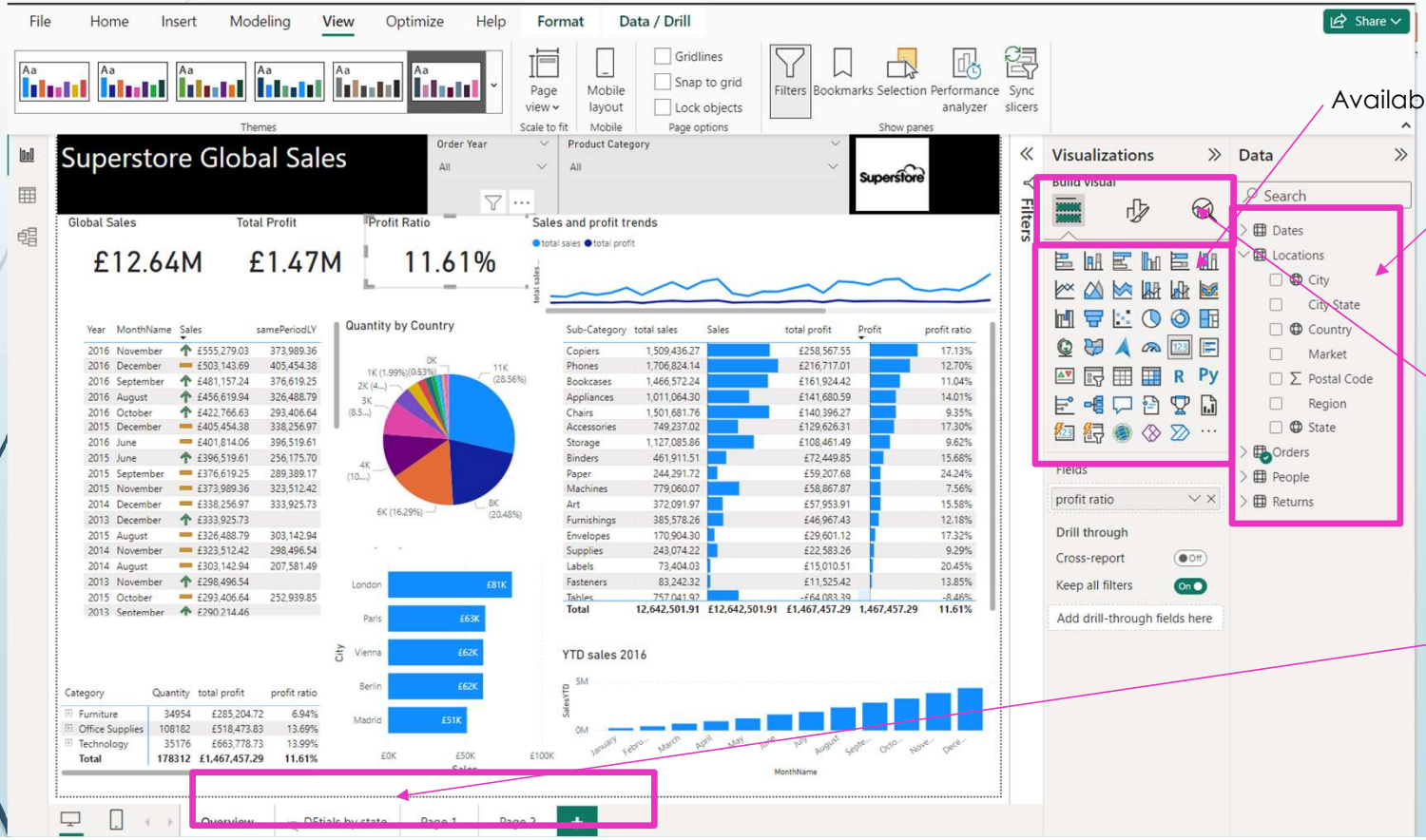
- Exercise to get data

Explore Power Bi Desktop

- Report view
  - Create visuals
- Table view
  - Format data
  - Delete columns
  - Hide columns
- Model view
  - Create and edit relationships
  - View tables and column Properties

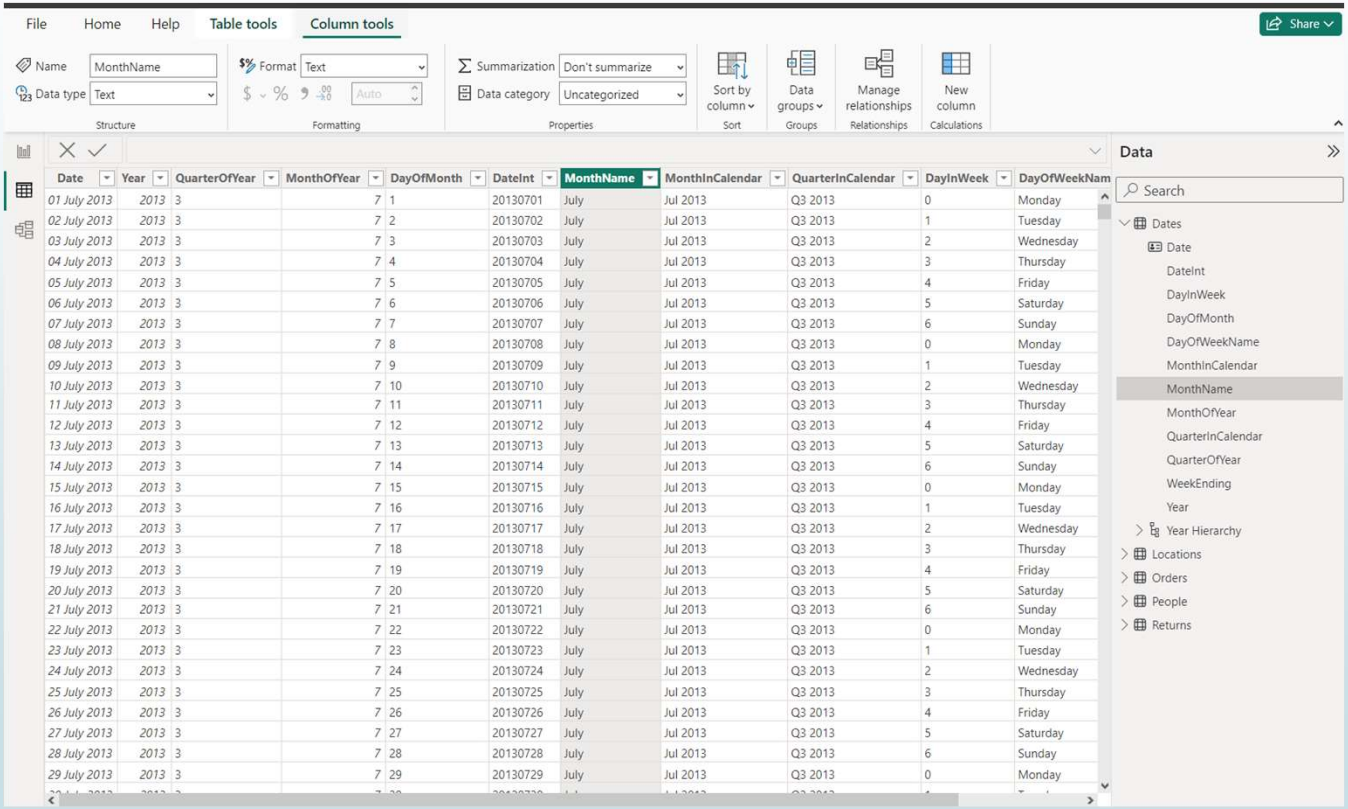
Explore Power BI Desktop

- **Report view**
  - Canvas to create visuals and reports pages



Explore Power BI Desktop

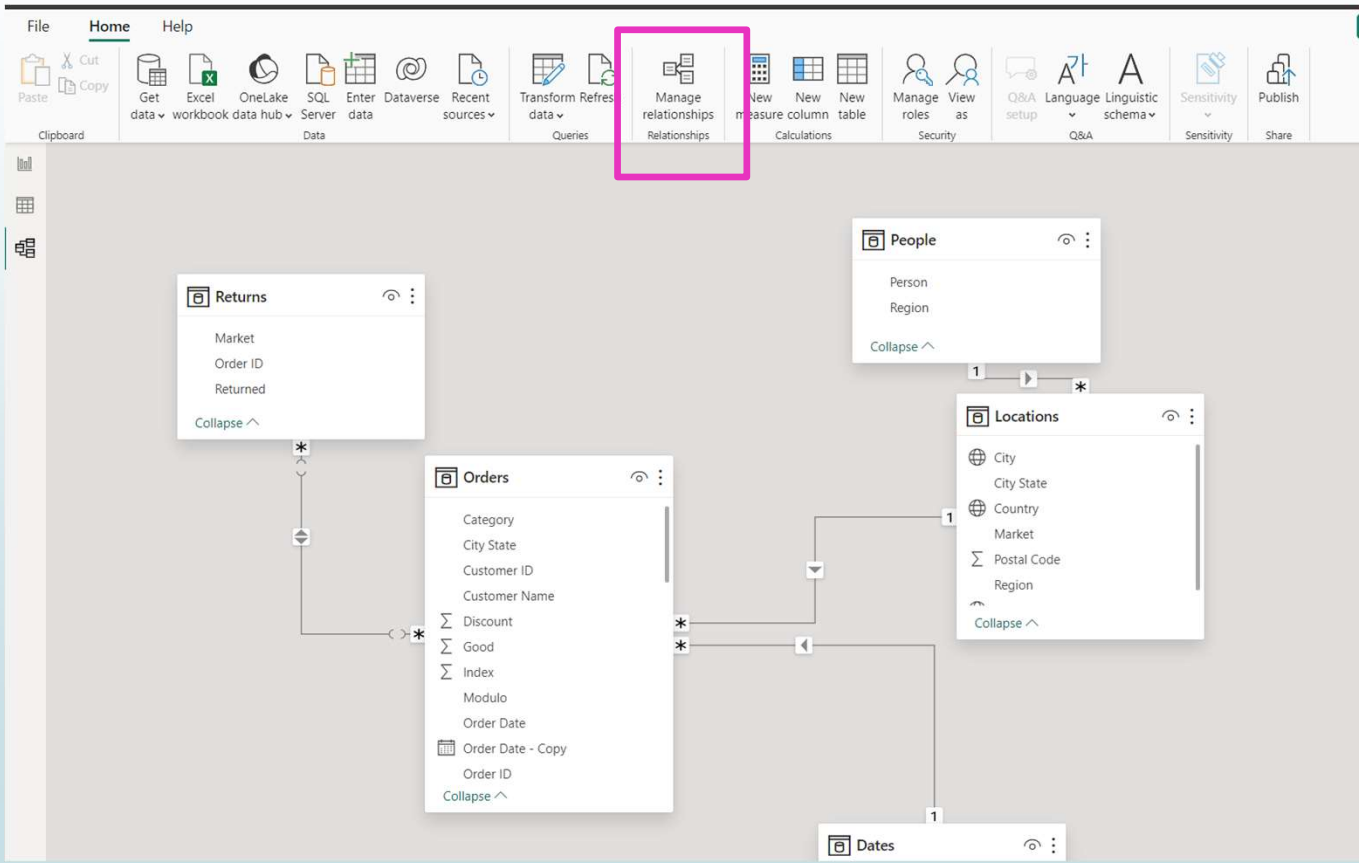
- **Table view**
  - Look at data in tables
    - Select a table from Fields menu on the right end side
  - Format fields and columns
    - Select a field and use Modelling tab to format
    - Sort columns by another column (e.g. Month name by month number)
  - Hide columns from Report view
    - Right click column and select “hide in Report view” (e.g. key columns)



