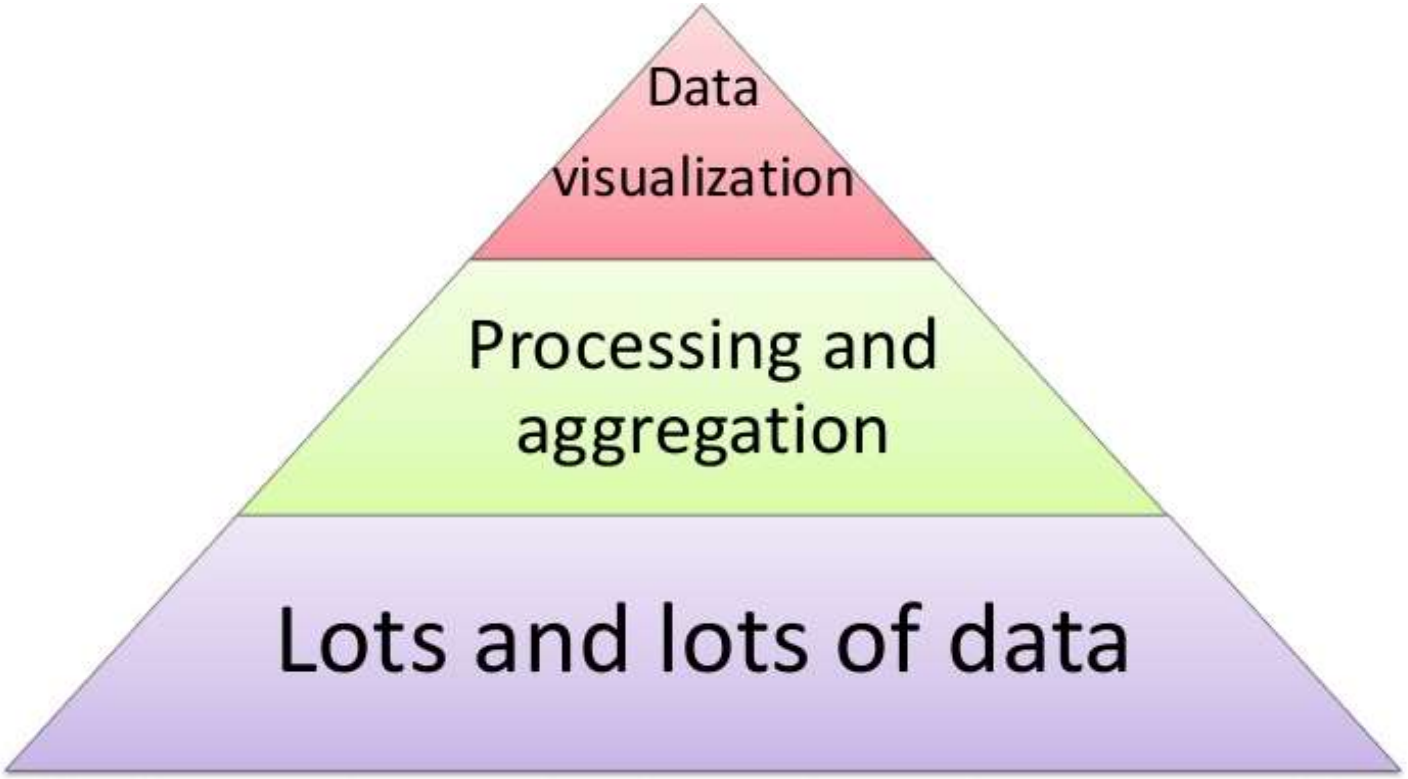
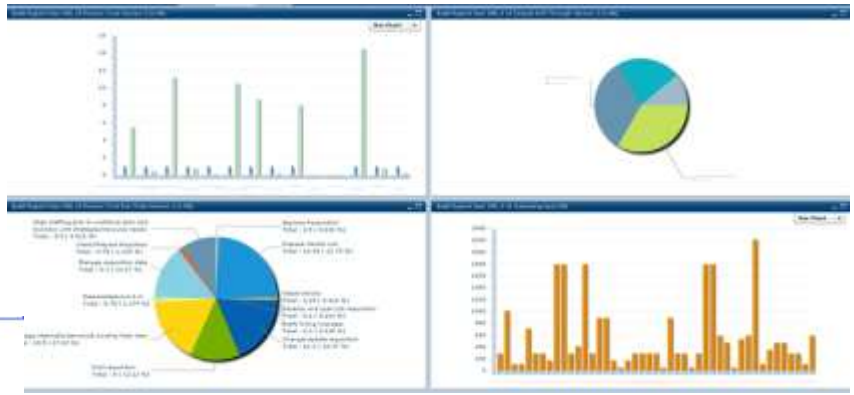
# Agenda

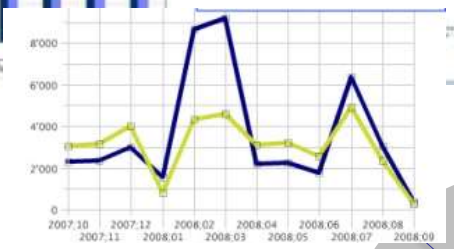
- What is Business Intelligence ?
- What is Power BI?
- Cloud Vs On Premises solution
- What is Power BI Desktop ?
- Developing visuals in Power BI
- Publish , Share ,Security - PBIRS
- Modelling Data in power BI
- DAX
- Q&A




**Business intelligence** (**BI**) is a set of theories, methodologies, architectures, and technologies that **transform raw data into meaningful and useful information** for business purposes.

# Business Intelligence

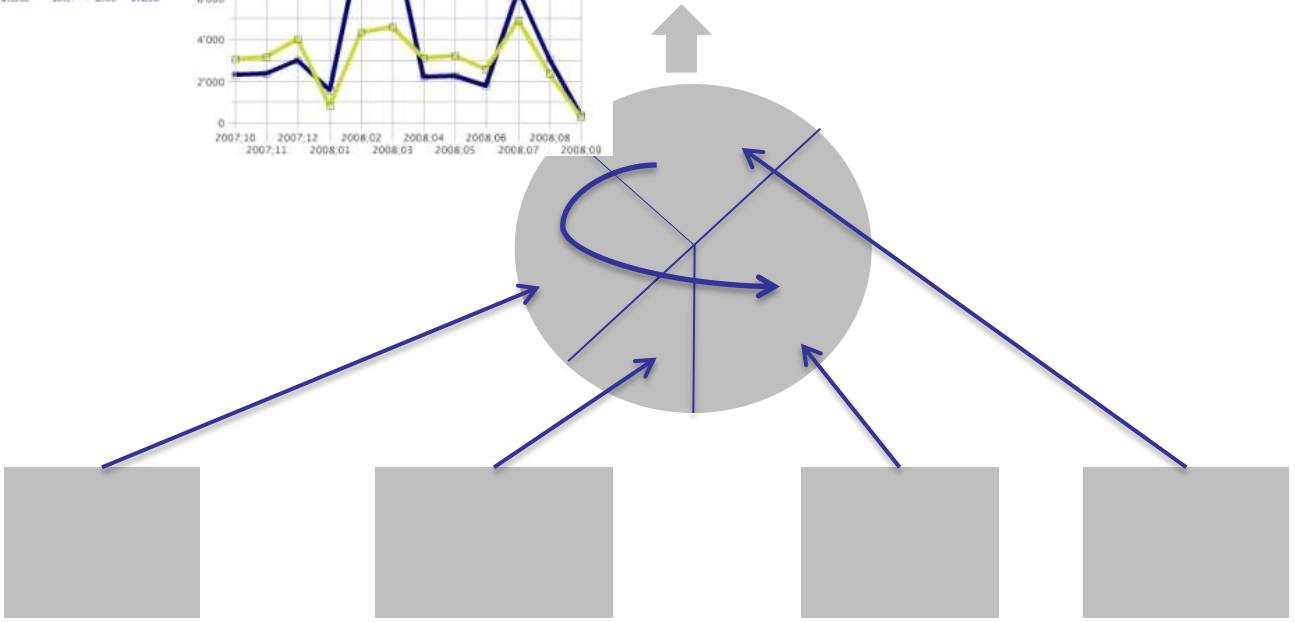




Reports

Data repository

Different systems





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# Introducing

Power BI

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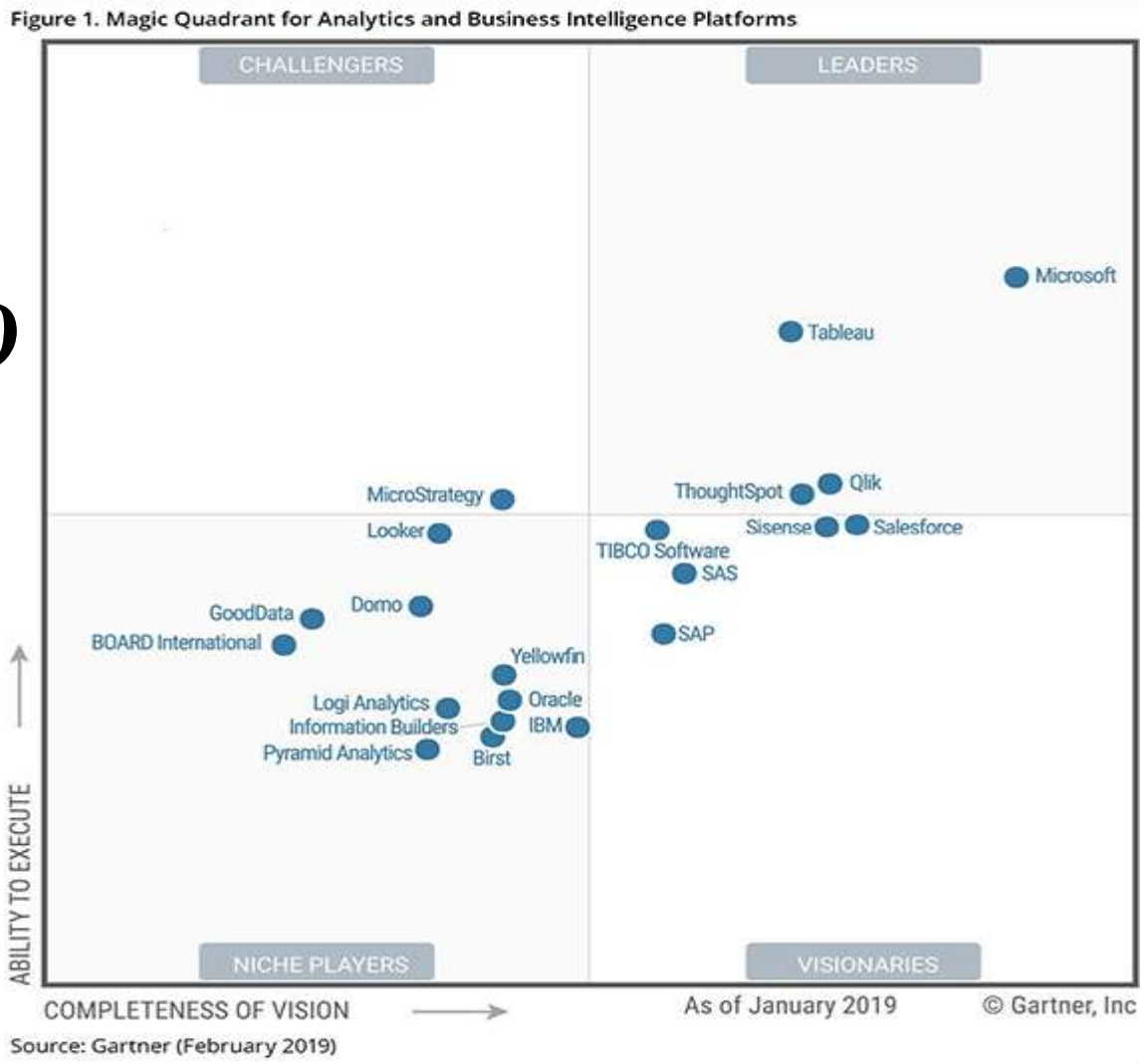
# Magic Quadrant report for 2019




**(Gartner, feb 2019)**



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# The world of data is changing

**10x** increase every five years

**85%** from new data types

**Big Data**

**Consumerization of IT**

**4.3** connected devices per adult

**27%** using social media input

"Organizations that build a modern information management system will outperform their peers financially by 20 percent."

– Gartner, Mark Beyer., "Information Management in the 21st Century"

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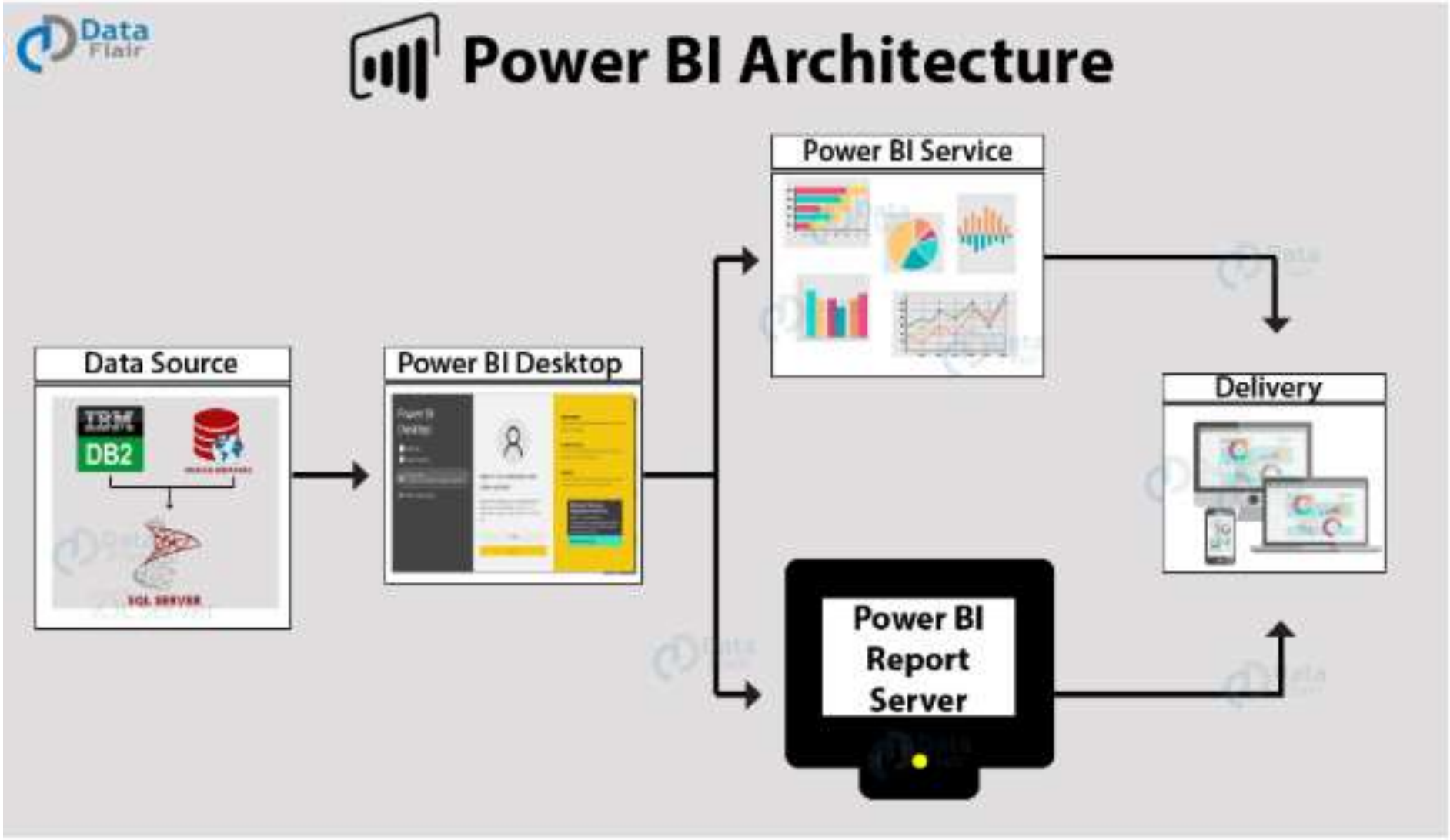
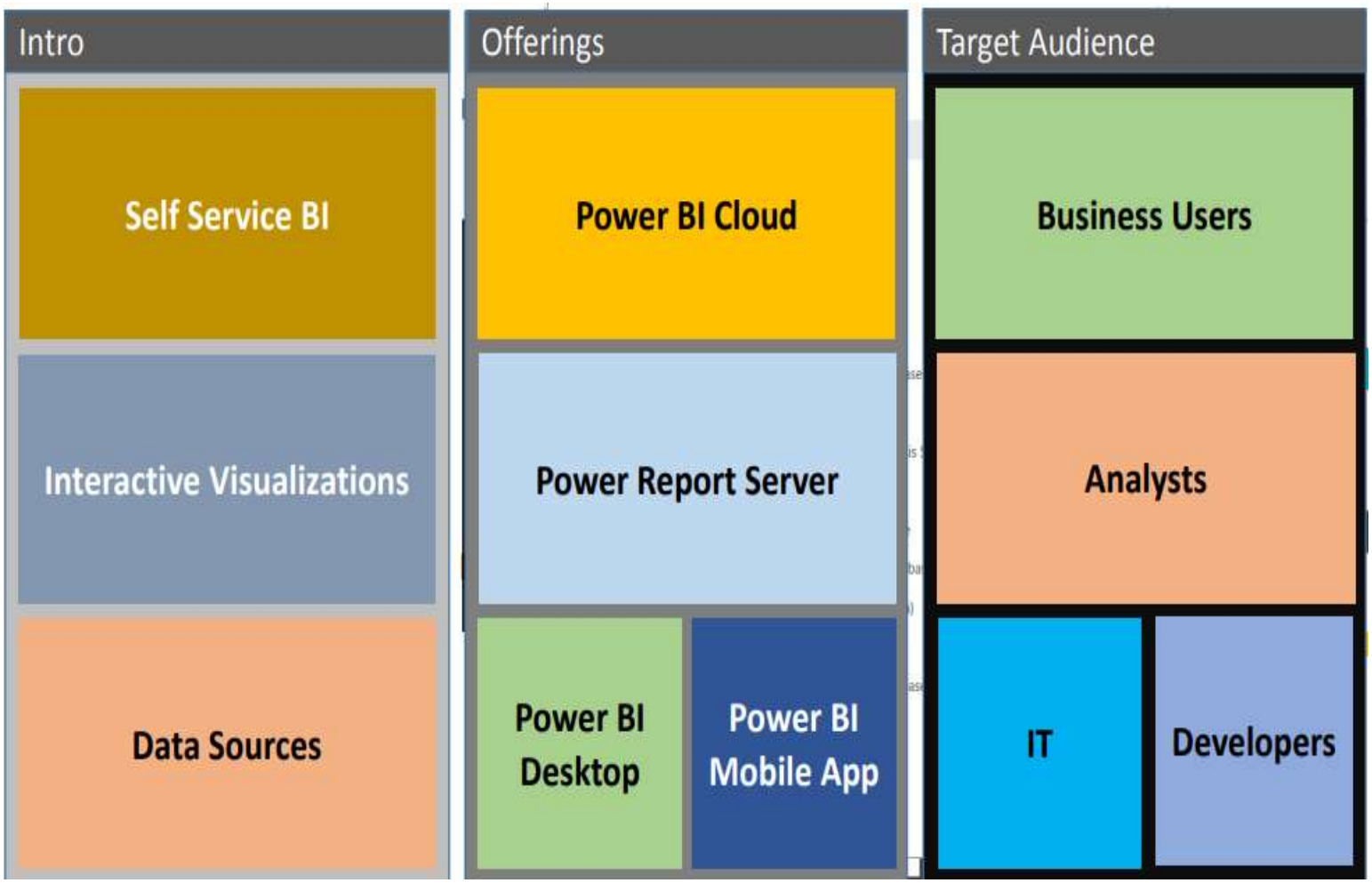
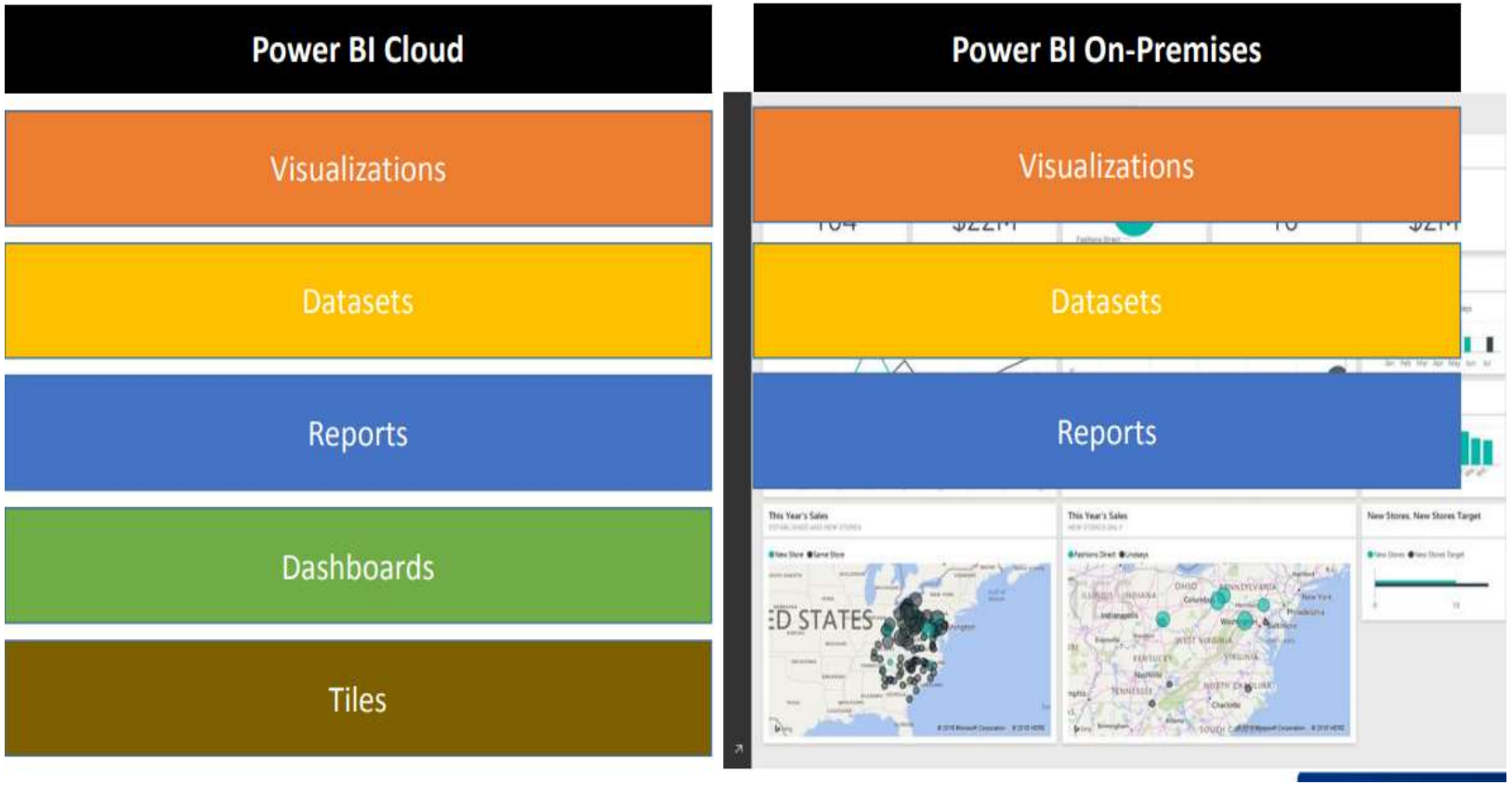
# Power BI Architecture



