

# Designing Queries to Extract and Transform Data



# Agenda

- Deciding What To Measure
- Understanding Queries in Power BI Desktop
- Working with the Query Editor Window
- Designing Advanced Combine Queries
- Importing OLTP Data Into a Star Schema
- Understanding Parameters and Template Files



# Data Discovery

- Data can live in a variety of sources
  - Files (e.g. CSV file, Excel workbook)
  - OLTP Databases
  - OLAP Databases
  - SharePoint Lists and Document Libraries
  - Azure-based services
  - Online services & SaaS applications



# Deciding What To Measure

- You Must Determine Measurable Objectives
  - Financial (revenue, expenses, profit margin, etc.)
  - Business processes efficiency
  - Customer Satisfaction Levels



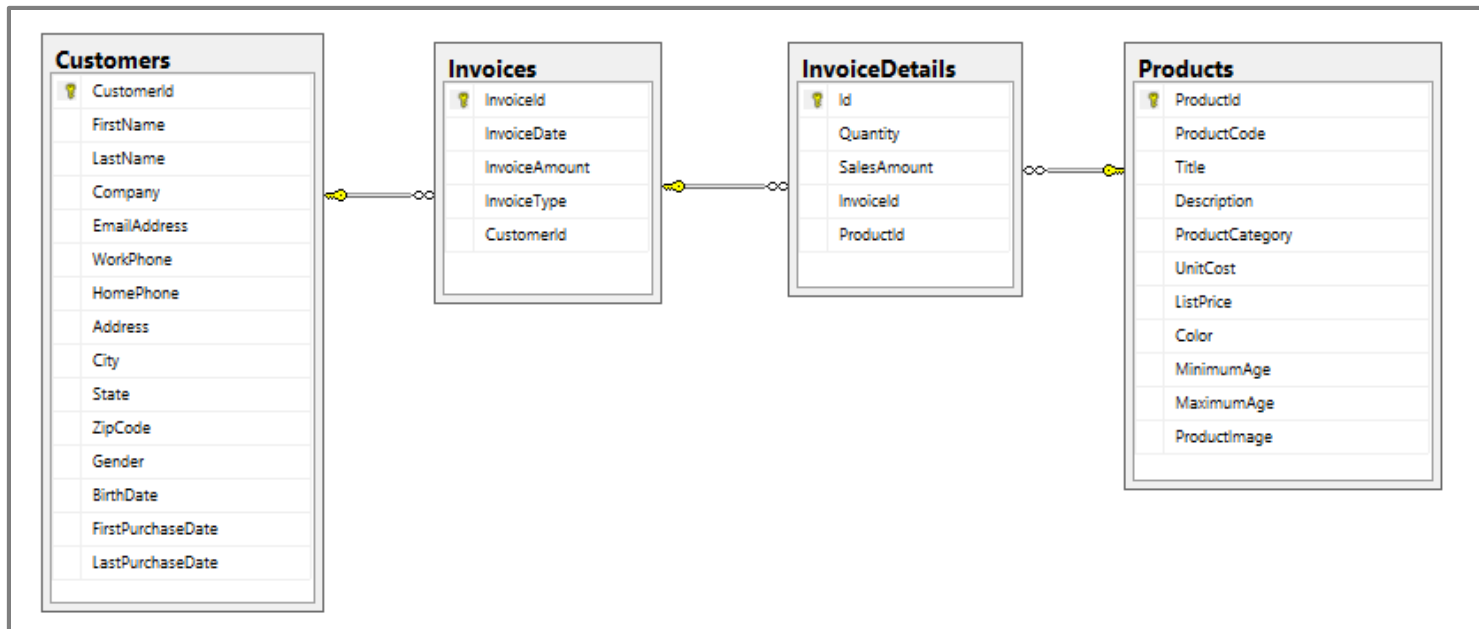
# Defining Grain Statements

- Grain statements should be defined in initial design phase
  - Grain statements helps determine requirements for BI queries
  - Grain statements can be created & understood by business users
- Example grain statements for BI project at Wingtip Toys
  - What was the total sales revenue over the last 4 years?
  - What was the sales revenue by year, quarter and month?
  - What was the sales revenue by region, state, city and zip code?
  - What was the sales revenue by category, subcategory and product?
  - What was the growth in sales revenue from month to month in 2013?
  - What was profit margin for each product by year, quarter and month?
  - Have their been any products with significantly decreasing profit margin?