Date	Year	QuarterOfYear	MonthOfYear	DayOfMonth	DateInt	MonthName	MonthInCalendar	QuarterInCalendar	DayInWeek	DayOfWeekNam
01 July 2013	2013	3	7	1	20130701	July	Jul 2013	Q3 2013	0	Monday
02 July 2013	2013	3	7	2	20130702	July	Jul 2013	Q3 2013	1	Tuesday
03 July 2013	2013	3	7	3	20130703	July	Jul 2013	Q3 2013	2	Wednesday
04 July 2013	2013	3	7	4	20130704	July	Jul 2013	Q3 2013	3	Thursday
05 July 2013	2013	3	7	5	20130705	July	Jul 2013	Q3 2013	4	Friday
06 July 2013	2013	3	7	6	20130706	July	Jul 2013	Q3 2013	5	Saturday
07 July 2013	2013	3	7	7	20130707	July	Jul 2013	Q3 2013	6	Sunday
08 July 2013	2013	3	7	8	20130708	July	Jul 2013	Q3 2013	0	Monday
09 July 2013	2013	3	7	9	20130709	July	Jul 2013	Q3 2013	1	Tuesday
10 July 2013	2013	3	7	10	20130710	July	Jul 2013	Q3 2013	2	Wednesday
11 July 2013	2013	3	7	11	20130711	July	Jul 2013	Q3 2013	3	Thursday
12 July 2013	2013	3	7	12	20130712	July	Jul 2013	Q3 2013	4	Friday
13 July 2013	2013	3	7	13	20130713	July	Jul 2013	Q3 2013	5	Saturday
14 July 2013	2013	3	7	14	20130714	July	Jul 2013	Q3 2013	6	Sunday
15 July 2013	2013	3	7	15	20130715	July	Jul 2013	Q3 2013	0	Monday
16 July 2013	2013	3	7	16	20130716	July	Jul 2013	Q3 2013	1	Tuesday
17 July 2013	2013	3	7	17	20130717	July	Jul 2013	Q3 2013	2	Wednesday
18 July 2013	2013	3	7	18	20130718	July	Jul 2013	Q3 2013	3	Thursday
19 July 2013	2013	3	7	19	20130719	July	Jul 2013	Q3 2013	4	Friday
20 July 2013	2013	3	7	20	20130720	July	Jul 2013	Q3 2013	5	Saturday
21 July 2013	2013	3	7	21	20130721	July	Jul 2013	Q3 2013	6	Sunday
22 July 2013	2013	3	7	22	20130722	July	Jul 2013	Q3 2013	0	Monday
23 July 2013	2013	3	7	23	20130723	July	Jul 2013	Q3 2013	1	Tuesday
24 July 2013	2013	3	7	24	20130724	July	Jul 2013	Q3 2013	2	Wednesday
25 July 2013	2013	3	7	25	20130725	July	Jul 2013	Q3 2013	3	Thursday
26 July 2013	2013	3	7	26	20130726	July	Jul 2013	Q3 2013	4	Friday
27 July 2013	2013	3	7	27	20130727	July	Jul 2013	Q3 2013	5	Saturday
28 July 2013	2013	3	7	28	20130728	July	Jul 2013	Q3 2013	6	Sunday
29 July 2013	2013	3	7	29	20130729	July	Jul 2013	Q3 2013	0	Monday

Explore Power BI Desktop

- **Model view**
  - Create and edit relationships
  - Importance of relationship
    - All tables in a model should be related in order to work together in visuals and filters



Exercise

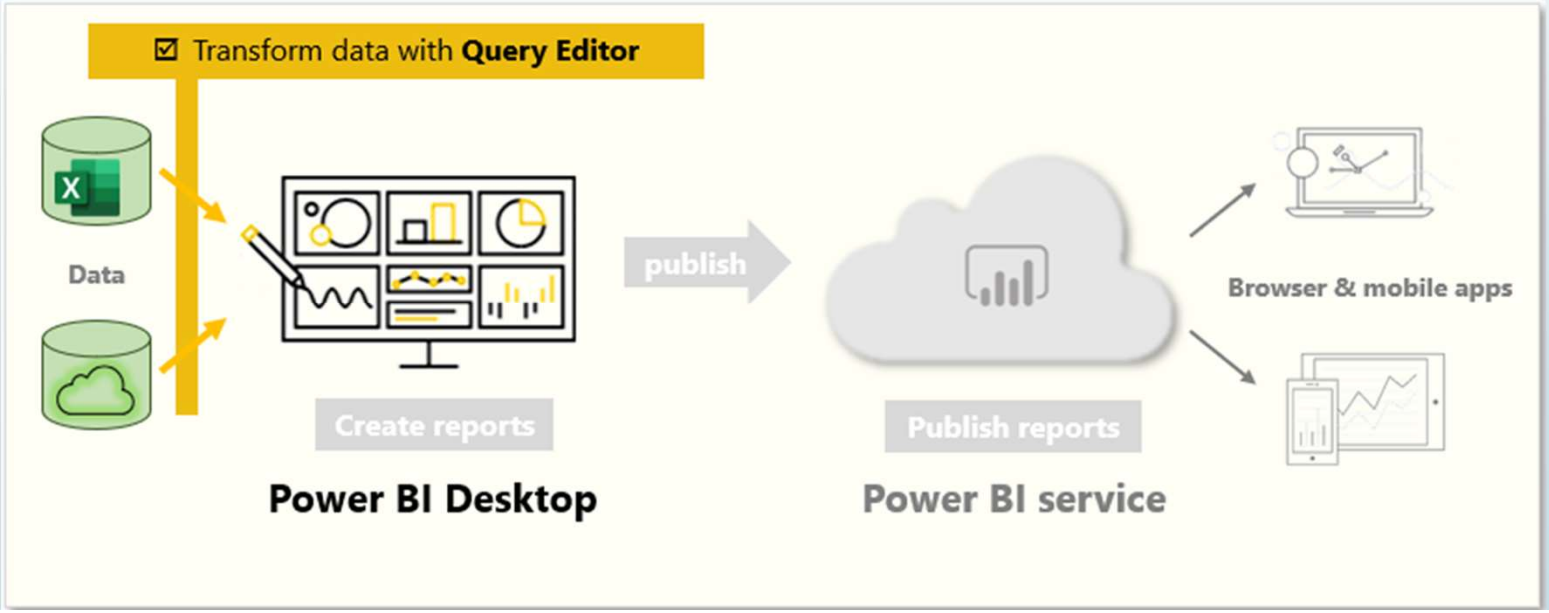
- **Exercise 2: Explore Power BI desktop**

POWER BI

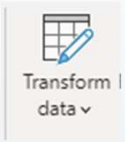
Transforming data: Query Editor

Query editor

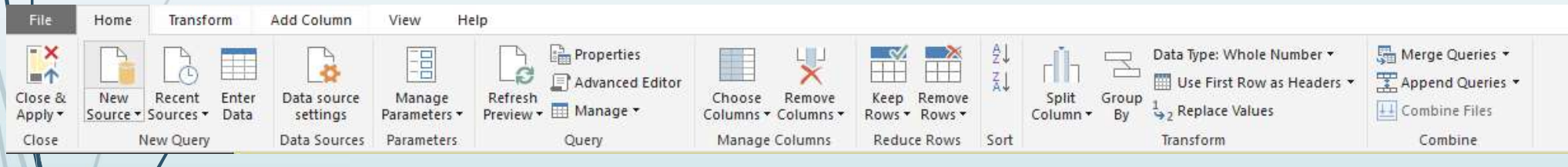
- Any data loaded into Power Bi Desktop **always** goes through Query Editor
  - Query Editors holds the connection with the source
  - Desktop hold a copy of the data
- Use query editor to **prepare the data**: **cleanse, edit, reduce the amount of data** loaded in desktop

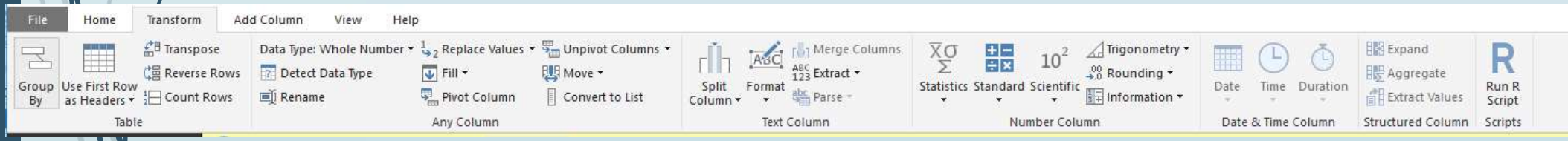


Query Editor

- Powerful and easy to use interface to **manipulate data**
- Click on Transform Data 

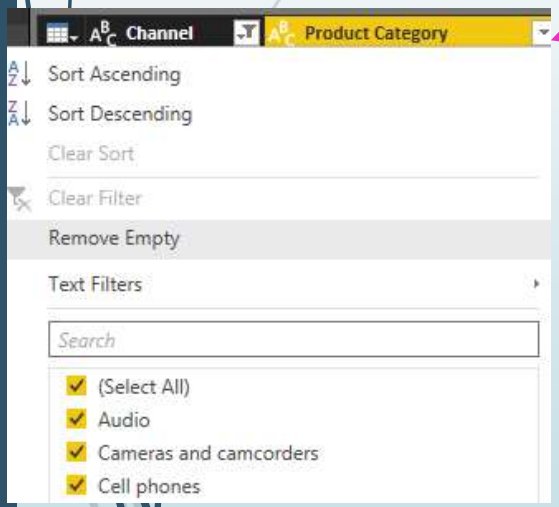
or click on Transform Data when loading data
- Different tabs with commands to edit data:

