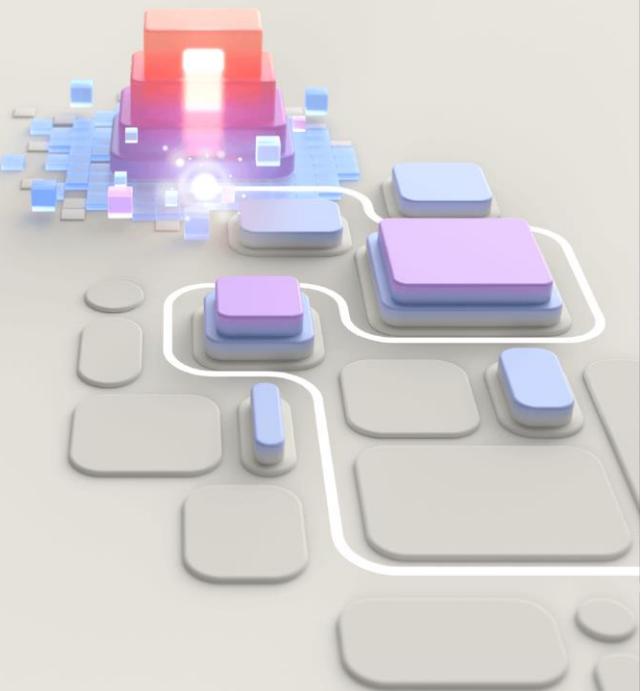




Microsoft Power BI Data Analyst [PL-300]

aka.ms/PL300-Course

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1

Course objectives

After completing this course, you should be able to:

- Retrieve and **profile data** from various sources, applying necessary **transformations**.
- Design and implement a **data model**, enhancing it with **DAX** expressions, variables, and aggregations.
- Create insightful reports and dashboards to effectively **visualize data**.
- Perform **advanced analytics** to gain deeper insights from the data.
- Manage workspaces, datasets, and row-level security settings for **collaboration** and **data governance**.

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Audience profile

Candidates for this exam:

- Leverage **data** and **domain expertise** to deliver **insights**.
- Collaborate with stakeholders to identify **business requirements**.
- **Clean, transform**, and **model** data by using Power BI.
- Provide value through **data visualizations** and **self-service analytics**.
- Deploy and configure **solutions for consumption**.
- Use **Power Query** and **DAX** proficiently.

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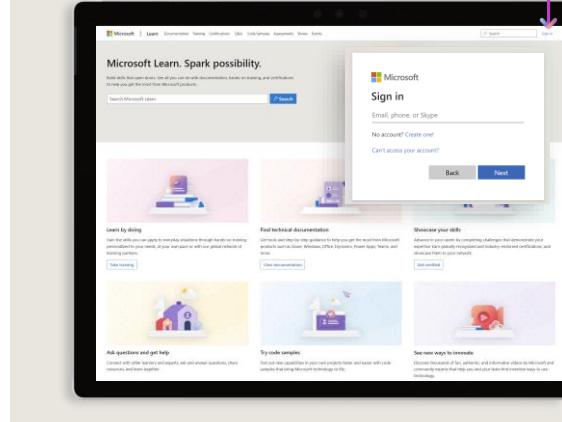
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All course content is available on Microsoft Learn

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- We'll go through this content together and as the course progresses, I will advise you on which modules to review.
- You can provide feedback for modules on Microsoft Learn. Find how at the bottom of each page.

This course includes labs:

- Detailed lab instructions are included in your lab environment.

aka.ms/PL300-Labs

Need help? See our [troubleshooting guide](#) or provide specific feedback by [reporting an issue](#).

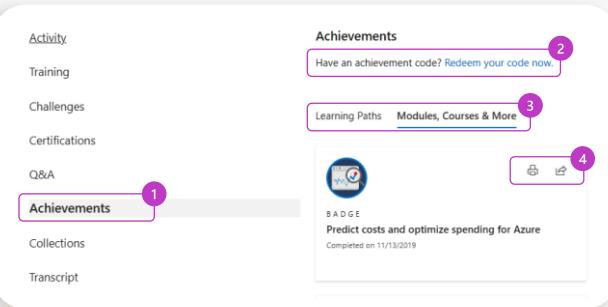
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¹ "2023 Value of IT Certification | Candidate Report," Pearson VUE, 2023 ² Microsoft fundamentals certifications don't expire

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Get ready for your Microsoft Certification exam

Exam PL-300: Microsoft Certified Power BI Data Analyst

Study area	Percentage
Prepare the data	20-25%
Model the data	15-20%
Visualize and analyze the data	15-20%
Deploy and maintain assets	20-25%

Exam preparation resources:

- Watch exam prep videos
- Review the exam study guide
- Demo the exam experience with the exam sandbox
- Take a practice assessment



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The slide features the Microsoft logo in the top left corner. To the right is a stylized graphic of 3D blocks in shades of blue, purple, and red, arranged in a stepped, mountain-like shape. Below this graphic is a large, light-colored 3D button or trackball with several smaller, rounded rectangular buttons around it. A white line traces a path from the bottom left towards the central button.

Get started with Microsoft data analytics

aka.ms/PL300-1

13

Agenda

Discover data analysis

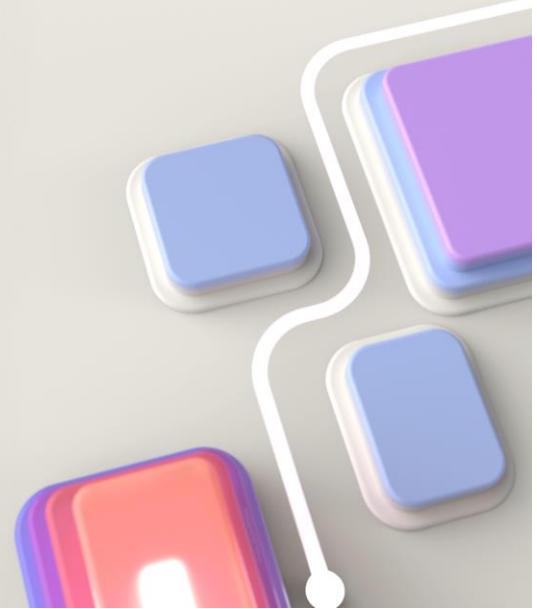
- Different data roles
- Data analyst tasks

Get started with Microsoft data analytics

- Data analytics with Microsoft
- Building blocks of Power BI
- Compelling visuals and reports

14

Discover data analysis



15

From data to business insights with Power BI



16

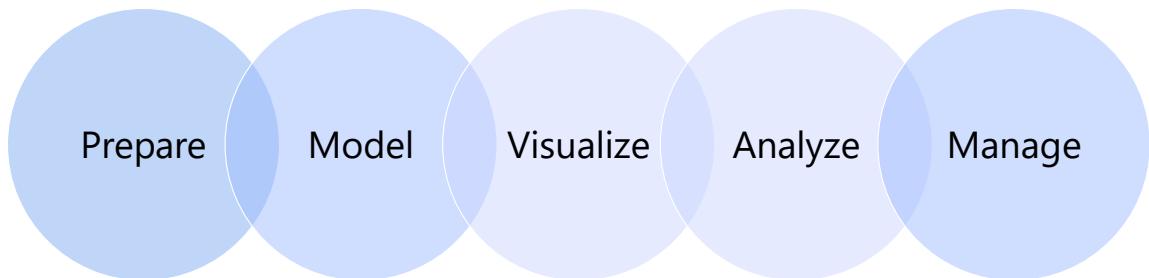
Different types of analysis

Data analysis is another form of storytelling with five categories:

- **Descriptive:** Summarize past data
- **Diagnostic:** Explain past data
- **Predictive:** Forecast future data
- **Prescriptive:** Optimize future data
- **Cognitive:** Learn from data

17

Tasks of a Data Analyst



18

Knowledge check: data analytics



Which role enables advanced analytics capabilities through reports and visualizations?

- Data analyst
- Data engineer
- Data scientist

Which data analyst task has critical performance impact on reporting and data analysis?

- Analyze
- Model
- Visualize

What is a key benefit of data analysis?

- Decisive analytics
- Informed business decisions
- Complex reports

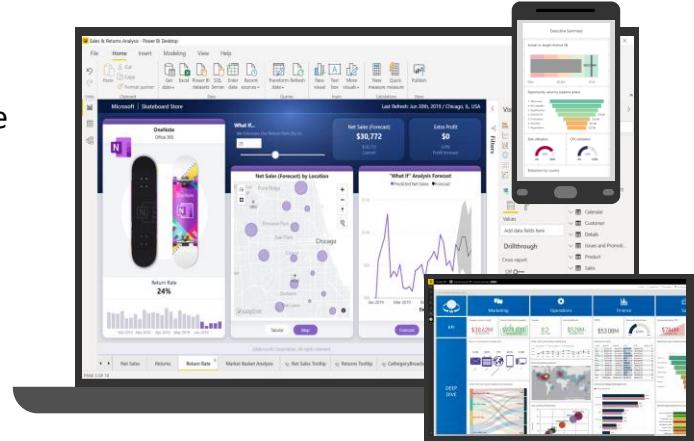
19

Get started building with Power BI

20

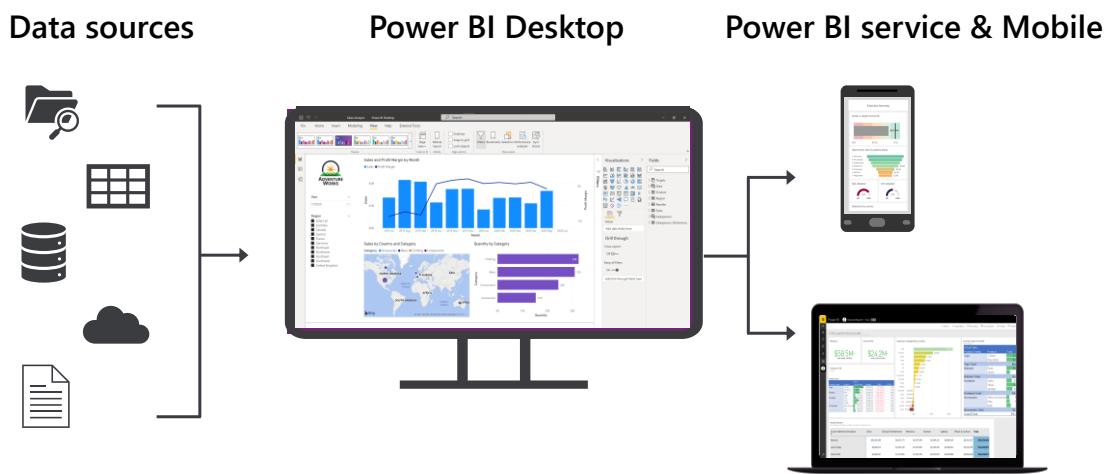
Introduction to Power BI environment

- Create with Power BI Desktop
- Distribute with Power BI service
- Access with Power BI Mobile



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The flow of Power BI

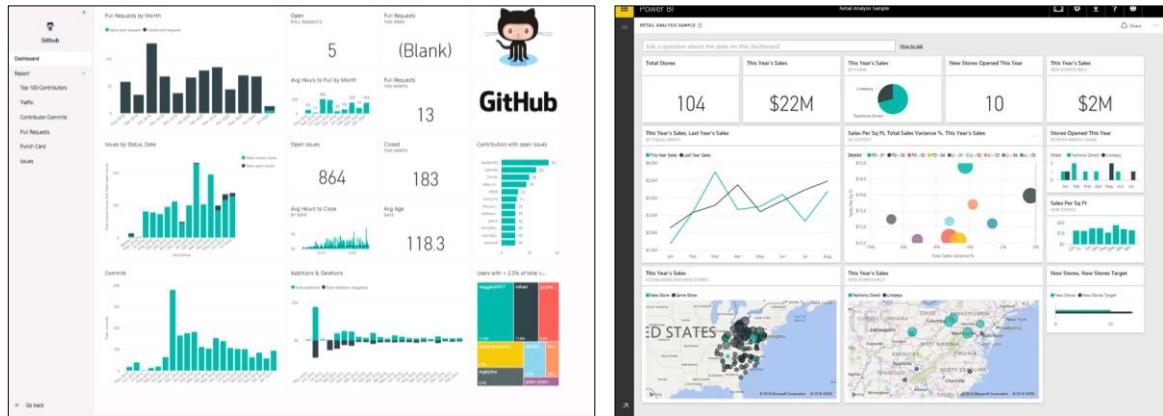


22

Building blocks of Power BI service

Consumable read-only reports and custom apps to enhance distribution.

Single-page dashboards can be derived from reports in the service.