# Power BI Offerings:



# Building Blocks (Cloud vs On-premises)



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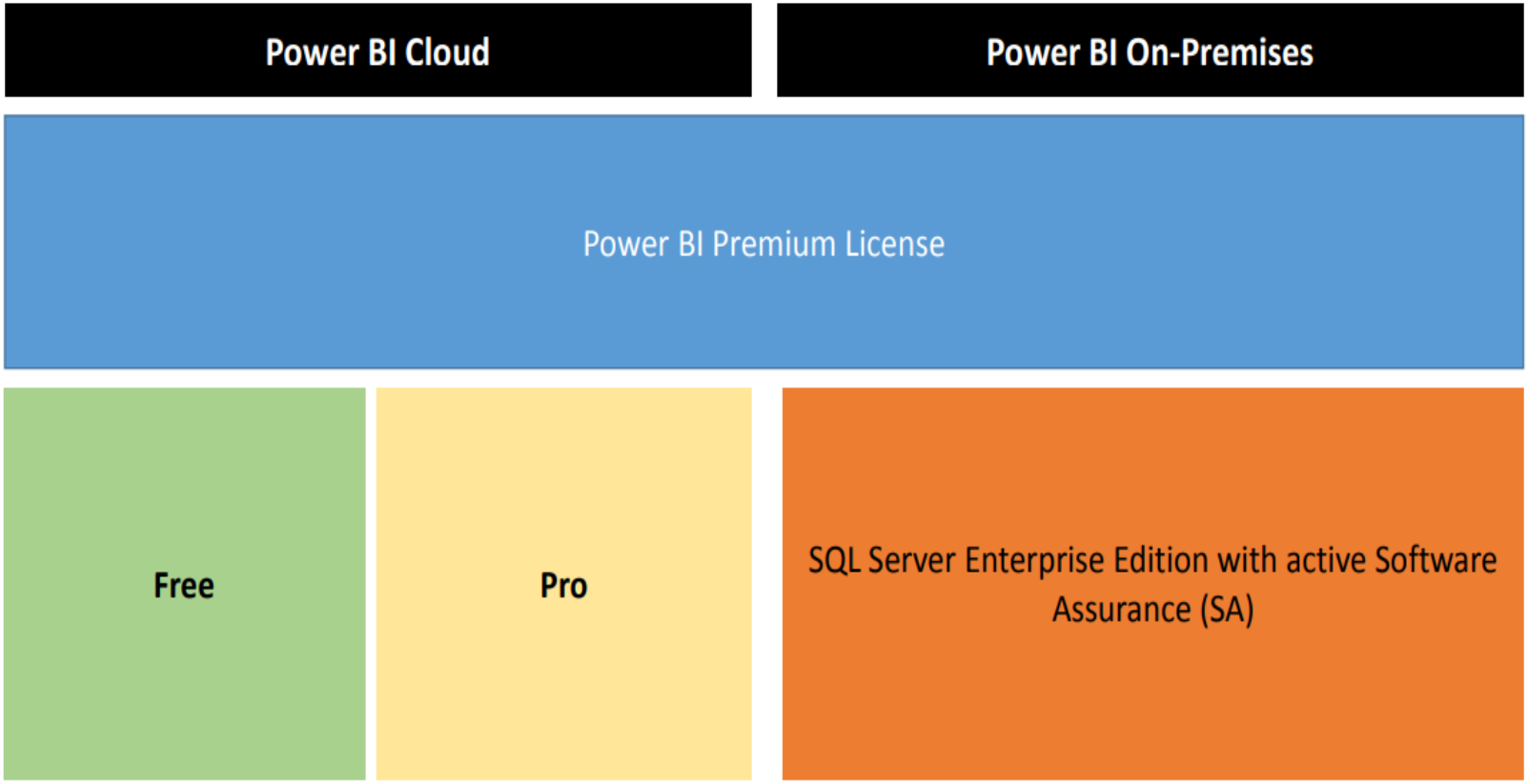
# Power BI Licensing (Cloud vs On premises)



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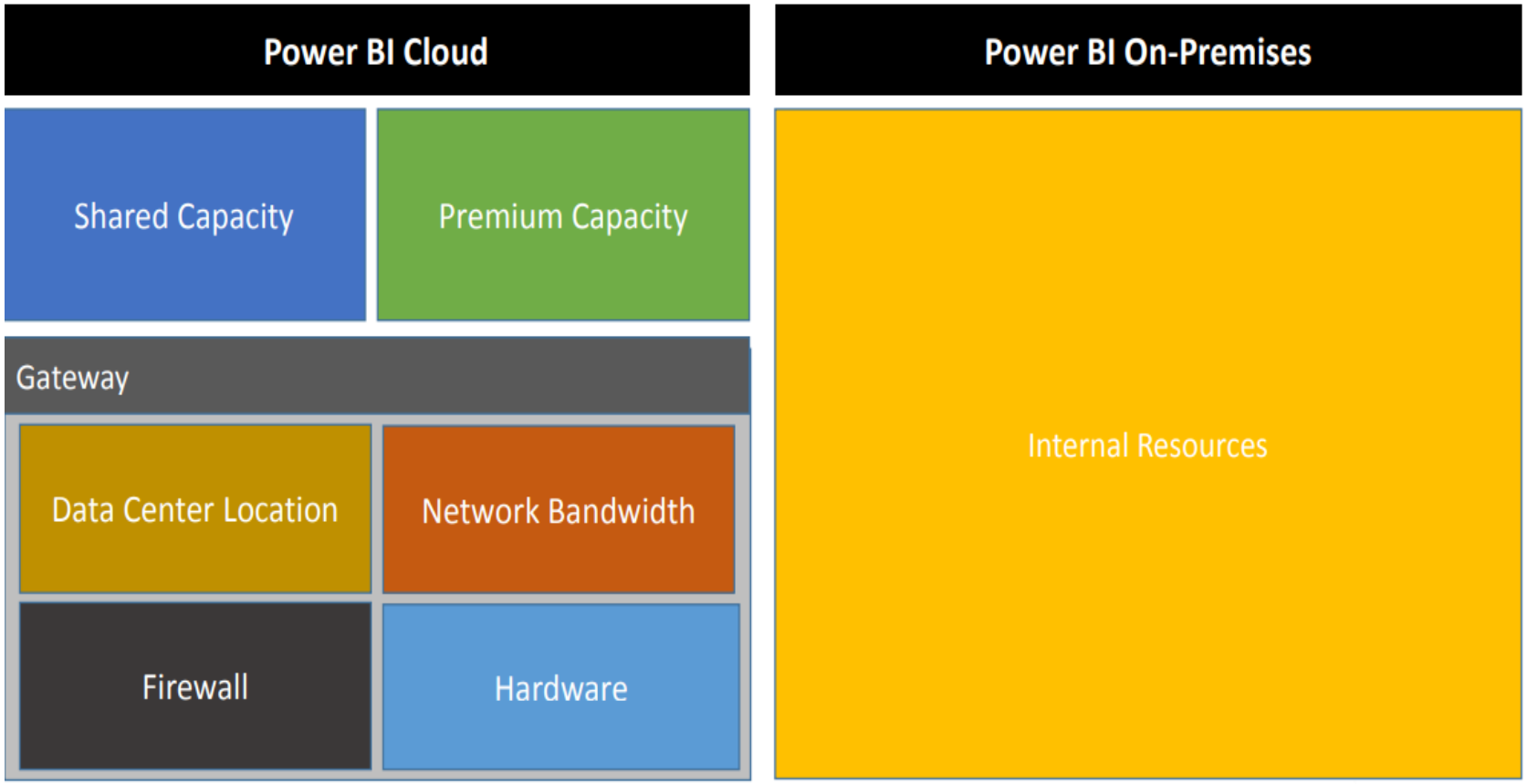
# Performance (Cloud vs On premises)



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# Vocabulary

**Power BI**

- An application that lets you connect to, transform, and visualize your data.

**Power BI Desktop**

- Where the report is created from data that is selected.

**Power BI Server**

- Published reports hosted on On-Prem server called PBIRS

**Visualizations**

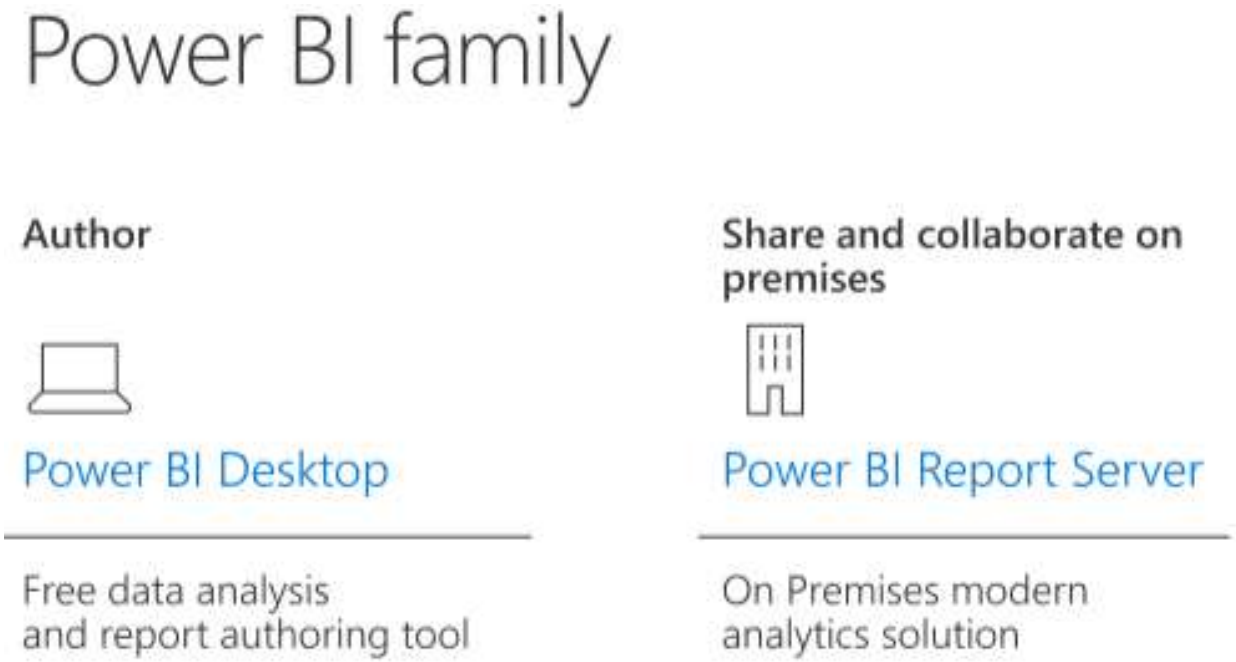
- A visual representation of data such as a chart, graph, or map.

**Slicer**

- A filter on your report in the form of various types such as a list or a dropdown.

# Security

- **Browser** – can view, run and create reports
- **Publisher** –can publish a report to a program folder; only one or two granted per program




Power BI is a free Microsoft analytics tool which includes Desktop and Report Server (DEP does not have *Cloud Service*).

**Power BI Desktop** is where the report will be built and transformed.

**Power BI Report Server** is where the report can be published. Anyone with the program login can go into a program folder with *Browser* security to view and run the report. The reports are kept on premises, meaning not in the Cloud.

# Power BI Desktop

- Power BI Desktop is a free application for PCs that lets you gather, transform, and visualize your data.

- Versions of Power BI Desktop :

  Power BI Desktop for Cloud

https://www.microsoft.com/en-us/download/details.aspx?id=58494

  Power BI Desktop Optimized for On-Prem :

https://www.microsoft.com/en-us/download/details.aspx?id=57271

The most common uses for **Power BI Desktop** are the following:

- Connect to data
- Transform and clean that data, to create a data model
- Create visuals, such as charts or graphs, that provide visual representations of the data
- Create reports that are collections of visuals, on one or more report pages

Power BI Desktop

# Consolidate data from a broad range of sources

- Use Query functionality to connect to data from a variety of sources beyond those available from powerbi.com
- Navigate data quickly with in-memory processing that optimizes performance
- Pare down datasets to only what's needed by editing queries before data loading

*Data sources available through Power BI Desktop*

| File | Database | Azure | SaaS | Other |
|---|---|---|---|---|
| • Excel<br>• CSV<br>• XML<br>• Text<br>• JSON<br>• Folder | • SQL Server Database<br>• Access Database<br>• SQL Server Analysis Services Database<br>• Oracle Database<br>• IBM DB2 Database<br>• MySQL Database<br>• PostgreSQL Database<br>• Sybase Database<br>• Teradata Database | • Microsoft Azure SQL Database<br>• Microsoft Azure Marketplace<br>• Microsoft Azure HDInsight<br>• Microsoft Azure Blob Storage<br>• Microsoft Azure Table Storage | • appFigures<br>• QuickBooks Online<br>• Zendesk<br>• GitHub<br>• Twilio<br>• SweetIQ | • Web<br>• SharePoint List<br>• OData Feed<br>• Hadoop File (HDFS)<br>• Active Directory<br>• Microsoft Exchange<br>• Dynamics CRM Online<br>• Facebook<br>• Google Analytics<br>• SAP Business Objects BI Universe<br>• Salesforce Objects<br>• Salesforce Reports<br>• ODBC Query<br>• ODBC Tables |

Power BI Desktop

# Shape data into the format and structure you need

- Transform data to fit your needs using intuitive UI
  - Select data for inclusion
  - Cleanse data and remove errors
  - Precisely tune the query step sequence: re-order, add, edit or delete steps as needed
  - Modify data types to support specific calculation requirements
- Very powerful for advanced scenarios (M, Mashups)

**Common data-shaping tasks**

- Remove rows or columns
- Change a data type
- Pivot columns and group rows
- Modify a table name
- Identify and fix errors
- Merge or append queries to combine data from multiple queries into a single query

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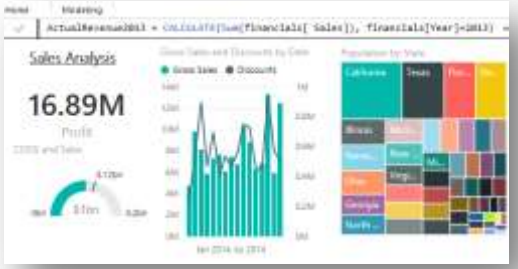
Power BI Desktop

# Produce rich data models using formulas and relationships

- Automatically create a model by importing data
  - Desktop detects relationships automatically, categorizes data and applies default summarization
- Refine models to enable complex calculations
  - Create relationships between tables manually or using the AutoDetect feature
  - Adjust relationship type (1:1, many: many, m:1) and cross-filter data for new insights
- Define calculations – known as measures – to generate new fields for use in reports
  - Use automatically generated measures, or create custom measures with Data Analysis Expressions (DAX) formulas
- Develop advanced analytics using a combination of measures and relationships
  - Uncover correlations, highlight exceptions and understand business outcomes

*Apply complex schema and business logic to create rich, reusable data models*

*Create and modify relationships*




*Define and use measures with DAX formulas*

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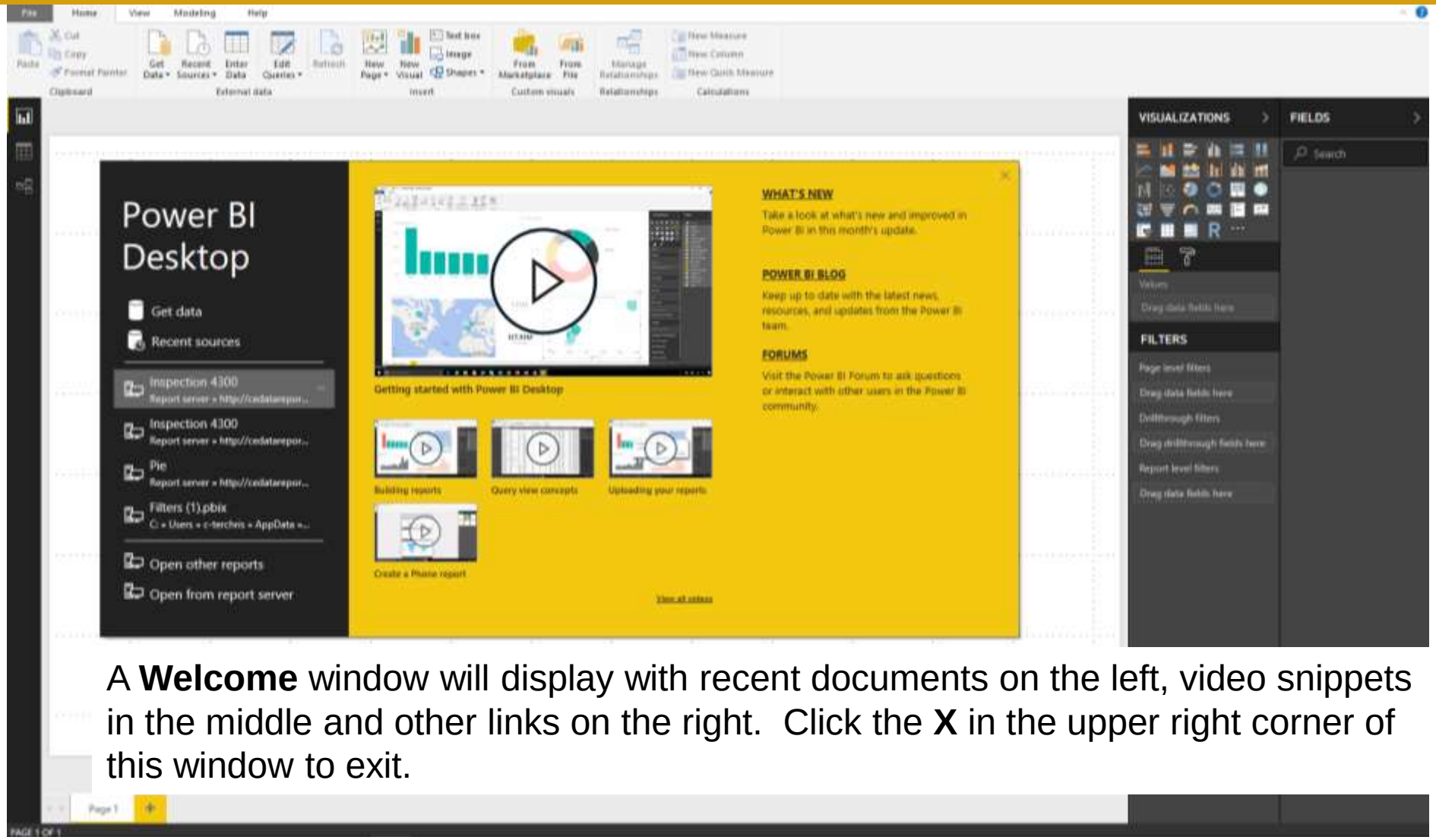
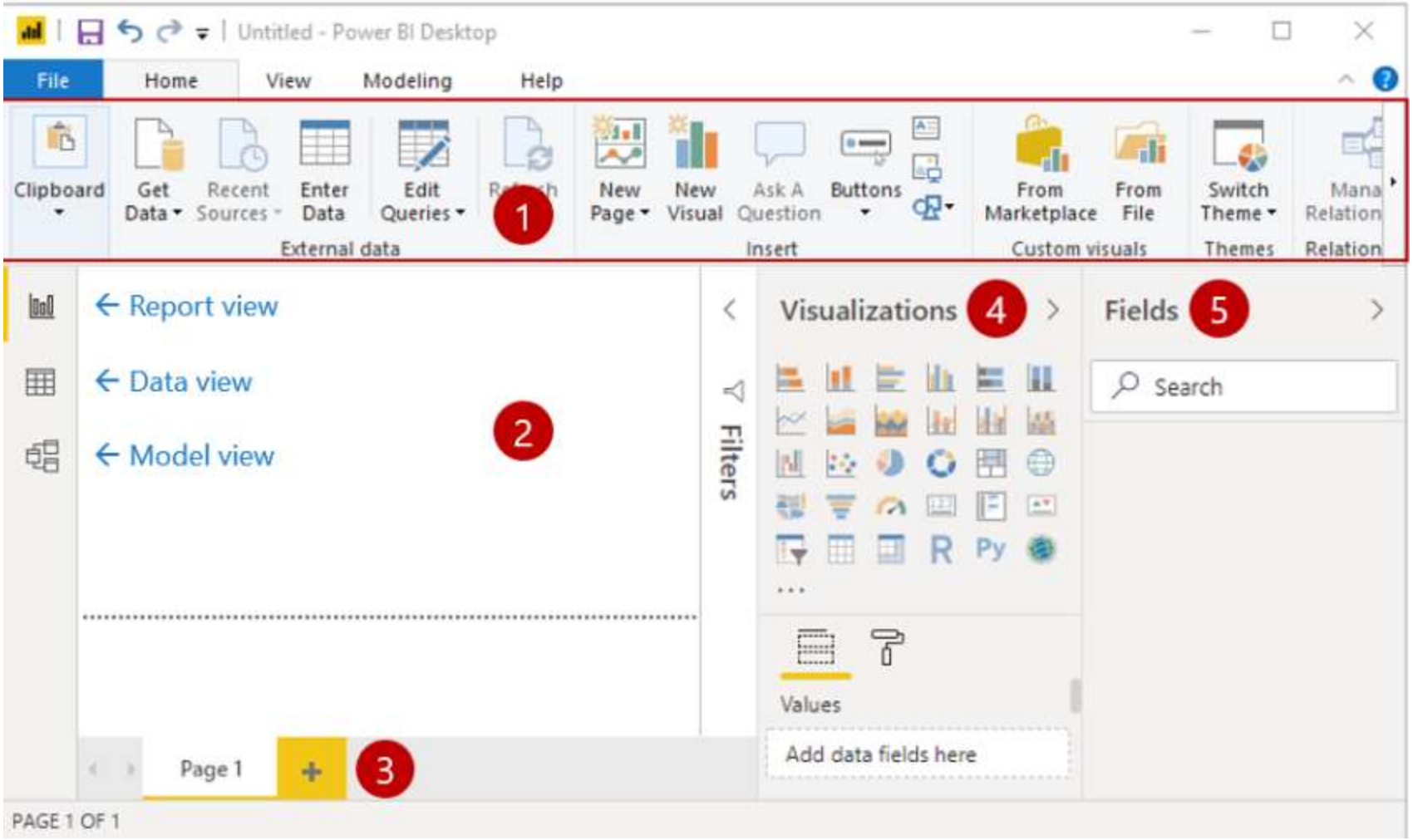
# Log in

Click the

Power BI Desktop shortcut icon.




A **Welcome** window will display with recent documents on the left, video snippets in the middle and other links on the right. Click the **X** in the upper right corner of this window to exit.