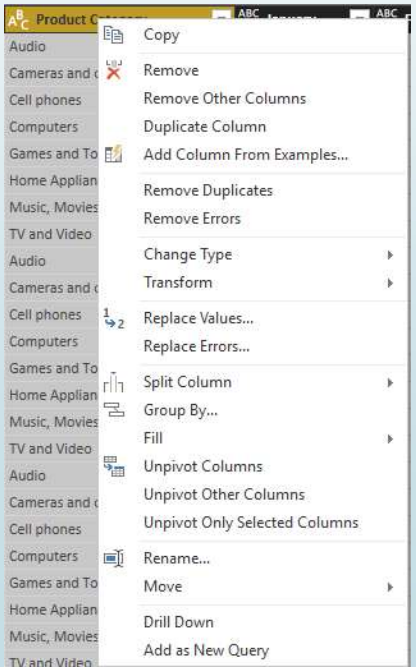


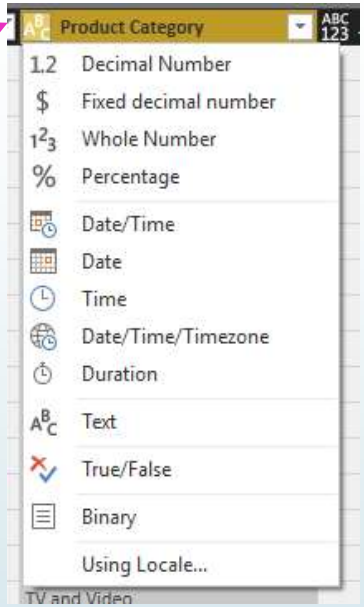


Query Editor

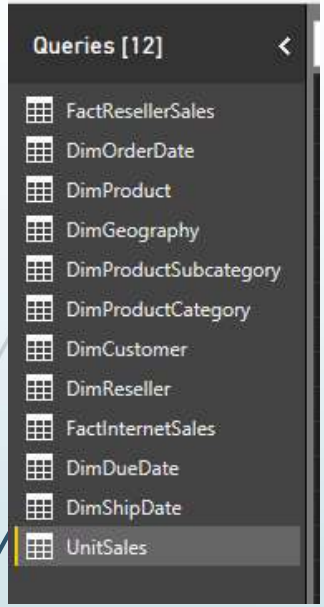
- Each column has different menus:
  - Data type on top right:
    - Can change data type from this menu
  - Sort and filters from drop down on left
  - Right click for more options



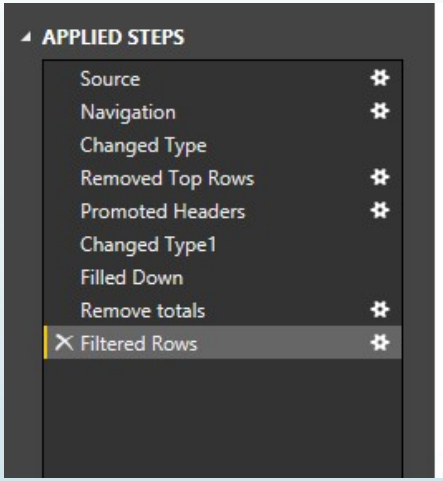


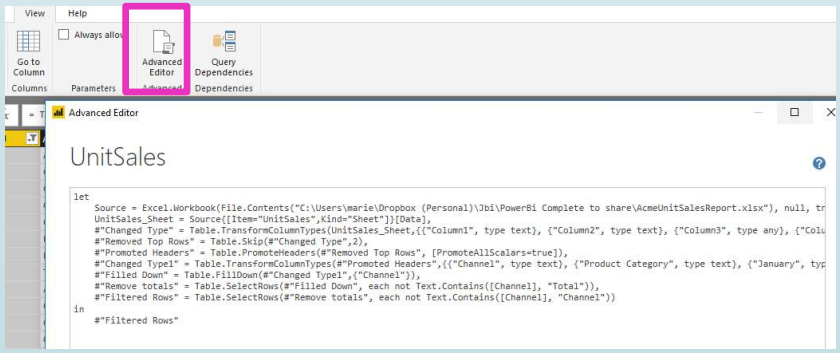


Query Editor



- List of tables on right
  - Right click table to copy and paste, duplicate
- List of steps executed per each table (on left)
  - Each step can be deleted
  - "walk" up the steps to see status at that point
  - All steps are applied every time data refreshed
- Tab View -> advanced editor
  - Steps in script (M language)



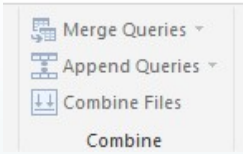


Query Editor

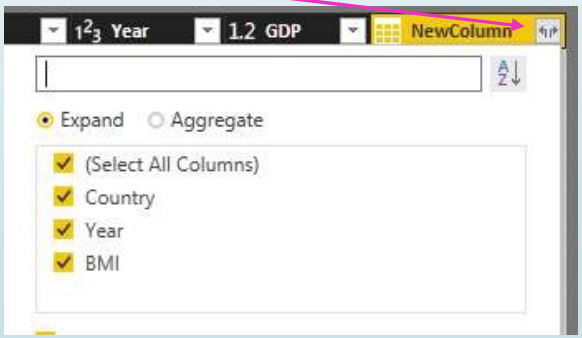
- **Do now**: import and clean "AcmeUnitSalesReport.xls"
  - Remove first 2 rows
  - Promote first row as header
  - Fill down first column
  - Remove rows with "Total"
  - Remove rows with "channel"
  - Remove last two columns
  - Unpivot
  - Change column type

Query Editor

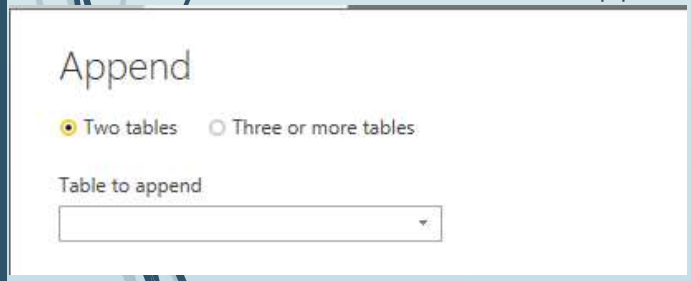
- Combine tables

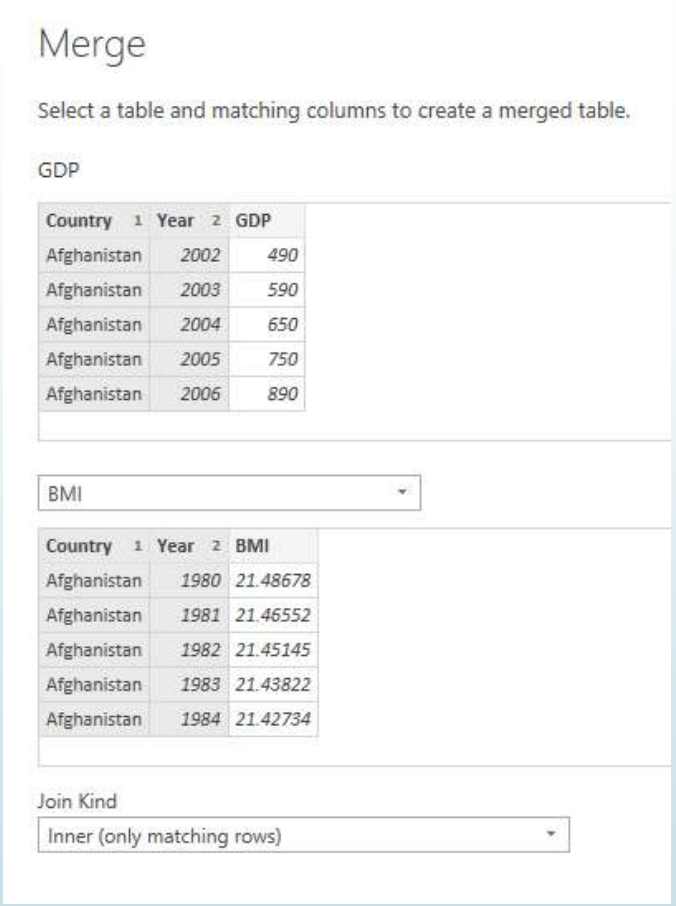


  - **Merge**
    - Tables are merged into one
    - Select 2 tables
    - Select common fields
    - Select type of join (left, right, inner)
    - In merged table expand to select fields



  - **Append**
    - Select table to append

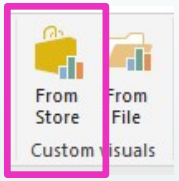




Exercise

- Exercise 3: Transforming Data
- Exercise 4: From Spreadsheet to Scatter Chart

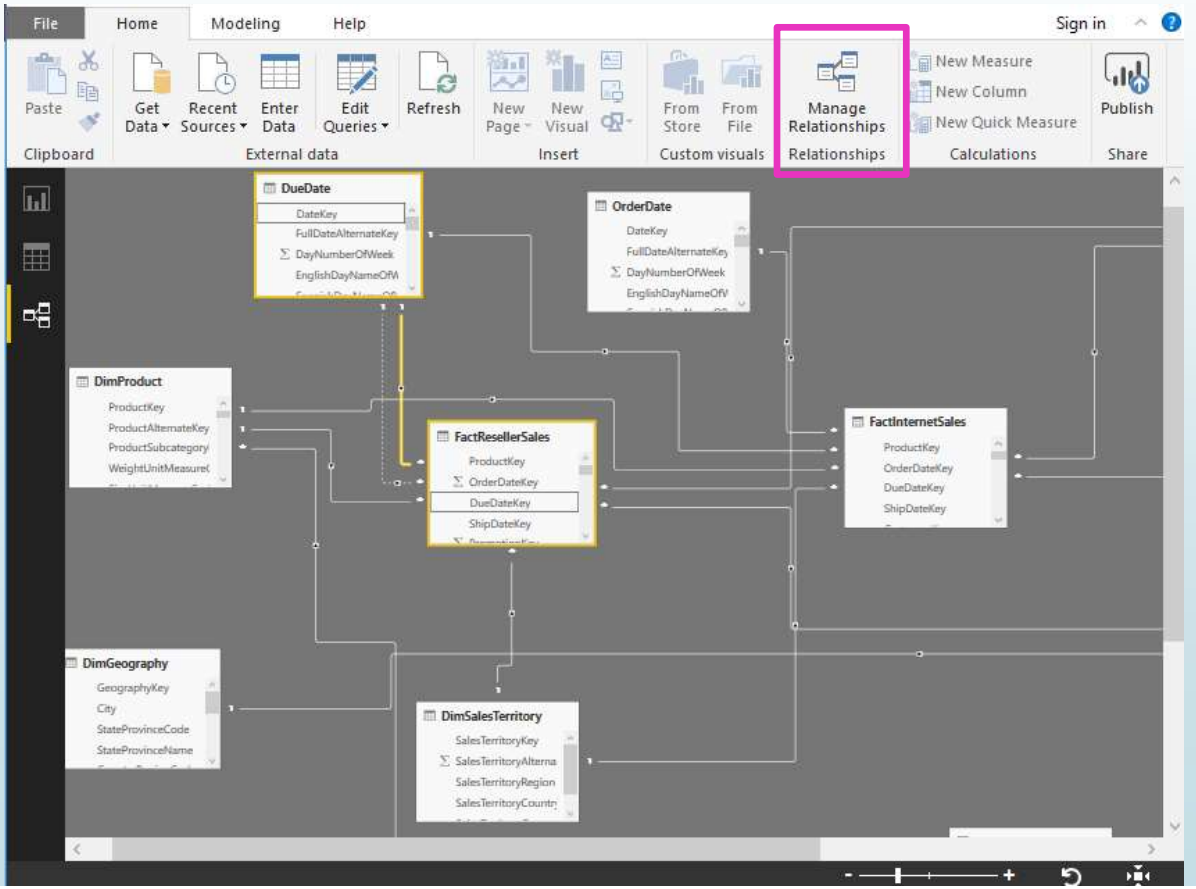
Visuals: create and format

- All available visuals are listed in the VISUALIZATION area
- Custom visuals can be added
  - A rich list of custom visuals are available clicking on 