# Sample OLTP Database: WingtipSalesDB

- Online Transaction Processing (OLTP) System
  - Used for real-time data access and transaction-based data entry
  - Optimized for faster transactions (e.g. inserts, updates & deletes)
  - Tables normalized to reduce/eliminate redundancies
  - Table schemas can be hard for business users to understand



# Agenda

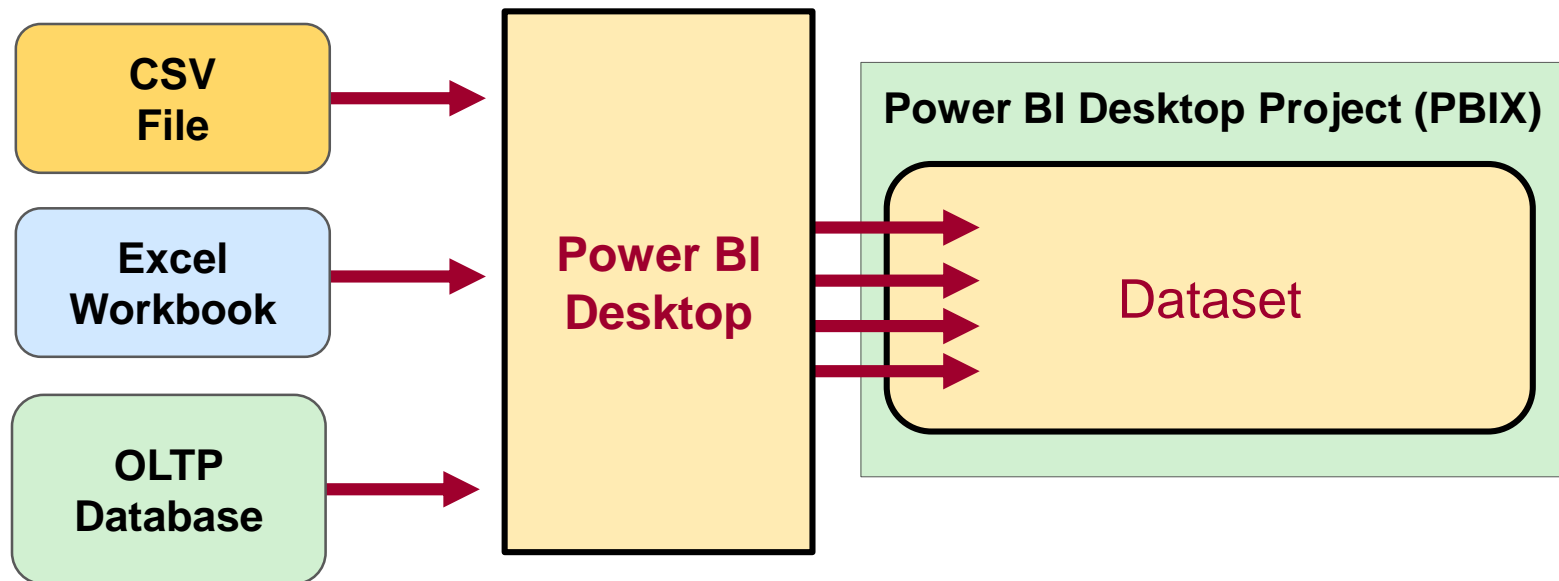
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# Power BI Desktop is an ETL Tool

- ETL process is essential part of any BI Project
  - **Extract** the data from wherever it lives
  - **Transform** the shape of the data for better analysis
  - **Load** the data into dataset for analysis and reporting