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Thanks

Resources

[Discover data analysis](#)
[Get started with Power BI](#)

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Prepare data in Power BI Desktop

aka.ms/PL300-2

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Agenda

Get data in Power BI

- Retrieve data from various data sources
- Select storage mode
- Resolve import errors

Clean, transform, and load data in Power BI

- Resolve inconsistencies and data quality issues
- Profile data for better insights
- Apply data shape transformations

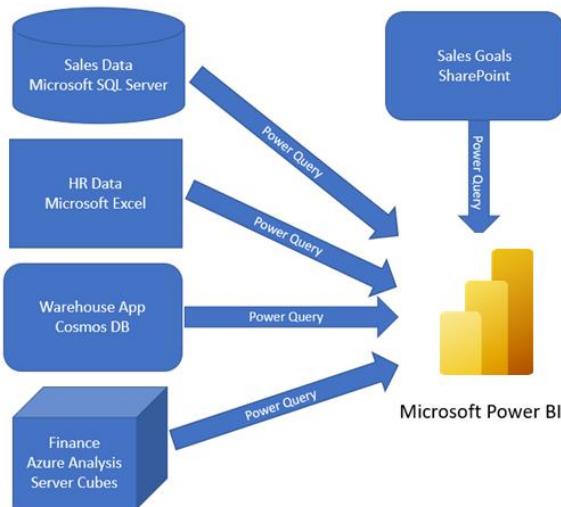
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Get data in Power BI

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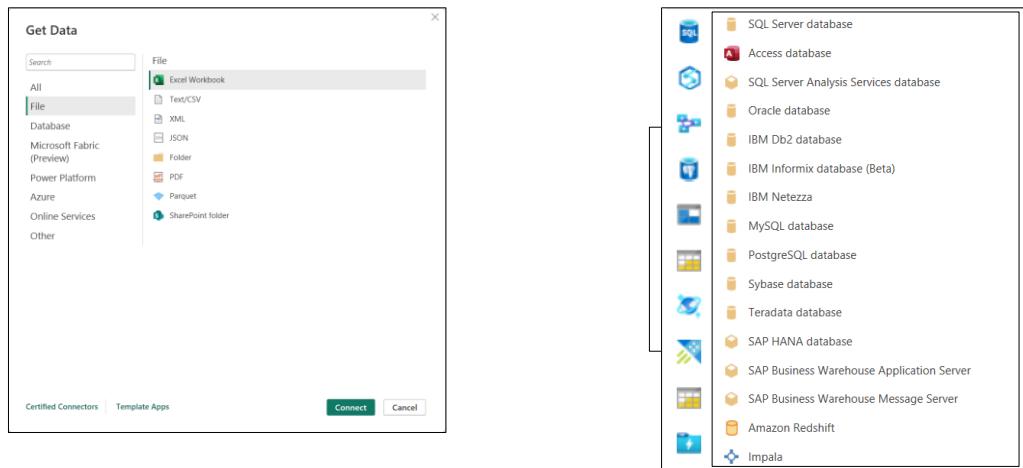
Combine all data into a single dataset



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Get data from a wide variety of sources



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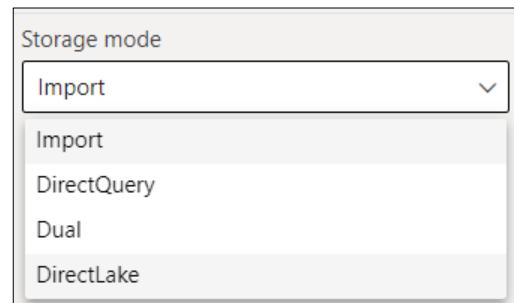
29

Select a storage mode

Storage mode affects

- Available transformations
- Report performance

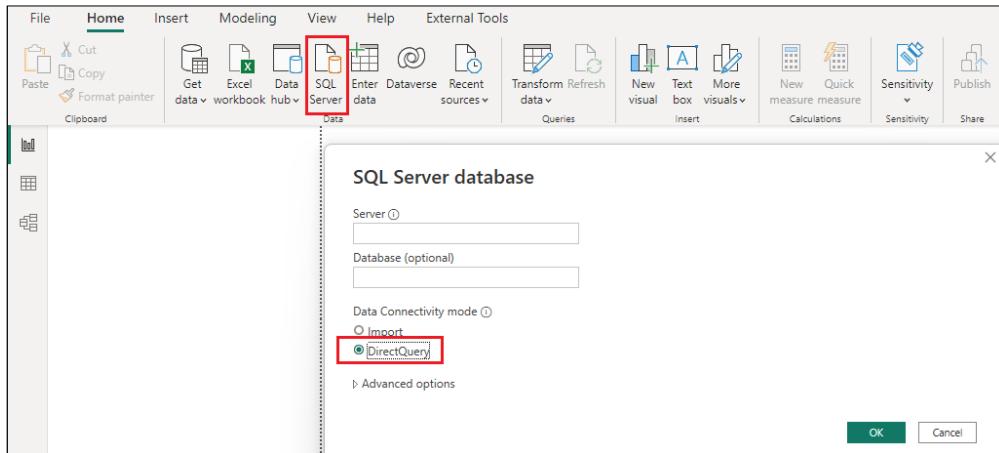
**Not all sources support all modes*



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Introduction to DirectQuery



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Implications of using DirectQuery

Benefits

- Frequently changing data
- Need near real-time
- Large data volumes
- Multi-dimensional data

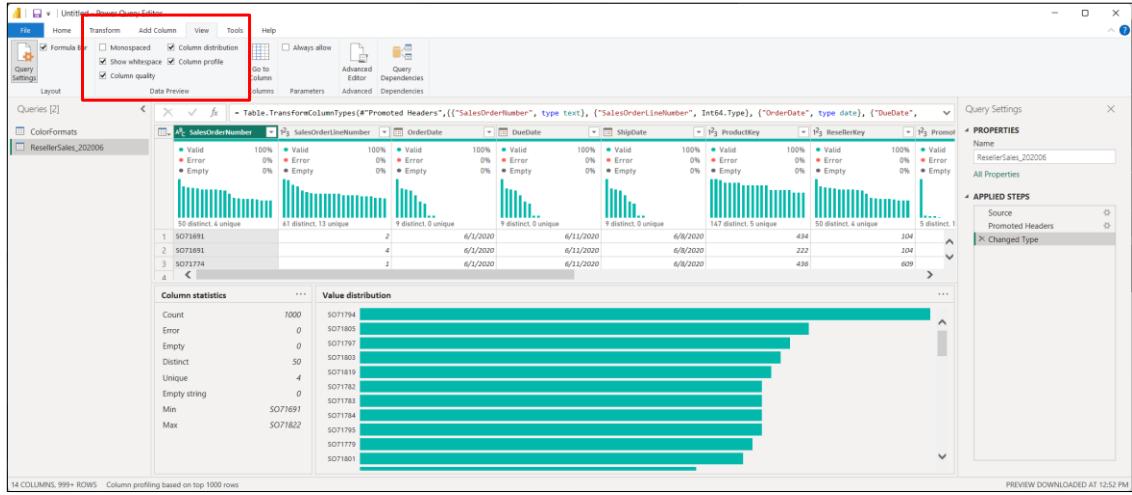
Limitations

- Dependent on data source performance
- Security between source and destination
- Limited modeling capabilities
- Limited transformation features

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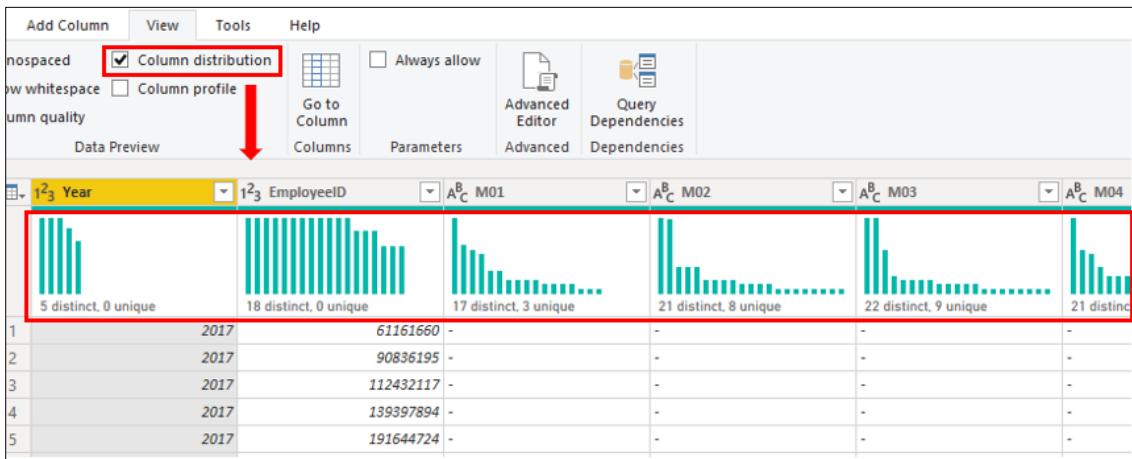
Data profiling options in Power Query Editor



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Determine cardinality of a column

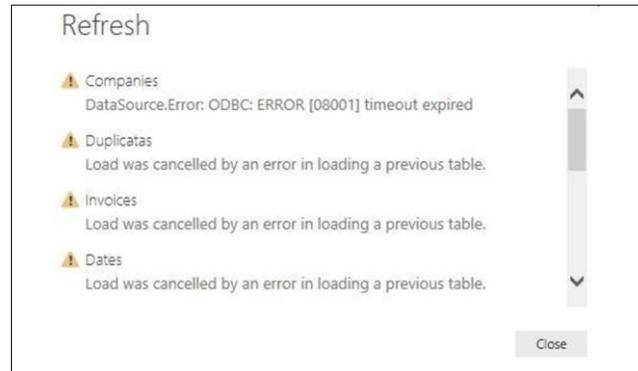


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Data import errors

- Possible data load errors:
 - Query Timeout
 - Couldn't find data formatted as a table
 - Could not find file
 - Data type errors



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Lab: Prepare data in Power BI Desktop (30 minutes)



Prepare Data | GitHub Exercise

This lab is designed to introduce you to Power BI Desktop application and how to connect to data and how to use data preview techniques to understand the characteristics and quality of the source data.

- Open Power BI Desktop
- Connect to source data
- Preview source data
- Use data profile tools

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Clean, transform, and load data

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Transform data with Power Query Editor

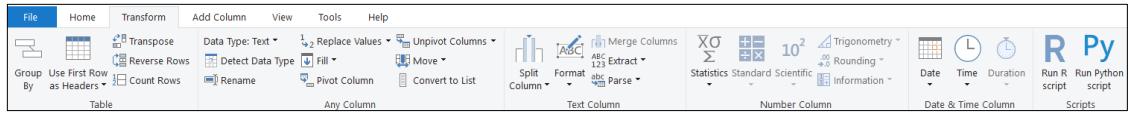
The screenshot shows the Microsoft Power Query Editor interface. The main area displays a table with 14 columns and 999+ rows. The columns include SalesOrderNumber, SalesOrderLineNumber, OrderDate, DueDate, ShipDate, ProductKey, and several numerical columns. The 'ProductKey' column has a tooltip indicating it is of type Int64.Type. The 'SalesOrderNumber' and 'SalesOrderLineNumber' columns are highlighted with orange boxes. The 'Transform' ribbon tab is selected, showing various data transformation tools like 'Close & Apply', 'New Query', 'Data source settings', 'Manage Parameters', 'Refresh', 'Advanced Editor', 'Properties', 'Choose Columns', 'Remove Columns', 'Keep Rows', 'Remove Rows', 'Split Column', 'Group By', 'Reduce Rows', 'Sort', 'Data Type: Text', 'Merge Queries', 'Append Queries', 'Text Analytics', 'Combine Files', 'Azure Machine Learning', and 'AI Insights'. On the right side, there is a 'Query Settings' pane with sections for 'PROPERTIES' (Name: ResellerSales_202006, All Properties) and 'APPLIED STEPS' (Source: promoted Headers, Changed Type). The status bar at the bottom indicates '14 COLUMNS, 999+ ROWS' and 'Column profiling based on top 1000 rows'.

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Common transformations

Transform columns, add new, split, extract, and more



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Choose user-friendly values

ID	Subcategory Name	Attribute
1 1	Mountain Bikes	January
2 1	Mountain Bikes	February
3 1	Mountain Bikes	March
4 1	Mountain Bikes	April
5 1	Mountain Bikes	May
6 1	Mountain Bikes	June
7 1	Mountain Bikes	July
8 1	Mountain Bikes	August
9 1	Mountain Bikes	September
10 1	Mountain Bikes	October
11 1	Mountain Bikes	November
12 1	Mountain Bikes	Dezember
13 2	Road Bikes	January
14 2	Road Bikes	February

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Shaping table structure

The screenshot shows the 'Advanced Editor' ribbon with the 'Manage' tab selected. A red box highlights the 'Remove Columns' button under the 'Columns' section. Below the ribbon is a table with two columns: Column13 and Column14. The first row contains November and December. The second row contains 880000 and 890000. The third row contains 9500 and 10000. The fourth row contains 511000 and 512000.

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Evaluate and change column data types

The screenshot shows a table in the 'Advanced Editor' with three columns: SalesOrderNumber, OrderDate, and TotalCost. The 'OrderDate' column is highlighted with a red box. The data shows various sales orders from July 1, 2017, with their respective total costs.

SalesOrderNumber	OrderDate	TotalCost
SO43659	7/1/2017	2024.99
SO43659	7/1/2017	6074.97
SO43659	7/1/2017	2024.99
SO43659	7/1/2017	2039.99
SO43659	7/1/2017	2039.99
SO43659	7/1/2017	4079.98
SO43659	7/1/2017	2039.99
SO43659	7/1/2017	86.52
SO43659	7/1/2017	28.84
SO43659	7/1/2017	34.2

Couldn't load the data for this visual

MdxScript(Model) (19, 40) Calculation error in measure
'Sales'[Quantity of Orders YTD]: A column specified in the call to
function 'TOTALYTD' is not of type DATE. This is not supported.

[Copy details](#)

[Send a Frown](#) [Close](#)

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Combine multiple queries into one

Append

Append

Concatenate rows from three or more tables into a single table.

Two tables Three or more tables

Available tables		Tables to append	
Production Suppliers	Production Suppliers	Sales Customers	Sales Customers
Sales Customers		HR Employees	HR Employees
HR Employees			

Add >> OK

Merge

Merge

Select a table and matching columns to create a merged table.

Sales Orders

orderid	custid	empid	orderdate	requireddate	shippeddate	shipperid	freight	shipname
10248	85	5	7/4/2014	8/1/2014	7/16/2014	3	32.38	Ship to 85-B
10249	79	6	7/5/2014	8/16/2014	7/16/2014	1	11.61	Ship to 79-C
10250	34	4	7/8/2014	8/5/2014	7/12/2014	2	65.83	Destination SCQ
10251	84	3	7/8/2014	8/5/2014	7/15/2014	1	41.34	Ship to 84-A
...

Sales OrderDetails

orderid	productid	unitprice	qty	discount
10248	11	14.00	12	0
10248	42	9.80	10	0
10248	72	34.80	5	0
10249	14	18.60	9	0
10249	51	42.40	40	0

Join Kind: Left Outer (all from first, matching from second) Use fuzzy matching to perform the merge
 Fuzzy matching options
 The selection matches 830 of 830 rows from the first table.

OK Cancel

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Unpivot or pivot columns

Add or remove table structure to meet your aggregation needs.