  - Select the visual and click Add
  - Visual is added in the VISUALIZATION area and can be used like any other visuals
- Two ways to create visual on a report
  - Drag and drop a field in the report canvas: a visual is automatically created
  - Alternatively, select a visual from the menu and then add fields
  - Visualization can be changed at any time clicking on another visuals from menu
- Fields, format and analytics menus 
  - Content of these menus change per each visual
  - Explore formatting menu as several options are available
  - analytics menu (available on some visuals only) to add "comparison" lines: constant, min, max etc

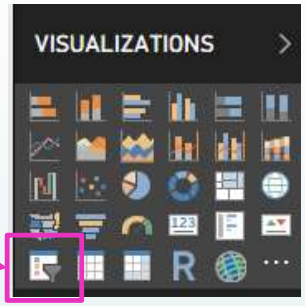
Relationships

- **Model view**
  - Create and edit relationships
    - Drag and drop fields or use "manage Relationship"
    - Requested condition: fields to be same type
  - Relationship cardinality
    - One to many
    - One-to-one
    - Many-to-many not directly supported
  - Relationship direction
  - Active and inactive relationship
    - Only one active relationship per each couple of tables
    - Dax function USERELATIONSHIP for inactive relationship
    - Workaround: create duplicate of table (e.g. date table)

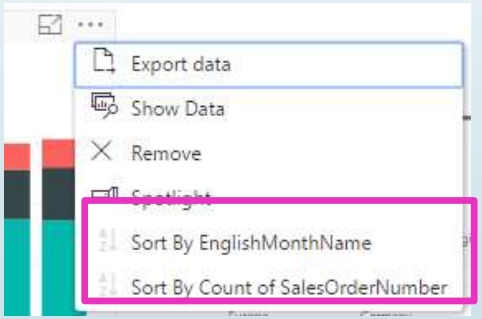


Visuals: create and format

- Slicer
  - It is a visual -> drag and drop it from menu to canvas
  - Add fields
  - Choose list or drop-down
  - Format-> selection control -> single selection = off to get multiple select



- Sort data in visual
  - Use top left ellipsis to get menu that allows sort by fields in the visual

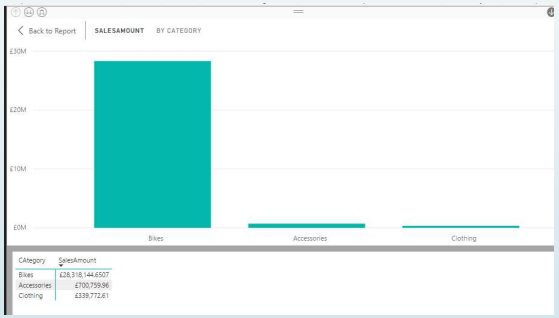


- Highlight filter -> edit interaction
  - Click on an area of one visual to filter all the page by that category
  - This behaviour can be controlled by "Edit Interaction" in Format tab

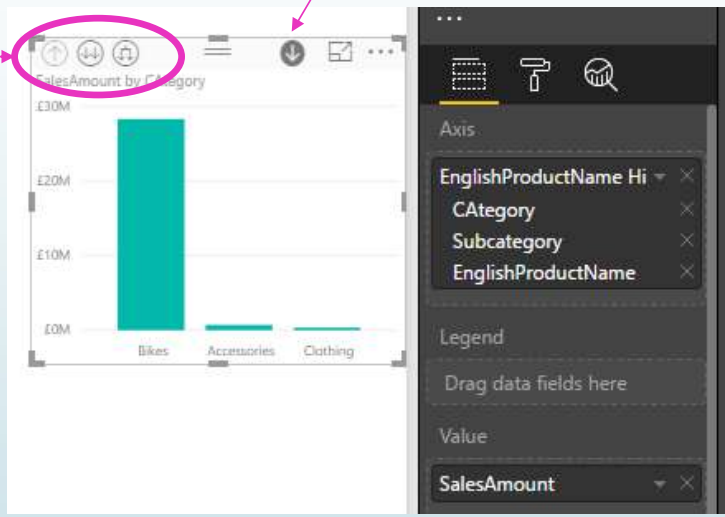
- Maps
  - In modelling Tab, select Data Category for each geographic field to get a better mapping

Visuals : hierarchies and drill down

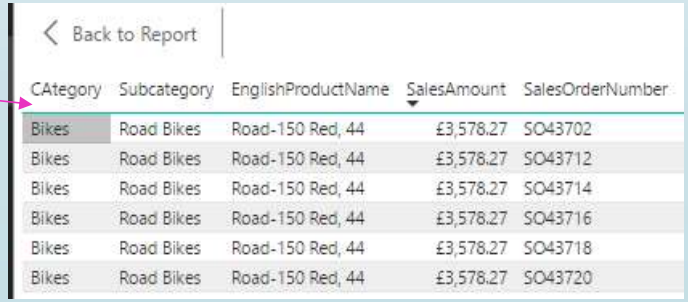
- Adding hierarchy into visuals will automatically enable drill down feature
  - Click on categories to drill down or use the top left arrows
  - Right click for "show data"



Enable click drilldown



  - Or "see records"



- Date hierarchies are automatically created by Power BI

Exercise : create visuals

- Exercise 5- Getting started with report authoring

- If you finish early you can try
  - Exercise 6 - Create Visuals in Power Bi Desktop (note this is a free exercise without step-by-step exercise)

Power BI

Calculated columns and measures: DAX

DAX

- Data Analysis EXpressions (DAX)
  - Functional language -> every expression is function
  - Syntax for both queries and expressions
  - Supported by Power BI, tabular model projects and PowerPivot
  - To build advanced queries DAX Studio is recommended
  - Meant to be Excel formula–like, and therefore, easy to use

DAX : function types

- DAX supports many function types
  - Excel functions
    - More than 80 supported
    - DAX does not support cell references
      - Only column names
  - Aggregate functions
  - Filter functions
  - Context functions
  - Time-intelligence functions
  - Ranking functions
  - Information functions
  - Table functions

Dax operators

Arithmetic	+, -, *, /, ^	Addition, subtraction, multiplication, division, and exponentiation
Comparison	>, >=, <, <=, <>	For comparing values
Logical	||, &&	Logical OR and AND
Concatenation	&	Concatenating text
Unary	+, -, NOT	Change the operand sign

DAX Columns

- Like any other column
- Visible at right end of table
- Computed at process time
  - Columns calculated insteps use more memory than one complex calculated column
- Can be text or calculations
  - Add calculated column: type name and formula

GROSSMARGIN = SALES[SALESAMOUNT] - SALES[TOTALPRODUCTCOST]

Initial =LEFT([FirstName], 1)

Full name=[FirstName] & " " & [LastName]

DAX : Measures

Measures create aggregated values

Three types of measures

- **Implicit measures**
  - Automatically created when adding a value into visual
  - Aggregating function can be changed by clicking on menu on added field
- **Explicit measures**
  - Created with "Add Measure" and DAX
  - Refer to the whole table
  - Result only visible when added to visual
- **Power Bi Quick measure**
  - Enabled in Preview
  - Created in value menu
  - Select calculation and fields to be used
  - Will automatically create DAX script

Measures vs calculated columns

- **Columns**
- Computed on creation or refresh
- Use only row context of table

- **Measures**
- Only calculated in the report context => depends on other values and filters on report
- Do not consume memory for storage

Measures vs calculated columns

- **Use Columns**
- Place the calculated results in **a slicer**, or see results **in rows or columns** in a table , or in the **axes of a chart**, or use the result as a filter condition in a DAX query.
- Define an expression that is strictly bound to the current row. For example, Price * Quantity
- Categorize text or numbers. For example, a range of values for a measure, a range of ages of customers, such as 0–18, 18–25, and so on.

- **Use Measures**
- whenever you want to display resulting calculation values that reflect user selections and see them in the **values area**

DAX : Aggregate Functions

- DAX supports Excel aggregate functions
  - `SUM`, `MAX`, `MIN`, `AVERAGE`, etc.
  - For example, `=SUM([SalesAmount])`
- DAX supports additional aggregate functions with `X` suffix
  - `SUMX`, `MAXX`, `MINX`, `AVERAGEX`, etc.
  - Functions take two parameters: a table and expression to be aggregated
  - Allows expressions like `SUMX('Internet Sales', [UnitPrice]*[OrderQty] )` to be done in one step
    - The alternative is to create a calculated column of `[UnitPrice]*[OrderQty]`, then apply a `SUM` function on result

DAX: Aggregate Functions

- Select the Internet Sales table, right click and select New Measure
- In the Calculation Area within the Internet Sales table, type
  `NumberOfTransactions =DISTINCTCOUNT(InternetSales[SalesOrderNumber])`
- On the InternetSales table, create another measure that calculates the sales per transaction. Type:
  `SalesPerTrans = sum(InternetSales[SAlesAmount])/[NumberOfTransactions]`
- Create a new calculated column called OrdYear to determine the year each order date was made: OrdYear = YEAR(InternetSales[OrderDate])
- Create a matrix or a visualizations that displays the `OrdYear` in the rows and the `NumberOfTransactions` and `SalesPerTrans` in the Values section
- Use the `SUMX()` function to create a calculation

TotalOrderValue = SUMX(`InternetSales`,

(1- `InternetSales`[UnitPriceDiscountPct]) * `InternetSales`[OrderQuantity] * InternetSales[UnitPrice])

DAX: Cross Table Lookups

- The `RELATED` function follows a many-to-one relationship to return a value
  - To return the product name of each product in the Internet Sales table:

```
=RELATED(Product[EnglishProductName])
```

- The `RELATEDTABLE` function is used to follow a one-to-many relationship
  - To return the total Internet sales amount of each product:

```
=SUMX(RELATEDTABLE('Internet Sales'), 'Internet
  Sales'[SalesAmount])
```

Exercise

- Dax Exercise
  - Step 2 to 4 (5 and 6 are optional)

DAX: CALCULATE Function

- The `CALCULATE` function is useful for changing the context of a calculation
  - Allows filters to be included: `CALCULATE(<expr>, <filter1>, <filter2>…)`
  - Filter context is determined by CALCULATE filters
    - Filters are evaluated to create the context
    - Expression is evaluated in the context created by the filter
    - Applies filters from the slicer
  - CALCULATE is the ONLY function that can change the context
- Example:

```
Sales of MountainBikes = CALCULATE (
  SUM( InternetSales[SalesAmount]),
       'Product'[ProductSubcategory] = "Mountain Bikes"
)
```

DAX: CALCULATE Function

- First we create a SalesAmount colum per row
- In a new column type
  - =Sales[Unit Price] *Sales[Quantity]
- Rename the column SalesAmountRow
- In the Calculation Area within the Sales table, type

```
SalesOfRedProducts:= CALCULATE
( sum(Sales[SalesAmountRow])
  , Product[Color]="Red")
```

- Format as currency and save
- Test your new measures:
  - Select Model on column, SalesAmount and SalesOfRedProduct as values
  - Put a slicer on color