# Query Steps

- A query is created as a sequence of steps
  - Each step is a parameterized operation on the data
  - Each step has formula which can be viewed/edited in formula bar
  - Query starts with Source step to extract data from a data source
  - Additional steps added to perform transform operations on data
  - You can replay query operations one by one by clicking on steps

The screenshot displays the Power BI Query Editor interface. At the top, the ribbon includes 'File', 'Home', 'Transform', 'Add Column', and 'View'. Below the ribbon, the 'Formula Bar' is active, showing the formula: `= Table.ReplaceValue("#Replaced Female Values","M","Male",Replacer.ReplaceText,`. A red dashed box highlights the formula bar, with a yellow callout box labeled 'step formula bar' pointing to it. On the left, the 'Queries [6]' pane lists 'Customers', 'Sales', 'Purchases', 'Products', 'SalesRegions', and 'SalesRegionsSort'. The main area shows a data table with columns: CustomerId, Customer, State, City, Zipcode, and Gender. The table contains 14 rows of data. On the right, the 'Query Settings' pane is open, showing the 'Properties' section with 'Name' set to 'Customers'. Below it, the 'Applied Steps' section is highlighted with a red dashed box and a yellow callout box labeled 'sequential list of steps for query'. The 'Applied Steps' list includes: Source, Navigation, Removed Other Columns, Merged Columns, Reordered Columns, Replaced Female Values, Replaced Male Values (selected), Changed Type, and Added Conditional Column.

CustomerId	Customer	State	City	Zipcode	Gender
1	Nina Diaz	CA	Eureka	95501	Female
2	Melinda Carter	CA	Napa	94558	Female
3	Pam Miller	CA	Napa	94558	Female
4	Merle Blackwell	CA	Sacramento	95823	Female
5	Ariel Hale	CA	Sacramento	95818	Male
6	Randy Carter	CA	Sacramento	95818	Male
7	Lillie Hinton	CA	Eureka	95501	Female
8	Ladonna Moody	CA	Napa	94559	Female
9	Buddy McKay	OR	Bend	97701	Male
10	Warren Sykes	CA	Sacramento	95818	Male
11	Jan Rutledge	OR	Portland	97216	Female
12	Dallas Lester	OR	Eugene	97402	Male
13	Matthew Zimmerman	OR	Portland	97220	Male
14	Sheryl Hernandez	CA	Sacramento	95823	Female