Category Name	Subcategory Name
Bikes	Mountain Bikes
Bikes	Road Bikes
Bikes	Touring Bikes
Clothing	Bib-Shorts
Clothing	Caps
Clothing	Gloves
Clothing	Jerseys
Clothing	Shorts
Clothing	Socks
Clothing	Tights
Clothing	Vests
Accessories	Bike Racks
Accessories	Bike Stands
Accessories	Bottles and Cages

1.2 Bikes	1.2 Components	1.2 Clothing	1.2 Accessories
1	3	14	8
			12

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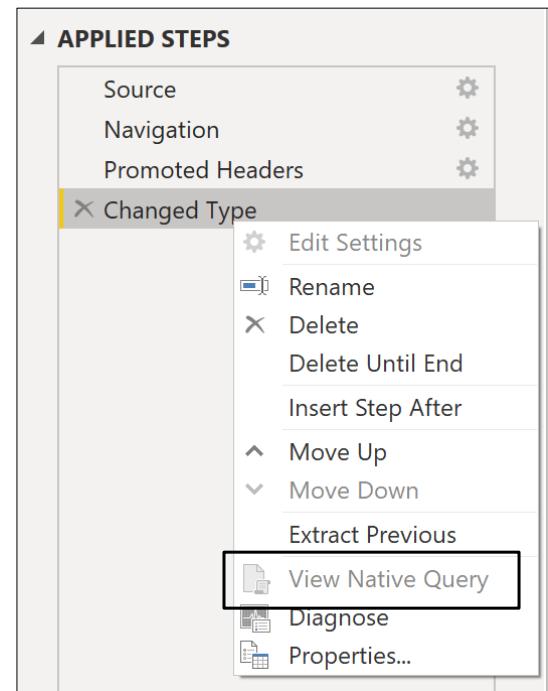
Query folding

Pushes data transformations
to the source for better
performance and efficiency.

Supported sources

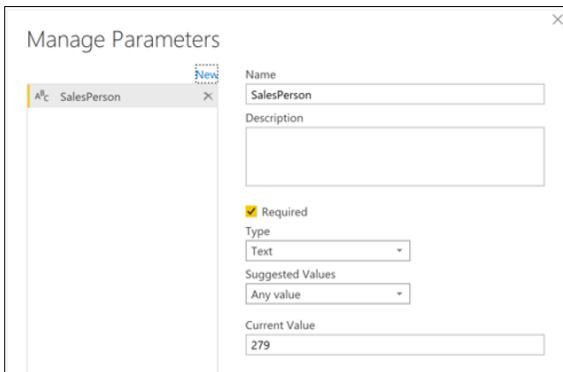
- Relational databases
- OData feeds
- Active Directory

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Dynamic reports with parameters



	A ⁸ C SalesOrderNumber	1 ² 3 SalesOrderId	1 ² 3 SalesPersonID
1	SO43659	43659	279
2	SO43660	43660	279
3	SO43681	43681	279
4	SO43684	43684	279
5	SO43685	43685	279
6	SO43694	43694	279
7	SO43695	43695	279
8	SO43696	43696	279

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Performance recommendations

- Only keep necessary data
- Check data types
- Reduce cardinality
- Disable query load
- Use parameters

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Lab: Load data in Power BI Desktop (45 minutes)



[Load Data | GitHub Exercise](#)

In this lab, you'll apply transformations to each of the queries created in the previous lab. You'll then apply the queries to load each as a table to the data model.

In this lab you learn how to:

- Apply various transformations
- Apply queries to load them to the data model

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Thanks

Resources

[Prepare data for analysis](#)

[Clean, transform, and load data in Power BI](#)

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Model data with Power BI Desktop

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Agenda

Introduction to data modeling

- Data types
- Star schema

Manage relationships

- Create relationships
- Edit relationships
- Create hierarchies

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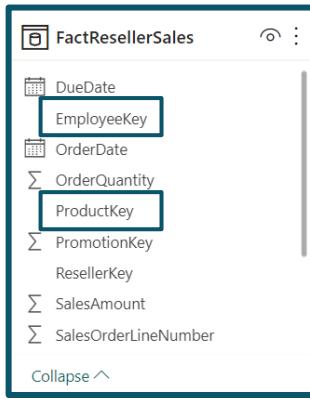
Introduction to data modeling

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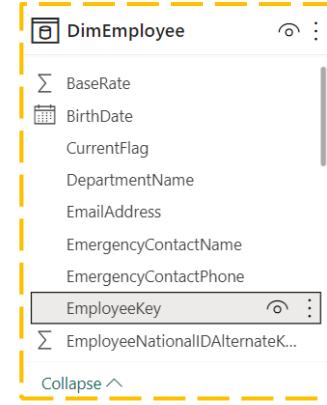
52

Data table types

Fact tables are activities or events.



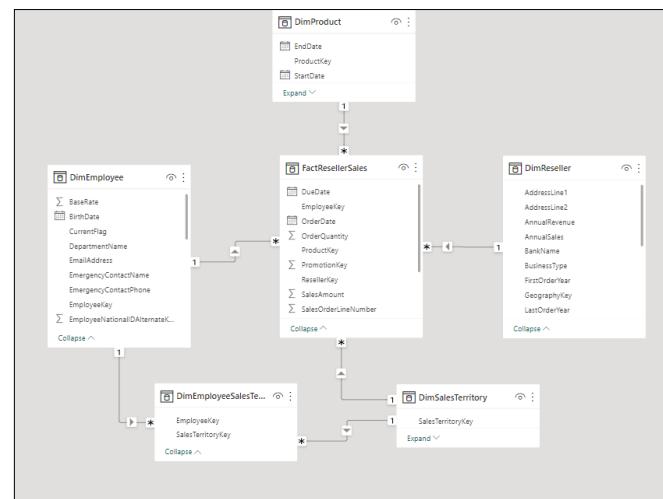
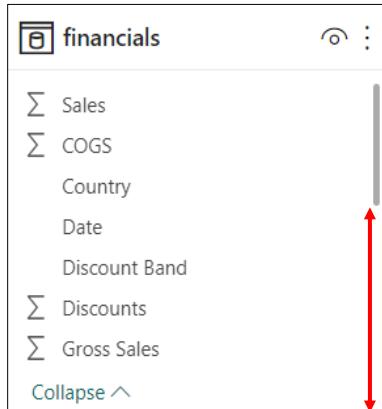
Dimension tables provide the details.



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Understand star schemas



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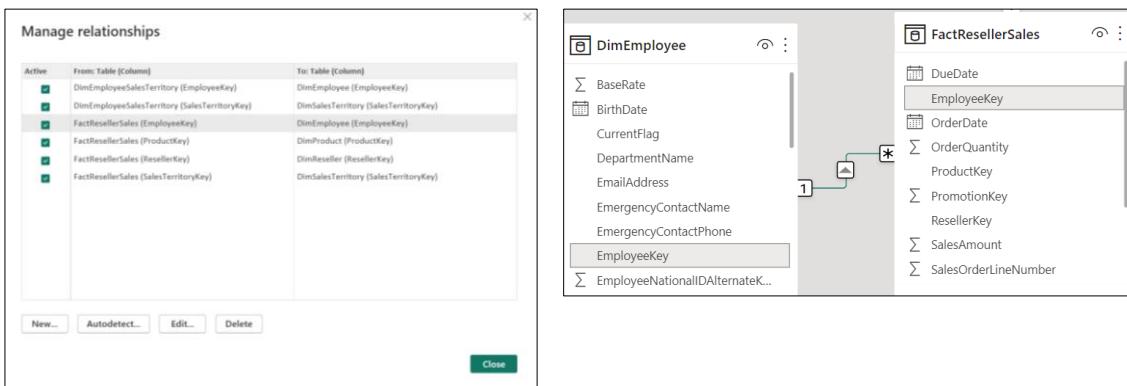
Manage relationships

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Create relationships



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Edit relationships

Edit relationship

Select tables and columns that are related.

FactResellerSales

DueDate	ShipDate	ProductKey	ResellerKey	PromotionKey	EmployeeKey	SalesTerritoryKey
Monday, September 4, 2017	Friday, September 1, 2017	235	312	1	282	
Monday, September 4, 2017	Friday, September 1, 2017	351	312	1	282	
Monday, September 4, 2017	Friday, September 1, 2017	348	312	1	282	

DimEmployee

EmployeeKey	ParentEmployeeKey	EmployeeNationalIDAlternateKey	ParentEmployeeNationalIDAlternateKey
12	185	912265825	33237992
17	189	132674823	33237992
24	201	835460180	332349500

Cardinality: Many to one (*:1)

Cross filter direction: Single

Make this relationship active

Apply security filter in both directions

Assume referential integrity

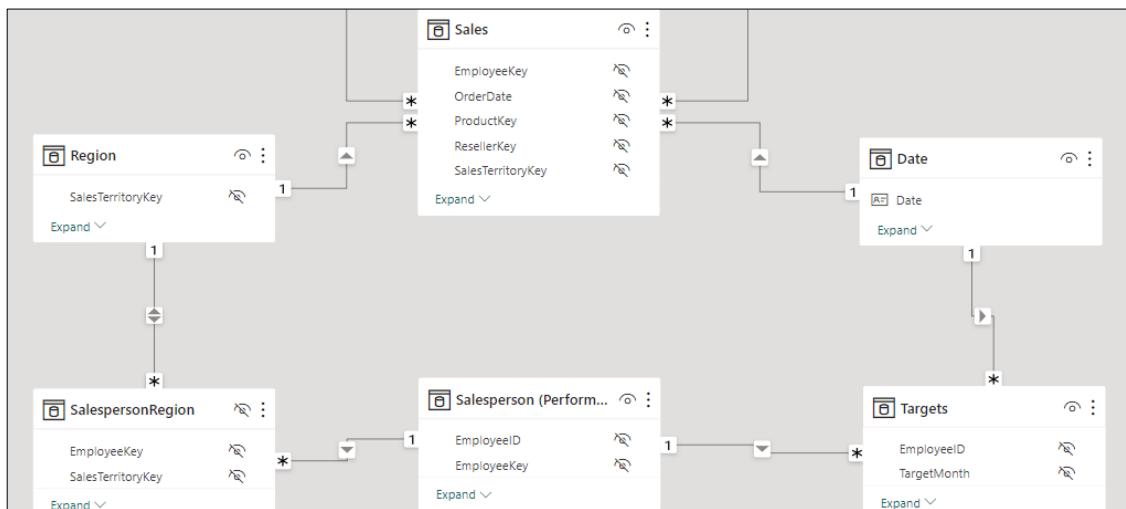
FactResellerSales

DueDate	EmployeeKey	OrderDate	ProductKey	ResellerKey	SalesTerritoryKey	ShipDate
---------	-------------	-----------	------------	-------------	-------------------	----------

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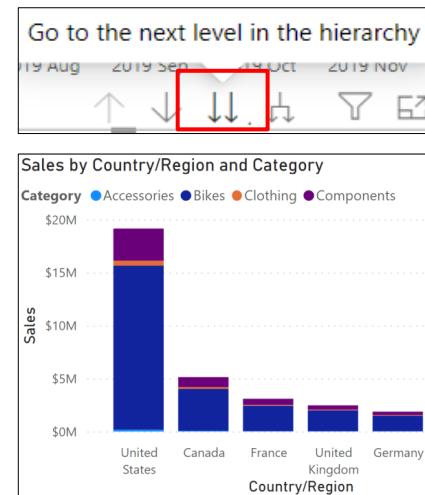
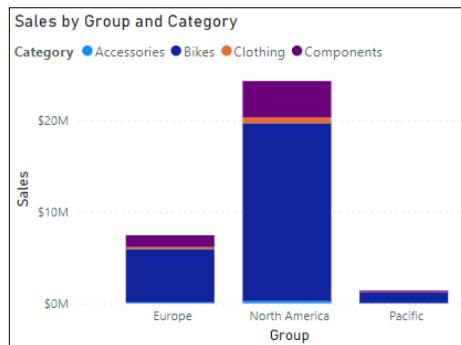
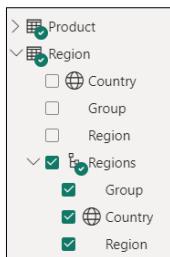
Implications of circular relationships



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How to use hierarchies for data fields



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Lab: Design a data model in Power BI Desktop (45 minutes)



Configure data model | GitHub exercise

In this lab, you'll commence developing the data model. It will involve creating relationships between tables, and then configuring table and column properties to improve the friendliness and usability of the data model.

- Create model relationships
- Configure table and column properties
- Create hierarchies and quick measures

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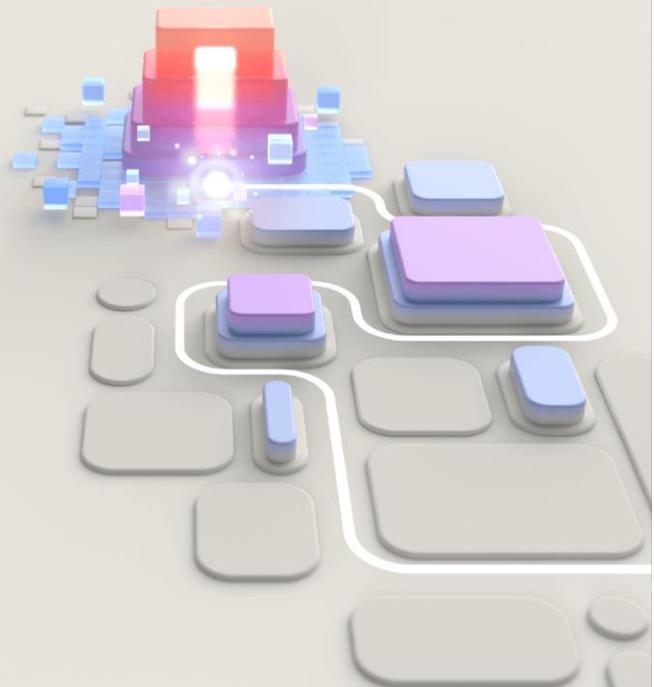
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Create calculations with DAX in Power BI

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Agenda

Introduction to DAX

- What is DAX
- Calculated measures, columns, and tables

Optimize DAX performance

- Variables in DAX expressions
- Performance analyzer

Advanced DAX concepts

- Filter context
- Semi-additive measures
- Time intelligence functions

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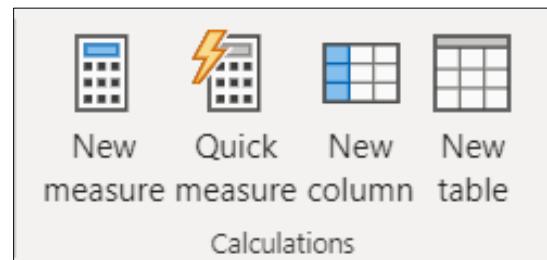
Introduction to DAX

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What is DAX?