DAX: USERELATIONSHIP Function

- Tabular Mode does not support role-playing
  - Each table can have only 1 active relationship
  - Tables can have inactive relationship
  - To use an inactive relationship in a calculation USERELATIONSHIP has to be specified, together with CALCULATE
- Example:

```
DeliveredAmount2007:=CALCULATE(
  SUM( Sales[SalesAmountRow]),
FILTER(CALCULATETABLE(Sales,
USERELATIONSHIP(Sales[DeliveryDateKey], 'Date'[DateKey])),
  RELATED('Date'[Calendar Year Number]) =2007))
```

DAX: Time-Intelligence Functions

- DAX features many time-intelligence functions
  - `STARTOFMONTH`, `ENDOFYEAR`, etc.
    - Return a single date
  - `PREVIOUSQUARTER`, `NEXTYEAR`, etc., each return a table of dates
    - Typically nested inside an aggregate function
    - To return total Internet sales amounts for the previous year:

```
=CALCULATE(SUM('Internet Sales'[SalesAmount]),
  PREVIOUSYEAR('Date'[FullDateAlternateKey]))
```

  - `DATESQTD`, `DATESYTD`, `DATESMTD` each return a table of all dates up to and including the current date in quarter, year, or month
    - To return the quarterly total sales to date:

```
=CALCULATE([Total Sales], DATESQTD('Date'[FullDateAlternateKey]))
```

DAX: Time-Intelligence

- Conditions for time intelligence
  - Calendar table
    - All dates should be present
    - No gaps between dates or time intelligence will not work
    - Best practice
      - One view for each "role dimension"
  - In the function use field from the right dimension
    - Field from Date
    - NOT field from Fact

Time Intelligence Functions

Reference

- CLOSINGBALANCEMONTH
- CLOSINGBALANCEQUARTER
- CLOSINGBALANCEYEAR
- DATEADD
- DATESBETWEEN
- DATESINPERIOD
- DATESMTD
- DATESQTD
- DATESYTD
- ENDOFMONTH
- ENDOFQUARTER
- ENDOFYEAR
- FIRSTDATE
- FIRSTNONBLANK
- LASTDATE
- LASTNONBLANK
- NEXTDAY
- NEXTMONTH
- NEXTQUARTER
- NEXTYEAR
- OPENINGBALANCEMONTH
- OPENINGBALANCEQUARTER
- OPENINGBALANCEYEAR
- PARALLELPERIOD
- PREVIOUSDAY
- PREVIOUSMONTH
- PREVIOUSQUARTER
- PREVIOUSYEAR
- SAMEPERIODLASTYEAR
- STARTOFMONTH
- STARTOFQUARTER
- STARTOFYEAR
- TOTALMTD
- TOTALQTD
- TOTALYTD

DAX: exercises

- DAX time intelligence

Power BI

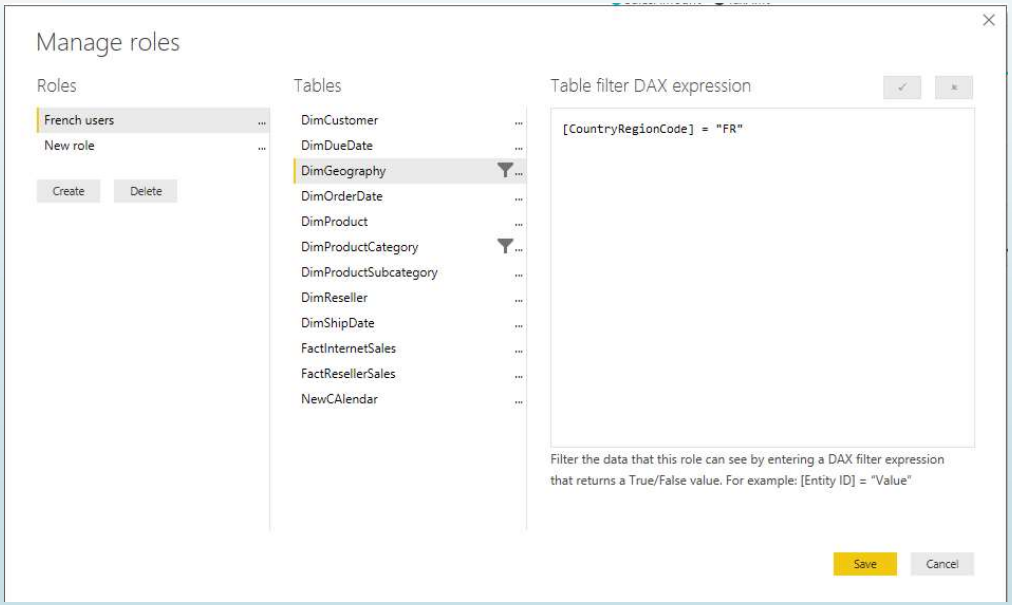
Security

Power BI: Role Level Security

- Security can be managed creating roles in Power Bi Desktop and associating them with emails on Power BI Services
- Click on "Manage Roles"

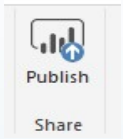
- Create a role using filters on tables
- Test your roles using

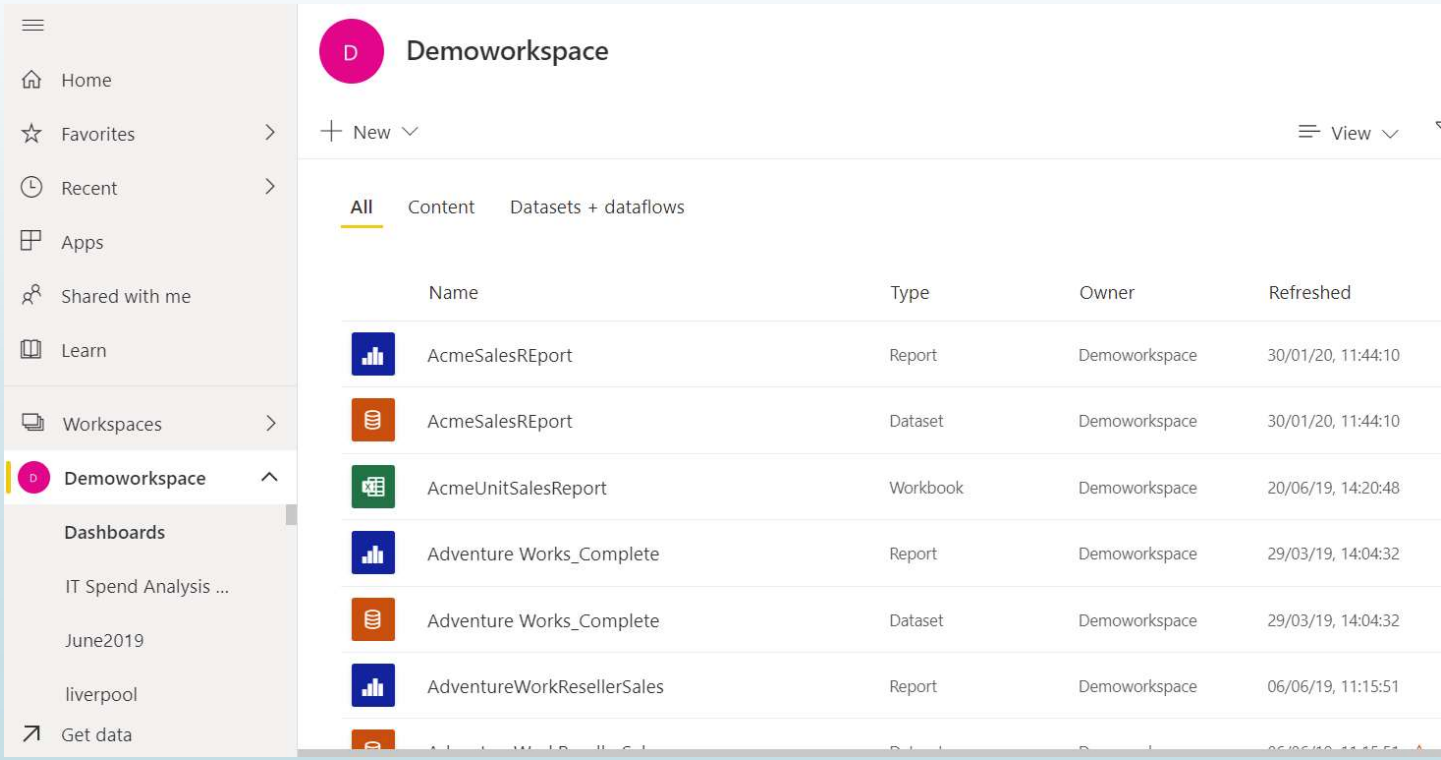
- After publishing report on line:
  - Select Dataset -> Security
  - List emails addresses of users to be added to the role



Publish reports to Power Bi services

- From desktop click on "publish"
- Login if needed
- Publishing reports will add dataset and Report in power Bi services