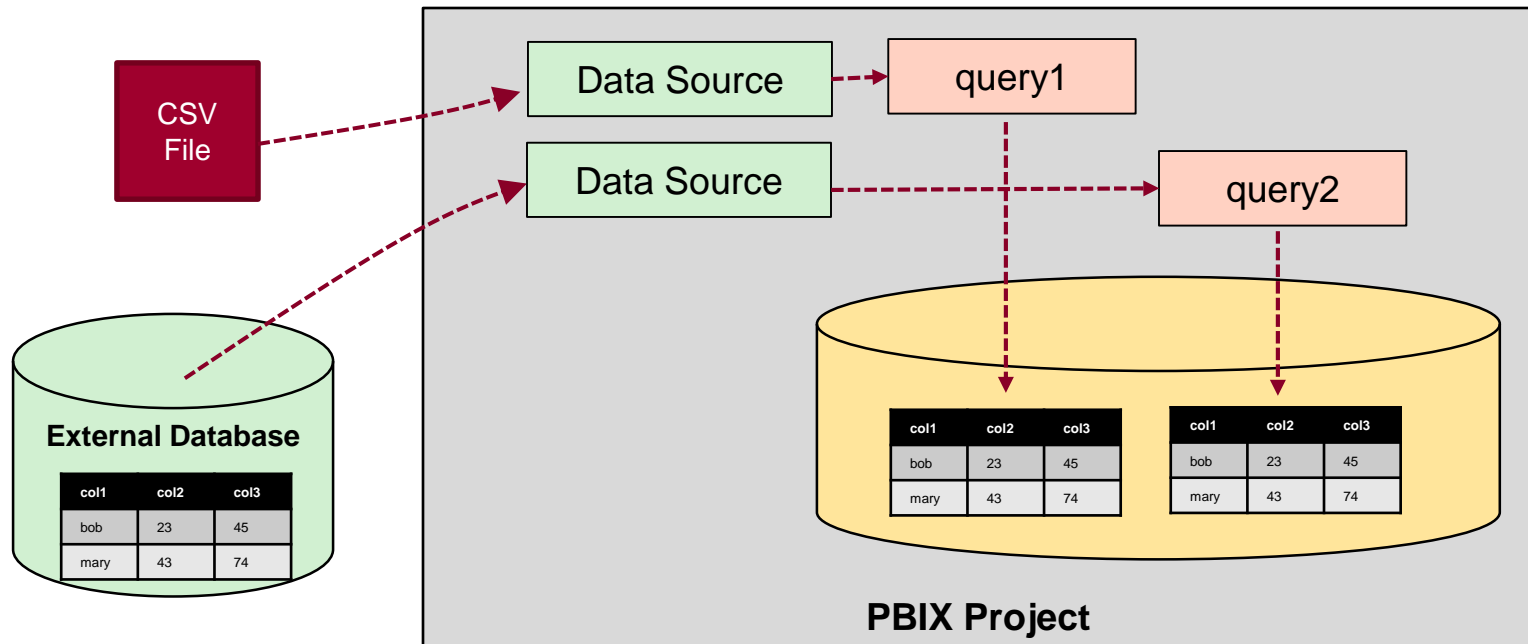
# Advanced Editor

- Power BI Desktop based on "M" functional language
  - Query in Power BI Desktop saved as set of M statements in code
  - Query Editor generates code in M behind the scenes
  - Advanced users can view & modify query code in Advanced Editor