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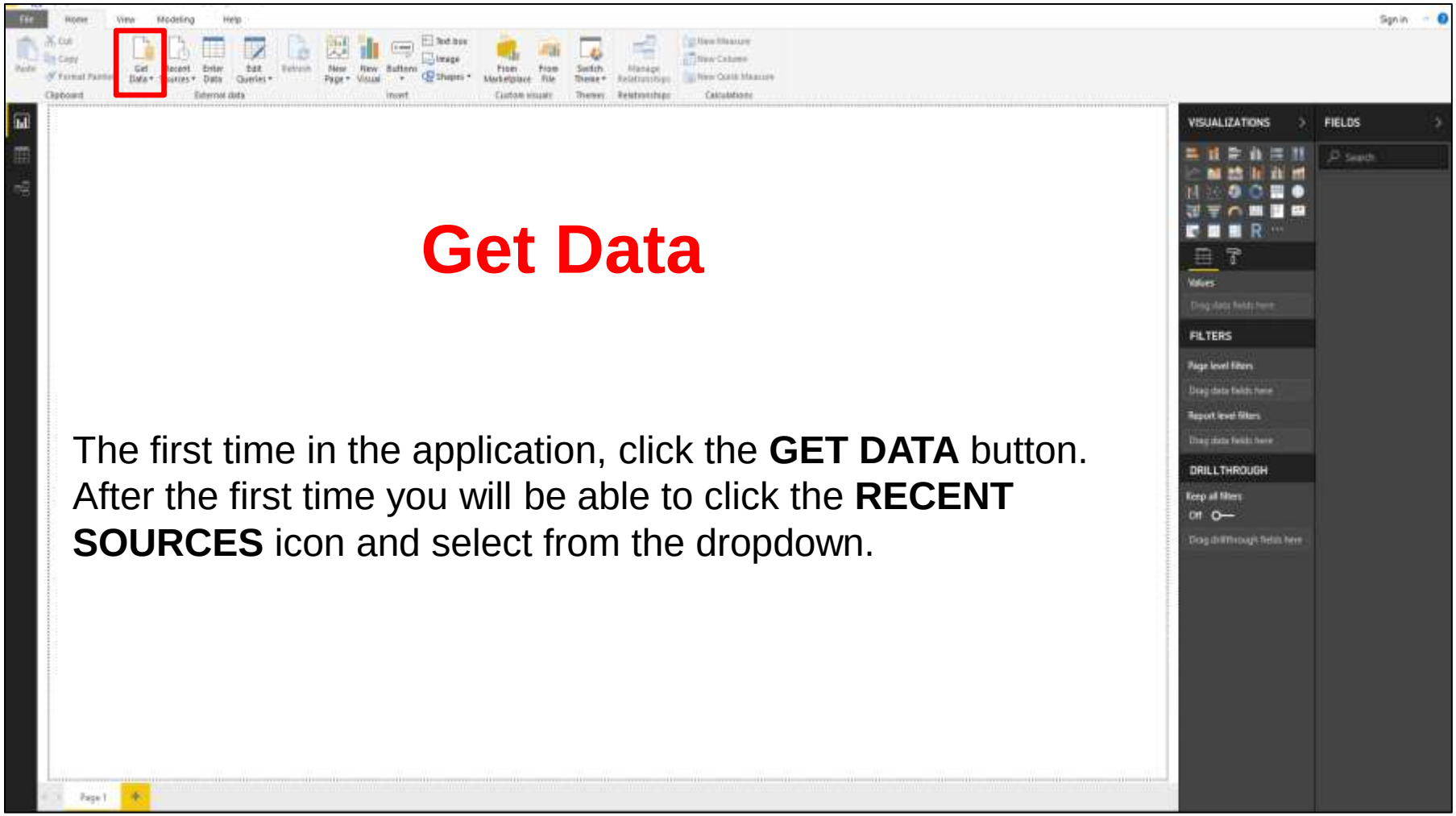
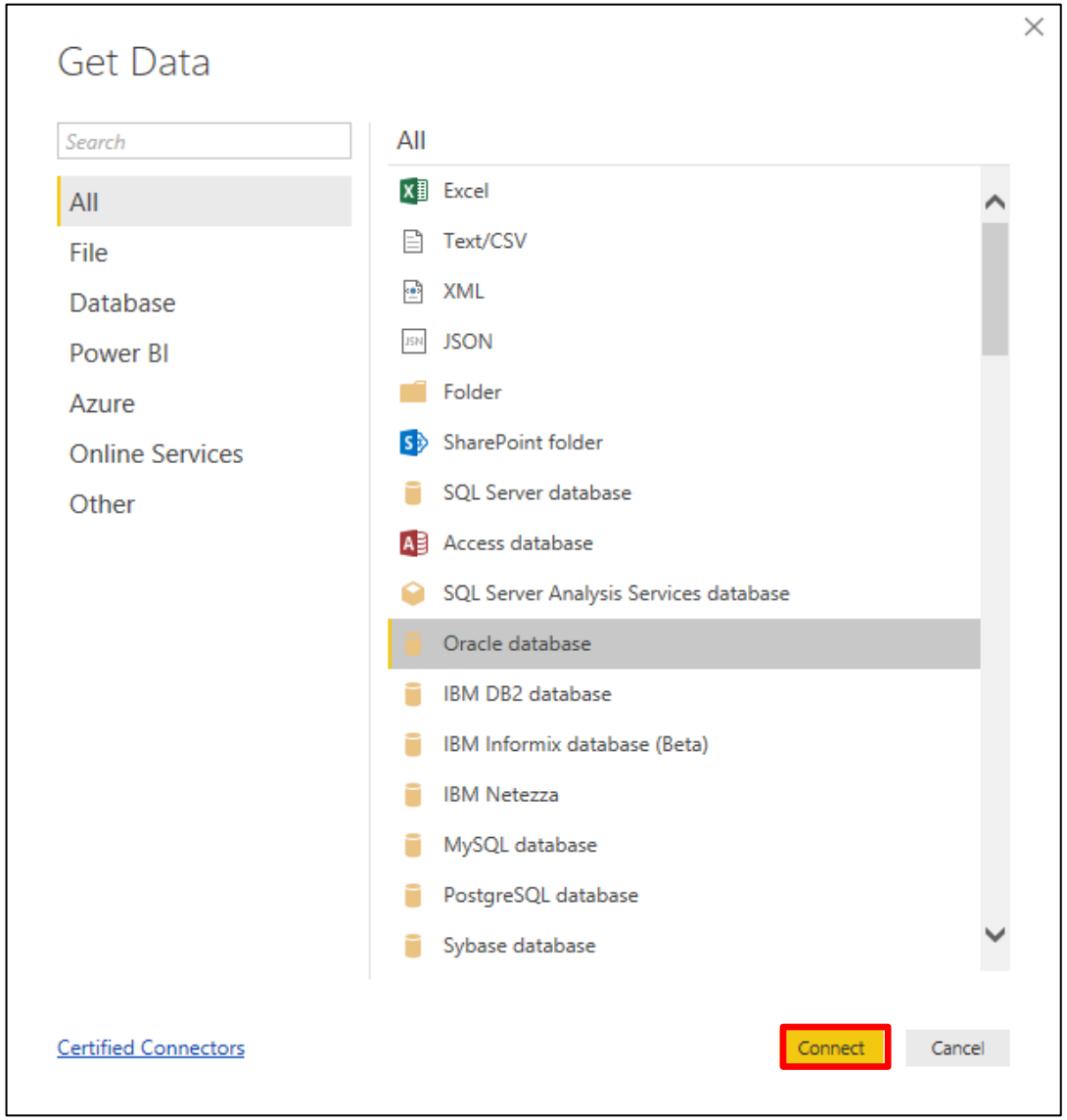

Get Data
The first time in the application, click the **GET DATA** button. After the first time you will be able to click the **RECENT SOURCES** icon and select from the dropdown.
VISUALIZATIONS
FIELDS
FILTERS
DRILLTHROUGH

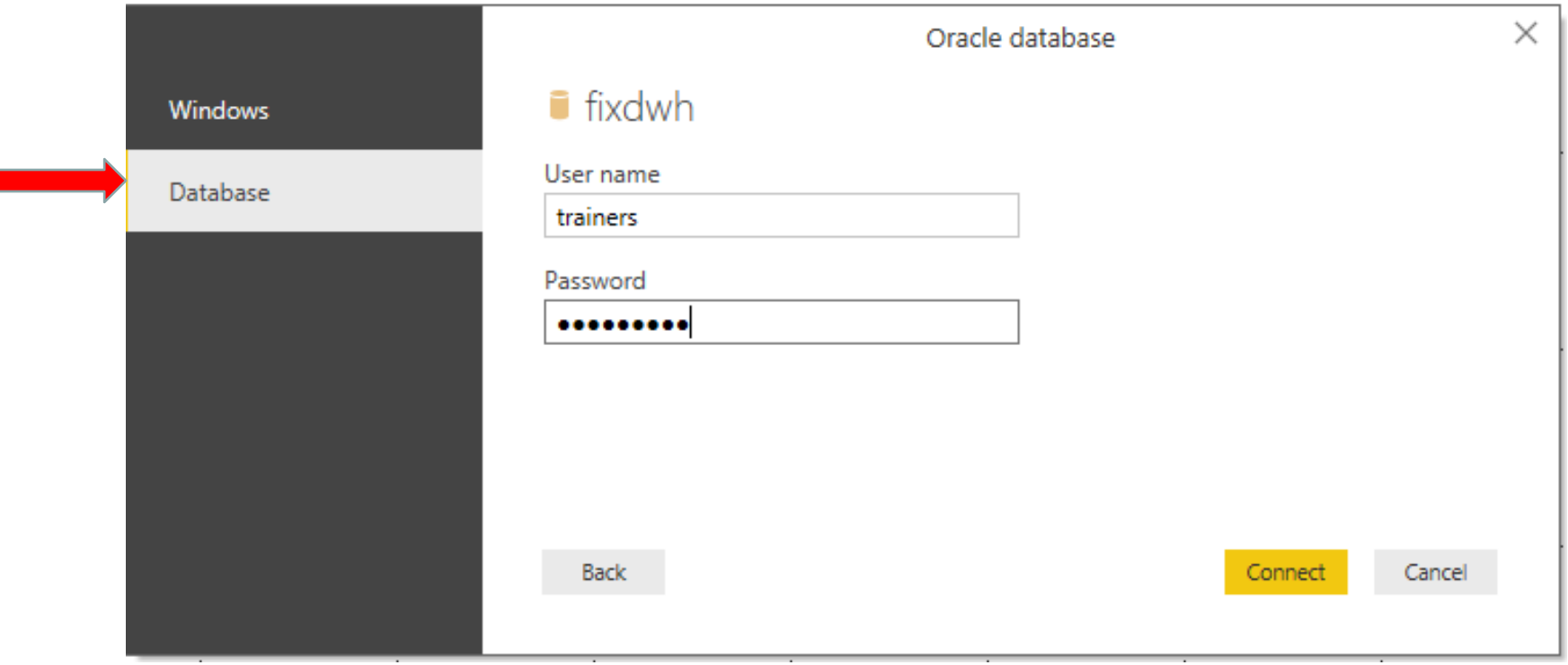



Select **Oracle Database** and then click the **Connect** button.

**Server:** Type *fixdwh*

ʘ Change to DirectQuery

Click the **OK** button.



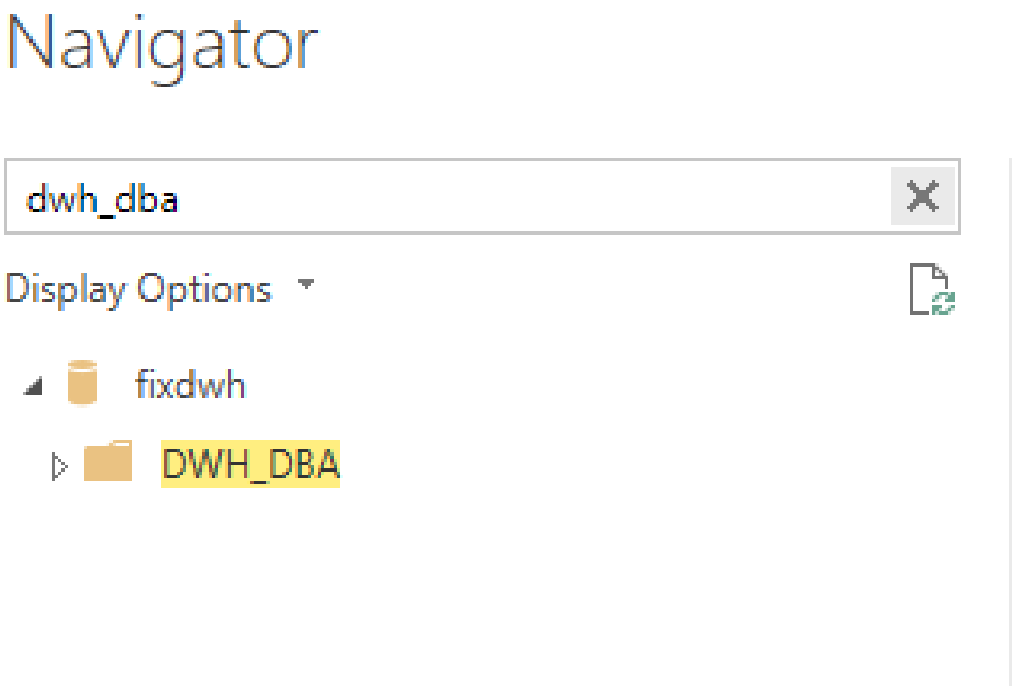

In the left pane, click **Database**

Enter Program **Username** and **Password**

Click the **Connect** button

Instead of the Program login you can also use:
Username: Shared_Reports
Password: reporter

In the Search box type: *dwh_dba*
The folders will display below that match.



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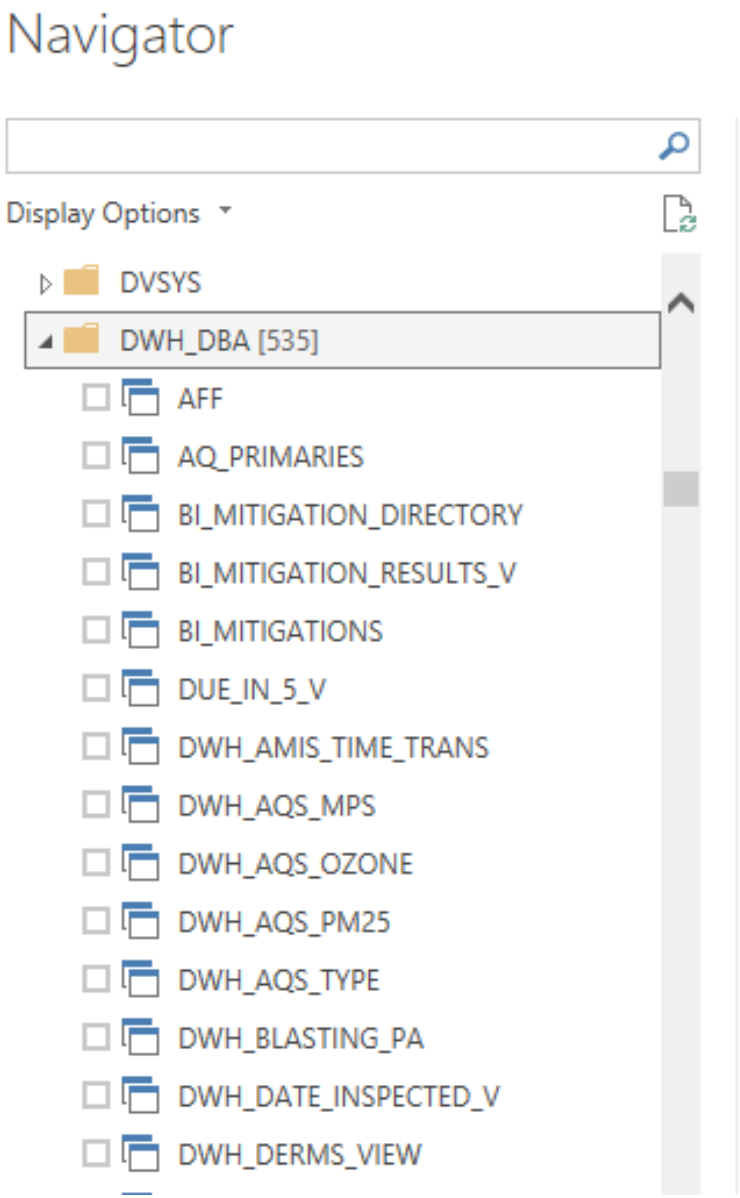
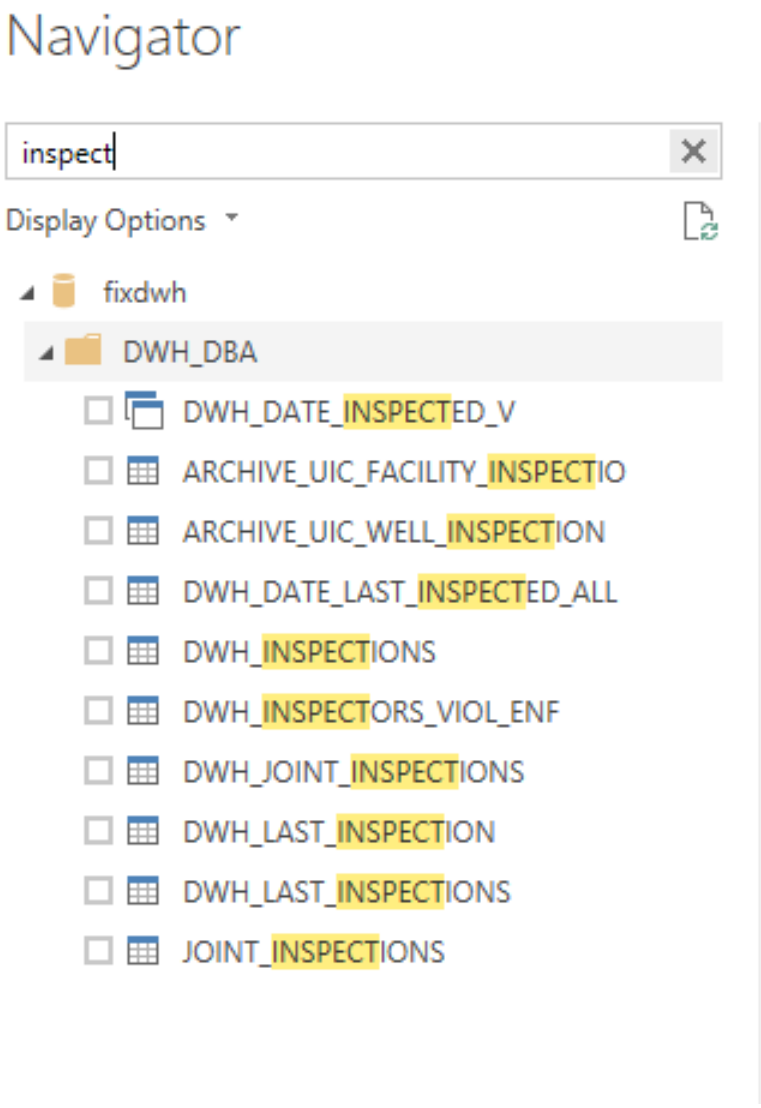
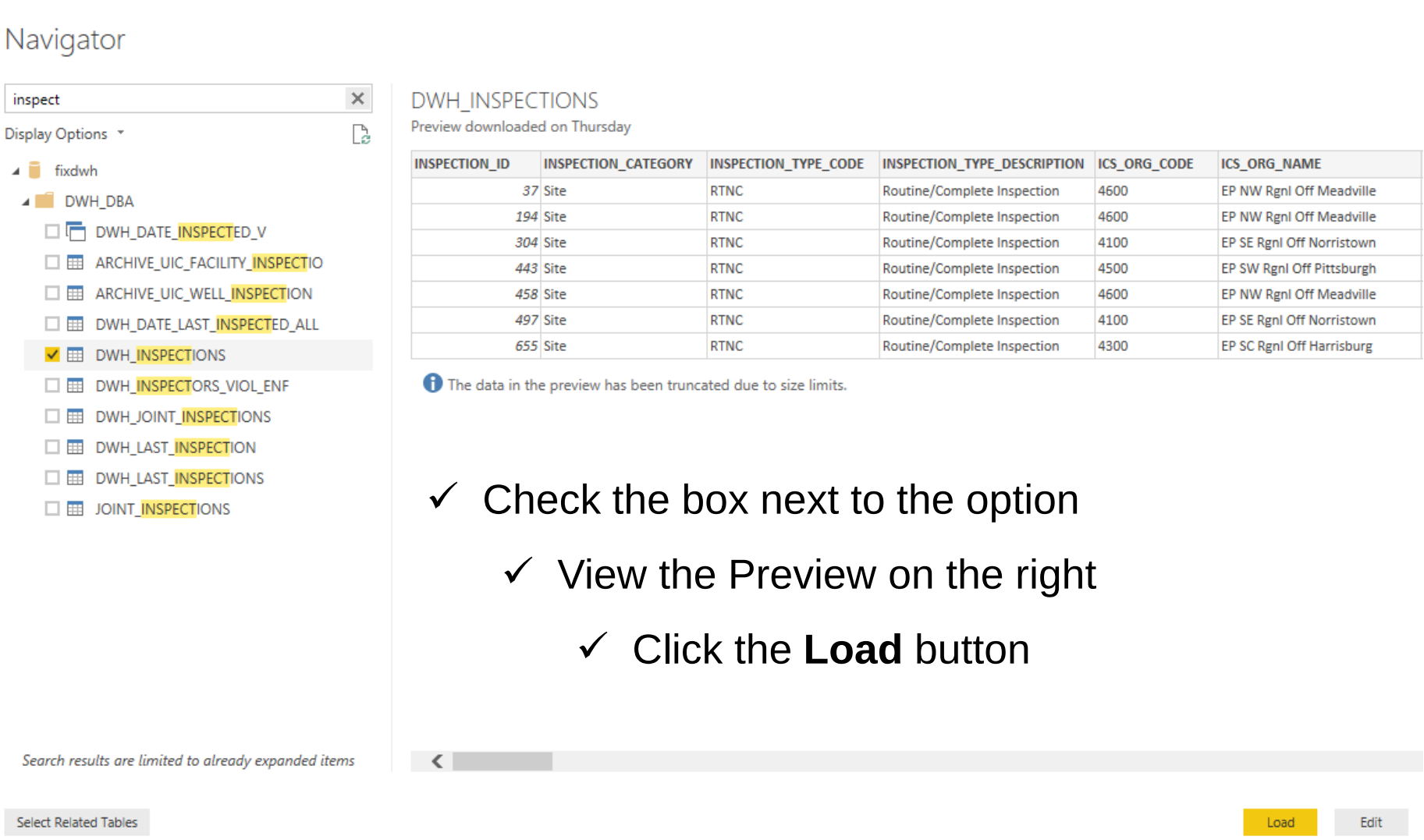
Expand the folder and view the possible folders you want to extract data from.

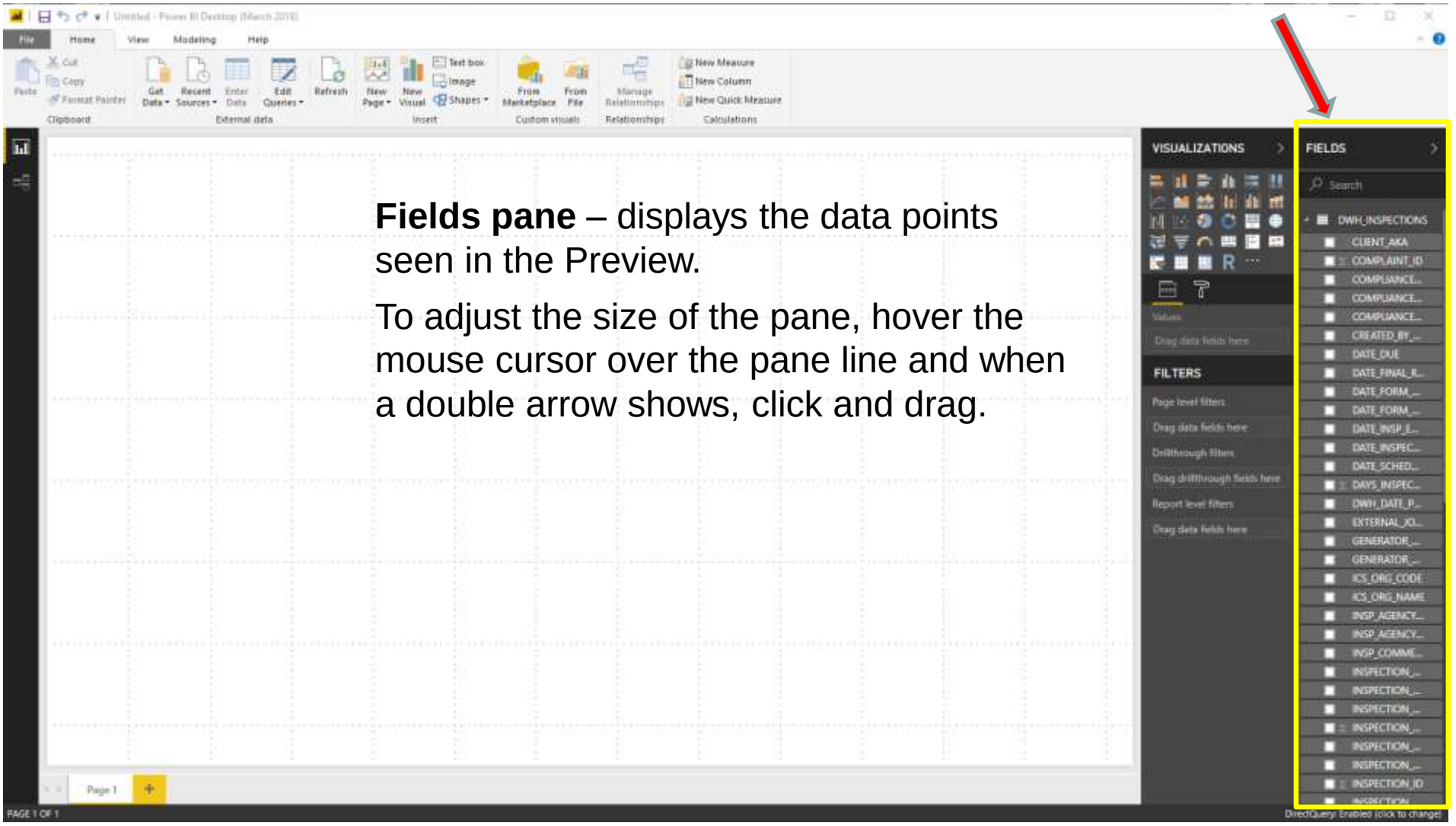


In the Search box enter a keyword. The possible options matching the keyword will display.