- Data Analysis Expressions
- Library of functions and operators
- Build formulas and expressions
- Create calculated measures, columns, and tables



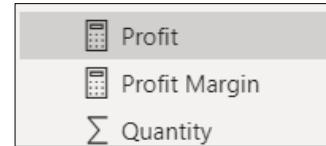
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Create calculated measures

- Defined with DAX definitions
- Computed on the fly.
- Not stored in data model.
- Responsive to interactions.
- Indicated by calculator icon.

The screenshot shows the Power BI ribbon with the 'Measure tools' tab selected. In the 'Name' field, 'Profit' is entered. Under 'Home table', 'Sales' is selected. The 'Format' dropdown shows 'Currency'. Below the table, the DAX code for the measure is displayed: `1 Profit =
2 SUM('Sales'[Sales]) - SUM('Sales'[Cost])`.



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Implicit vs. Explicit vs. Quick measures

A screenshot of a Power BI visual showing a list of measures. The first three measures—'Sales % All Region', 'Sales % Country', and 'Sales % Group'—have their calculator icons highlighted with a red box, indicating they are implicit measures. The other measures listed are 'Sales' (with a blue dashed box around its icon) and 'ShipDate'.

A screenshot of the 'Quick measure' dialog box. It includes sections for 'Calculation' (set to 'Filtered value'), 'Base value' (with a note to 'Add data fields here'), and 'Filter' (with a note to 'Add data fields here').

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Create calculated columns

- Defined using DAX expressions.
- Computed & stored in data model.
- Useful “helper/connector columns.”
- Recalculated during data refresh.
- Table and Sigma icon.

Total Price
\$57.68
\$4,049.98
\$4,049.98
\$57.68
\$1,637.4
\$40.38
\$4,049.98

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Create calculated tables

- Defined using DAX expressions.
- Computed & stored in data model.
- Useful for aggregating data or creating custom tables.
- Table and calculator icon.

Date	Year	Quarter	Month	MonthKey
7/1/2017 12:00:00 AM	FY2018	FY2018 Q1	2017 Jul	201707
7/2/2017 12:00:00 AM	FY2018	FY2018 Q1	2017 Jul	201707
7/3/2017 12:00:00 AM	FY2018	FY2018 Q1	2017 Jul	201707
7/4/2017 12:00:00 AM	FY2018	FY2018 Q1	2017 Jul	201707
7/5/2017 12:00:00 AM	FY2018	FY2018 Q1	2017 Jul	201707
7/6/2017 12:00:00 AM	FY2018	FY2018 Q1	2017 Jul	201707
7/7/2017 12:00:00 AM	FY2018	FY2018 Q1	2017 Jul	201707
7/8/2017 12:00:00 AM	FY2018	FY2018 Q1	2017 Jul	201707
7/9/2017 12:00:00 AM	FY2018	FY2018 Q1	2017 Jul	201707
7/10/2017 12:00:00 AM	FY2018	FY2018 Q1	2017 Jul	201707

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Columns vs. measures

Calculated columns:

- Create values for each row in table.
- Store values in the .pbix file.
- Increases data model size.
- Row-by-row calculation can impact performance.
- Must be referenced with measures for reuse.

Measures:

- Calculate on demand.
- Calculated based on filters.
- Doesn't affect data model size.
- DAX expressions may still be suboptimal.
- Can reference other measures directly for reuse.

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Lab: Create DAX calculations in Power BI Desktop (45 min)



Create DAX calculations | GitHub exercise

In this lab you'll create calculated tables, calculated columns, and simple measures using Data Analysis Expressions (DAX).

In this lab you learn how to:

- Create calculated tables
- Create calculated columns
- Create measures

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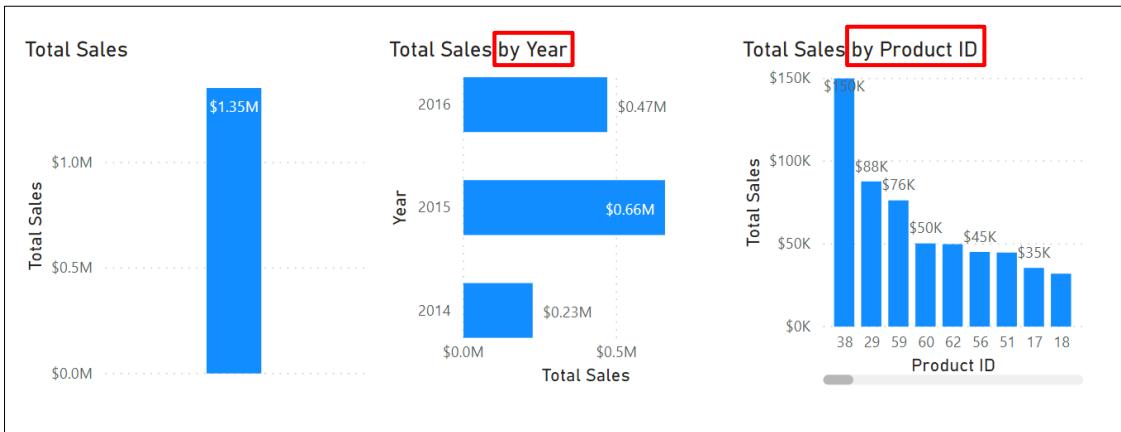
Advanced DAX concepts

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71

Understanding filter context

Measures are contextually different, or “dynamic,” depending on filters.

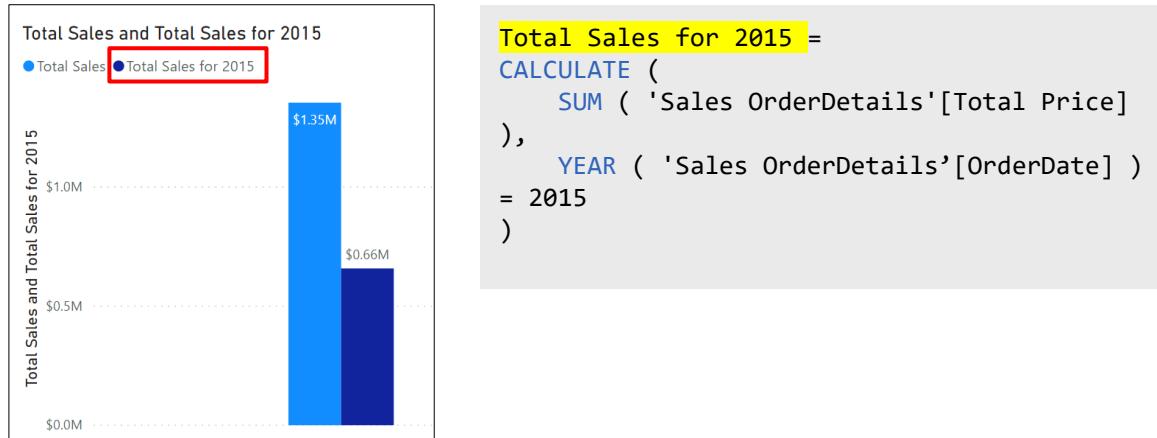


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72

CALCULATE() function

Adjusts how measures interpret data filters, enabling context control.

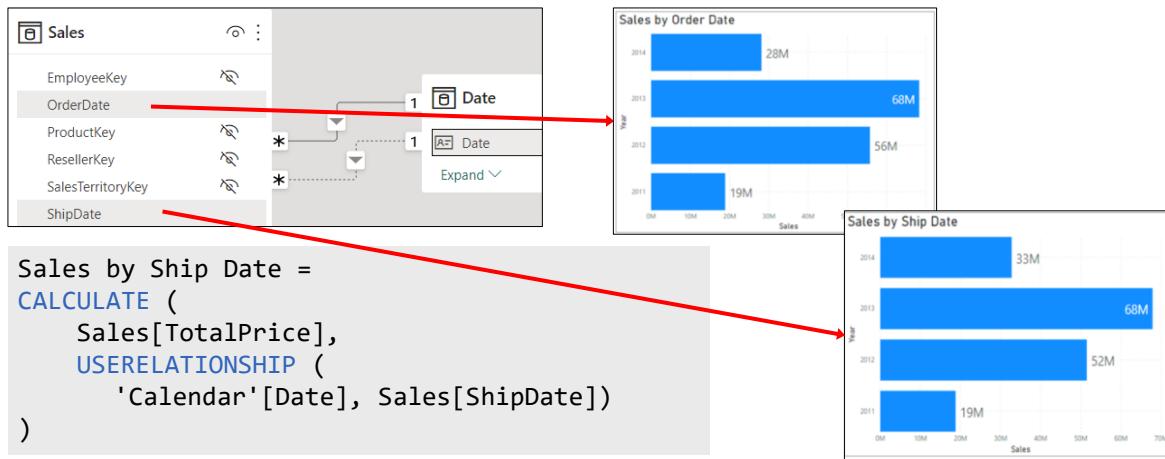


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Use inactive relationships with DAX

Enable additional table filtering without impacting the active relationship.

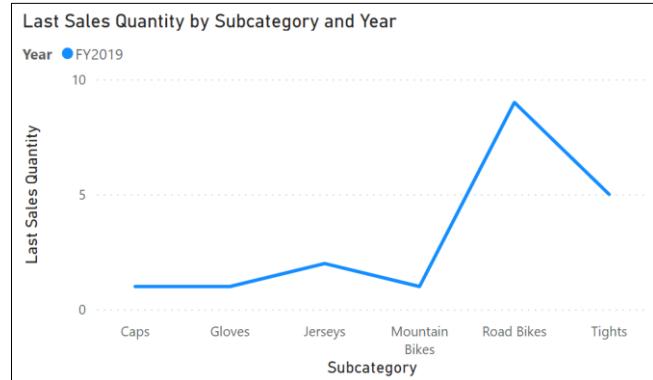


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Semi-additive measures

- **Context-dependent:**
Results vary based on dimensions.
- **Time Intelligence:**
Useful for averages, ratios, balances.
- **Caution with aggregation:**
Beware of misleading results when aggregating.

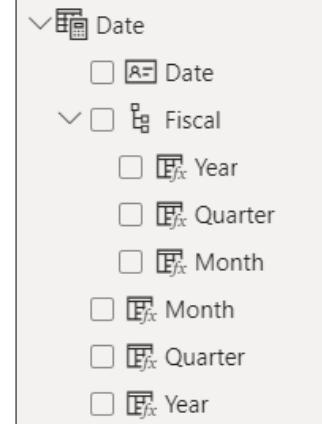
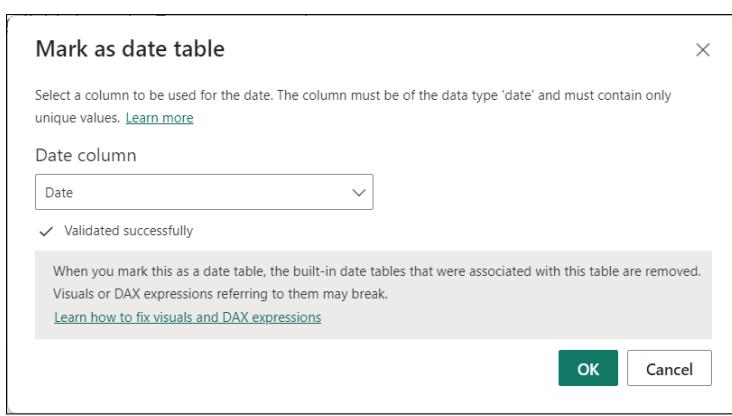


```
Last Sales Quantity =
CALCULATE(
    SUM(Sales[Quantity]),
    LASTDATE('Date'[Date])
)
```

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Create a common date table



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Time Intelligence functions

Month	2014	2015	2016
January		\$66,692.8	\$100,854.72
February		\$107,900	\$205,416.67
March		\$147,879.9	\$315,242.12
April		\$203,579.29	\$449,872.68
May		\$260,402.99	\$469,771.34
June		\$299,490.99	\$469,771.34
July	\$30,192.1	\$354,955.92	\$469,771.34
August	\$56,801.5	\$404,937.61	\$469,771.34
September	\$84,437.5	\$464,670.63	\$469,771.34
October	\$125,641.1	\$534,999.13	\$469,771.34
November	\$175,345.1	\$580,912.49	\$469,771.34
December	\$226,298.5	\$658,388.75	\$469,771.34
Total	\$226,298.5	\$658,388.75	\$469,771.34

Total Sales Previous Month =

```
CALCULATE ( SUM ( Sales[Total Price] ),  
PREVIOUSMONTH ( 'Date'[Date] ) )
```

April	\$55,099.59
May	\$56,823.7
June	\$39,088
July	\$55,464.93
August	\$49,981.69
September	\$59,733.02
October	\$70,328.5
November	\$45,913.36
December	\$77,476.26

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Optimize DAX performance

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Use variables to improve performance and readability

Without variable:

```
Sales YoY Growth =
    DIVIDE (
        ( [Sales] - CALCULATE ( [Sales], PARALLELPERIOD ( 'Date'[Date], -12, MONTH ) ) ),
        CALCULATE ( [Sales], PARALLELPERIOD ( 'Date'[Date], -12, MONTH ) ) )
```

With variable:

```
Sales YoY Growth =
    VAR SalesPriorYear = CALCULATE ( [Sales], PARALLELPERIOD ( 'Date'[Date], -12, MONTH ) )
    VAR SalesVariance = DIVIDE ( ( [Sales] - SalesPriorYear ), SalesPriorYear )
    RETURN
    SalesVariance
```

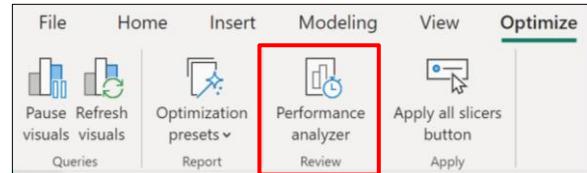
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Tune report performance

Performance analyzer in Power BI Desktop

- Record report interactions.
- Review query and rendering times.
- Identify bottlenecks, optimize queries.