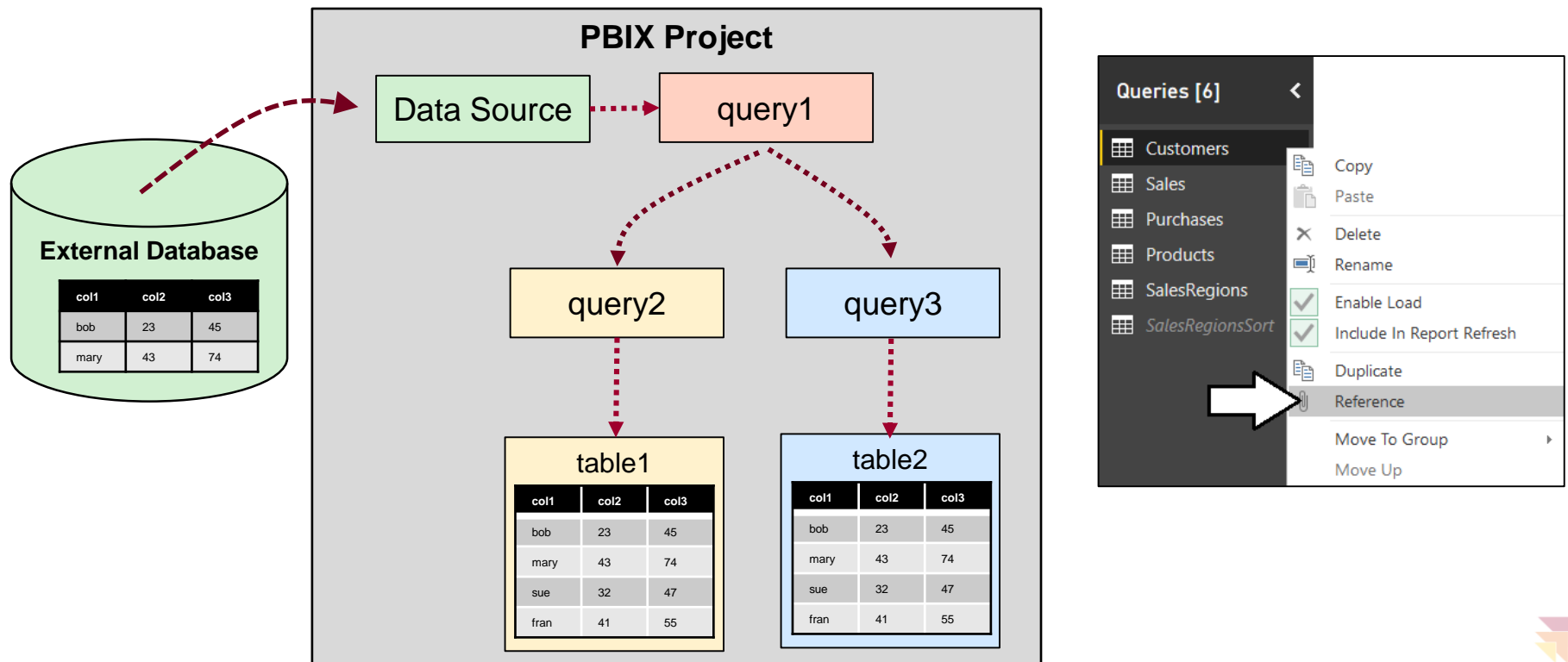
# Understanding Query Input and Output

- PBIX project is container for data sources and queries
  - Queries created and saved within scope of Power BI project
  - Queries can pull data from local files
  - Queries can pull data from external content sources
  - Queries main purpose is to load imported data into data model



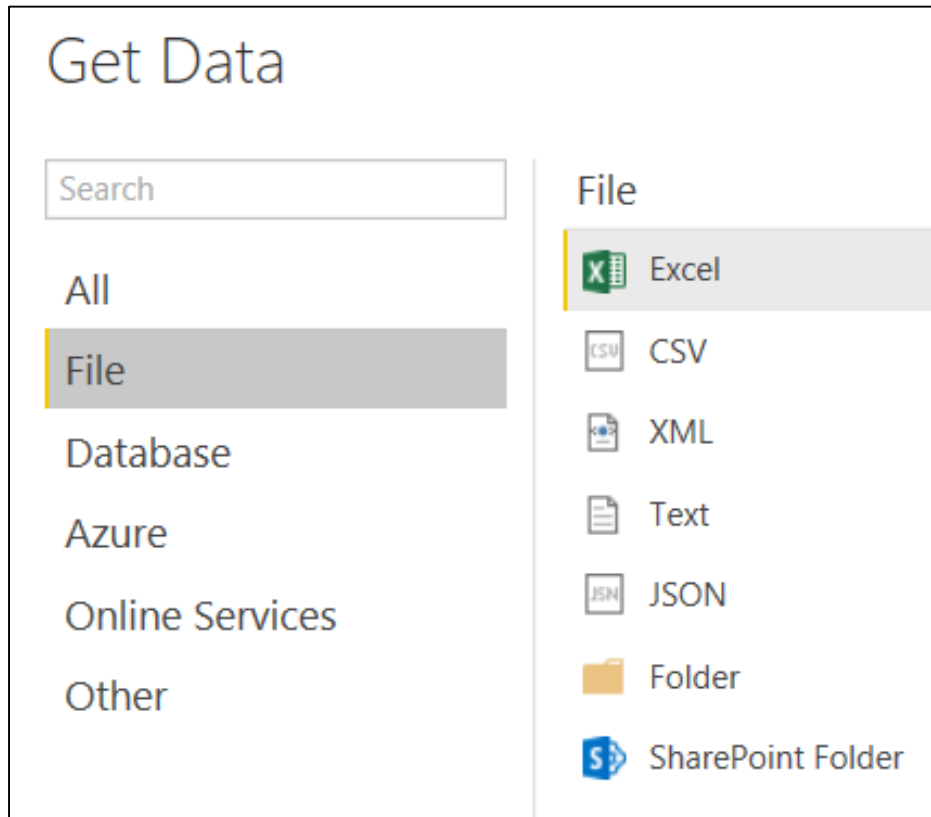
# Query Composition

- Query can serve as source for other queries
  - Allows for creation of reusable base queries & query composition
  - Complexity can be hidden in base queries
  - **Reference** command creates new query based on another query