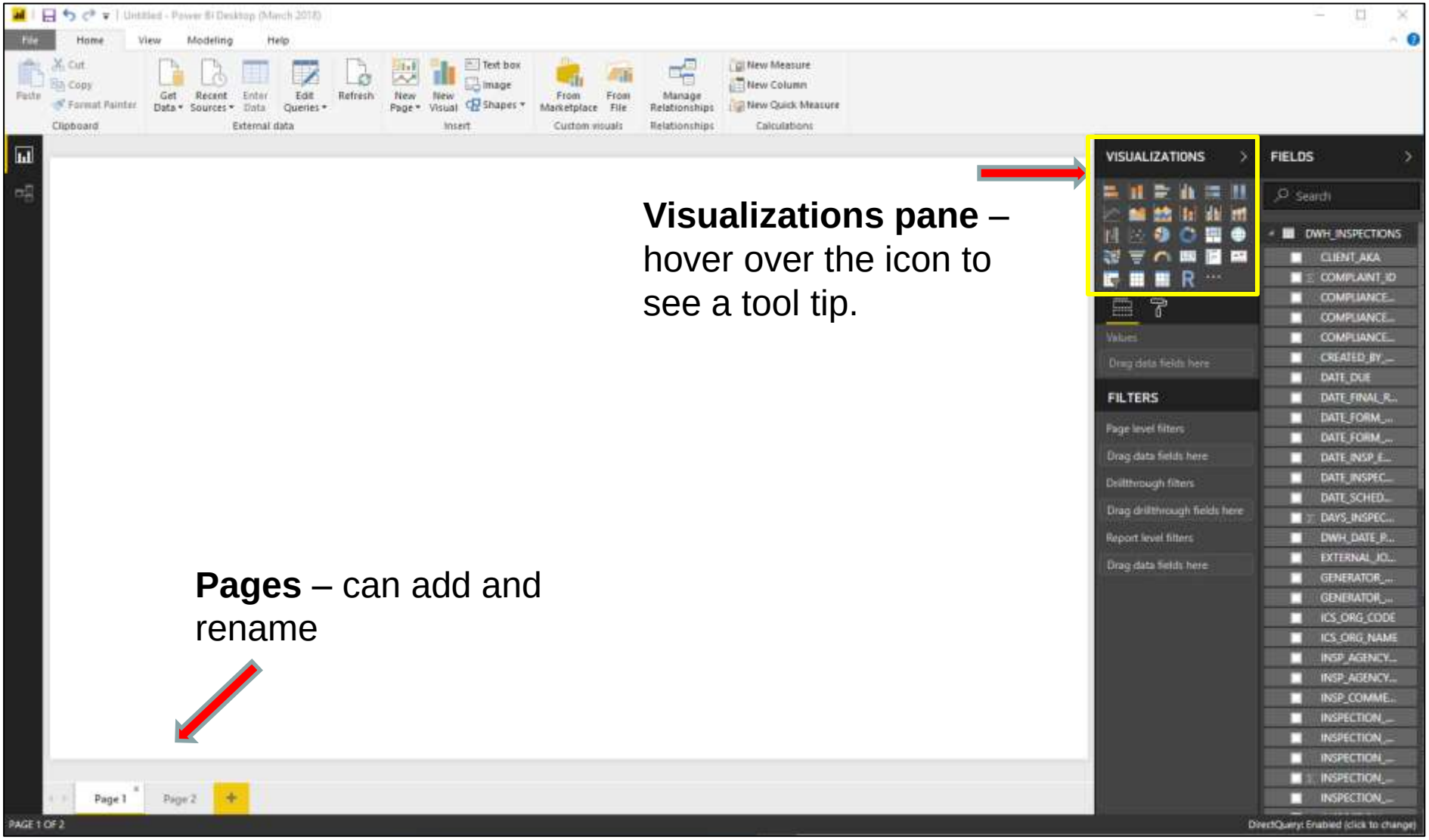



- ✓ Check the box next to the option
- ✓ View the Preview on the right
- ✓ Click the **Load** button




**Fields pane** – displays the data points seen in the Preview.

To adjust the size of the pane, hover the mouse cursor over the pane line and when a double arrow shows, click and drag.




**Visualizations pane** – hover over the icon to see a tool tip.

**Pages** – can add and rename



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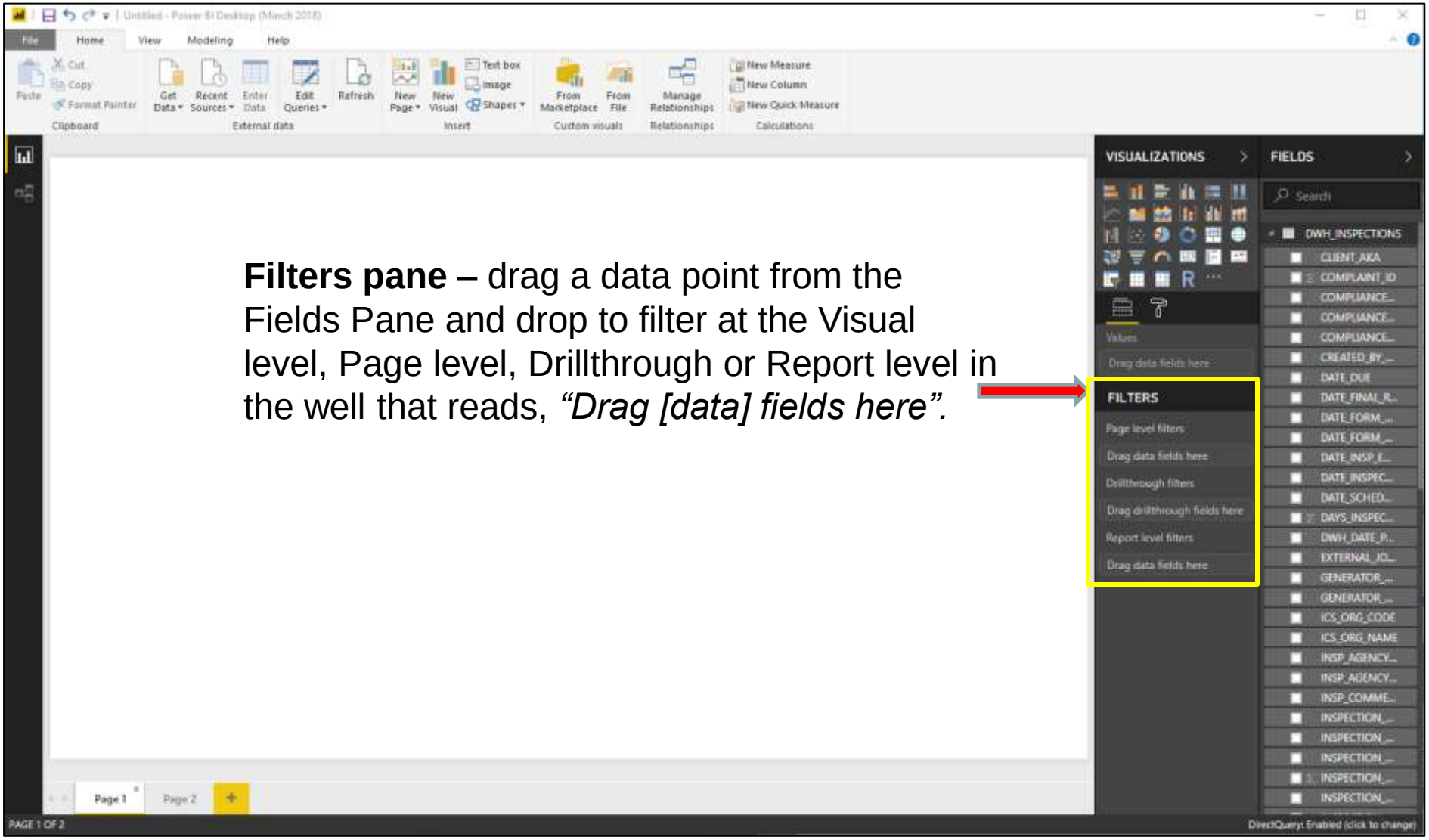


**Filters pane** – drag a data point from the Fields Pane and drop to filter at the Visual level, Page level, Drillthrough or Report level in the well that reads, *"Drag [data] fields here".*



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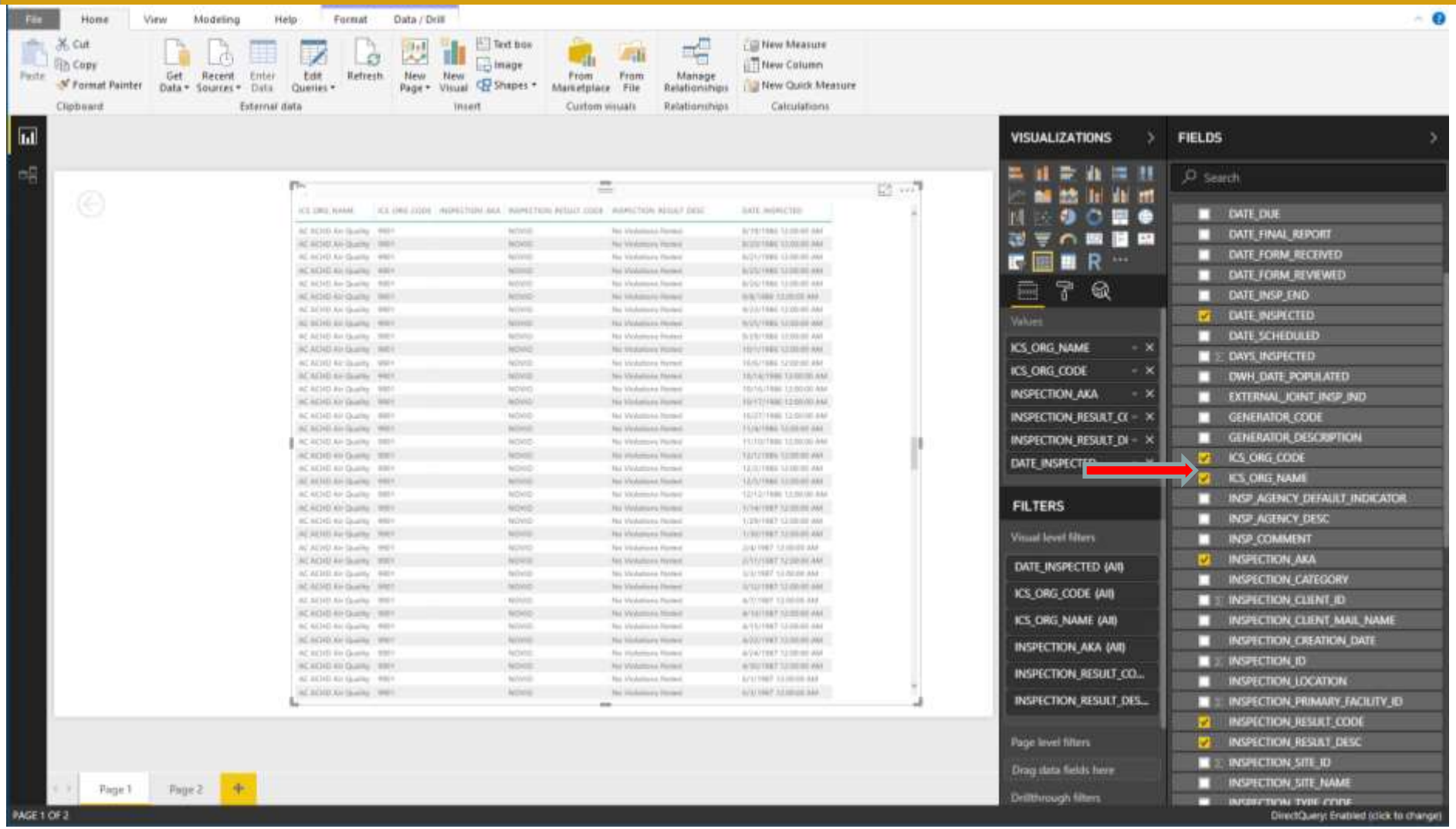
# Developing Visuals

# Types of Visualizations

1) Stacked Bar Chart
2) Stacked Column Chart
3) Clustered Bar Chart
4) Clustered Column Chart
5) 100% Stacked Bar Chart
6) 100% Stacked Column Chart
7) Line Chart
8) Area Chart
9) Stacked Area Chart
10) Line and Stacked Column Chart
11) Line and Clustered Column Chart
12) Ribbon Chart
13) Water Fall Chart
14) Scatter Chart
15) Pie Chart
16) Donut Chart
17) Tree Map
18) Funnel Chart
19) Gauge Chart
20) Multi Row Card
21) Score Card
22) KPI
23) Table Visual
24) Matrix Visual

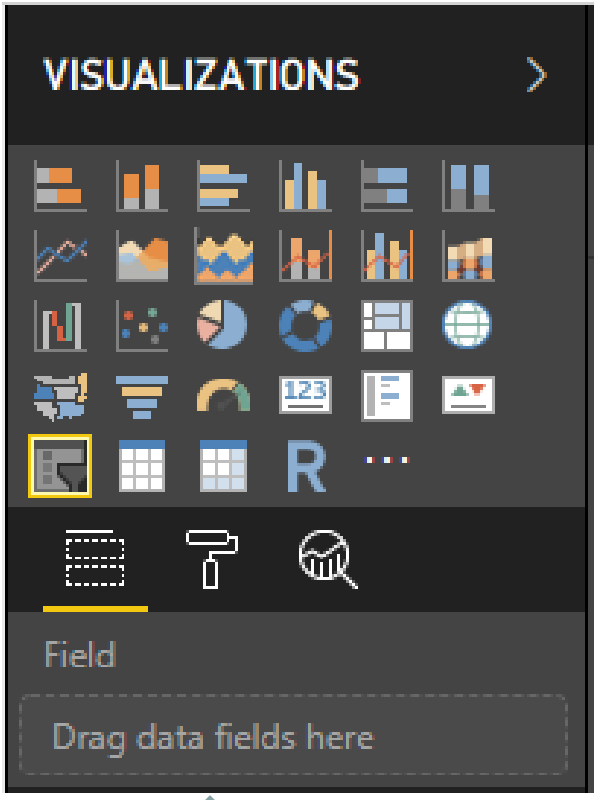
# Create a Table Visual



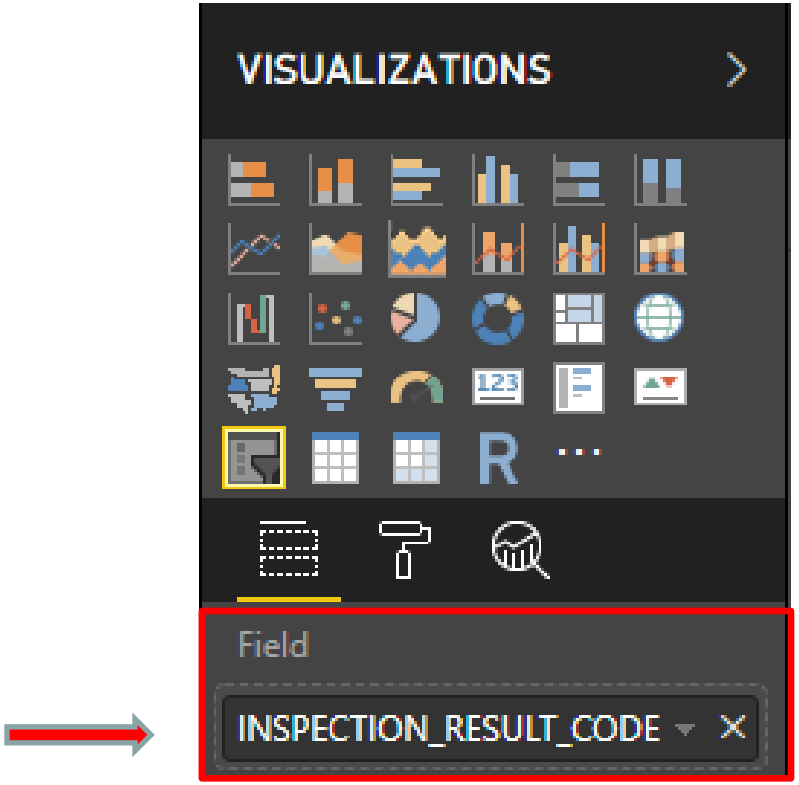

Put a check in the box next to the data points or fields you would like to put into a report. By default, Power BI usually selects the **Table** visual (yellow box around the Table visual icon) and will load the fields selected. *Before you adding fields to the table, make sure that your table is active* (note the “fill handles”).

# Add a Slicer

From the Visualizations Pane, click the **Slicer** icon. A yellow box will display around the icon.
A template placeholder will display in the report area waiting for you to select what values to display.

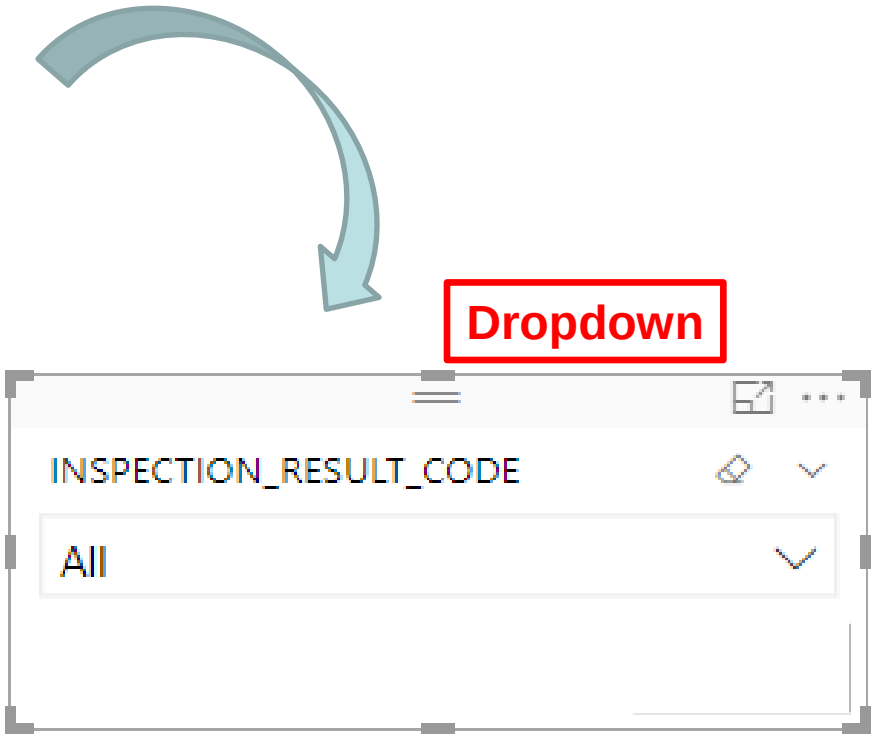



Click and drag a data point field into this well.



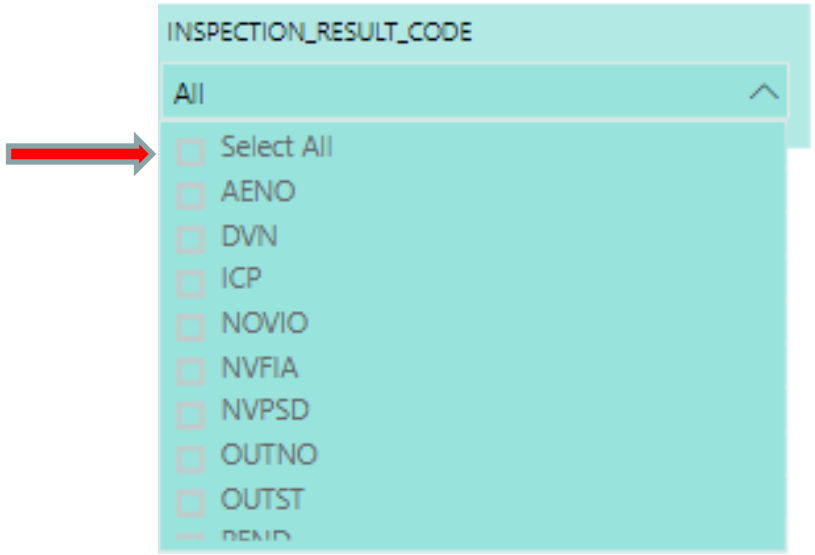

Click and drag a data point to the Field well (or check the data point box) and the template will display a *list* of selections.

Change from a **List** to a **Dropdown**

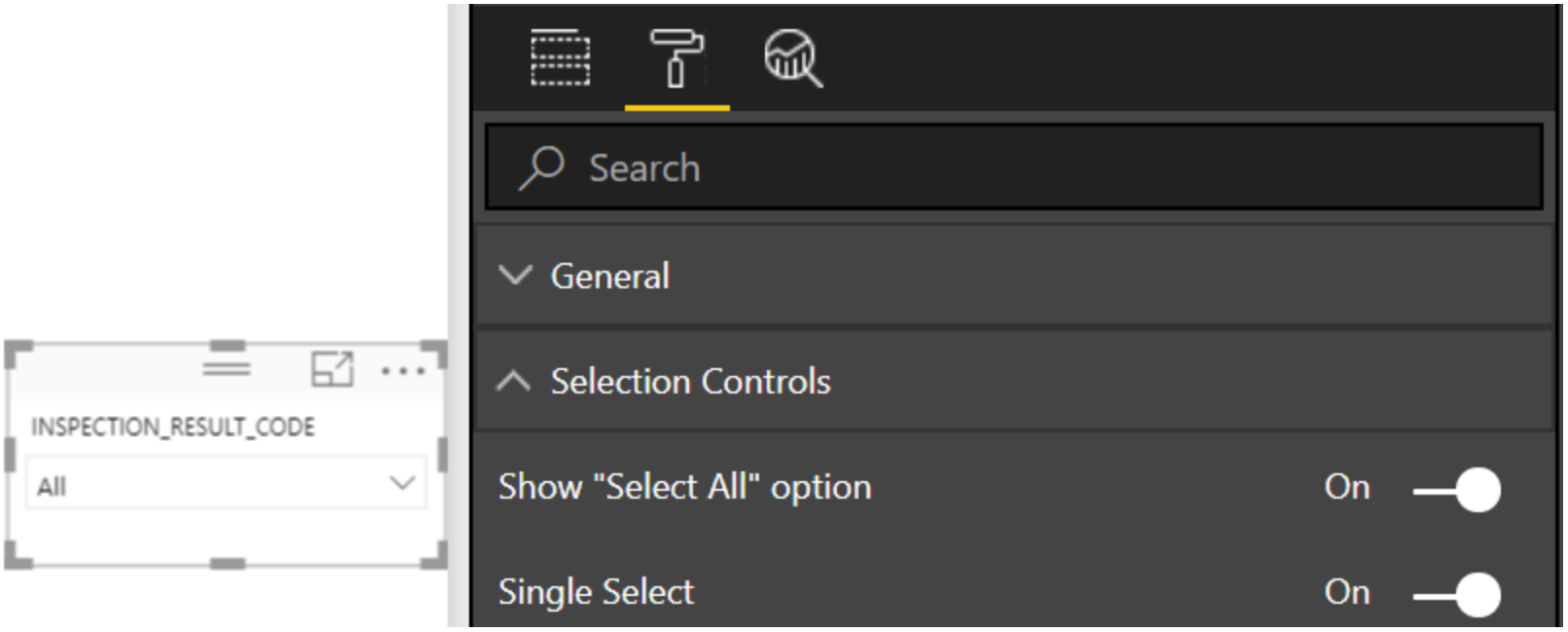



Hover over the List (to see the dropdown arrow) and click the dropdown. Select *dropdown.*

# Add a *Select All* choice to a Slicer.

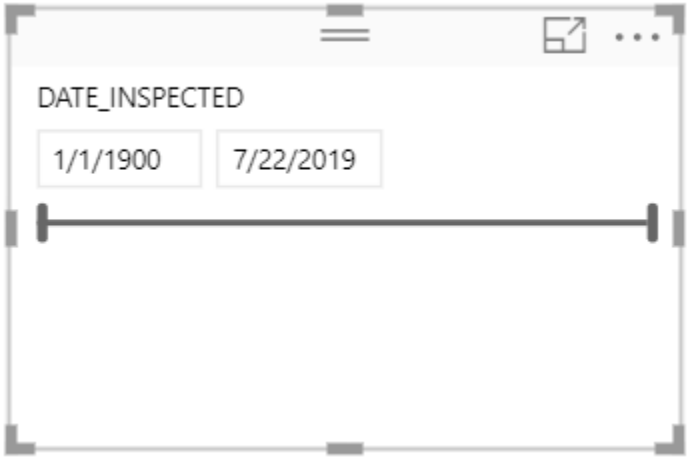


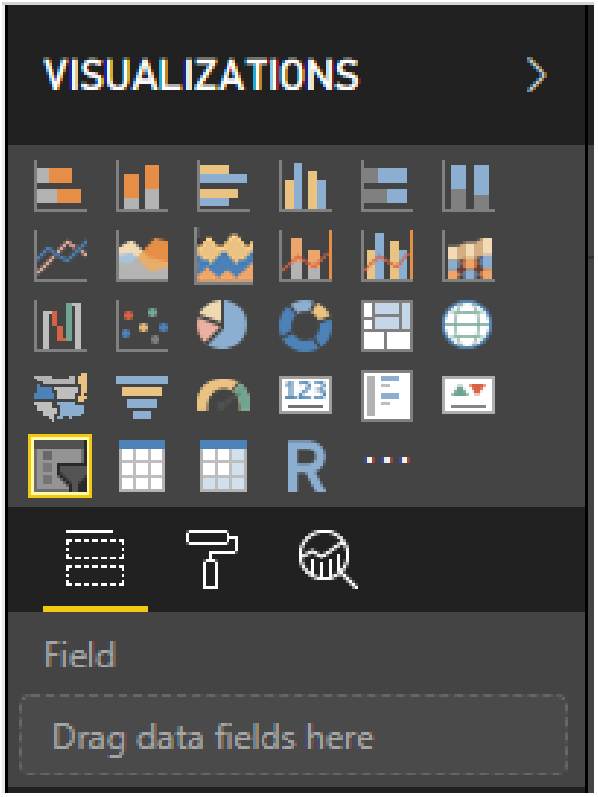
1. Make sure the Slicer is active (note the “fill handles”).
2. Click the **Format** icon (yellow bar under it).
3. Expand *Selection Controls.*
4. Click to turn **On** the *Show “Select All”* option.