Performance analyzer

Name	Duration (ms)
Recording started (6/19/2023 3:12:20 PM)	-
Cross-highlighted	-
Button	92
Image	91
Sales and Profit Margin by Month	359
DAX query	19
Visual display	28
Other	312
Copy query	
Quantity by Category	302
Slicer	129
Slicer	222

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80

Analyze query plans for optimization opportunities

```
Count Customers =
CALCULATE (
    DISTINCTCOUNT ( Order[ProductID] ),
    FILTER ( Order, Order[OrderQty] >= 5 )
)
```

```
Count Customers =
CALCULATE (
    DISTINCTCOUNT ( Order[ProductID] ),
    KEEPFILTERS (Order[OrderQty] >= 5 )
)
```

<input type="checkbox"/> Sales by Year	270
DAX query	2754
Visual display	57
Other	160
Copy query	

<input type="checkbox"/> Sales by Year	270
DAX query	54
Visual display	57
Other	160
Copy query	

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Thanks

Resources

[Design a data model in Power BI](#)

[Write DAX formulas for Power BI Desktop models](#)

[Add measures to Power BI Desktop models](#)

[Use DAX time intelligence functions in Power BI Desktop models](#)

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Create reports in Power BI Desktop

aka.ms/PL300-5

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Agenda

Work with visuals

- Add visuals to report
- Choose effective visuals
- Format and configure visuals

Report layout and interactions

- Design appealing report layout
- Cross-highlight and drill down

Navigation and filtering

- Navigate and sort report
- Filters and slicer visual

Report design elements

- Add shapes, buttons, text, images
- Bookmarks and drill through
- Selection order (accessibility)
- When to use paginated reports

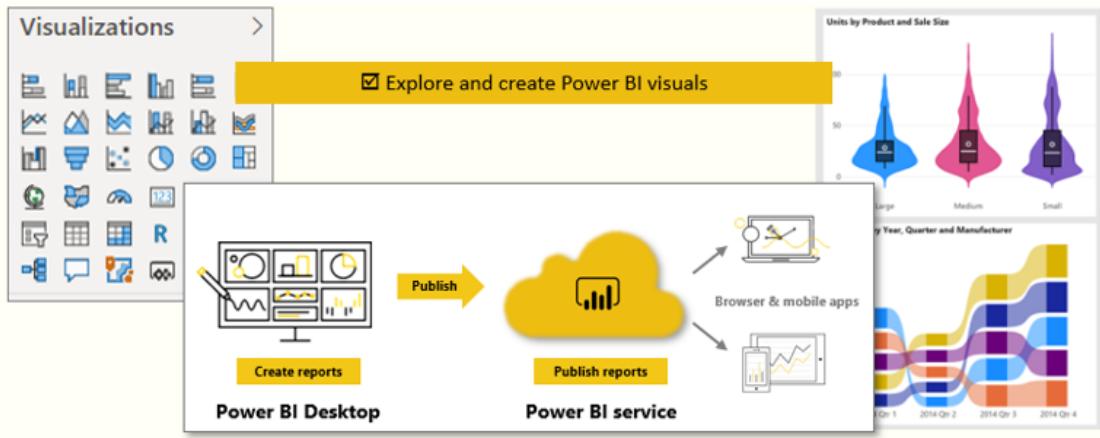
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Work with visuals

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Add visualizations to reports



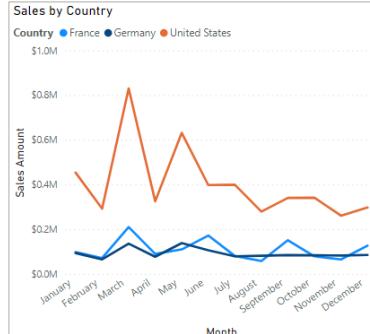
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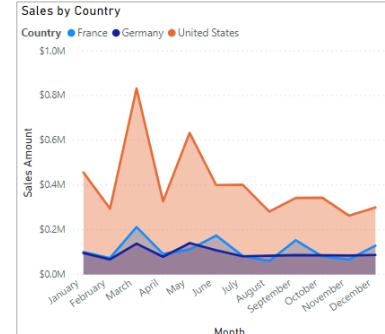
Choose effective visualizations

Country	Sales Amount
United States	\$7,390,464
France	\$773,445
Germany	\$493,628
Total	\$8,550,077

Table



Line Chart



Area Chart

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Import custom visualizations from AppSource

A red arrow points from the 'Visualizations' section of the Power BI service ribbon to the 'Power BI visuals' gallery window. The gallery lists various custom visualizations, such as Text Filter, Chidlet Slicer, Word Cloud, Box and Whisker chart, Timeline Slicer, Gantt, Advance Card, Play Axir, Inforiver Charts, and Radar Chart. Each visualization is shown with its name, provider, rating, and a preview icon. A dropdown menu in the top right corner is set to 'Sort by: Power BI Certified'.

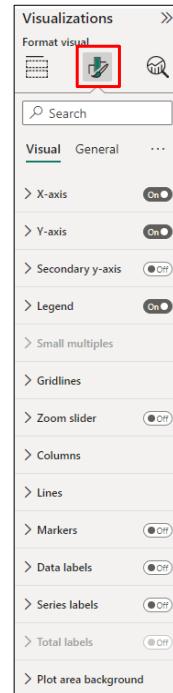
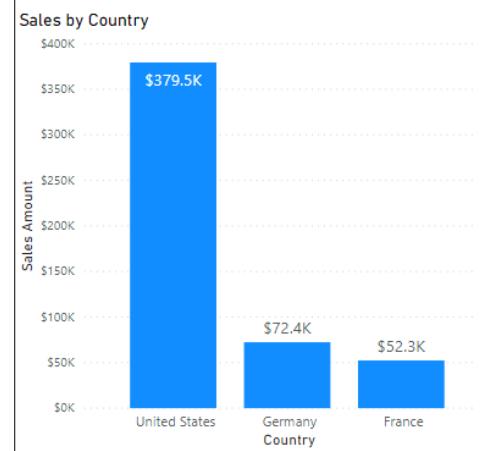
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Format and configure visualizations

Common options:

- Title
 - Background
 - Border
 - Font type/size/color
 - Data labels
 - Tooltips



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Configure conditional formatting

Enhance certain visuals with dynamic color schemes.

Region	Sales
Australia	\$1,391,025
Canada	\$13,875,633
Central	\$7,633,387
France	\$4,527,840
Germany	\$1,877,743
Northeast	\$6,715,354
Northwest	\$12,004,822
Southeast	\$7,638,607
Southwest	\$18,001,116
United Kingdom	\$3,883,043
Total	\$77,548,570

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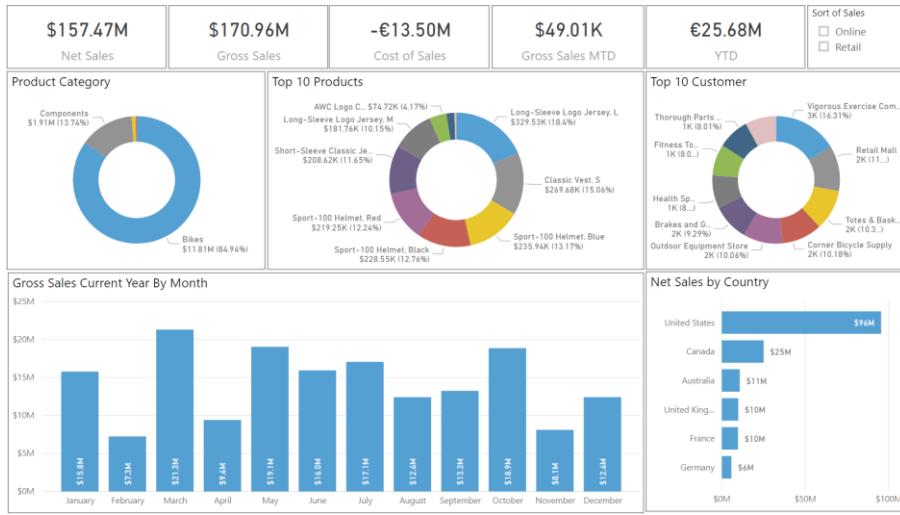
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Report layout and interactions

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Design an appealing report layout



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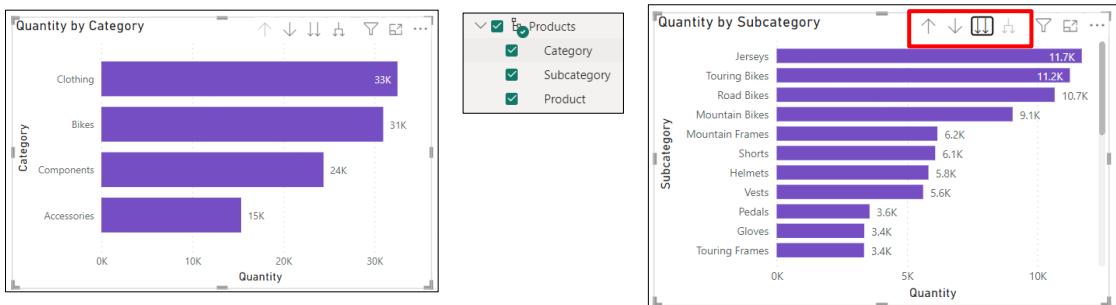
Cross-highlight between visuals



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Drill down through a hierarchy in a visual



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Lab: Design a report in Power BI Desktop (45 minutes)



[Design a Report | GitHub Exercise](#)

In this lab, you'll create a three-page report. You'll then publish it to Power BI, whereupon you'll open and interact with the report.

- Design a report
- Configure visual fields and format properties

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Navigation and filtering

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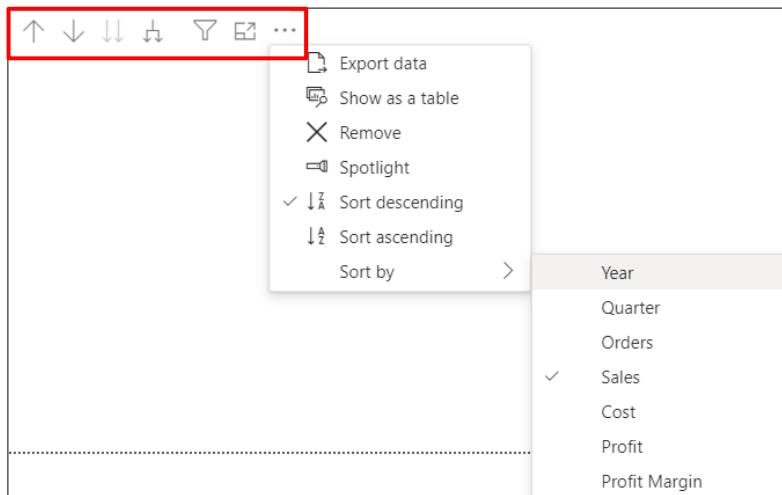
Design functional report navigation



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97

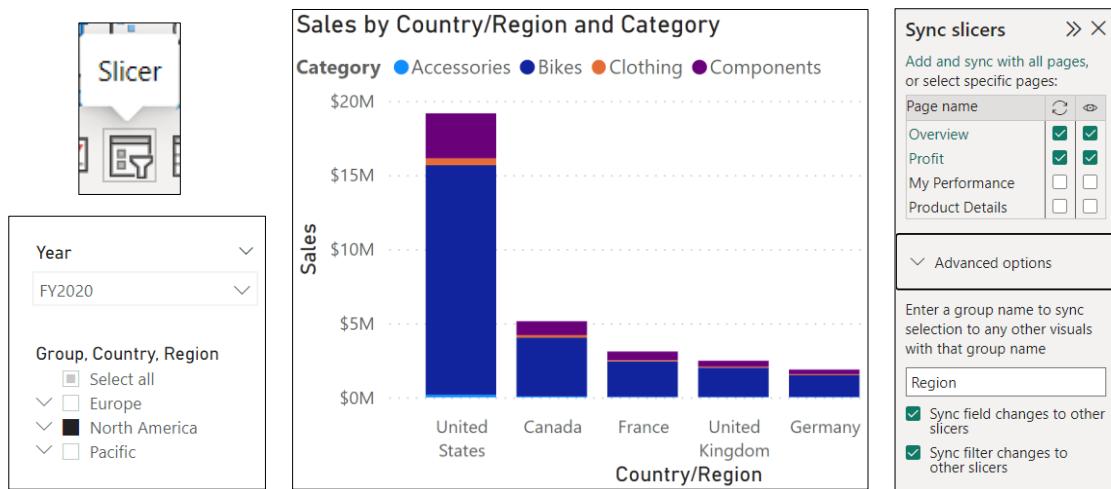
Sort visuals in the most effective order



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Use the Slicer visual to provide on-report filtering



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Create complex filter conditions with the Filter pane

The figure shows the Power BI Filter pane and Data pane. The Filter pane on the left has sections for 'Filters on this visual', 'Filters on this page', and 'Filters on all pages', each with an 'Add data fields here' button. The central area shows two filter conditions: 'Date is (All)' with 'Filter type' set to 'Basic filtering' and 'Profit Margin is (All)' with 'Show items when the value is less than' and a dropdown for 'And' or 'Or'. The Data pane on the right lists various data sources and visualizations, including 'Targets', 'Date' (with 'Fiscal' checked), 'Year', 'Product', 'Region', 'Reseller', 'Sales', 'Salesperson', and 'Salesperson (Performance)'. A 'Visualizations' section is also visible.

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Enhance design with report elements

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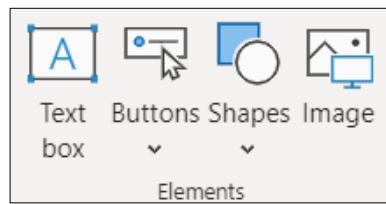


101

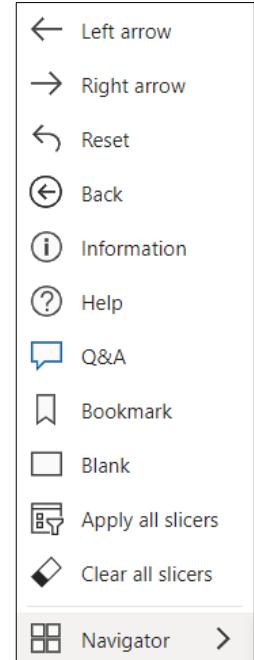
Add shapes and buttons

Enhance reports with:

- Text boxes
- Images
- Shapes



Improve navigation with Buttons.