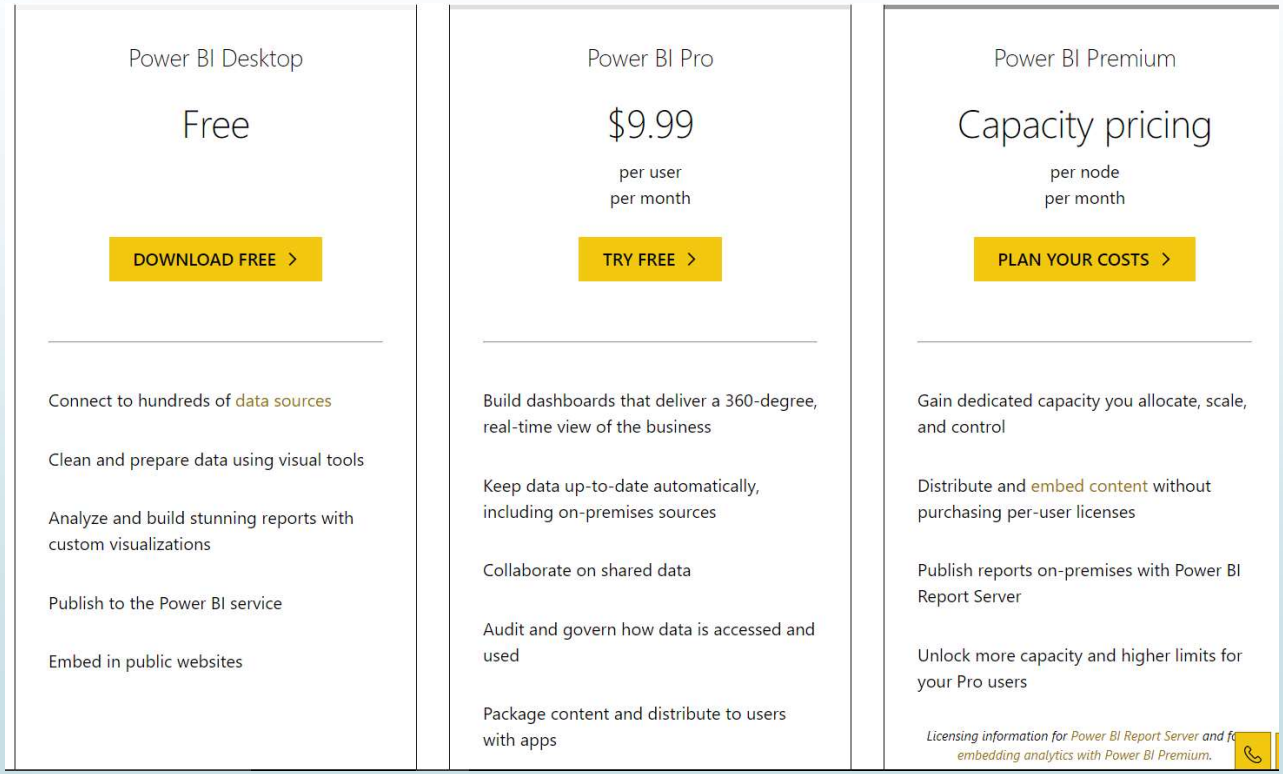




Power BI

Publish and share reports

Power BI Services : Licence schema



Power BI Desktop

Free

DOWNLOAD FREE >

Connect to hundreds of data sources

Clean and prepare data using visual tools

Analyze and build stunning reports with custom visualizations

Publish to the Power BI service

Embed in public websites

Power BI Pro

$9.99

per user
per month

TRY FREE >

Build dashboards that deliver a 360-degree, real-time view of the business

Keep data up-to-date automatically, including on-premises sources

Collaborate on shared data

Audit and govern how data is accessed and used

Package content and distribute to users with apps

Power BI Premium

Capacity pricing

per node
per month

PLAN YOUR COSTS >

Gain dedicated capacity you allocate, scale, and control

Distribute and embed content without purchasing per-user licenses

Publish reports on-premises with Power BI Report Server

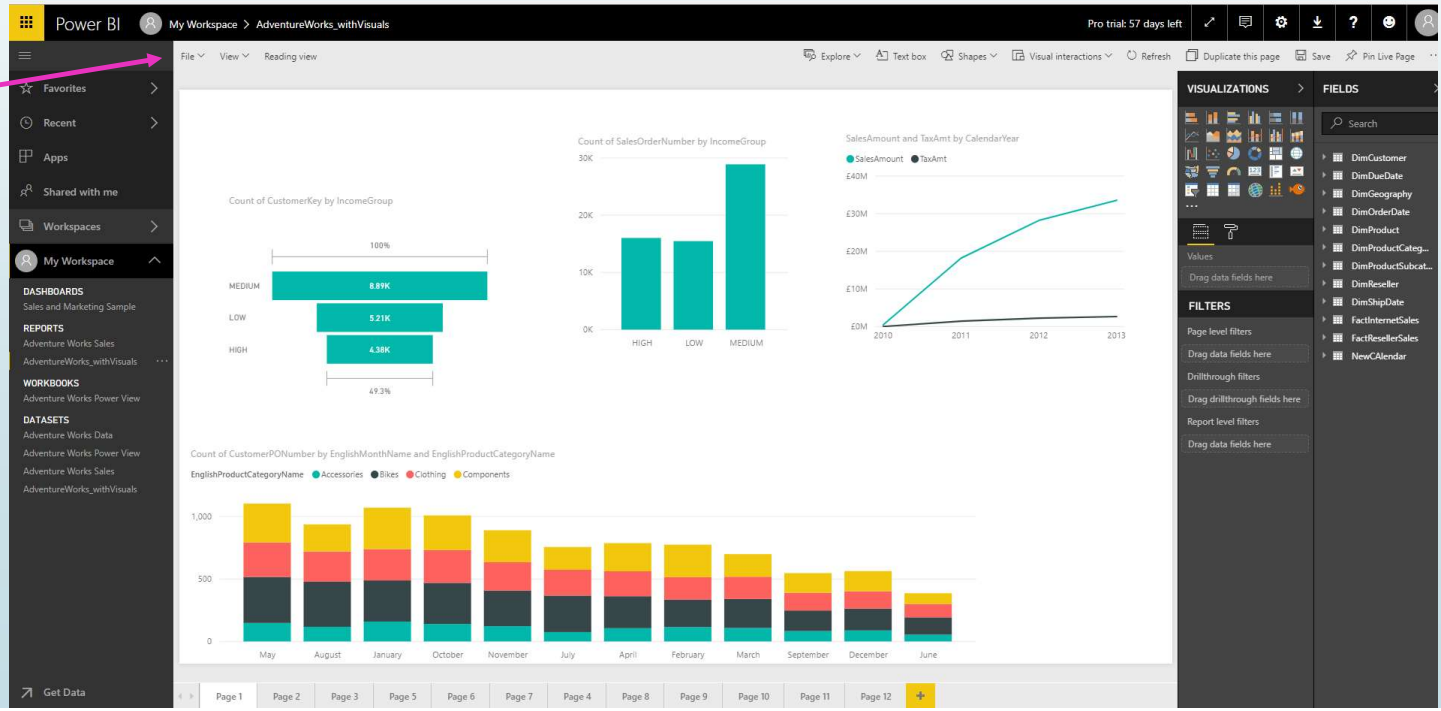
Unlock more capacity and higher limits for your Pro users

Licensing information for Power BI Report Server and fo
embedding analytics with Power BI Premium.

Power BI Services

- Reports can be built or modified directly on line:
- Not best practice except for streaming data
  - Click on report in report list to edit it

Toggle between edit view and reading view



Power BI

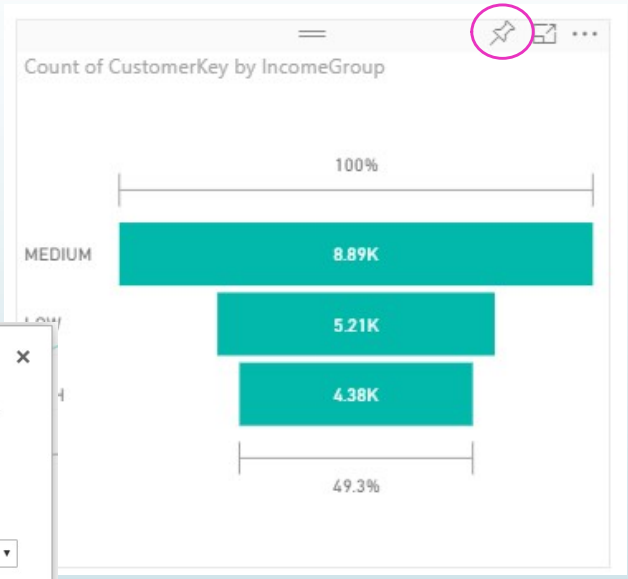
Power Bi Services: Dashboards

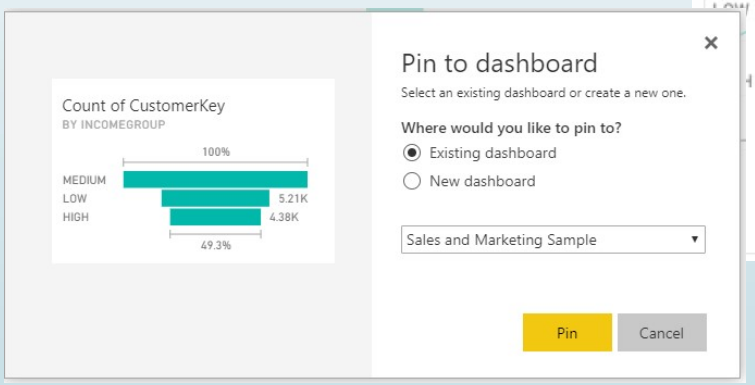
Power BI Services - Dashboards

- Dashboards
  - Summary “At a glance”
  - Keep it simple
  - Direct dashboard to a specific audience
  - Highlight the most relevant information
  - Tell a story
  - Be consistent

Power BI Services

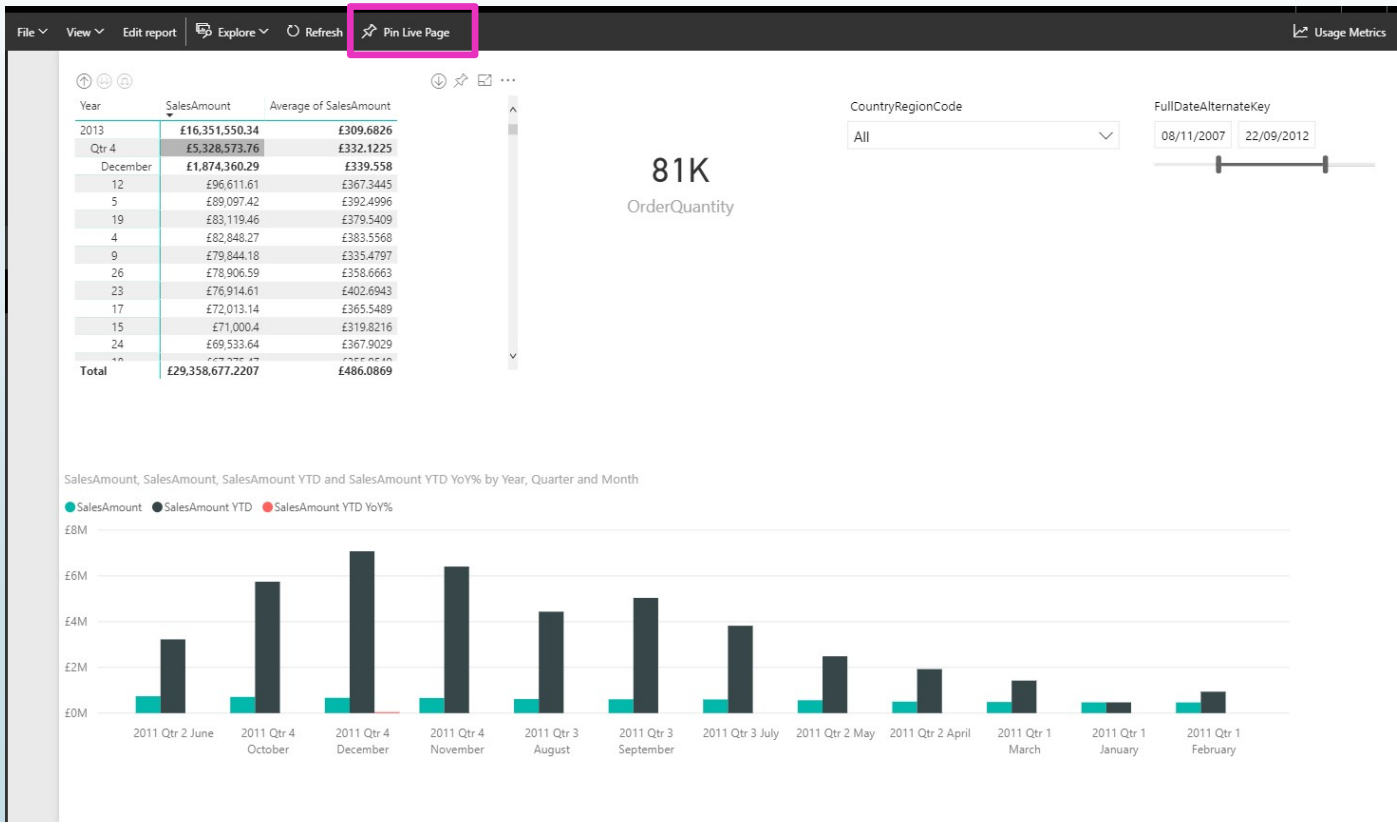
- Pin visuals to dashboard
  - Each visual can be pinned to dashboard
  - Click pint in the top right corner
  - Select new or existing Dashboard
  - Each visual can be pinned to several Dashboards
  - Slicers cannot be pinned to dashboard