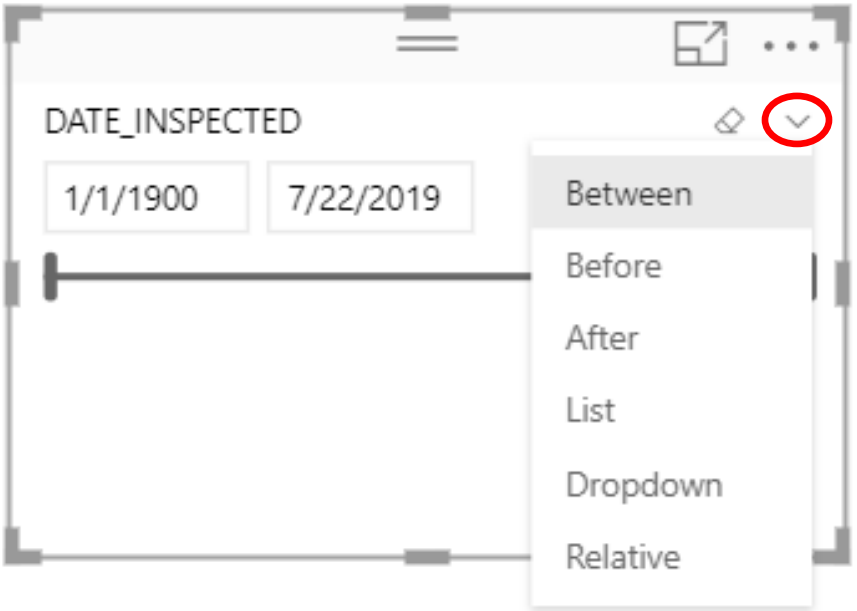
# Add a Date Slicer

From the Visualizations Pane, click the **Slicer** icon. A yellow box will display around the icon.
The **Slicer** will display with a begin and end date and a slider.

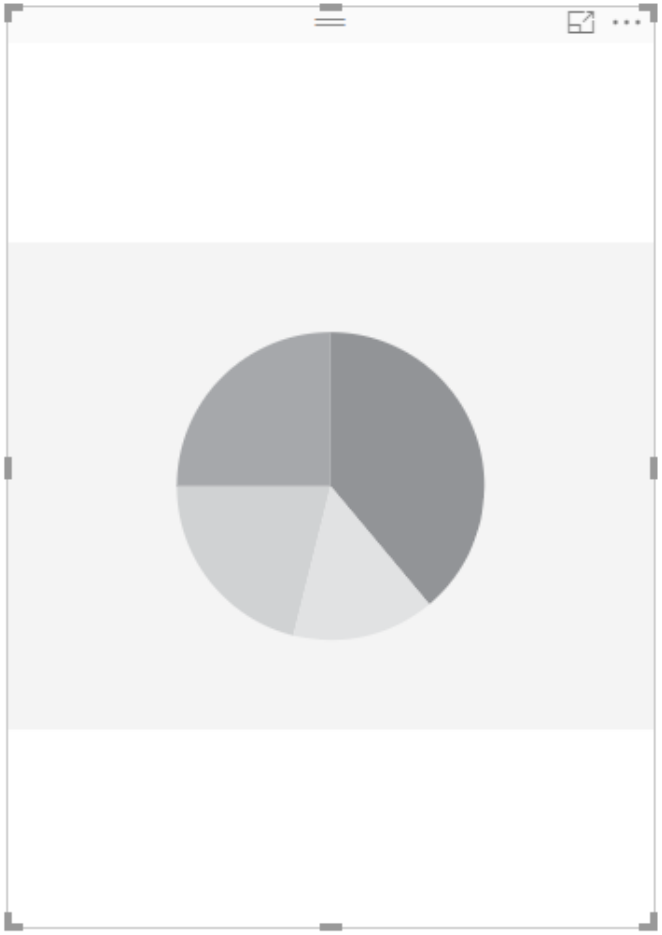


To create relative date choices, with the Slicer active (note the “fill handles”) hover the mouse cursor over the **Slicer** and click the drop down arrow and make a selection.



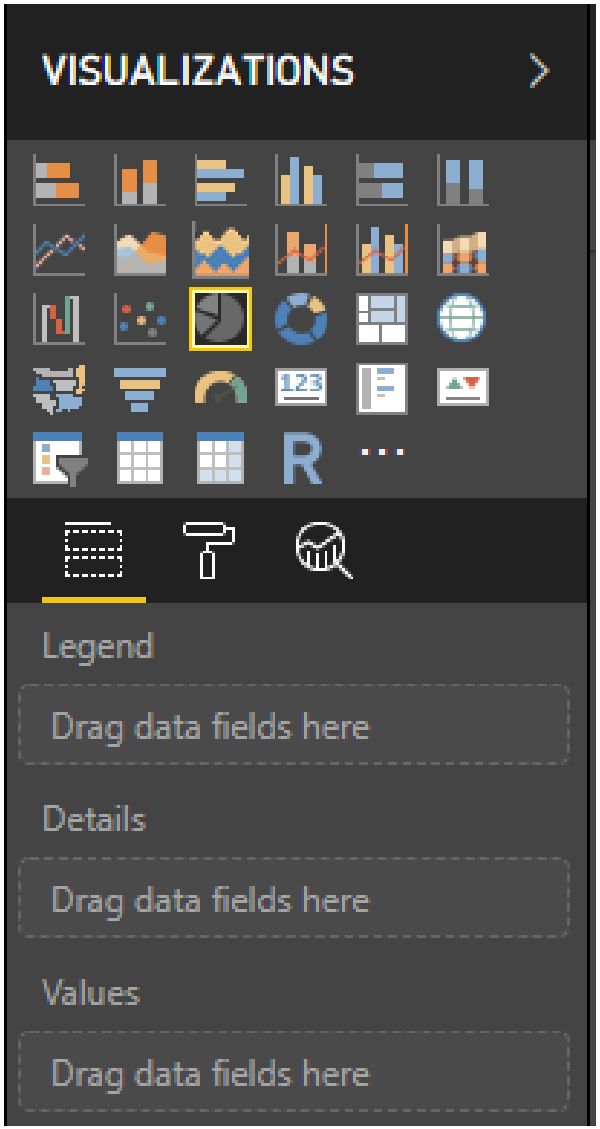
# Add a Pie Chart Visual

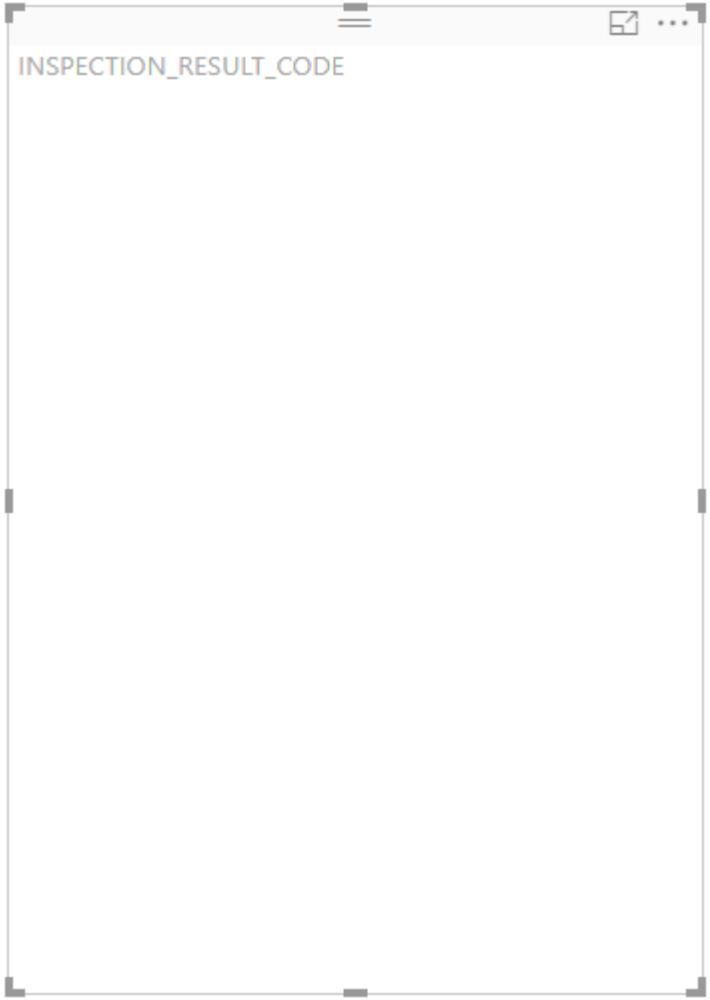


Click in a blank area of the Report Viewing area.

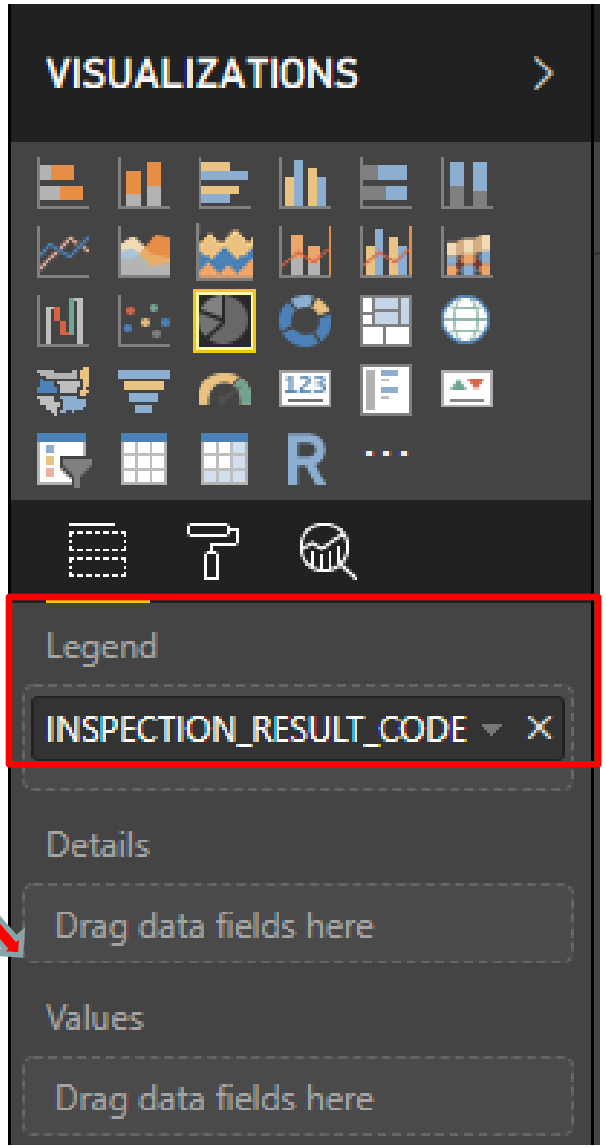
In the Visualizations pane, click the **Pie Chart** icon.

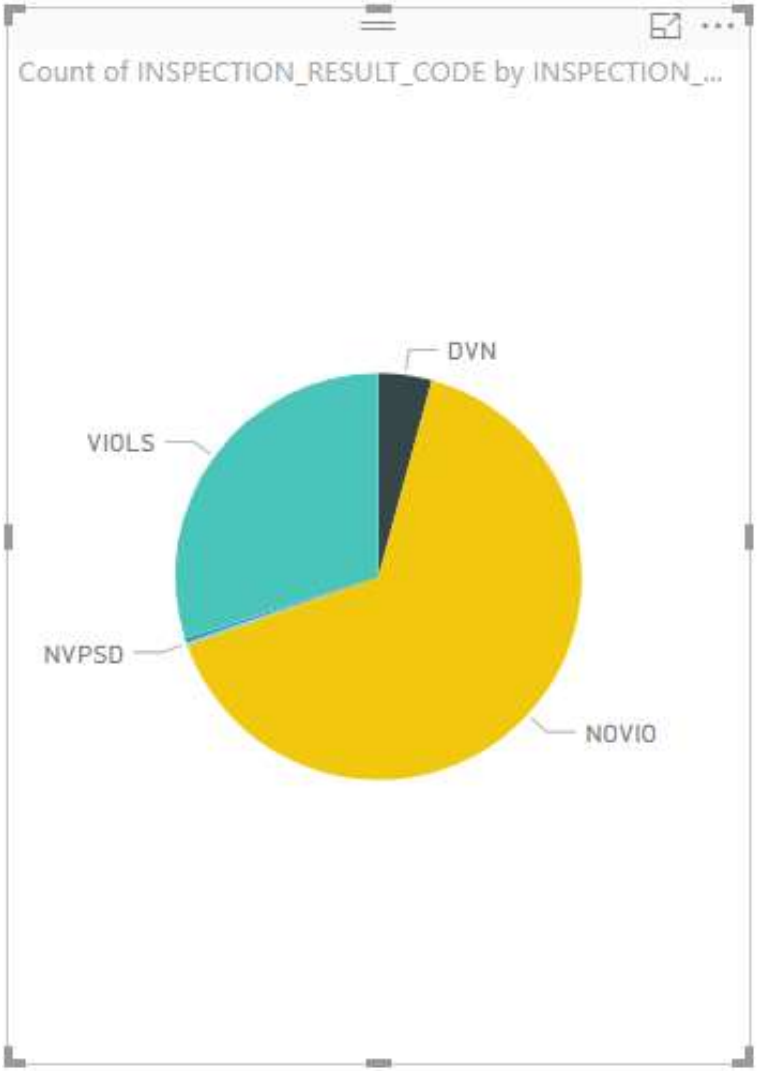
A yellow box will display around the icon and a template placeholder will display in the report area waiting for you to select the data.



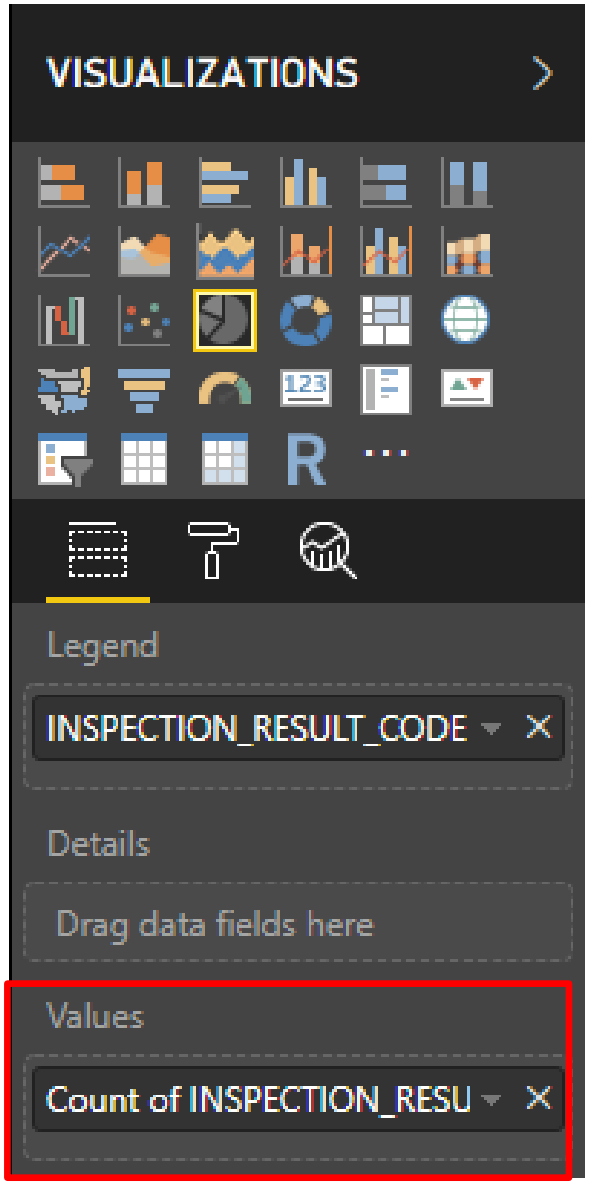



From the **Fields** Pane, check a box next to the data point you want to bring into the Pie Chart. (The **Legend** well is populated). The template is ready for you to select what **Values** to display.






Click and drag [INSPECTION_RESULT_CODE] to the **Values** well. The Pie Chart is created showing the count of different inspection results.



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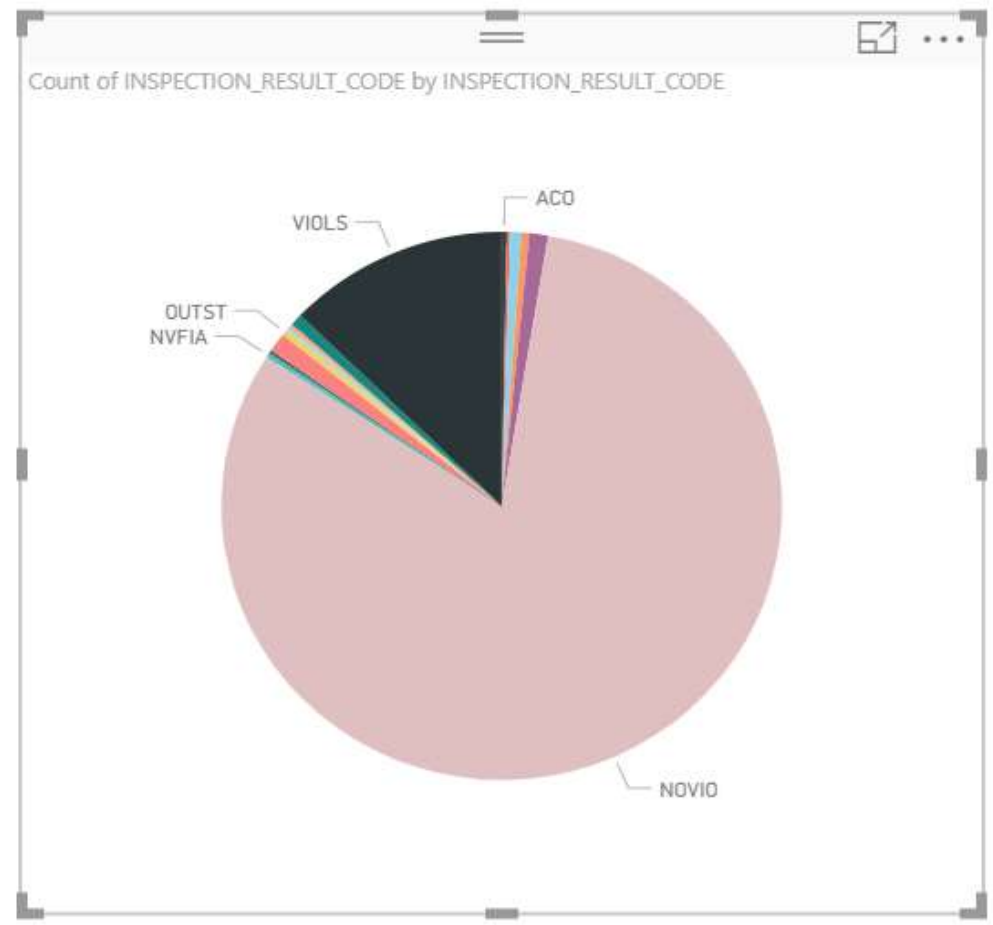
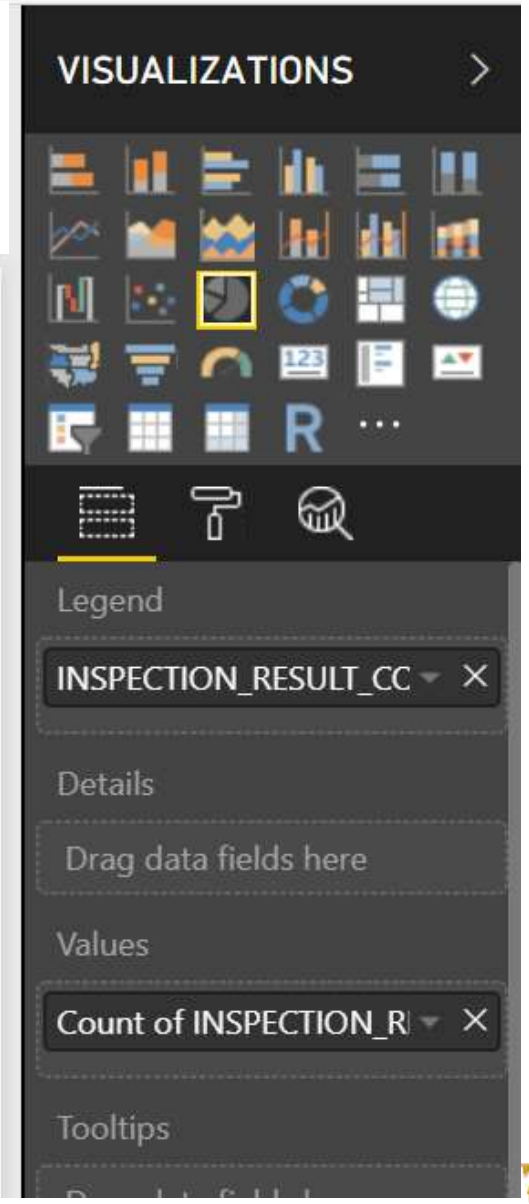
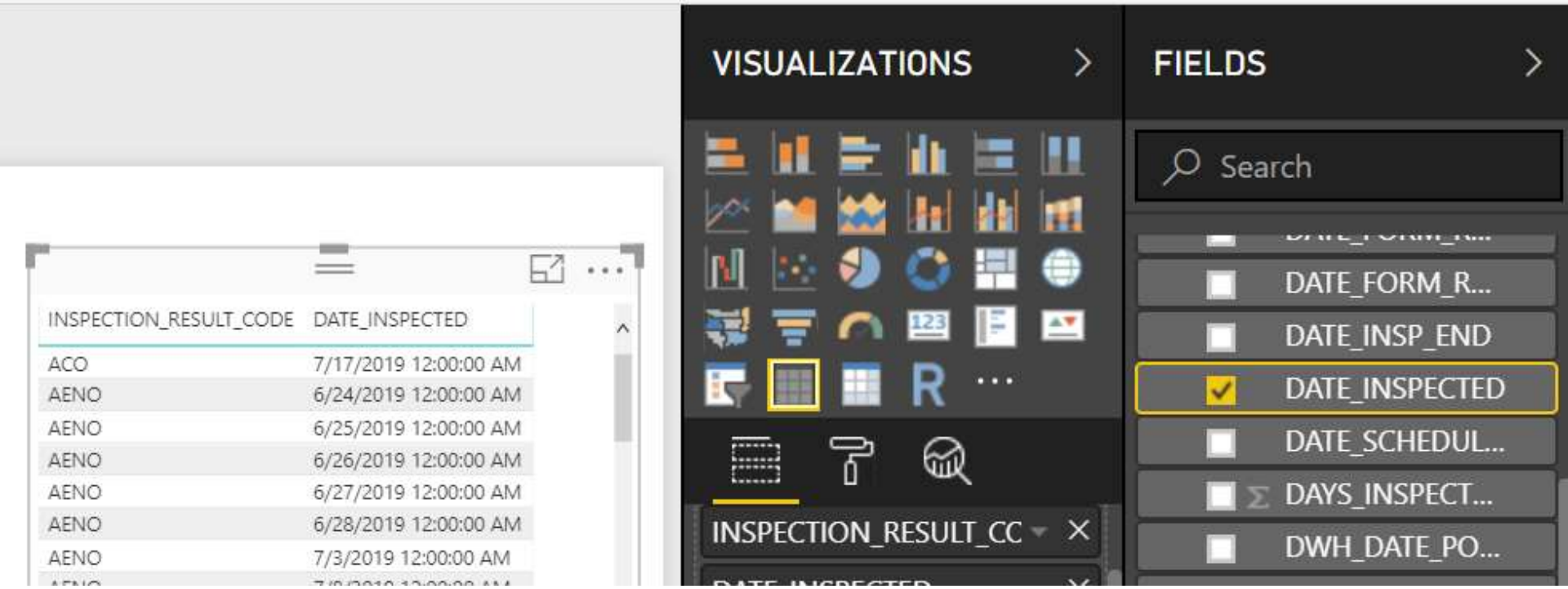
When the visual is active (note the “fill handles”), a yellow box will display around the icon. To change visualizations, from the active visual simply click on a different visualization icon.