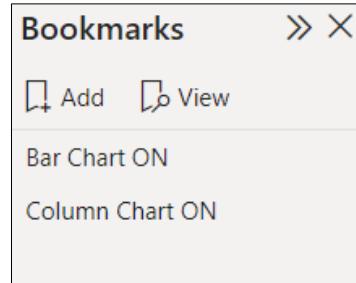
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Preserve report state with bookmarks

Bookmarks capture:

- Current page
- Filters
- Slicers
- Sort order
- Drill location



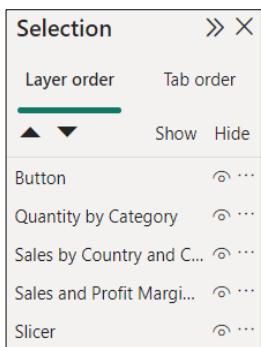
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Use selection order for accessibility

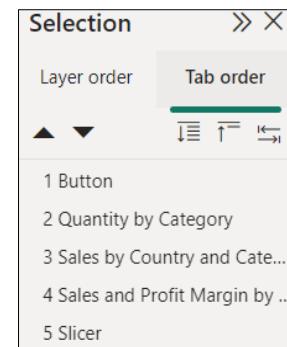
Layer order:

Defines the order of visuals.



Tab order:

Controls keyboard user navigation.



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Drill through from one visual to another

The screenshot illustrates a drill-through interaction between two Power BI visualizations. On the left, a stacked bar chart titled "Sales by Country and Category" shows sales for the United States across four categories: Accessories (blue), Bikes (dark blue), Clothing (orange), and Components (purple). A context menu is open over the "Bikes" bar, with the "Drill through" option highlighted and selected. This action has triggered a transition to the right visualization, which is a table titled "Bikes". The table displays detailed sales data for various bike subcategories, including Mountain Bikes, Road Bikes, and Touring Bikes, categorized by color (Black, Silver, Red, Yellow) and grouped by Profit Margin (ranging from -16.63% to 8.69%). The total sales for all categories are summarized as \$15,481,954. The top right corner of the slide contains filter settings for "Category is Bikes", "Country is United States", and "Year is FY2020".

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Choose when to use paginated reports

The screenshot shows a paginated report interface. At the top, there are filters for "Buying Group" (set to "Tailspin Toys"), "Location" (set to "Absecon, NJ, Aceituna..."), and date ranges ("Invoices From 05/01/2016" and "Invoices To Date 05/31/2016"). A yellow "View Report" button is also present. Below the filters, the report title is "Buying Group Account Statement" for the period May 01, 2016 to May 31, 2016. It indicates "Buying Group: Tailspin Toys, 201 Customers Selected". To the right, there is a logo for "Wide World Importers" featuring a stylized "W" and "WWI". The main content area displays an invoice summary for "Invoice No: 73507-70431". The summary includes the date "May 31, 2016", purchase order "16826", and delivery information: "Floor 20, Import Plaza, 105 Silk Road, Tradesville, WA 99999". Below this, it says "Invoice 2 of 3". The detailed invoice table shows a single item: "DBA joke mug - you might be a DBA if (White)" with a quantity of 7, unit price of \$13.00, tax of \$13.65, and a line total of \$104.65.

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Lab: Enhance a report in Power BI Desktop (45 minutes)



[Enhance a Report | GitHub Exercise](#)

In this lab, you'll enhance the Sales Analysis with advanced design features.

In this lab you learn how to:

- Sync slicers
- Create a drill through page
- Apply conditional formatting
- Create and use bookmarks

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Perform Advanced Analytics with Power BI Desktop

aka.ms/PL300-6



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Agenda

Explore insights with Advanced Analytics

- Data comparison with Analyze feature.
- Group and bin data.
- Cluster data and find outliers with Scatter chart visual.
- Key Performance Indicator visual.
- What-if parameters for scenario planning.

Leverage AI visuals

- AI insights during data preparation.
- Use key influencers and decomposition tree visuals.

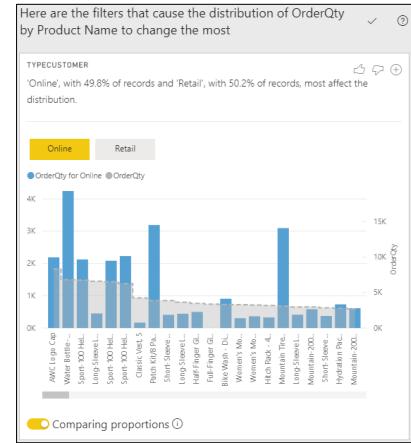
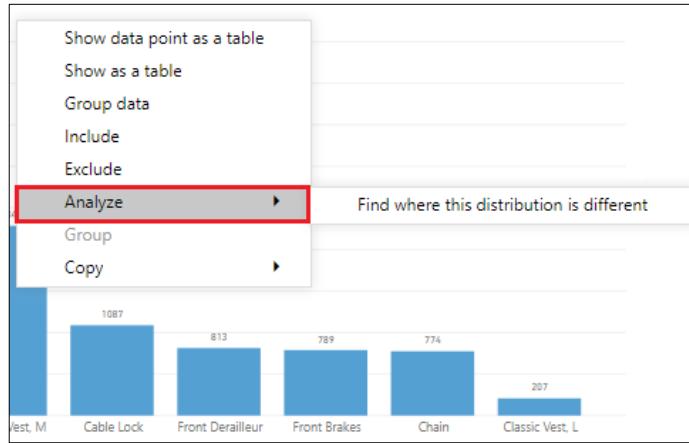
109

Explore insights with Advanced Analytics

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Compare data with the Analyze feature

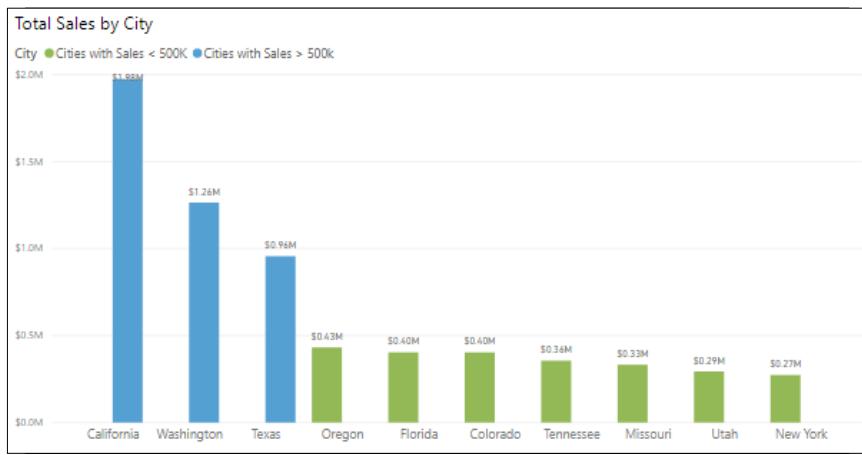


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Group and bin data

Organize data into categories or intervals to better analyze and visualize data.

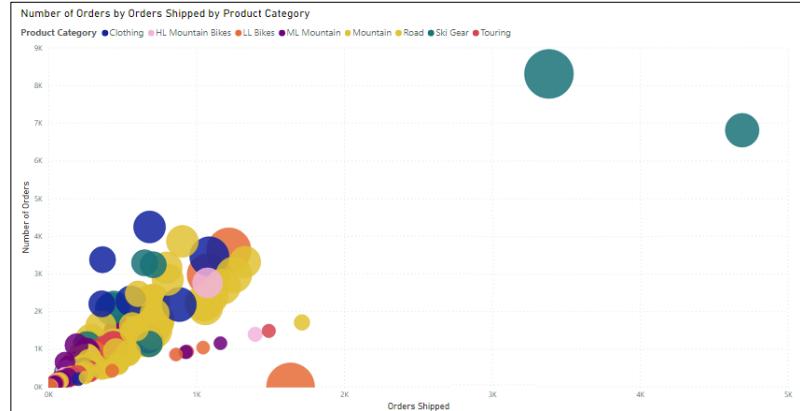


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Identify outliers in data

- Unexpected deviations in data.
- Scatter charts can detect outliers.
- Use DAX to define and analyze outliers dynamically.

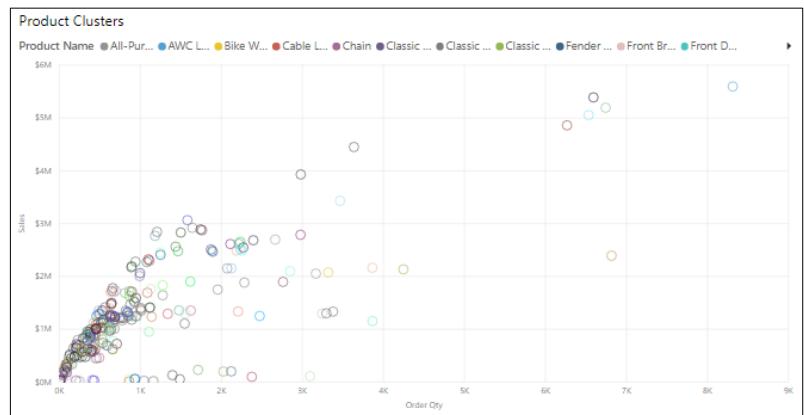


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Clustering with Scatter chart visual

- Automatic data grouping.
- Enhance pattern recognition and insights.
- Simplify data understanding and analysis.

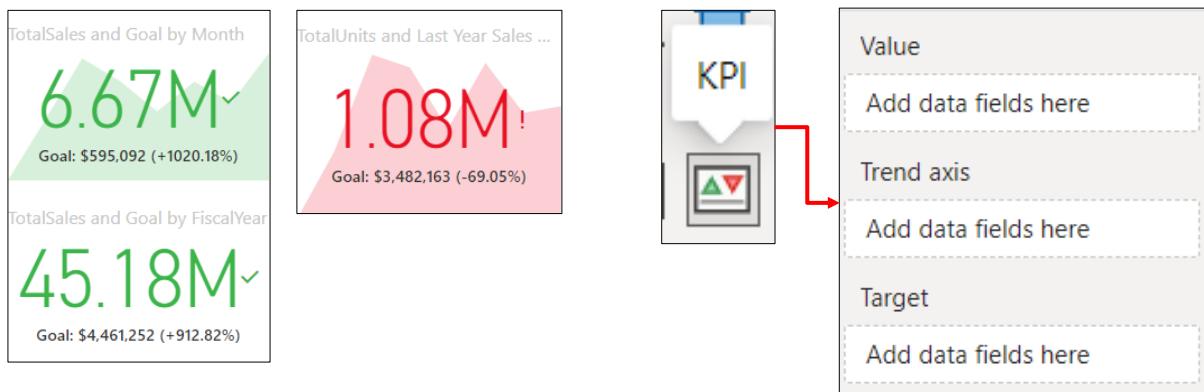


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Key Performance Indicator visual

At-a-glance insights into performance against predefined targets.



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What-if parameters

Enable scenario planning and interactive exploration for better decision-making.

The screenshot shows the Power BI ribbon with the 'Modeling' tab selected. Below the ribbon, there are buttons for 'New column' and 'New table'. On the far right, there is a 'What if' button. To the right of the ribbon, a 'What-if parameter' dialog box is open, showing settings for a parameter named 'Sales Forecast Percentage'.

Name	Sales Forecast Percentage
Data type	Fixed decimal number
Minimum	1
Maximum	1.5
Increment	0.05
Default	1
<input checked="" type="checkbox"/> Add slicer to this page	

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Advanced Analytics custom visuals

Discover additional visuals developed with Advanced Analytics in mind.

The screenshot shows the Power BI Visuals AppSource page. On the left, there's a sidebar with a search bar and categories: All, Advanced Analytics (which is selected), Data Visualizations, Editor's Picks, Filters, and Gauges. The main area displays a "Variance Chart" with a "Getting started" button and a section titled "Explore 15+ custom visuals included with xViz Suite" showing three examples: Variance Chart, Linear Gauge, and Gantt Chart. To the right is a "Visualizations" pane containing icons for various chart types. A red arrow points from the "Gantt Chart" icon in the main preview area to the corresponding icon in the "Visualizations" pane.

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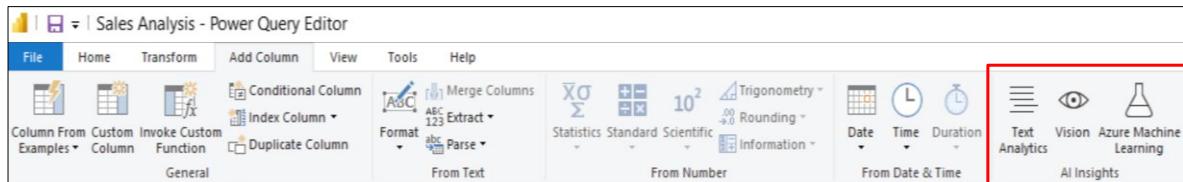
Leverage AI visuals

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AI Insights for data preparation in Power Query Editor

Leverage AI analysis of text, images, and use Azure Machine Learning models.



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AI in the Q&A feature

Use natural language to ask questions about data and create visuals for insights.

The left side of the image shows the Power BI Q&A interface. It has a text input field 'Ask a question about your data' with placeholder text 'Help Q&A understand people better by adding synonyms.' and a button 'Add synonyms now'. Below this is a section 'Try one of these to get started' with six blue buttons containing sample questions:

- top reseller state-provinces by min price
- top reseller country-regions by avg price
- what is the orders by reseller country-region
- what is the max price by reseller business type
- top colors by order lines
- top product subcategories by sales YTD
- show me max price for the last year
- show me order lines for the last year
- what is the max price by font color format
- sort regions by region country

The right side of the image shows a bar chart titled 'sales by country'. The chart displays sales amounts for three countries: France, USA, and Germany. The y-axis is labeled 'Region' and the x-axis is labeled 'SalesAmount' with ticks at \$0.0M, \$0.5M, \$1.0M, \$1.5M, and \$2.0M.

Region	SalesAmount
France	\$1.7M
USA	\$1.2M
Germany	\$0.5M

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Key influencers visual

Identify factors driving variations in a chosen target metric.