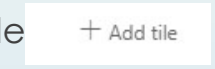


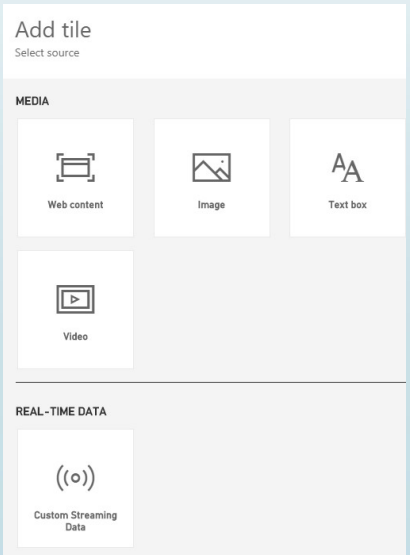
Power BI Services

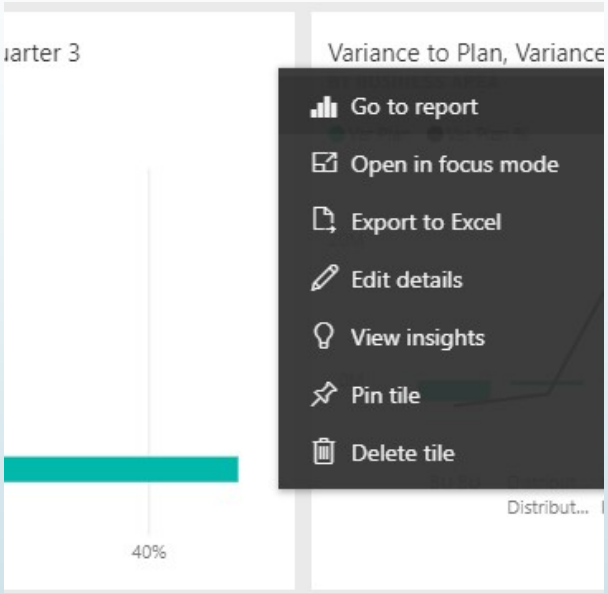
- Pin report to dashboard
  - An entire page can be pinned to dashboard
  - click “Pin Live page”
  - Slicers will be pinned as well



Power BI Services - Dashboards

- Dashboards
  - Each visual is a "tile"
  - Click on the tile to access report
  - Access menu per each tile using top right ellipses
  - click on Add Tile  to add
    - pictures (e.g.logo)
    - text boxes (e.g. title)
    - Web content
    - Real time data





Exercises

- Exercise – Creating and Modifying Tiles on Dashboards

Putting it all together

- Exercise: base project

Power BI

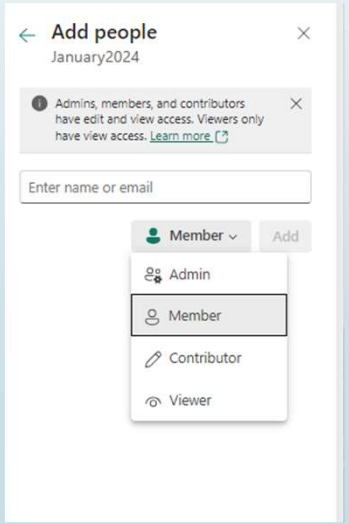
Share your reports

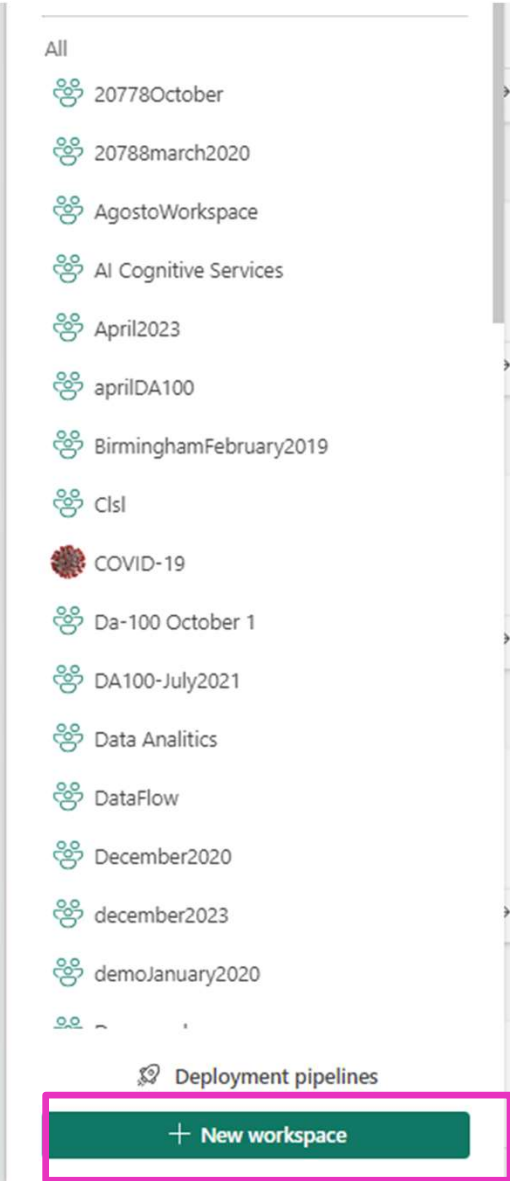
POWER BI: share your reports

- Different ways of sharing and publishing reports:
  - Collaborating with coworkers to create meaningful reports and dashboards in *app workspaces*.
  - Bundling those dashboards and reports into *apps* and publishing them to a larger group or your whole organization.
  - Sharing dashboards or reports with a few people
  - Publishing to the web, where anyone can see and interact with them.
  - Printing
  - Upload report in SSRS 2016 (or later)
  - Power BI Report Server (Premium)
  - Power Bi embedded

POWER BI: share your reports

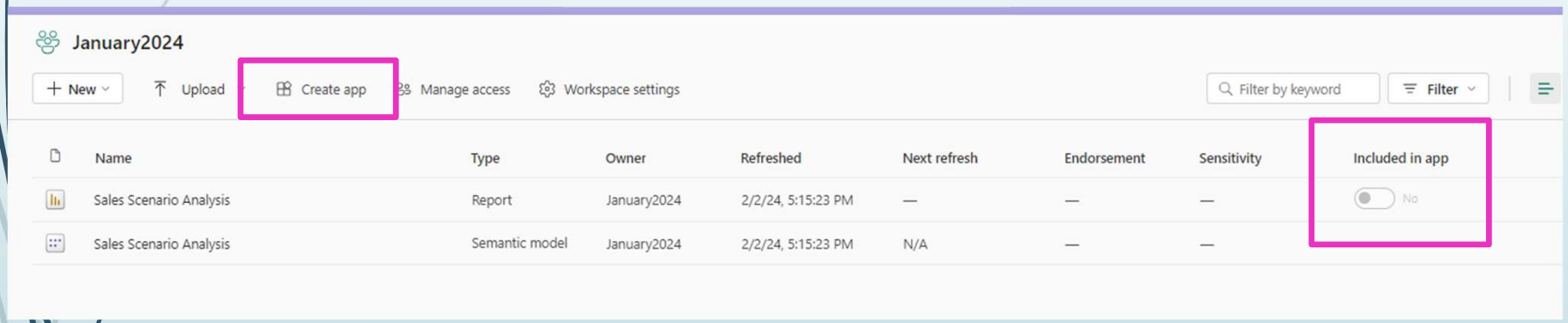
- **Create an *app workspace***
  - *Click on Workspaces -> Create App Workspace*
  - *Enter a name for the workspace*
  - *Set level*
  - *Add members (co-workers that will work with you in creating and editing content)*
  - *Members will find workspace listed in their App Workspace*





POWER BI: share your reports

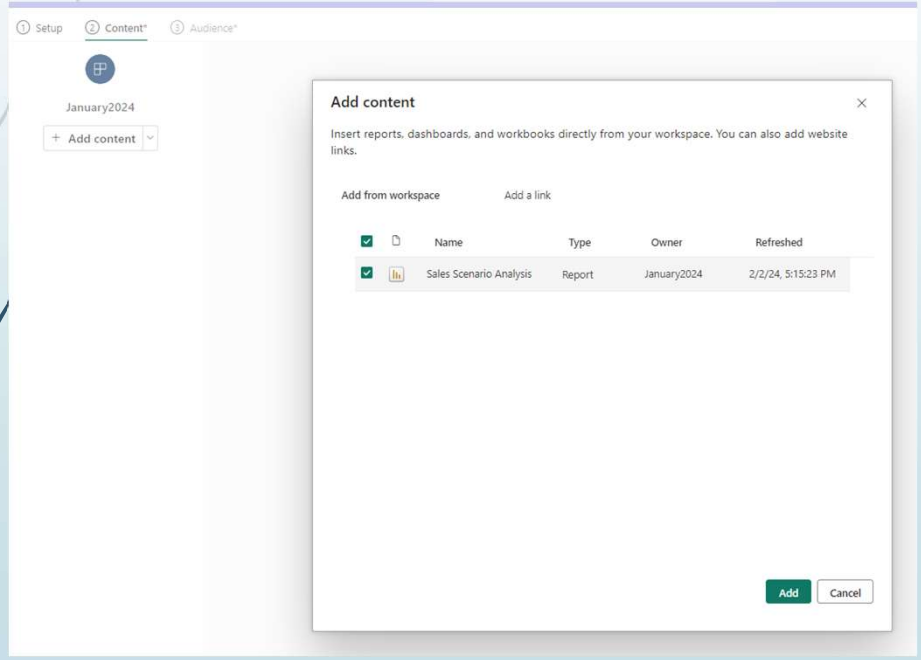
- **Add content to your workspace**
  - *Every member can publish reports and create dashboards in workspace*
- When content is ready to be shared with broader audience -> **Create App**
  - You can select what to include in published App



- You can share with entire organization or a select group (list emails in the Access tab)
- Send your business users a direct link to the app, or they can search for it in AppSource