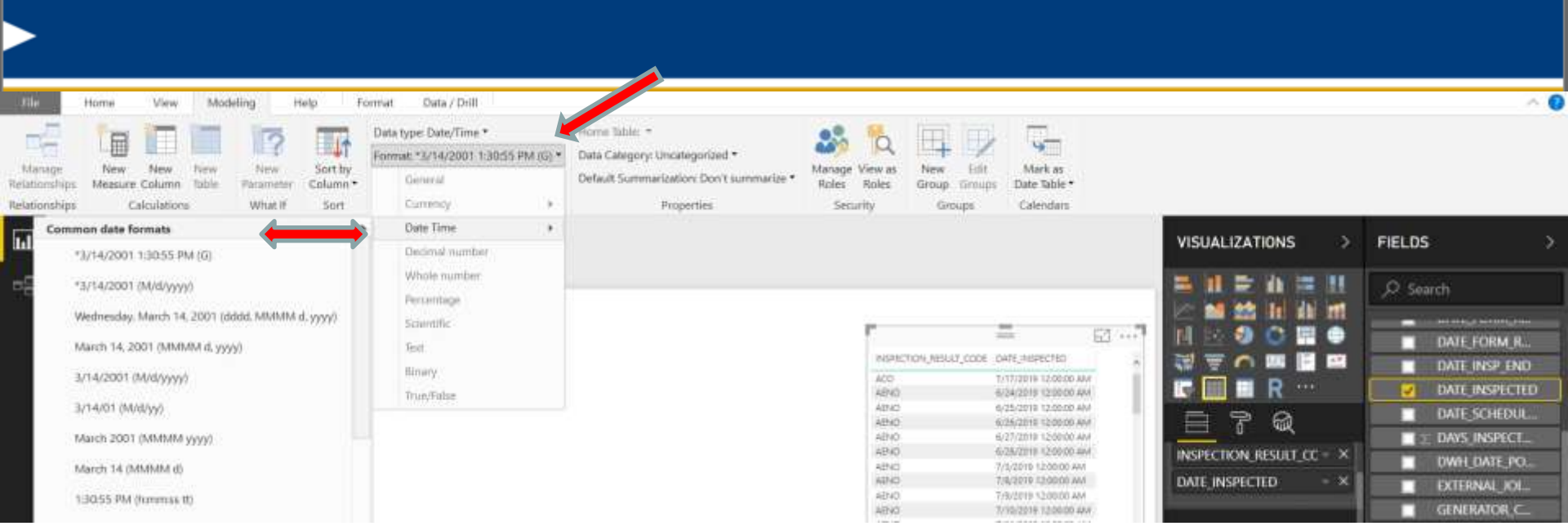


# Change the Date Format

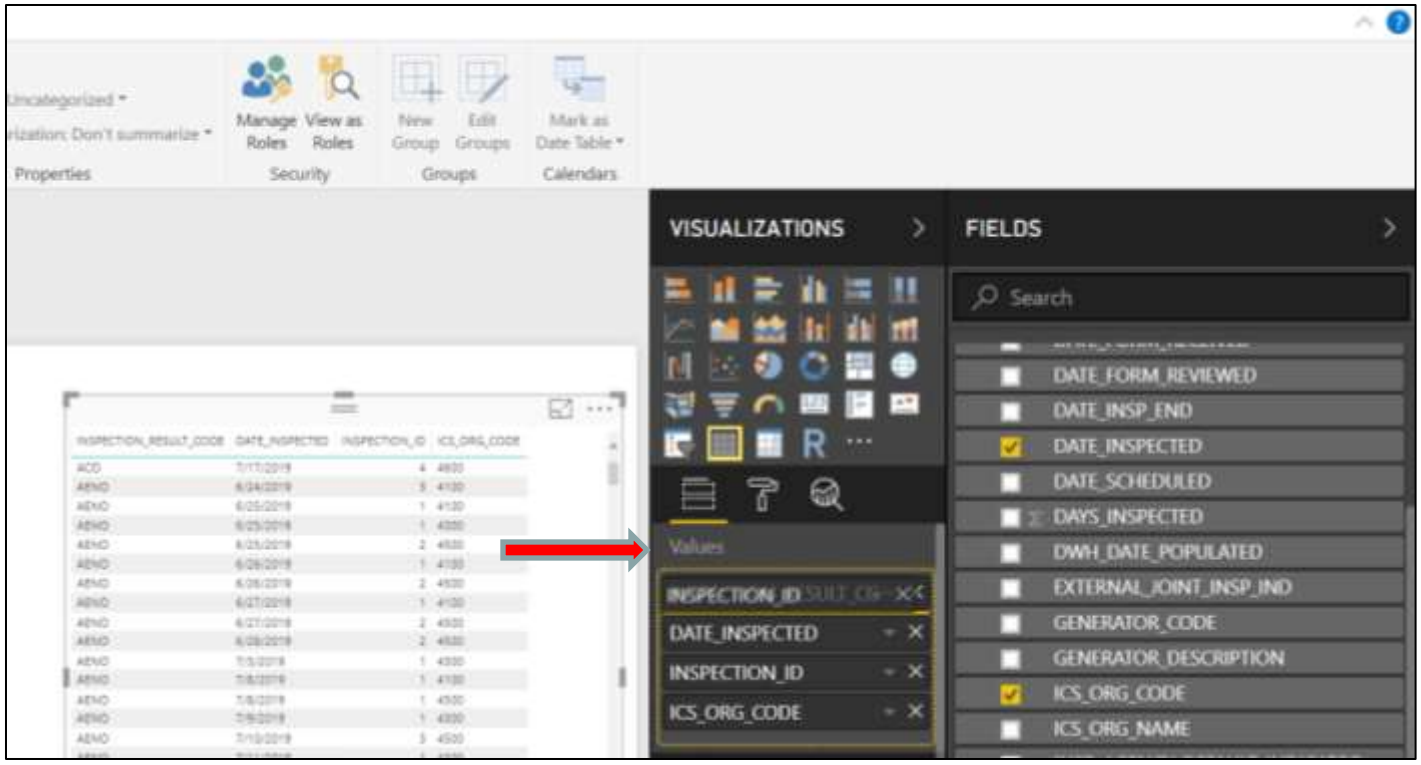



With your visualization active (note the “fill handles”), click on the date data point in the **Fields** pane. A yellow box will display around it.




Click on the **Modeling TAB.**
Click the *Format* dropdown.
Select *Date Time* and then select the format you want from the dropdown.
Your visualization will immediately re-format.

# Move Columns




In the **Values** pane, click a data point and drag up or down to the desired location.

A yellow line will display in the location it will be dropped. The visualization will change immediately.

# Change an Id into an eFACTS generated Id

## Client Id, Inspection Id, Primary Facility Id…



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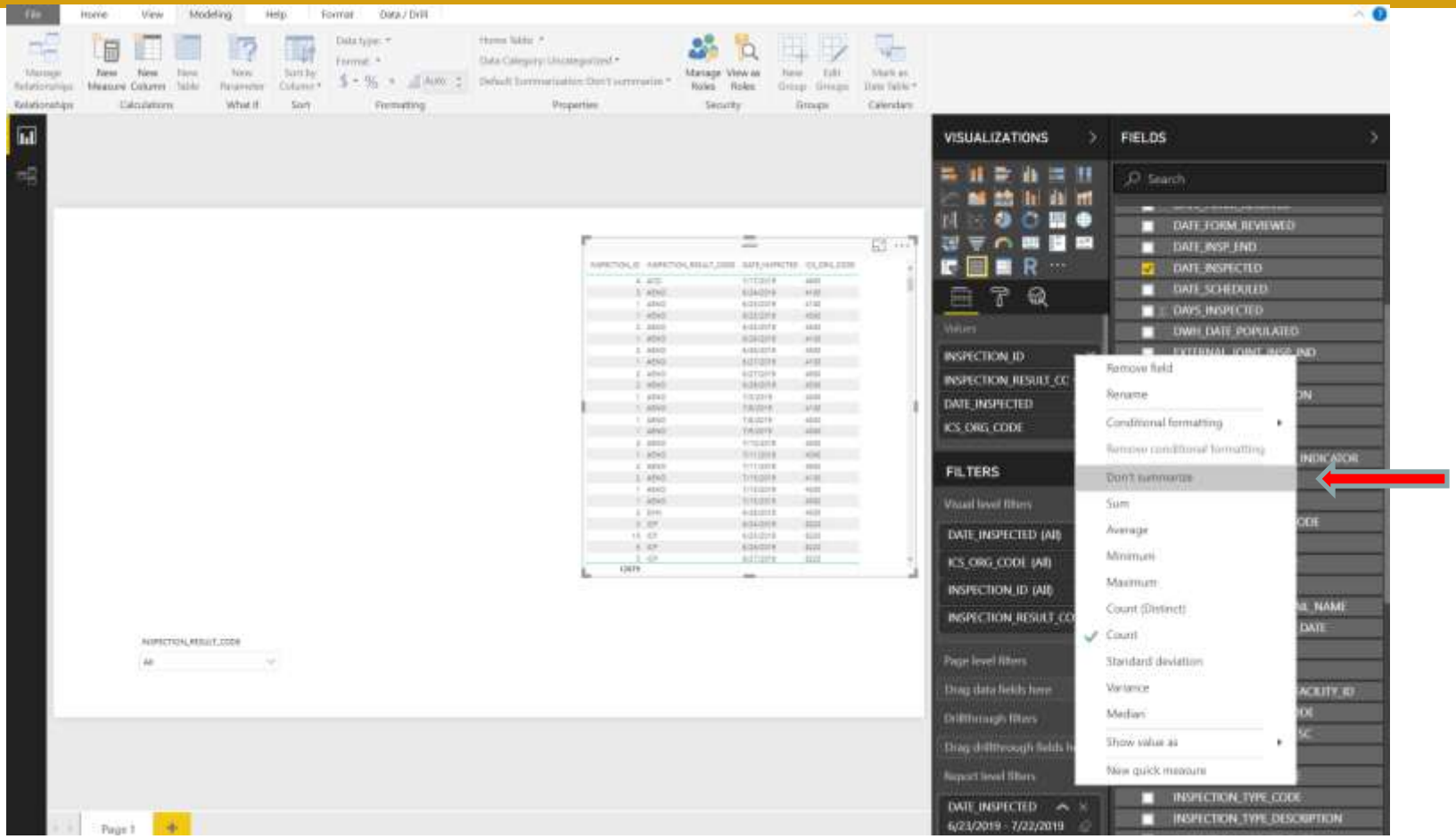
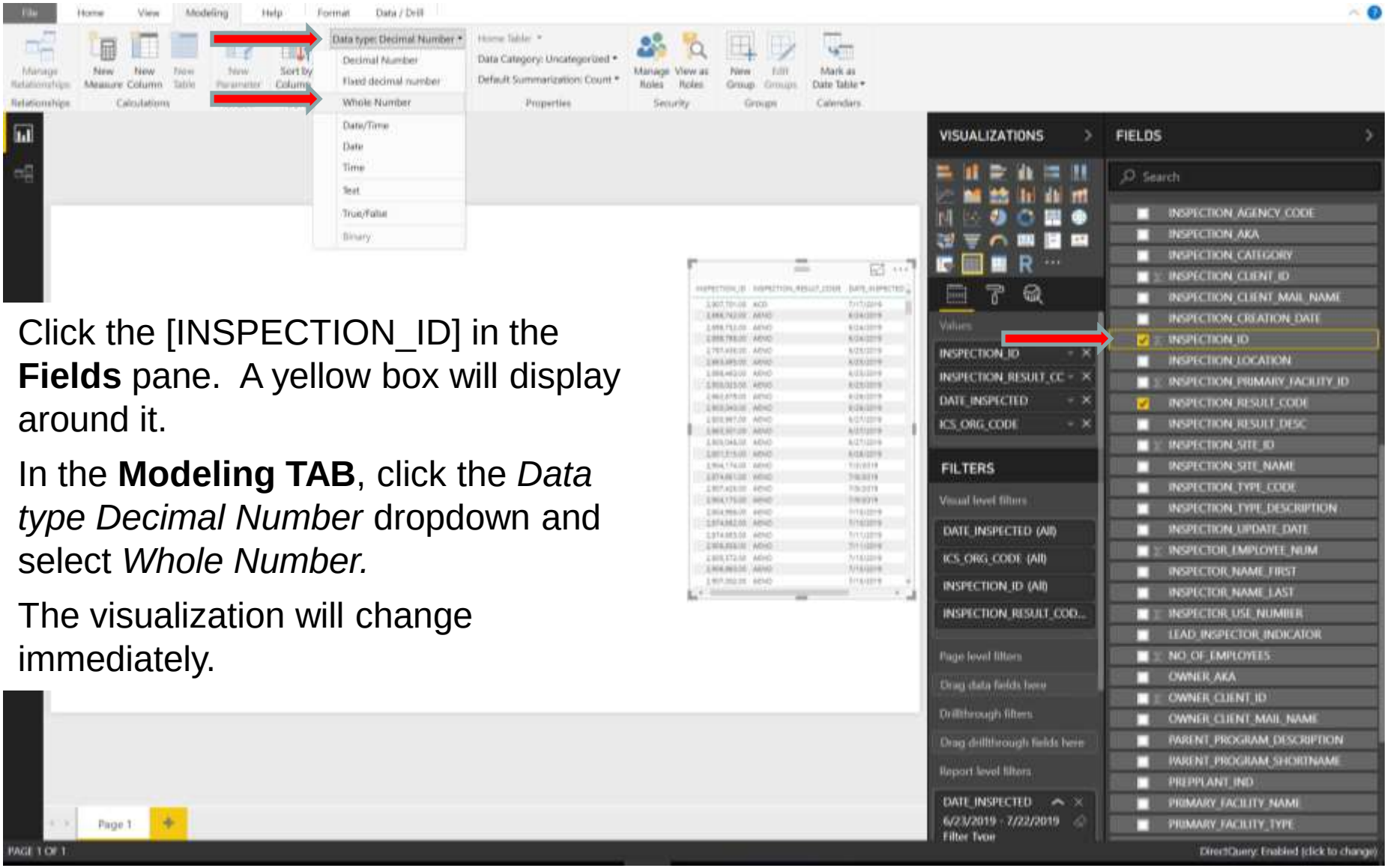



In the **Values** pane, click the dropdown next to [INSPECTION_ID]. Click on *Don't Summarize.*




Click the [INSPECTION_ID] in the **Fields** pane. A yellow box will display around it.

In the **Modeling TAB**, click the *Data type Decimal Number* dropdown and select *Whole Number.*

The visualization will change immediately.

# Add Gridlines



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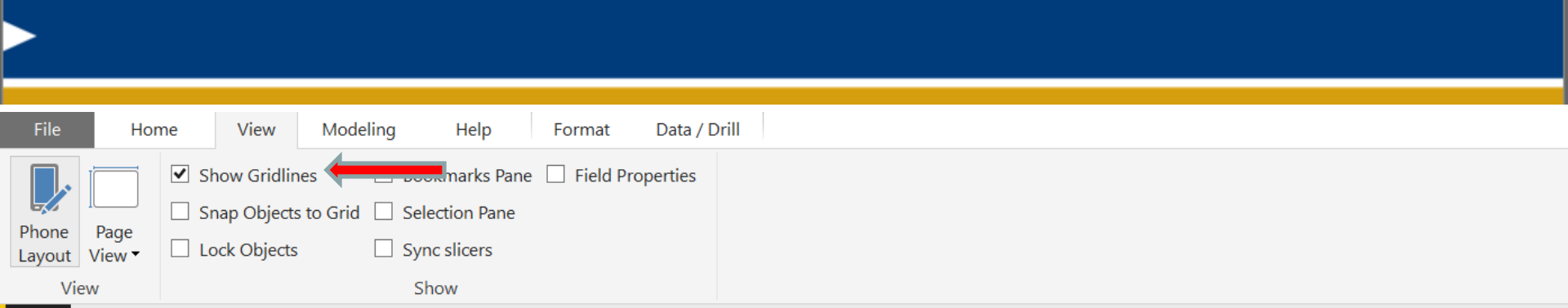


Click the **View TAB**. Check the *Show Gridlines* box. The Report View area will show dotted lines.



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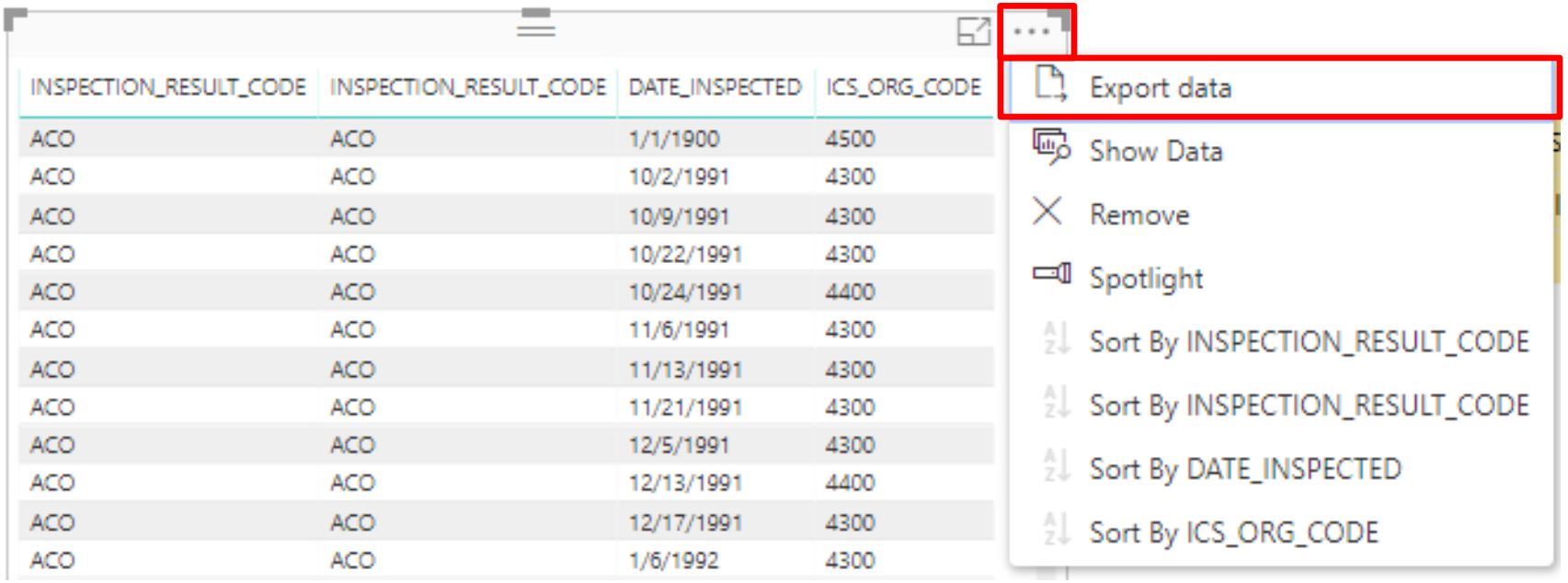
# Export Data

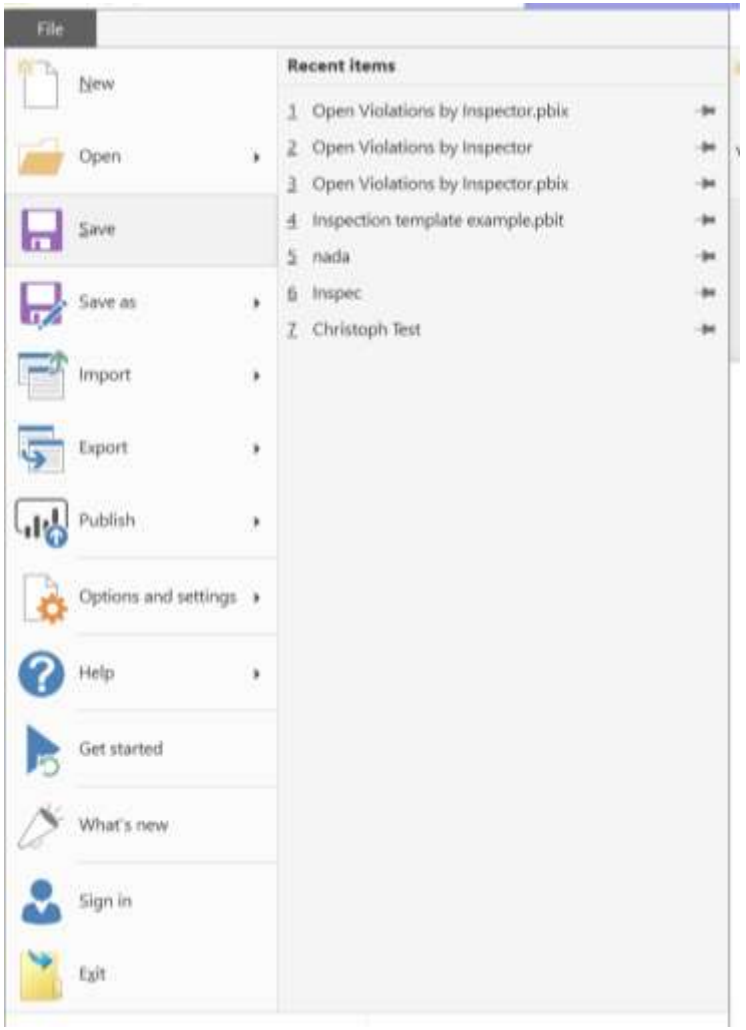



Click the ellipsis in the corner of a visual and from the dropdown select *Export data.* The data from the visual will be exported into a .csv file.