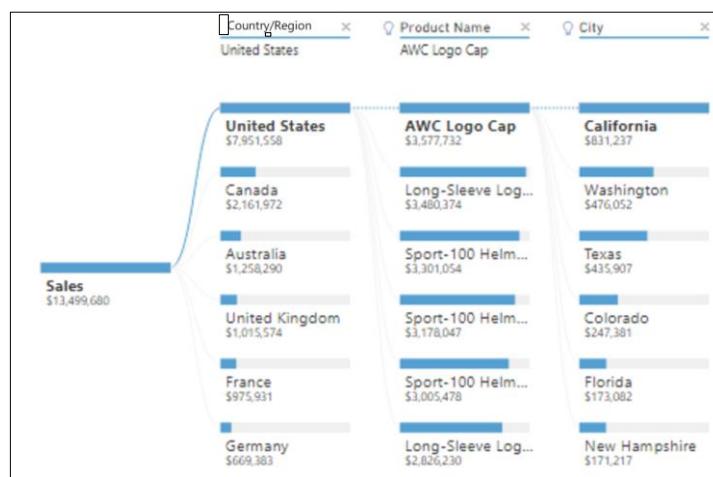


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Decomposition tree visual

Visualize data hierarchies for in-depth exploration and pattern discovery.



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Lab: Perform data analysis in Power BI (30 minutes)



[Perform Data Analysis | GitHub Exercise](#)

In this lab, you'll create the Sales Exploration report.

In this lab you learn how to:

- Create animated scatter charts
- Use a visual to forecast values

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Thanks

Resources

[Design Power BI reports](#)

[Configure Power BI report filters](#)

[Enhance Power BI report designs for the user experience](#)

[Perform advanced analytics in Power BI](#)

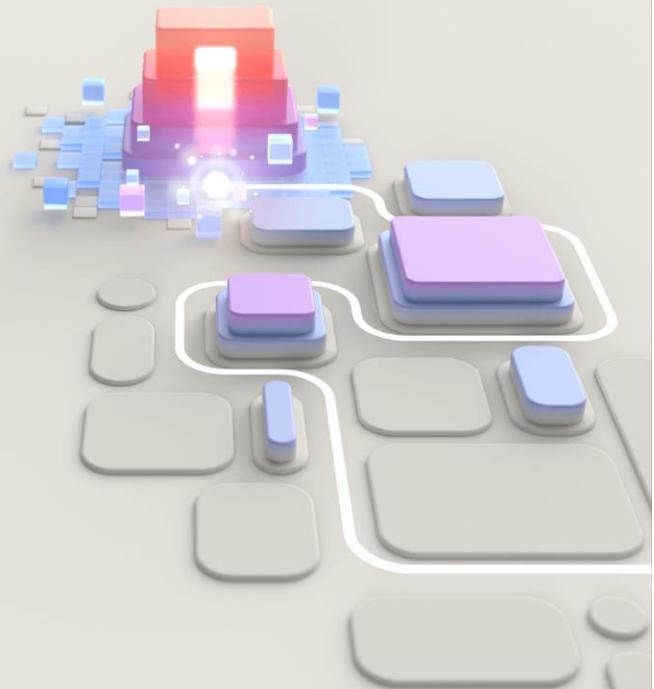
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Deploy and manage Power BI service items

aka.ms/PL300-7

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Agenda

Power BI workspaces

- Create and manage workspaces
- Interact with workspace items

Dashboards in Power BI service

- Create and use dashboards

Row-Level Security overview

- Enforce row-level security

Distribute and manage content

- Create apps for distribution
- Refresh, protect, and endorse datasets
- Review Usage Metrics report
- Power BI service licensing

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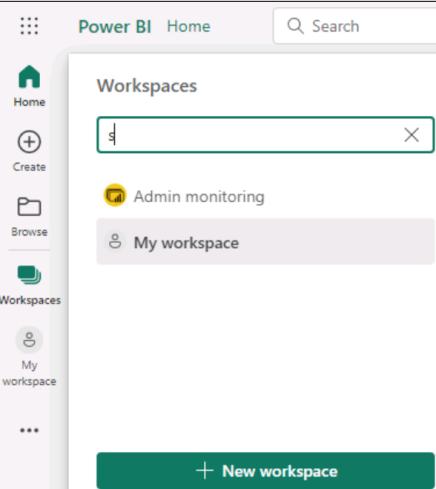
Create and manage workspaces

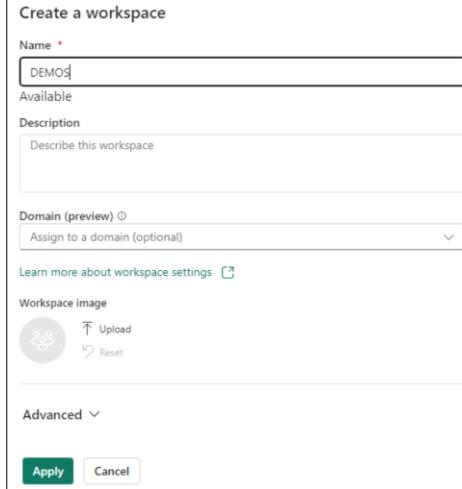
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Create Power BI workspaces





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Assign workspace roles

Use workspaces for collaboration with other developers, not content sharing.

Manage access

DEMOS

+ Add people or groups

Add people

DEMOS

Admins, members, and contributors have edit and view access. Viewers only have view access. Learn more

Enter name or email

Viewer

Admin

Member

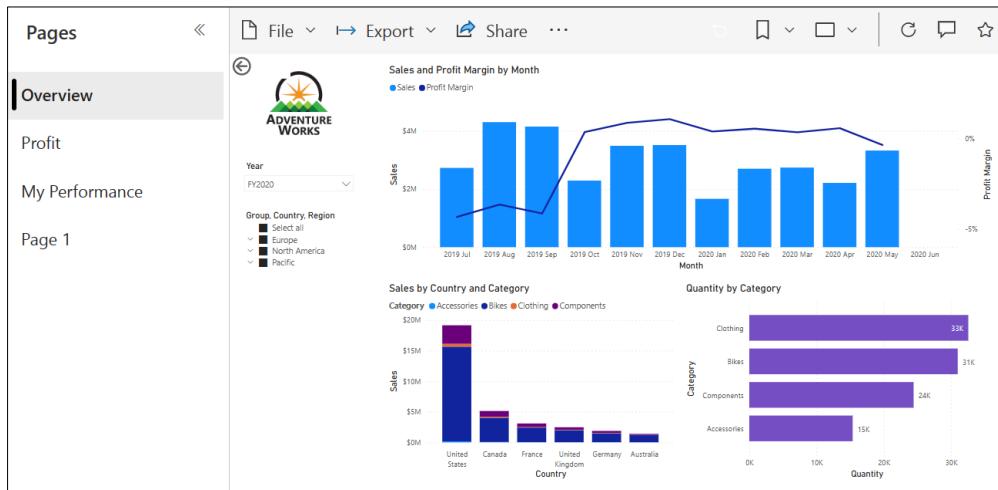
Contributor

Viewer

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Publish reports to a workspace



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130

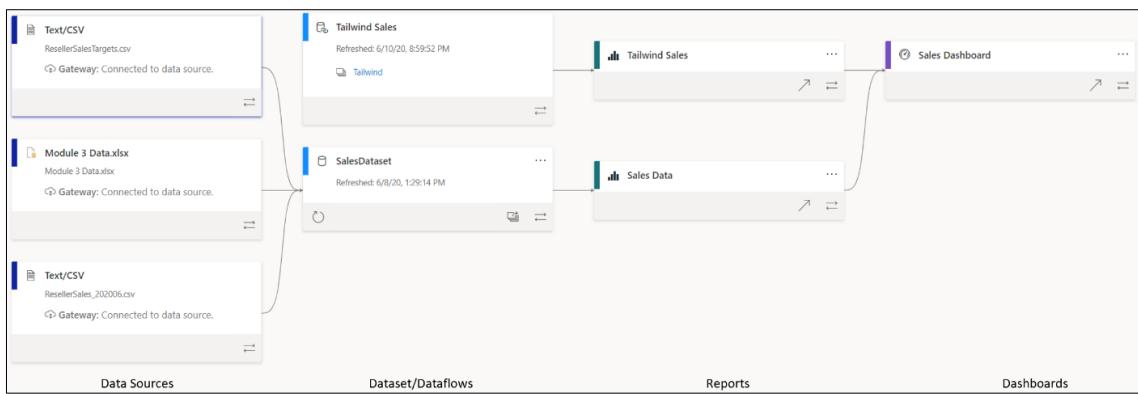
Explore different workspace items

The screenshot shows a Power BI workspace interface. On the left, there's a sidebar with a 'DEMONS' icon and a 'Link' section containing a 'DEMO' button and a 'Go back' link. The main area displays a dashboard titled 'Quick summary' with two bar charts. The first chart is titled 'Count of Table by Column1' and the second is 'Count of Table by Column2'. Both charts have a single blue bar. To the right of the charts is a 'Filters' pane with a search bar and a message stating 'There aren't any filters to display.' At the bottom right, there's a zoom control showing '40%'.

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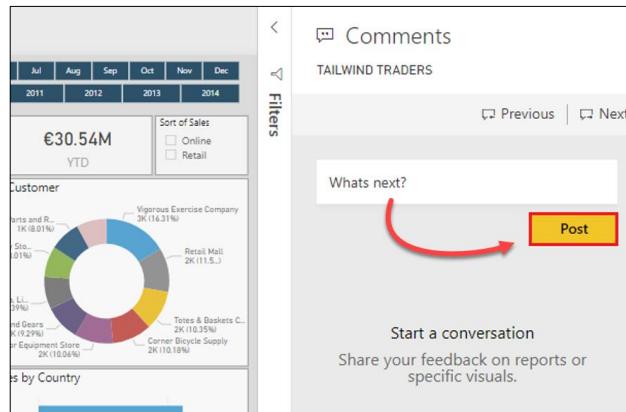
Identify relationships between items with Lineage view



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Provide feedback in report comments



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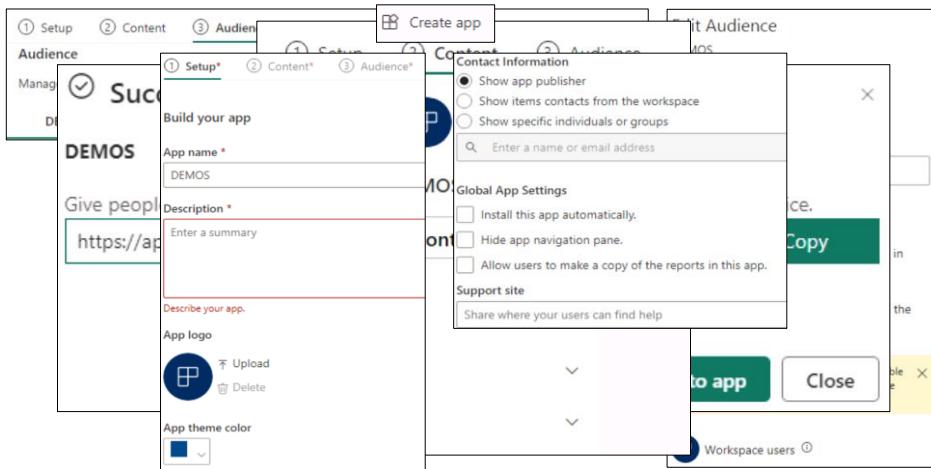
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Distribute and manage content

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Configure apps for distribution



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Keep data up to date

On-demand or scheduled refresh

- 8 times per day for shared
- Up to 48 times per day with Premium

Automatically pauses after

- 5 consecutive failures
- 2 months of inactivity

Scheduled refresh
Keep your data up to date
Configure a data refresh schedule to import data from the data source into the dataset.

On

Refresh frequency: Daily

Time zone: (UTC-08:00) Pacific Time (US and Canada)

Time: Add another time

Send refresh failure notifications to:

Dataset owner

These contacts:
Enter email addresses

Apply **Discard**

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Incremental refresh

- Works best with query folding
- DirectQuery requires Premium/PPU

How to enable:

- Define the filter parameters
- Use the parameters to apply a filter
- Define the incremental refresh policy

Incremental refresh and real-time data

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

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

1. Select table
Orders

2. Set import and refresh ranges
 Incrementally refresh this table
Archive data starting Years before refresh date
Data imported from 1/1/2017 to 11/17/2022 (inclusive)
Incrementally refresh data starting Days before refresh date
Data will be incrementally refreshed from 11/18/2022 to 11/20/2022 (inclusive)

3. Choose optional settings
 Get the latest data in real time with DirectQuery (Premium only) Learn more
Selected table cannot be folded for DirectQuery.
 Only refresh complete days Learn more
 Detect data changes Learn more

4. Review and apply
Archived

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Data protection report settings

- If and how users can export data.
- Set data sensitivity.

Export data
Choose the type of data you allow your end users to export.
<input checked="" type="checkbox"/> Summarized data and data with current layout
<input type="checkbox"/> Summarized data and data with current layout Summarized data, data with current layout and underlying data None

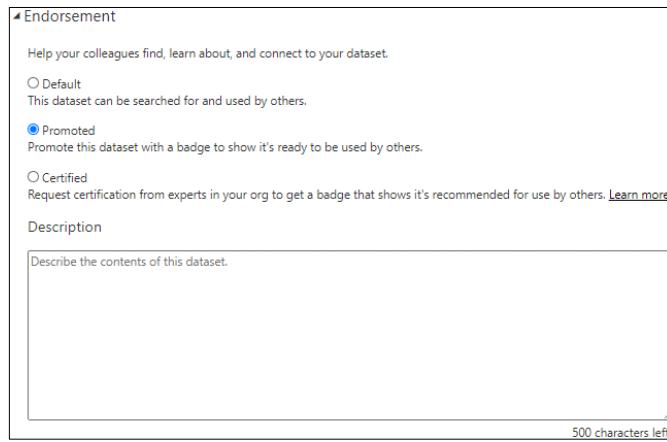
Sensitivity label *
Classify the sensitivity of this report content.
<input checked="" type="checkbox"/> Non-Business <input type="checkbox"/> Non-Business <input type="checkbox"/> Public <input type="checkbox"/> General

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Dataset endorsement

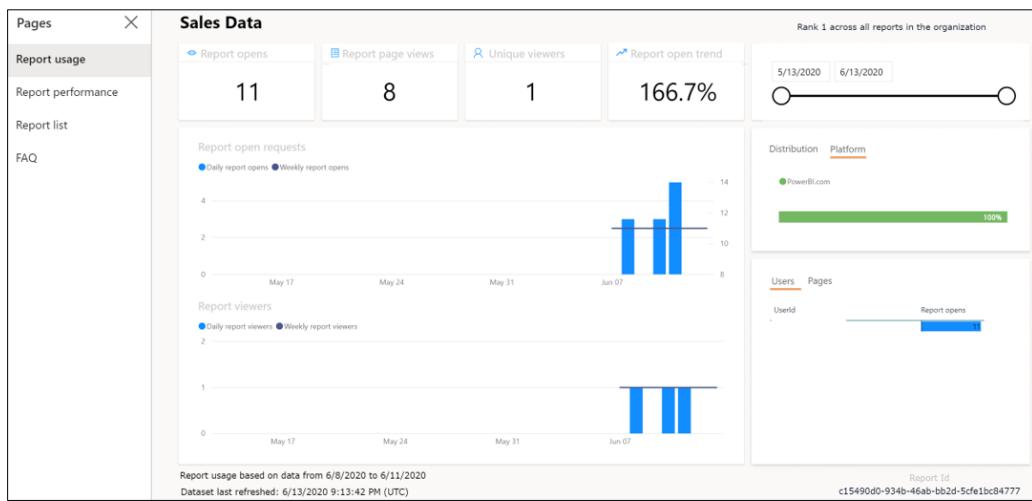
Provide trusted datasets and encourage reusability.