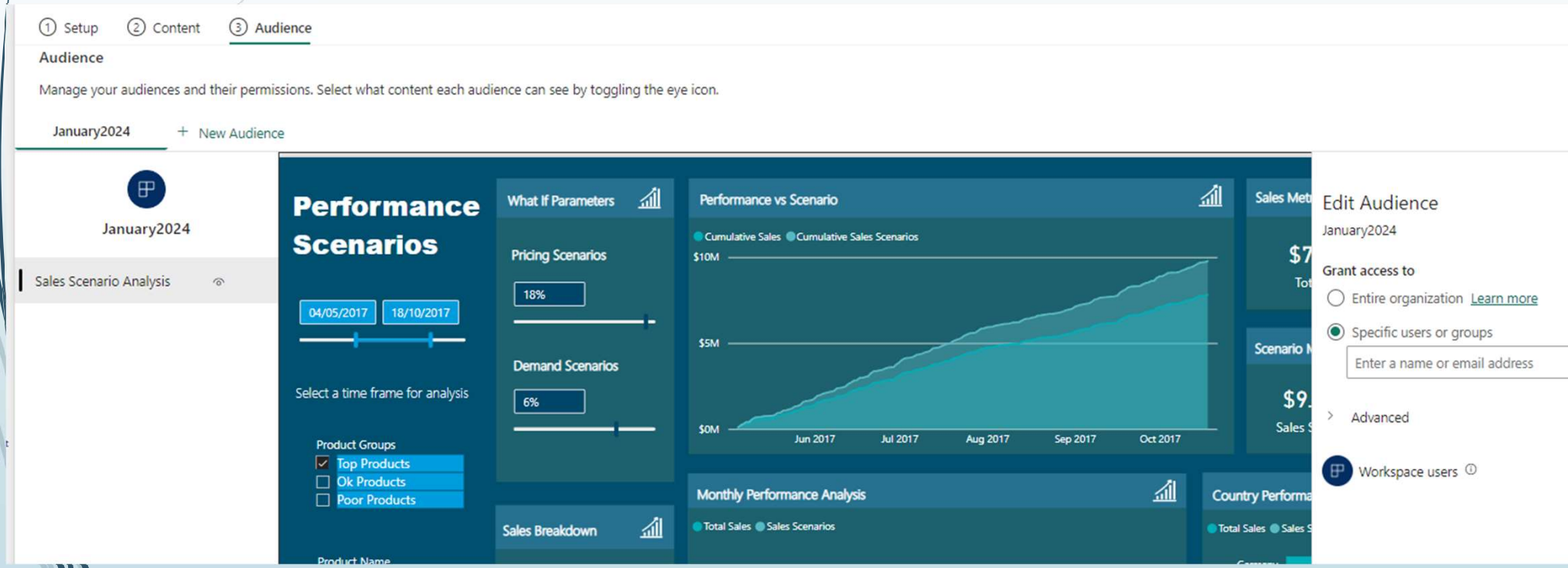
POWER BI: share your reports: Create app

Add reports



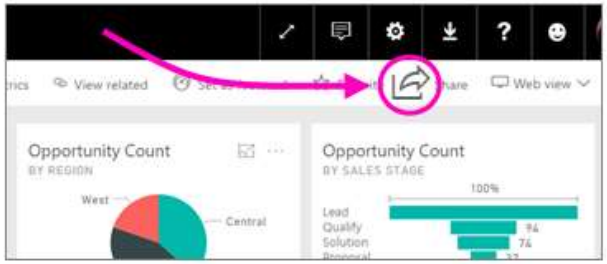
POWER BI: share your reports: Create app

Create Audience: group of users and content



POWER BI: share your reports

- **Sharing dashboards**:
  - Complete dashboards and reports can be shared
  - Go to dashboard and click Share
  - Users can view and interact with dashboard and reports
  - Users cannot edit dashboards and reports
  - They see the same data that you see in the dashboard and reports unless row-level security (RLS) is applied to the underlying dataset.
  - The coworkers you share it with can share with their coworkers, if you allow them to.
  - You can share with people outside your organization, too. They can view and interact with the dashboard too, but can't share it.



POWER BI: share your reports

- **Other ways of sharing**:
  - Printing
  - Exporting to power Point:
    - Live export or static
  - Upload report in SSRS 2016 (or later)
  - Power BI Report Server (Premium)
    - Content created in Power Bi Premium can be published on premises with Power BI report Server

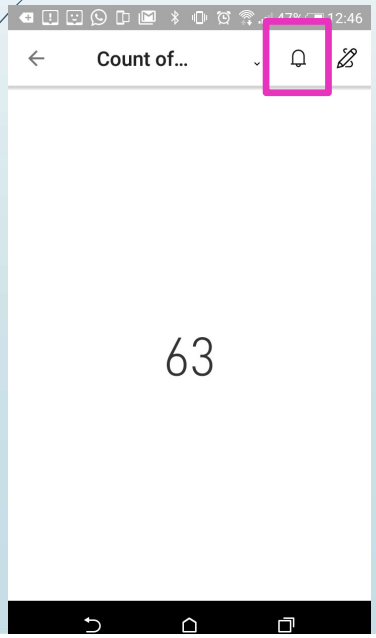
    https://powerbi.microsoft.com/en-us/report-server/
  - Power Bi embedded
    - Azure service to use the Power BI REST APIs to embed dashboards, reports, and tiles into your app.

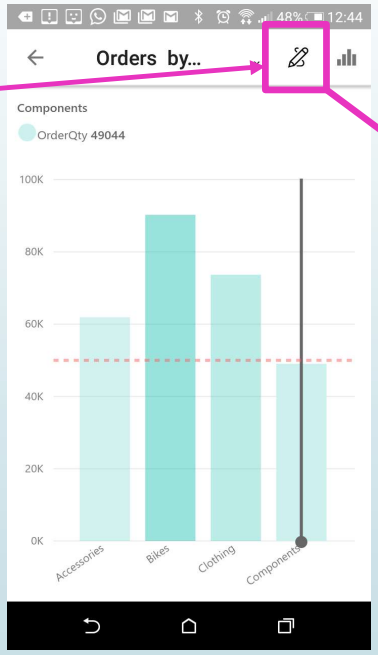
Power BI

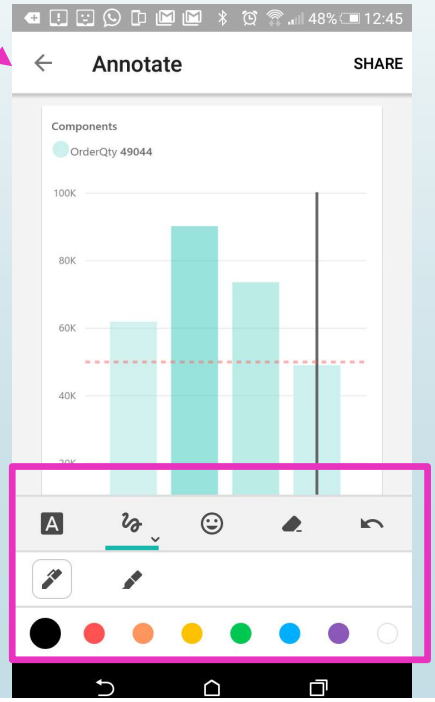
Mobile App

POWER BI Mobile

- Install Power Bi free app on your mobile.
- Connect to the server using the same login you use on powerbi.com
- View and interact with dashboards and reports
  - Click on pencil to annotate report
  - Alerts can be set on card visuals

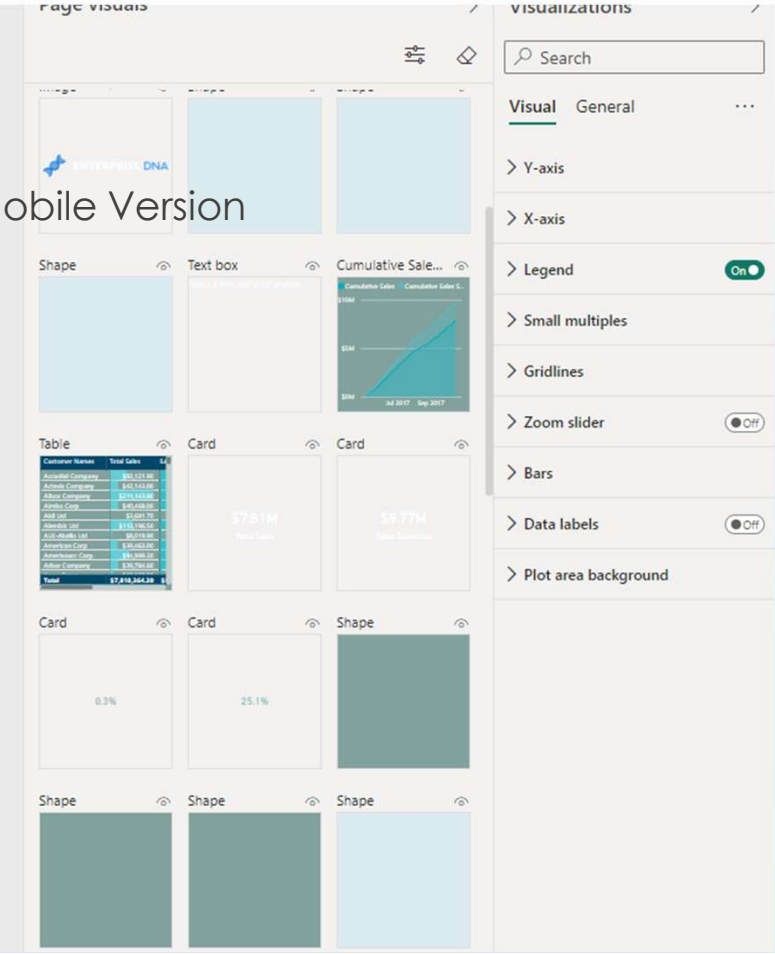






Power Bi Mobile

- Create and Format Mobile Version



Putting it all together

- Exercise: base project

Power BI

Thank you for following this course and good luck with your reports!!!

Power BI and DAX references

- https://www.daxpatterns.com
- https://www.sqlbi.com/
- Guy in the cube videos on youTube
- Chris Webb BI blog: https://blog.crossjoin.co.uk/
- https://community.powerbi.com/
- Power Bi Blog and updates: https://powerbi.microsoft.com/en-us/blog/2018/06/
- PowerBI user group: https://www.meetup.com/en-AU/London-PUG/

Power BI: next steps
Beyond the basics

Power Bi – Advanced DAX

- DAX Basics review
- Variables
- Review of Filter context
- CALCULATE
- Common functions
- Table Functions
- Semi additive measures
- Time Intelligence Calculations

- Advanced Evaluation Context DAX
  - Context transition
  - Iterator -> nested row context
- Creating Dynamic titles
- Using parameter table

Appendix: DAX Studio

- Dax as a query language
- Capturing and debugging queries with Dax Studio

Power Bi – Advanced Power Query and Power Bi Administration

TRANSFORMING DATA

- Shaping & Cleansing Data
- Basic Transformations
- Combining Datasets (append, join)

Advances Power Query and M

- Create tables
- Custom Column, conditional column, column from example

M language:

- The M Syntax
- M Query Basics
- Variables and Parameters
- M Query Functions
  - Automated import
- Create date table using M

DataFlow

- Create a dataflow
- Cleanse data using Dataflow
- Connect PowerBi Desktop to dataflow

Power Bi –Advanced Data Modelling and visualization

Advanced visualization

- Digital Storytelling
- Buttons and Bookmarks
- Selection Pane
- Drillthrough
- Tooltip Page

- Use of Custom Visuals
- Custom Themes
- Multiple pages slicers
- Layout
- Conditional Colour formatting

Advanced Modelling

- Many to many relationship
- Cross Filtering
- Role Playing dimension