# Save the Report

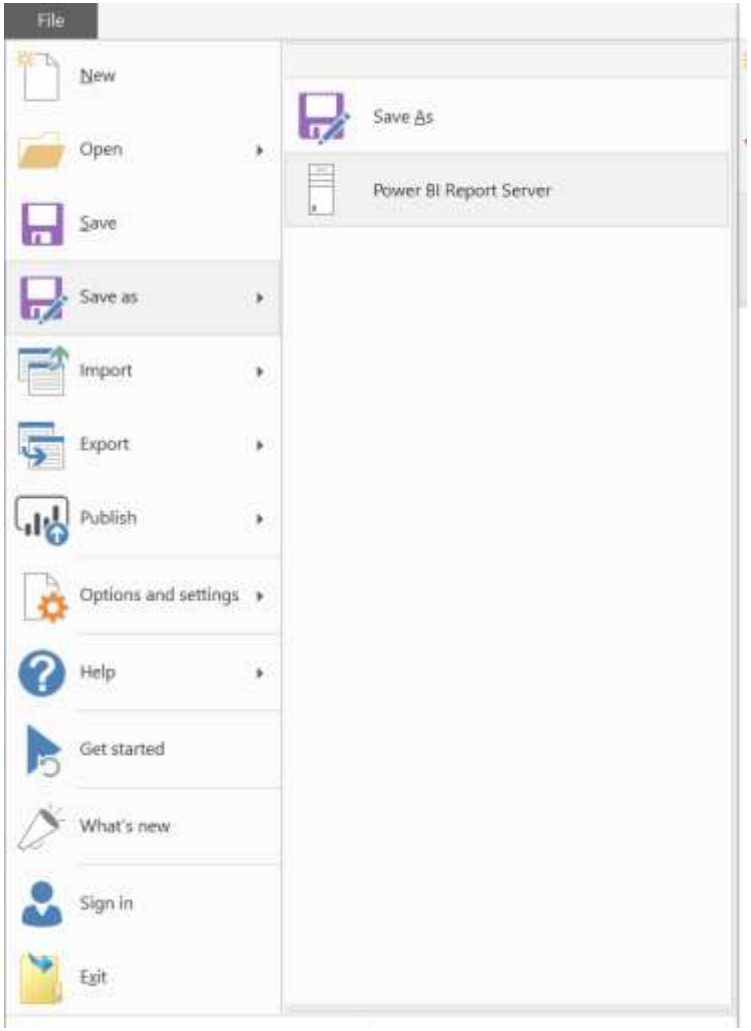
Click **File** and select *Save.*

This report can be then shared with anyone who has Power BI installed on their computer.  It will always open with refreshed data.

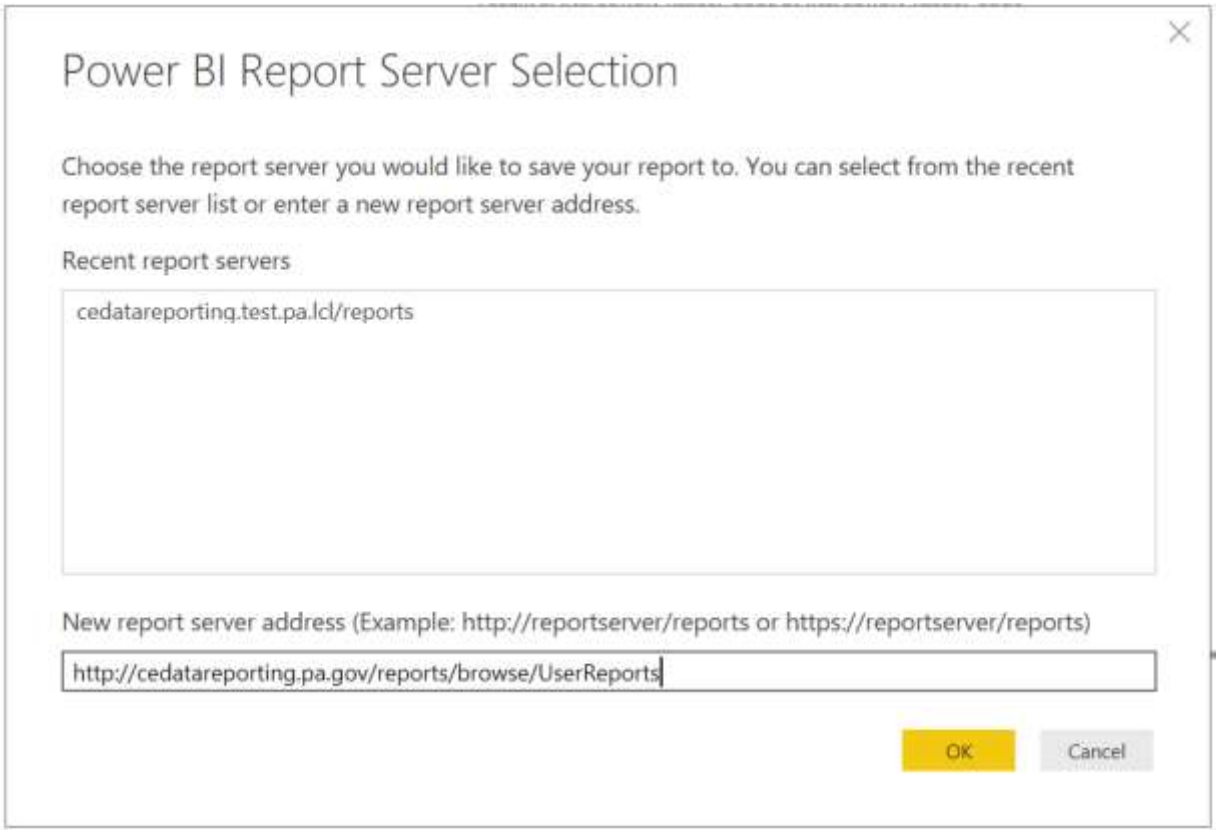


# Publish the Report

With Publisher security, click **File** and *Save as* and then select *Power BI Report Server.*



The production Report Server address should be defaulted. Click the **OK** button.



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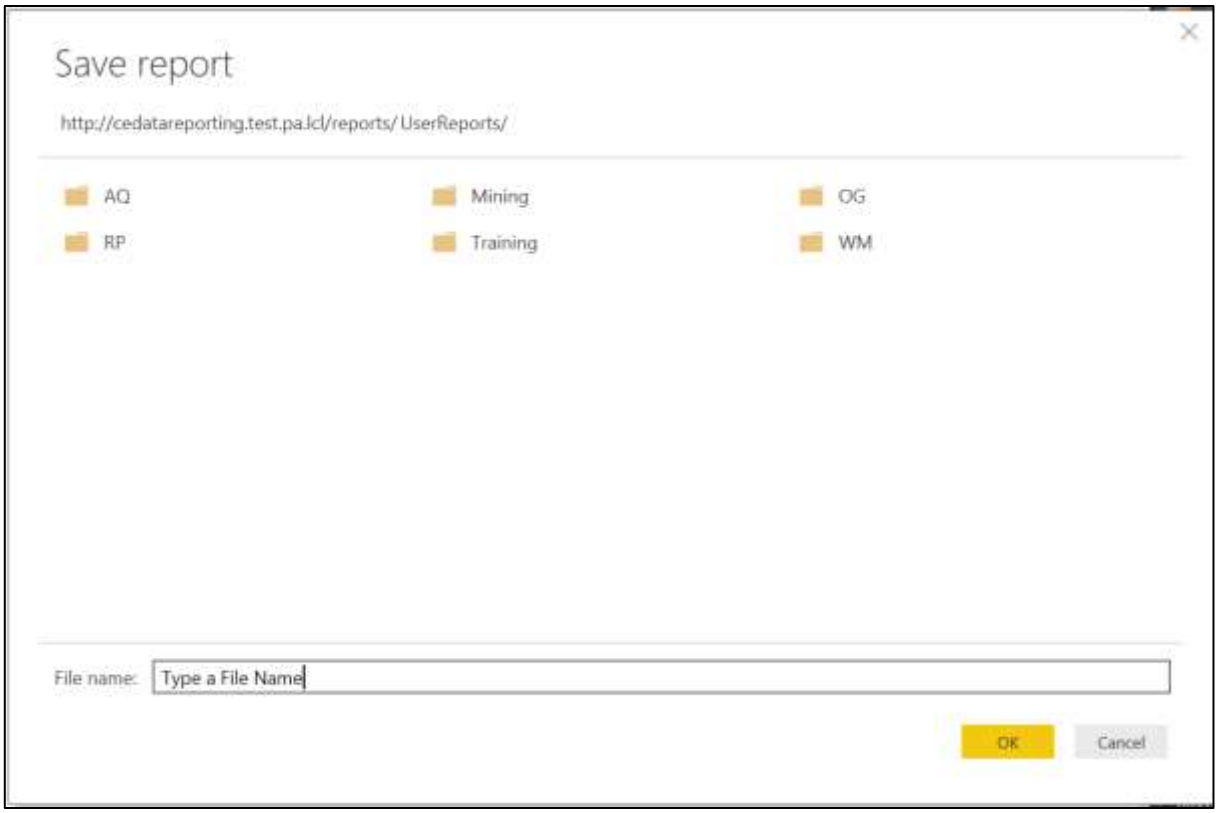
Give the report a name.
Select your program folder.

Click the **OK** button.



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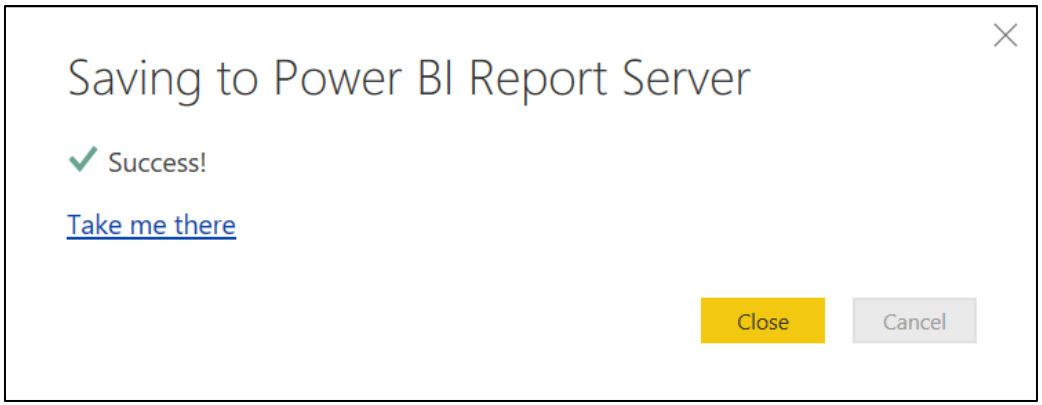
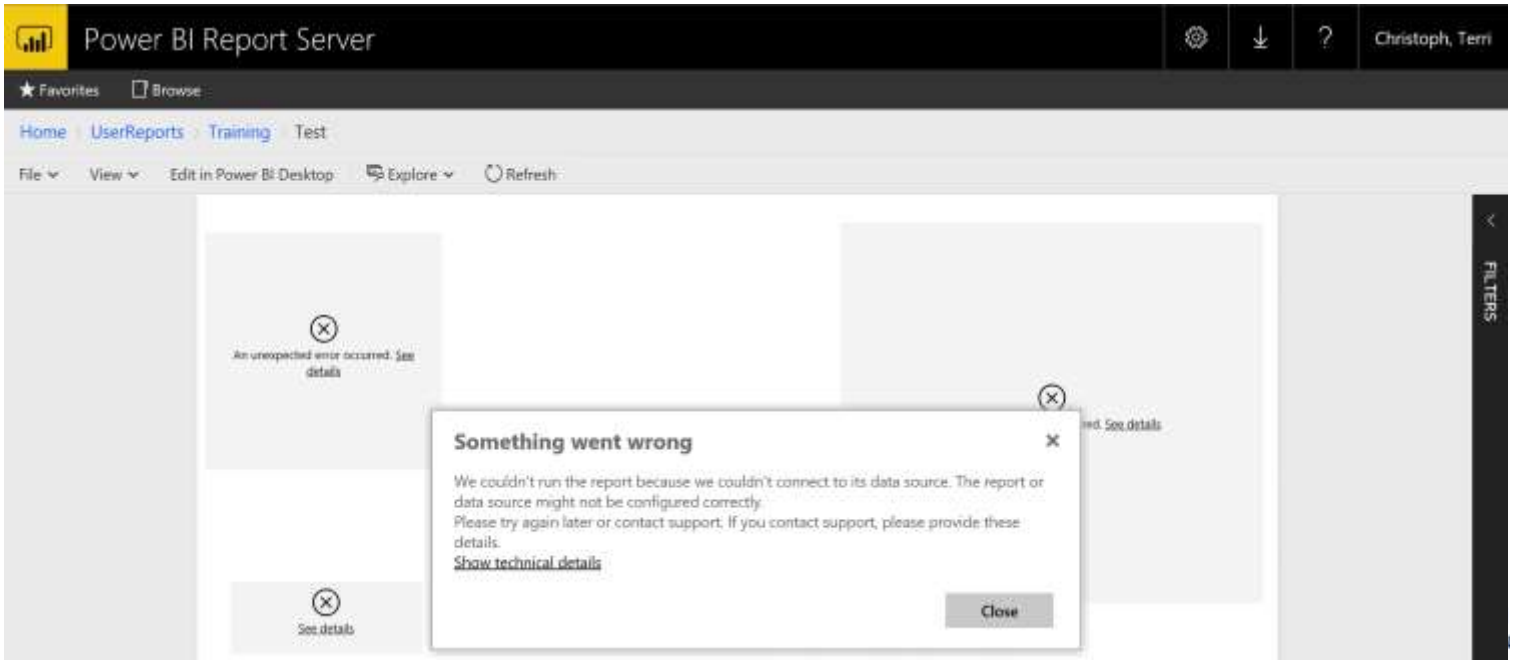
You will receive a Success confirmation.
Click the Take me there link.

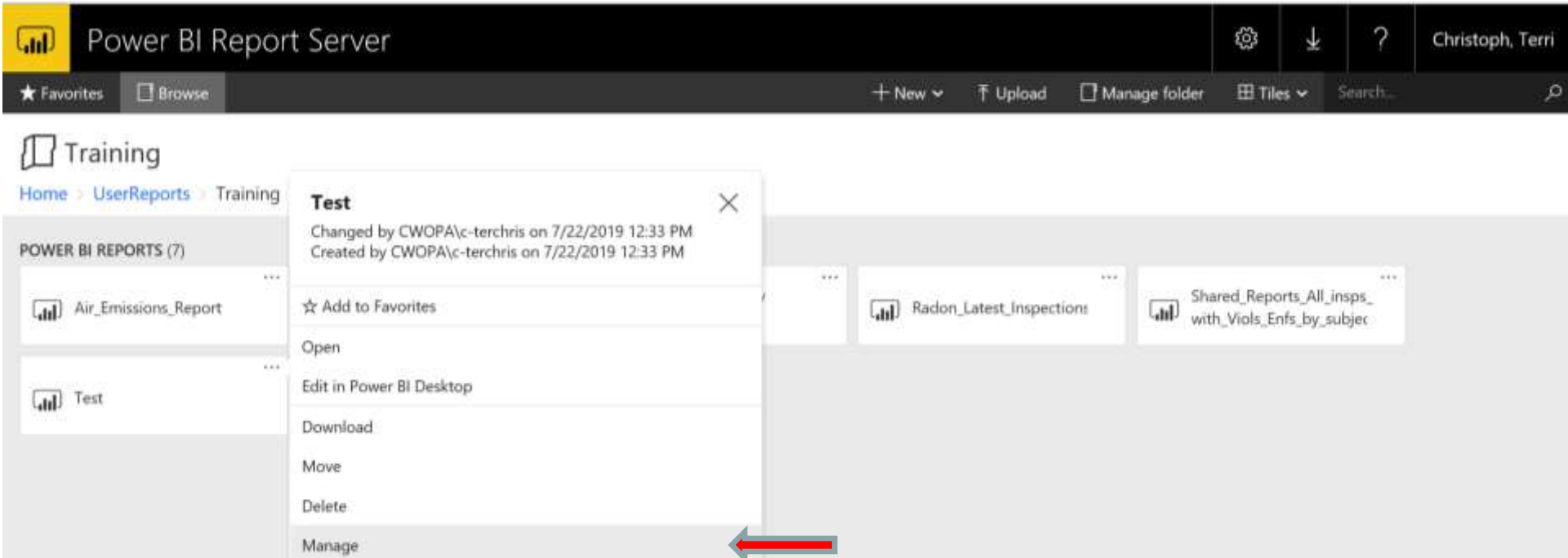


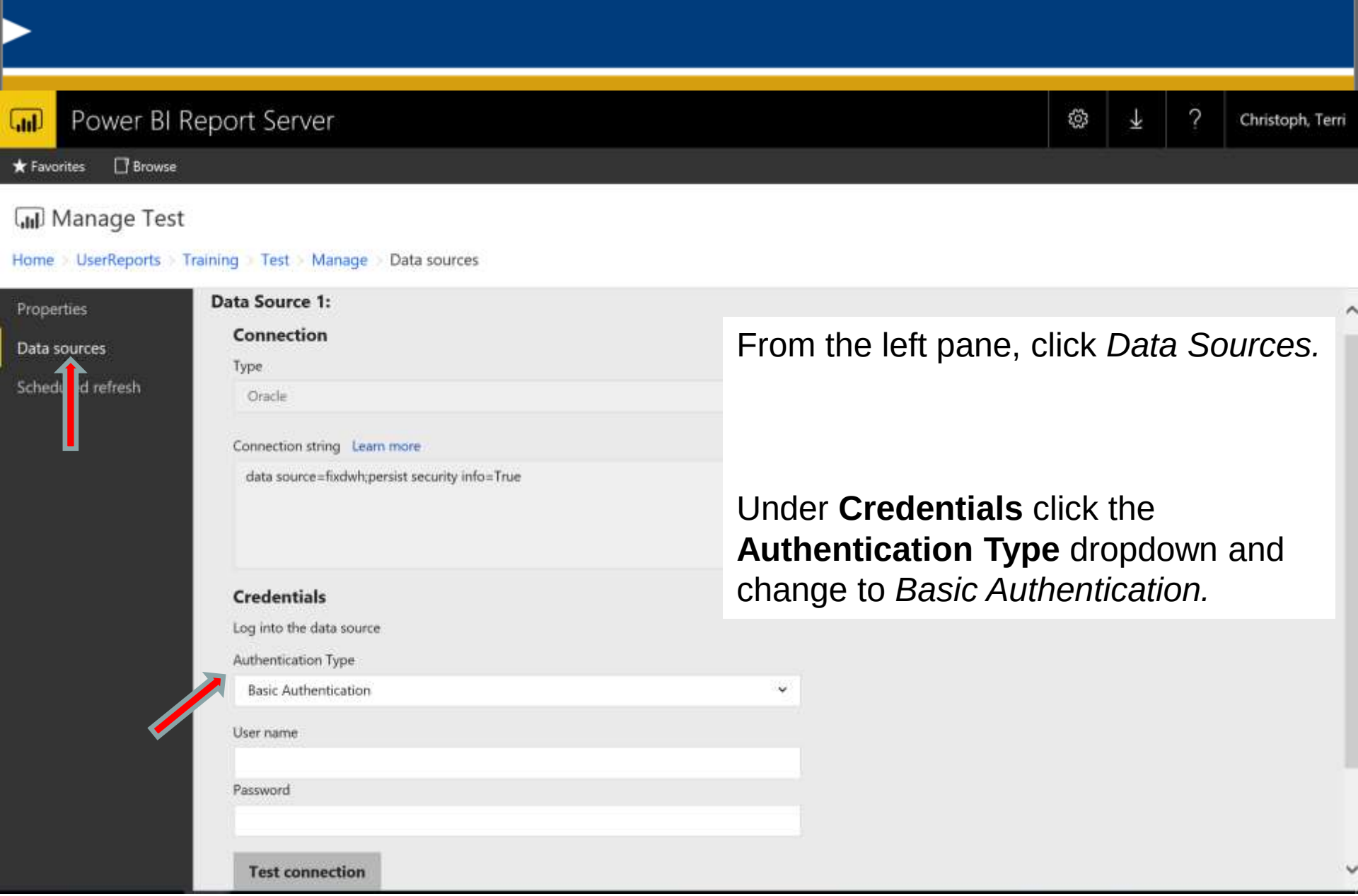

It is normal to receive the pop up *Something went wrong.* Click the **Close** button.



Click your program folder breadcrumb to find the report you just saved in that program folder. (I saved a report *"Test"* in the Training folder.

Right-click over that report name and from the dropdown select *Manage.*





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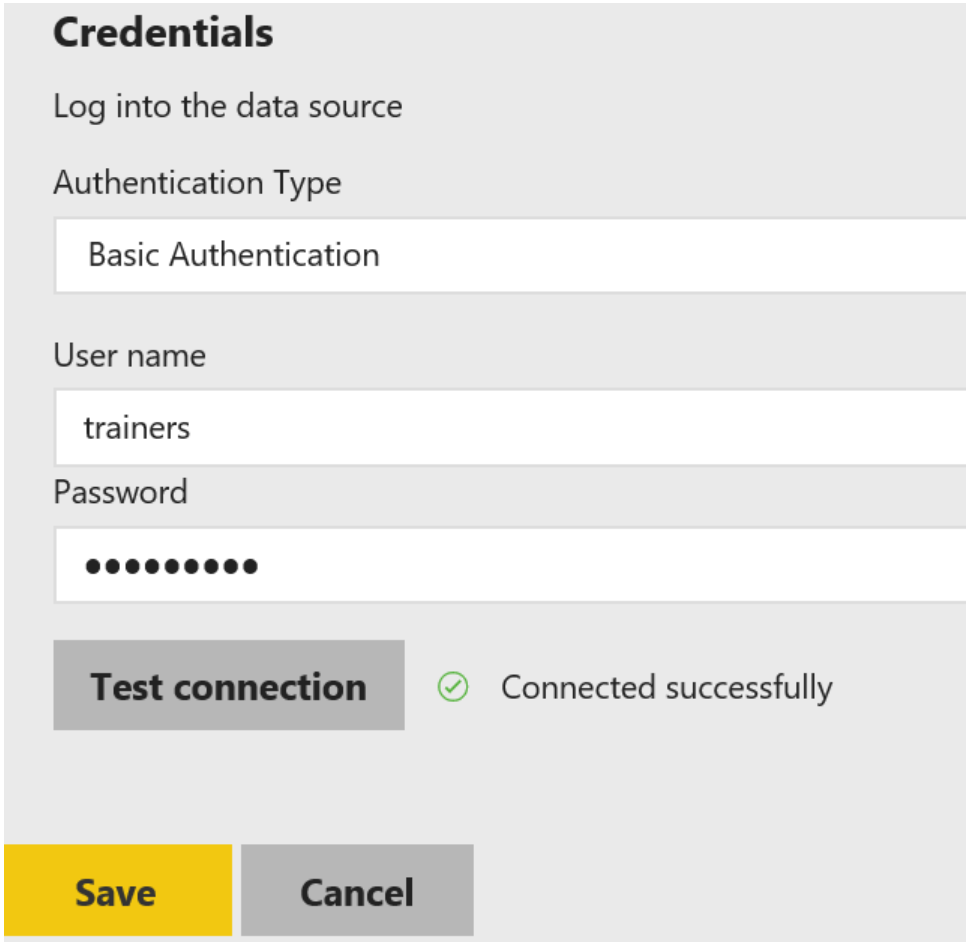
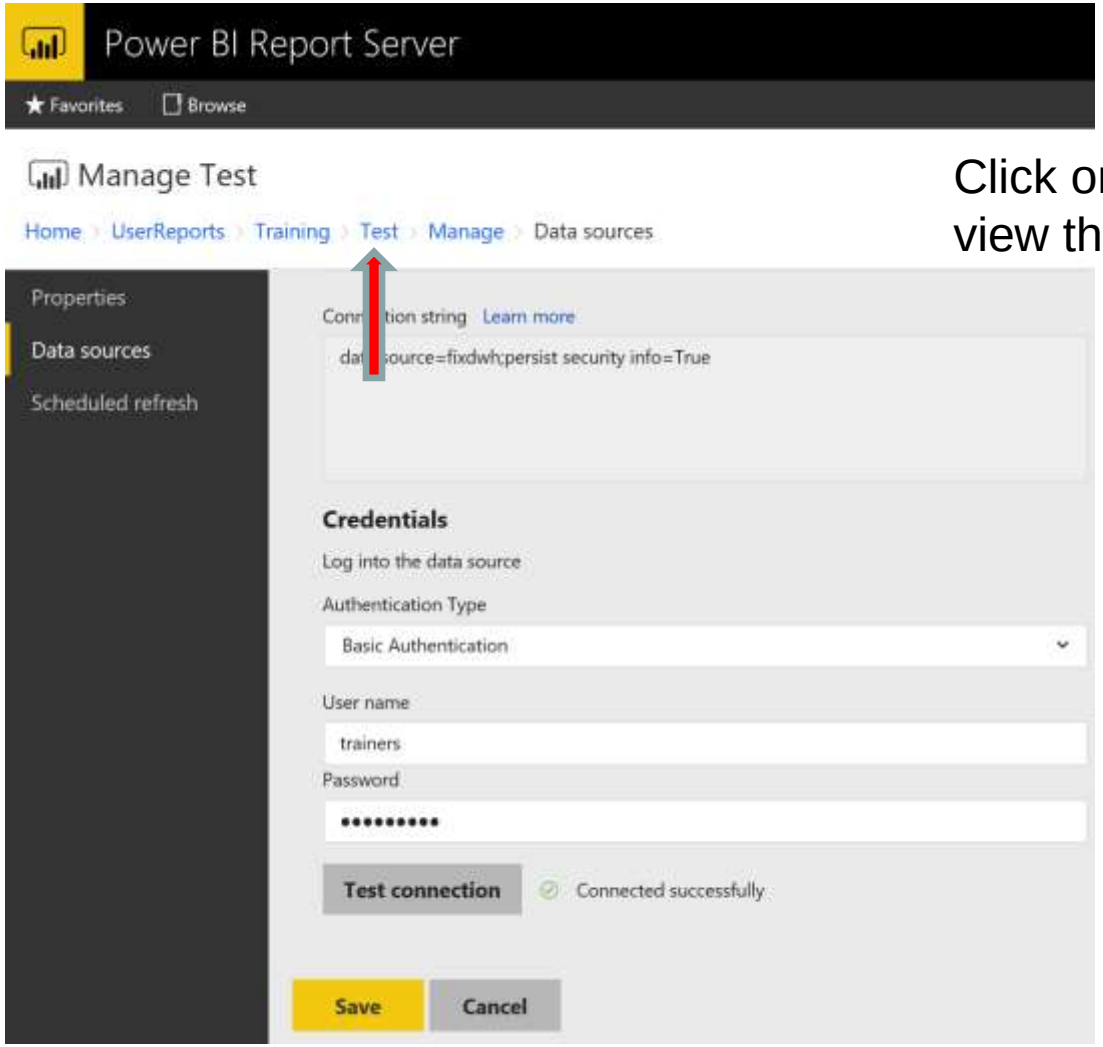



Enter the same user name and password used to create the report.