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Leverage Usage Metrics report for insights

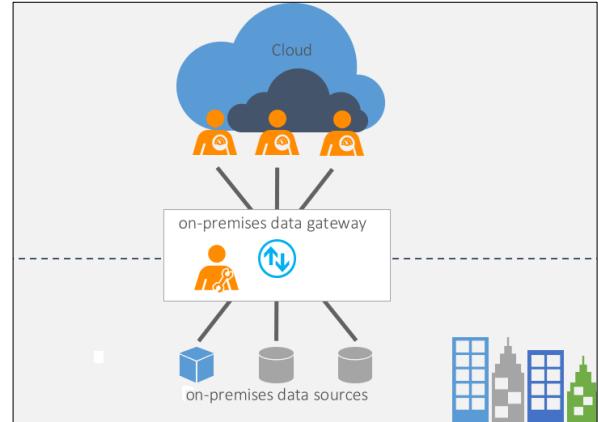


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Connect to on-premises data sources

- Gateways allow Power BI to connect and refresh **on-prem data sources**.
- Organizational or personal gateways available.
- Require credentials to data source.



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Power BI licensing overview

License	Shared workspace	Premium workspace 
Free	<ul style="list-style-type: none"> • Access to their own content. • Cannot distribute any content. 	<ul style="list-style-type: none"> • Access workspace content. • Cannot distribute any content.
Pro	<ul style="list-style-type: none"> • Access to all workspace content. • Distribute to other Pro users. 	<ul style="list-style-type: none"> • Access all workspace content. • Distribute content to all users.
Premium Per User (PPU)	<ul style="list-style-type: none"> • Access to all workspace content. • Distribute to other PPU users. 	<ul style="list-style-type: none"> • Access all workspace content. • Distribute content to all users.

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Create and use dashboards

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What is a Power BI dashboard?

- Single page
- Visuals pinned from reports
- Tiles are static
- Default Q&A feature
- Refreshes with dataset
 - DirectQuery every 15 min

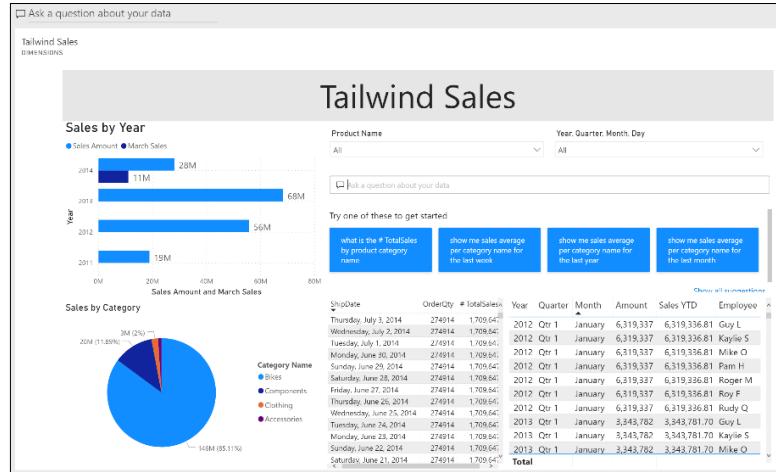
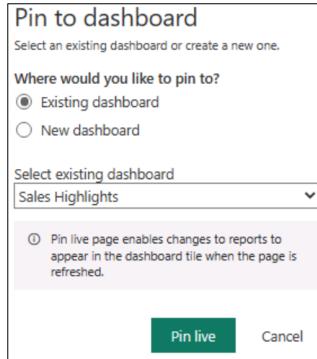


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Pin visuals to a dashboard

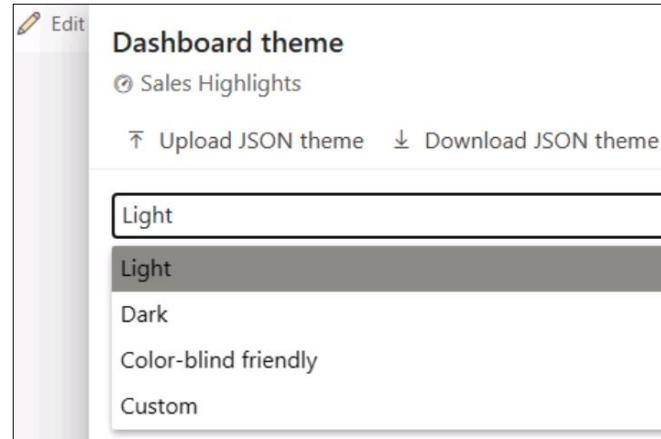
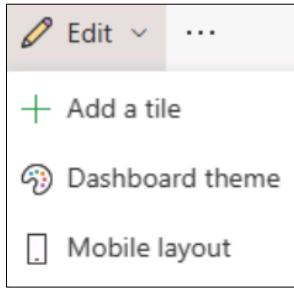
Include specific visuals or entire pages.



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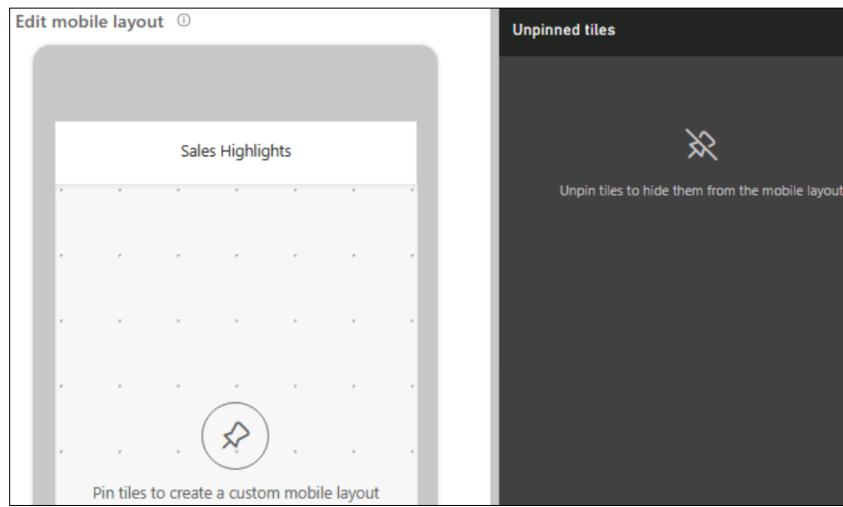
Enhance your dashboard with a theme



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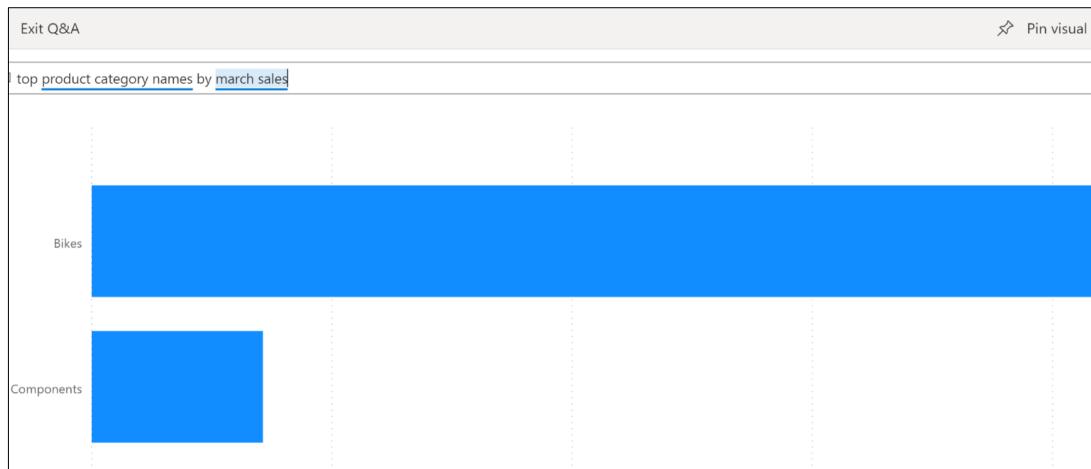
Design mobile layout for dashboards on the go



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Use natural language to explore with Q&A

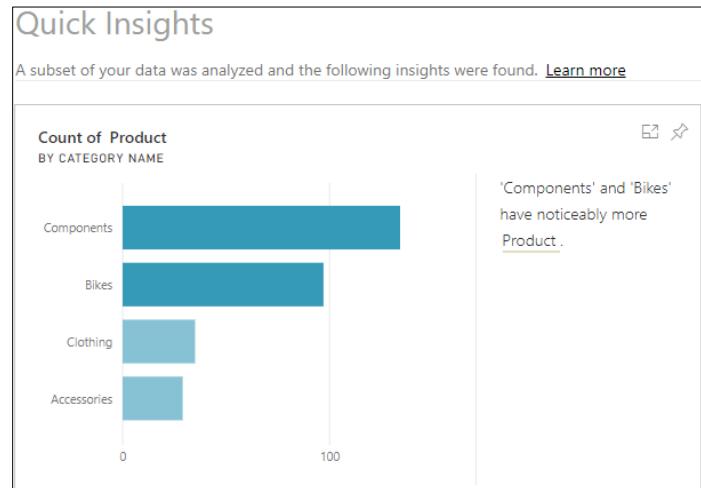


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Discover more with Quick Insights

- Uses Machine Learning algorithms.
- Generate visual interactions.
- Find insights missed during development.



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Create Real-time dashboards

Stream data and update dashboards as soon as the data is logged.



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Lab: Create a Power BI dashboard (30 minutes)



[Create a dashboard | GitHub Exercise](#)

In this lab, you'll create the Sales Monitoring dashboard in the Power BI service using an existing report.

- Pin visuals to a dashboard
- Use Q&A to create dashboard tiles

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Knowledge check: dashboards



What's the difference between a report and a dashboard?

- In reports, you can have multiple pages; in dashboards, you can have only one page.
- You can only build reports and dashboards in Power BI service.
- There's no difference between reports and dashboards.

Where can you configure and set data alerts?

- Data alerts can be set only in Power BI service on specific visuals such as KPI cards, gauges, and cards.
- Data alerts can be set in both Power BI service and Power BI Desktop on any kind of visual.
- Data alerts can be set in Power BI service on any kind of visual.

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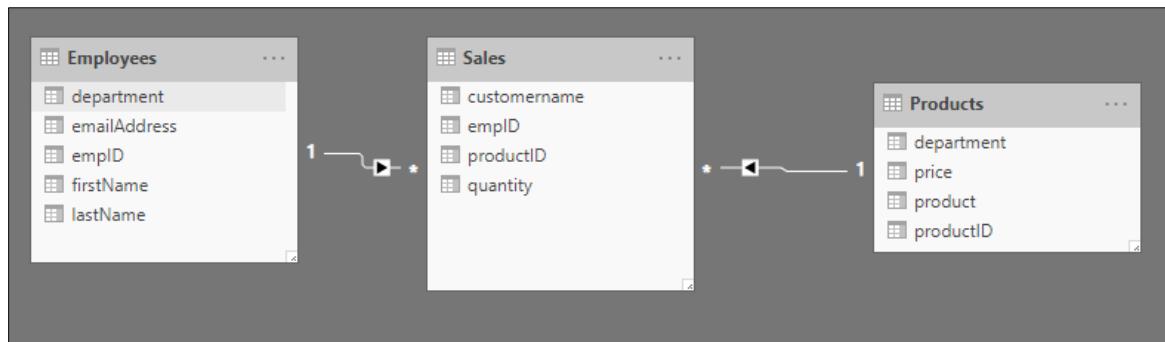
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Row-level security overview

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Security overview in Power BI



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Configure roles with Static method

Manage roles

Roles	Tables
Automotive	Employees
Clothing	Sales
Game	
Sports	

Table filter DAX expression

```
[department] = "Game"
```

Filter the data that this role can see by entering a DAX filter expression that returns a True/False value. For example: [Entity ID] = "Value"

Save Cancel

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Use a dynamic value with DAX filters

Manage roles

Roles	Tables
EmployeeEmailAddress	Employees
Create Delete	Products
	Sales

Table filter DAX expression

```
[emailAddress] = userprincipalname()
```

Save Cancel

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Lab: Enforce row-level security in Power BI (20 Minutes)



[Row-level security | GitHub Exercise](#)

In this lab, you'll enforce row-level security to ensure that a salesperson can only analyze sales data for their assigned region(s).

In this lab you learn how to:

- Enforce row-level security

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Thank you for attending this course

Quick reminders



Celebrate your new skills

- Redeem your achievement
- Share with us and your network



Let us know how we did

- Give us your feedback
- Survey will be sent via email



Become Microsoft Certified

- Explore additional resources to help prepare
- Schedule your exam

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What could be next in your learning journey?

[Use DAX in Power BI Desktop](#)

This learning path introduces Data Analysis Expressions (DAX) and provides you with foundational skills required to enhance data models with calculations. Module topics include:

- Using DAX iterator functions.
- Modifying DAX filter context.
- Using DAX time intelligence functions.

[DP-500 | Microsoft Certified: Azure Enterprise Data Analyst](#)

Responsibilities include:

- Cleaning and transforming data.
- Designing and building enterprise data models.
- Incorporating advanced analytics capabilities.
- Integrating with IT infrastructure.
- Applying development lifecycle practices.

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Thanks

Resources

[Create and manage workspaces](#)

[Manage datasets in Power BI](#)

[Create a Power BI dashboard](#)

[Implement row-level security](#)

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