Click the **Test Connection** button. *Connected successfully* should display.

Click the **Save** button.




Click on the report name breadcrumb to view the report on the Report Server.



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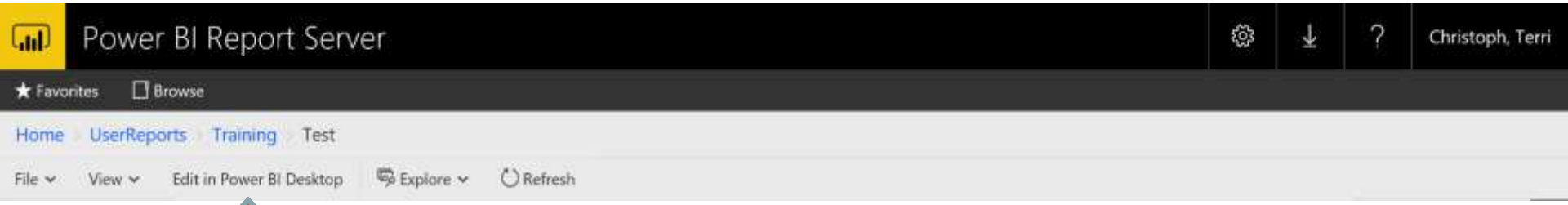
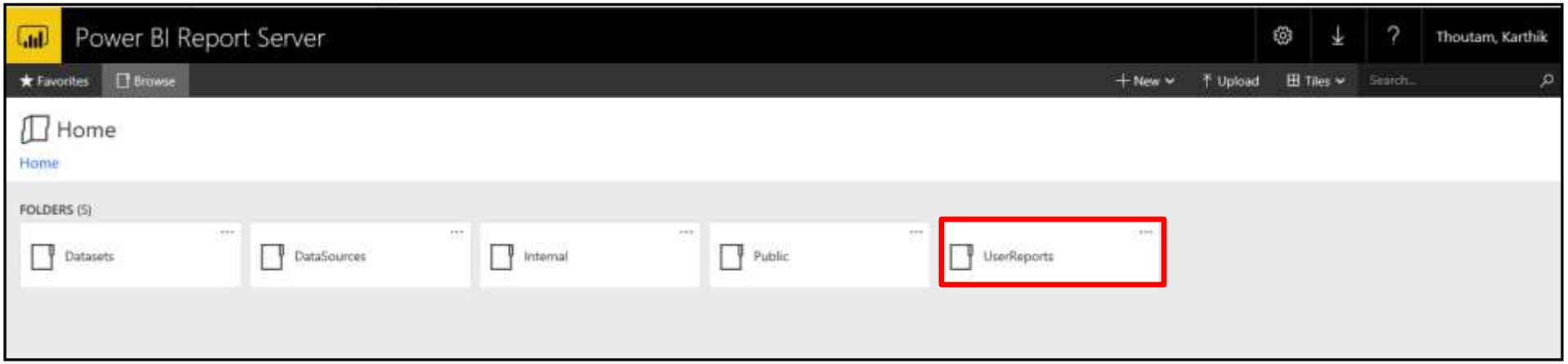



Publisher security will be able to **Edit in Power BI Desktop**. Browser security will not see this option.

Power BI Report Server

# Power BI Report Server




Everyone will have access to the **UserReports folder.** In that folder you will find several program folders. Single click to open a folder and single click to run a report. The program folders will have security on them. A user who does not have the login for a particular folder or report would not be able to open it.

# Sharing the report On-Prem

**Start the web portal**

1.Open your web browser.
2.See this list of supported web browsers and versions.
3.In the address bar, type the web portal URL.
4.By default, the URL is *https://[ComputerName]/reports*.
5.The report server might be configured to use a specific port. For example, *https://[ComputerName]:80/reports* or *https://[ComputerName]:8080/reports*

You see that the web portal groups items into these categories:
•KPIs
•Mobile reports
•Paginated reports
•Power BI Desktop reports
•Excel workbooks
•Datasets
•Data sources
•Resources



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# New Role Assignment

Home › Datasets › Manage › Security › New Role

Use this page to assign role-based security for **Datasets**.

**Group or user:** Name...

Select one or more roles to assign to the group or user.

| Role | Description |
|---|---|
| Browser | May view folders, reports and subscribe to reports. |
| Content Manager | May manage content in the Report Server. This includes folders, reports and resources. |
| My Reports | May publish reports and linked reports; manage folders, reports and resources in a users My Reports folder. |
| Publisher | May publish reports and linked reports to the Report Server. |
| Report Builder | May view report definitions. |

OK Cancel

# Modelling Data

# Create your data model with **PowerBI Desktop**

Data Sources

## Power BI Desktop file (.PBIX)

### Query Editor

Data Source Connections

Data Transformations

*(Prep data for Data Model)*

*Close & Apply*

**Close:** Closes Query Editor

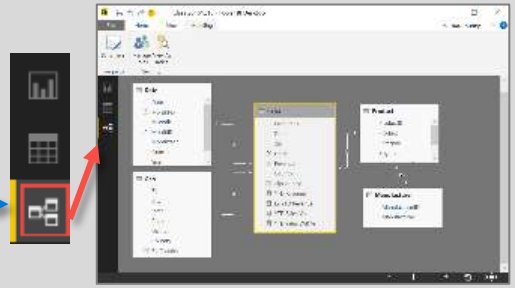
**Apply:** Loads data from sources to Data Model

### Report

Create Visuals

### Data

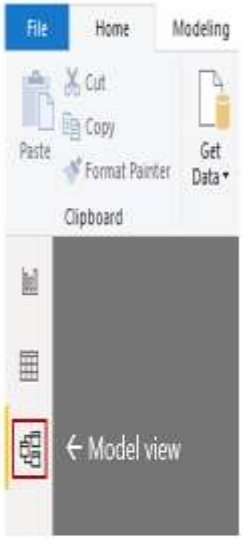
View Tables



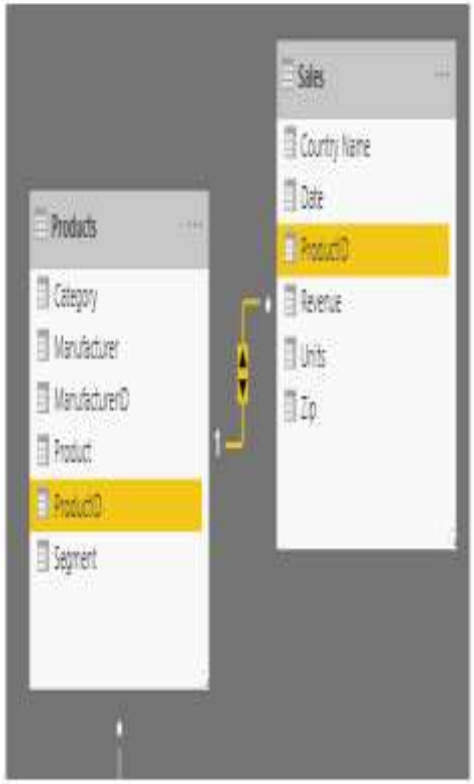
### Relationships

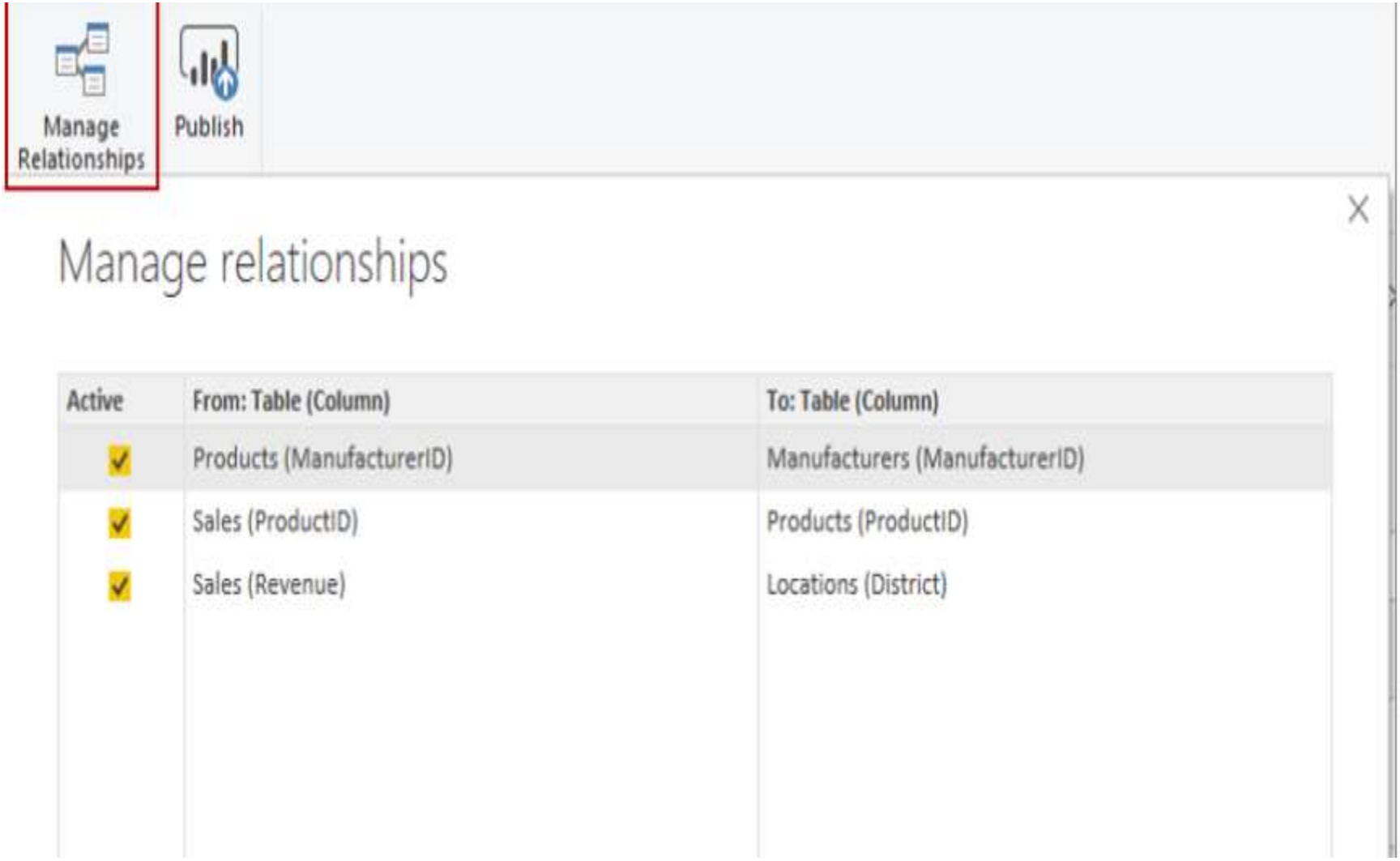
See how Tables relate to each other

In the Model view, notice that a block represents each table and its columns and that lines between them represent relationships.




Adding and removing relationships is straightforward. To remove a relationship, right-click the relationship and select **Delete**. To create a relationship, drag and drop the fields that you want to link between tables.




Manage Relationships
Publish
Manage relationships
Active
From: Table (Column)
To: Table (Column)
Products (ManufacturerID)
Manufacturers (ManufacturerID)
Sales (ProductID)
Products (ProductID)
Sales (Revenue)
Locations (District)

# Microsoft Training Videos for Data Modelling

https://docs.microsoft.com/en-us/learn/modules/model-data-power-bi/

# Understanding DAX

DAX is a complex yet robust development language. You'll need to become fluent in DAX to get the most out of your Tabular and Power BI Desktop models. The good news is there are lot of great, free resources on the Web to get you started.

DON'T GET FRUSTRATED! You can learn the basics of DAX fairly easily, but mastering DAX will take time and effort, and no one, not even Collie, Ferrari, and Russo (icons in Microsoft BI) have done it yet. Once you get experienced in DAX, you may grow to appreciate DAX's flexibility in solving complex analytic and reporting challenges.

# DAX: Base Measures

- When you load your data warehouse fact table measures into Power BI Desktop or SSAS Tabular for the first time, neither application recognizes these measures as aggregates.

- As a result, these data values can't be used in most DAX expressions. So it's necessary to convert your data warehouse measures into aggregable measures in your Power BI Desktop or SSAS Tabular data model.

- In most cases, you do this using the SUM, MIN, MAX, AVERAGE, FIRSTDATE, and LASTDATE DAX functions for numbers and dates, and the FIRSTNONBLANK and LASTNONBLANK DAX functions for text values.

- You'll use base measures to create all other types of measures that have implicit or explicit filters built into them. For example, to get Total Sales Amt, you build off the Sales Amt measure, but apply the ALL function on the Online Sales table telling the calculation to use all values in the Online Sales table and to disregard any filters that are contrary to this explicit filter.

```
Sales Amt = SUM('Online Sales'[Sales Amount])
```

```
Avg Sales Amt = AVERAGE('Online Sales'[Sales Amount])
```

```
Max Sales Amt = MAX('Online Sales'[Sales Amount])
```

```
Min Sales Amt = MIN('Online Sales'[Sales Amount])
```

```
Total Sales Amt = CALCULATE([Sales Amt], ALL('Online Sales'))
```

# DAX:  Time Intelligence Functions

- Time intelligence functions in DAX are fairly straightforward, but they don't work with complex fiscal calendars and you can't use time intelligence functions with live connections to relational databases.
- The four main functions you'll work with are **TOTALYTD**, **TOTALQTD**, **TOTALMTD**, and **SAMEPERIODLASTYEAR**.

```
MTD Sales Amt = CALCULATE(TOTALMTD([Sales Amt], 'Date'[Date]), FILTER('Date', 'Date'[Date] < TODAY()))
```

```
QTD Sales Amt = CALCULATE(TOTALQTD([Sales Amt], 'Date'[Date]), FILTER('Date', 'Date'[Date] < TODAY()))
```

```
YTD Sales Amt = CALCULATE(TOTALYTD([Sales Amt], 'Date'[Date]), FILTER('Date', 'Date'[Date] < TODAY()))
```

```
PY YTD Sales Amt = CALCULATE(CALCULATE([YTD Sales Amt], SAMEPERIODLASTYEAR('Date'[Date])), FILTER('Date', 'Date'[Date] < TODAY()))
```

- When time intelligence measures are created with no date context, the values of these measures will be blank.

```
YTD Sales Amt = TOTALYTD([Sales Amt], 'Date'[Date])
```

| Sales Amt | Min Sales Amt | Max Sales Amt | Avg Sales Amt | YTD Sales Amt |
|---|---|---|---|---|
| $2,475,142,932.73 | $0.00 | $3,199.99 | $222.42 | |

- Add date context as in the first four examples above…

| Total Sales Amt | Sales Amt | Min Sales Amt | Max Sales Amt | Avg Sales Amt | PREV WK Sales Amt | MTD Sales Amt | QTD Sales Amt | YTD Sales Amt |
|---|---|---|---|---|---|---|---|---|
| $2,475,142,932.73 | $2,475,142,932.73 | $0.00 | $3,199.99 | $222.42 | $17,109,818.61 | $42,343,035.58 | $202,722,315.17 | $614,668,334.27 |

# DAX: Special Time Intelligence: PREV WK

```
PREV WK Sales Amt:= CALCULATE
                        (  SUMX
                            (
                               SUMMARIZE
                               (
                                  DATESBETWEEN
                                  (
                                      'Date'[Date]
                                    , CALCULATE(LASTDATE('Date'[First Day of Prev Wk]), FILTER('Date', 'Date'[First Day of Prev Wk] < TODAY() ))
                                    , CALCULATE(LASTDATE('Date'[Last Day of Prev Wk]), FILTER('Date', 'Date'[Last Day of Prev Wk] < TODAY() ))
                                  )
                                , 'Date'[Date]
                                , "PREV WK Sales Amt"
                                , CALCULATE
                                  (
                                     [Sales Amt]
                                    , ALLEXCEPT('Date', 'Date'[Date])
                                  )
                               )
                            , [PREV WK Sales Amt]
                            )
                        , FILTER('Date', 'Date'[Date] < TODAY()))
```

| Total Sales Amt | Sales Amt | Min Sales Amt | Max Sales Amt | Avg Sales Amt | PREV WK Sales Amt | MTD Sales Amt | QTD Sales Amt | YTD Sales Amt |
|---|---|---|---|---|---|---|---|---|
| $2,475,142,932.73 | $2,475,142,932.73 | $0.00 | $3,199.99 | $222.42 | $17,109,818.61 | $42,343,035.58 | $202,722,315.17 | $614,668,334.27 |

# DAX: Special Time Intelligence: CAGR

```
CAGR 2YR Start:=  CALCULATE
                  (
                    CALCULATE
                    (
                      [Sales Amt]
                     , PARALLELPERIOD('Date'[Date], -2, YEAR)
                    )
                    , FILTER('Date', 'Date'[Date] < TODAY())
                  )
```

```
CAGR 2YR:= ((DIVIDE([Sales Amt], [CAGR 2YR Start], BLANK()))^(1/2)) - 1
```

# DAX In Depth Function Review: SUMMARIZE() and SUMX()

You've been asked by the business to provide custom sales totals for last week. You determine that a new measure called Prev Wk Custom Sales is needed. You decide to first use the SUMMARIZE() function to return an initial data set that totals custom sales for each day of the previous week and then to use the SUMX() function to aggregate the summarized data set into a single value.

**SUMMARIZE()**

For this request, custom sales data needs to be totaled for the previous week in the context of any selected date. We'll use the SUMMARIZE() function to accomplish this. The SUMMARIZE() function usually takes a minimum of four arguments:

```
SUMMARIZE(  <TABLE OR TABLE EXPRESSION>
                        , <GROUP BY COLUMN>
                        , <RESULT COLUMN NAME>
                        , <EXPRESSION>
                        )
```

- The first argument to the SUMMARIZE() function is a table or table expression. In this example, we only want to summarize the previous week of data, so we'll use the DATESBETWEEN function to return a table of seven consecutive dates, starting with the first day of the previous week and ending with the last day of the previous week in the context of the currently selected date. The DATESBETWEEN function takes three arguments: A reference to a date/time table column to be evaluated, a starting date, and an ending date. In this example, we use GL Invoice Date[Date] as the reference date, GL Invoice Date[First Day of Prev Wk] as the start date, and GL Invoice Date[Last Day of Prev Wk] as the end date. Notice that we also wrap the start and end dates in the LASTDATE() function. We do this because each day in any given week has the same start and end days for the previous week. Therefore each GL Invoice Date[First Day of Prev Wk] and GL Invoice Date[Last Day of Prev Wk] is listed seven times in the GL Invoice Date table. The LASTDATE() function like the FIRSTDATE(), MIN(), and MAX() functions aggregate data to return a single value. In this example, using any of these functions returns a single value representing the first or last day of the previous week in the context of the currently selected date.

```
SUMMARIZE(  DATESBETWEEN('GL Invoice Date'[Date], LASTDATE('GL Invoice Date'[First Day of Prev Wk]),  LASTDATE('GL Invoice Date'[Last Day of Prev Wk]))
                        , <GROUP BY COLUMN>
                        , <RESULT COLUMN NAME>
                        , <EXPRESSION>
                        )
```

- The second argument to the SUMMARIZE() function is a group by column from the first argument to the SUMMARIZE() function against which the results of the expression argument of the SUMMARIZE() function will be aggregated. In this example, the first argument to the SUMMARIZE() function is a single column table returned by the DATESBETWEEN function, so we'll use the GL Invoice Date[Date] column as our group by column. This group by column will serve as the unique row identifier for the data set returned by the SUMMARIZE() function. Please note that the SUMMARIZE() function allows multiple group by arguments.

```
SUMMARIZE(  DATESBETWEEN('GL Invoice Date'[Date], LASTDATE('GL Invoice Date'[First Day of Prev Wk]),  LASTDATE('GL Invoice Date'[Last Day of Prev Wk]))
                        , 'GL Invoice Date'[Date]
                        , <RESULT COLUMN NAME>
                        , <EXPRESSION>
                        )
```

- The third argument to the SUMMARIZE() function is the name to call the data set column that will store the values aggregated by the expression in the last argument to the SUMMARIZE() function. In this example, we name the data set column, #Prev Wk Custom Sales.

# FAQ's

1. **How can a Table be copied from one page to another?**

   A Table visual can be copied from one page to another within the same .pbix file by using Ctrl C + Ctrl V.

2. **How can I duplicate Slicers on another page?**

   Copy and paste as above and from the pop up asking if you want to sync the Slicers, click the **Sync** button.

3. **Can Power BI be embedded into a PowerPoint slide and then opened and be functional?**

   This feature is only available with the Cloud service, not on our on-premises report server.

4. **How many rows can be exported to Excel?**

   Currently the limit is 30,000 rows.  As the versions are updated, this may change.

6. **I just had Power BI installed on my computer and I am getting a *"Cannot Connect"* error message.**

   This could be because multiple versions of Oracle client on your PC are conflicting. Open a ticket and it will be corrected.

7. **What is the link to the Report Server in production?**

   http://cedatareporting.pa.gov/reports/browse/UserReports

Blogs

- Power Pivot Pro
- Marco Russo
- Alberto Ferrari
- SQLBI
- DAX Patterns

How To

- Get started with Power BI
- Tabular Model Row-Level Security
- Power BI Desktop Row-Level Security
- Pareto Charts

Mapping Resources

- Geo Names
- Map Shaper

Report and Dashboard Ideas

- Power BI Partner Showcase
- Power BI R Script Showcase

Software Downloads

- Power BI Desktop
- QGIS
- R Installation Package

# Thank you for participating in this training!

*Please sign up for the next scheduled training in your area*