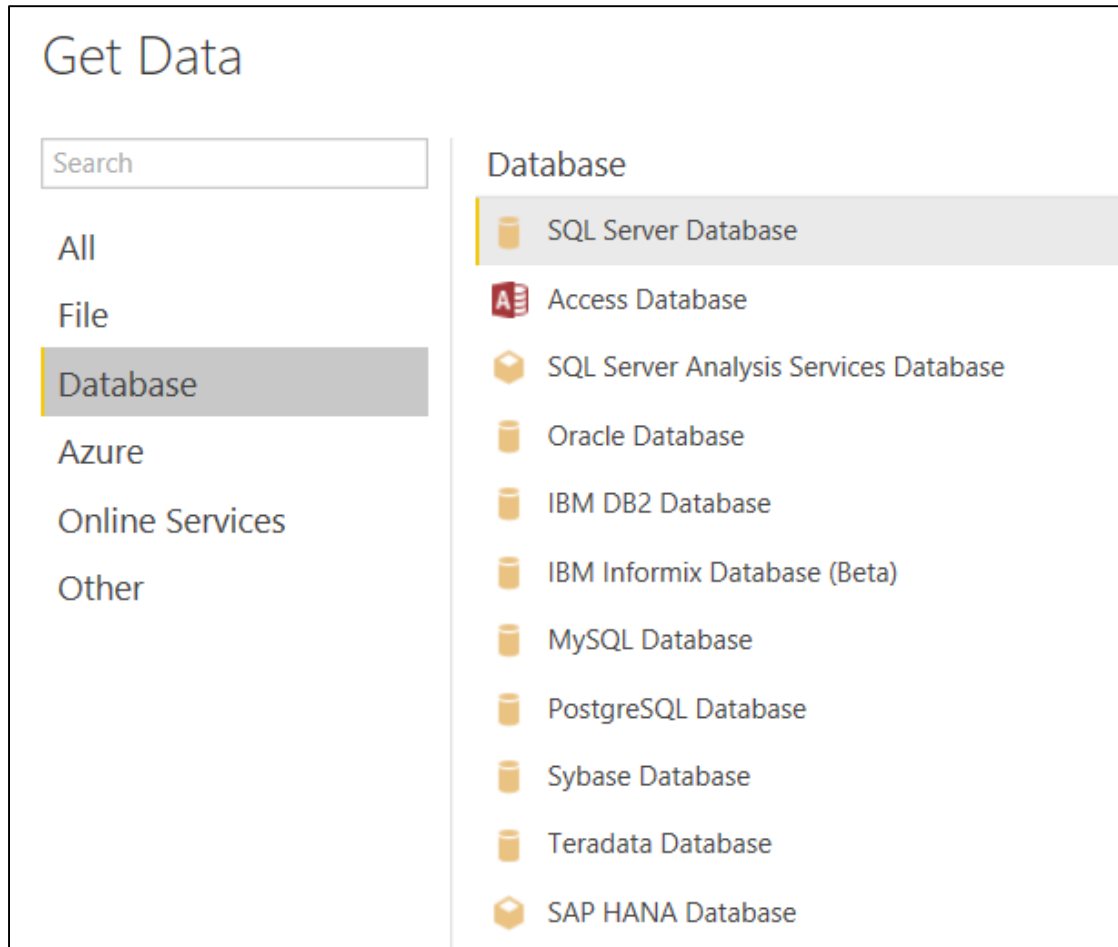
# File-based Data Sources

- Power BI Desktop supports common file types



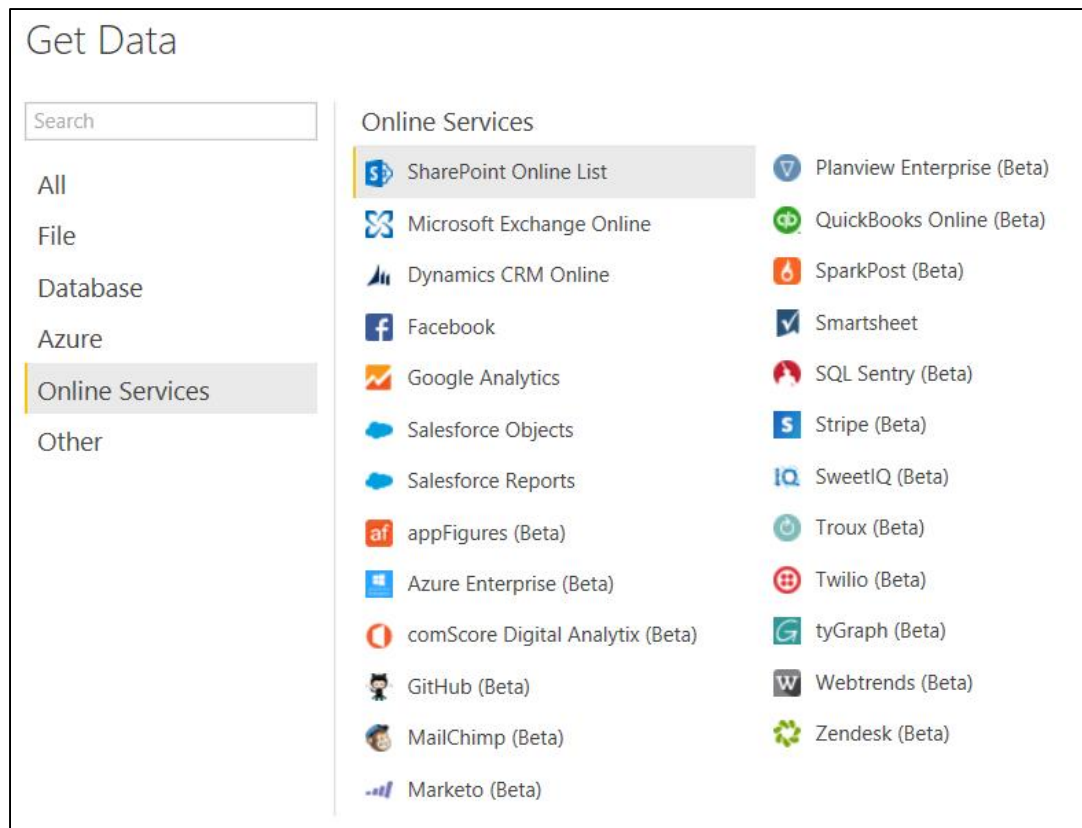
# Supported Databases

- Power BI Desktop supports many database systems



# Online Service Data Sources

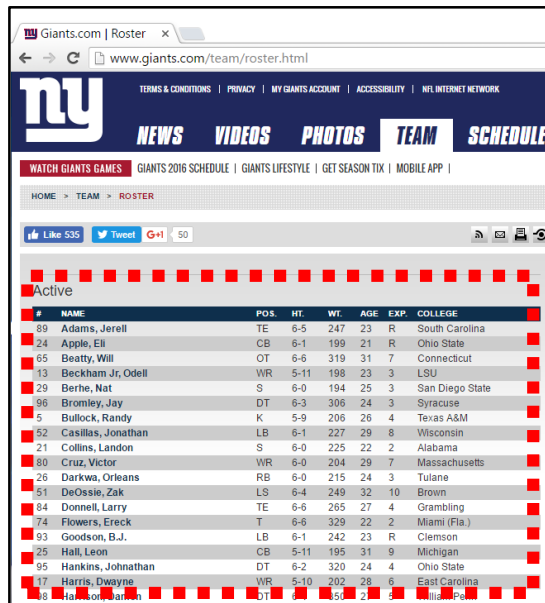
- Power BI Desktop Supports Online Services
  - Includes popular Software-as-a-Service (SaaS) applications
  - Microsoft is working with 3<sup>rd</sup> vendors to expand this list





# Working with Web Data Sources

- Many public websites publish data using HTML tables
  - Power BI desktop can scrape data from tables in HTML pages



Active

#	NAME	POS.	HT.	WT.	AGE	EXP.	COLLEGE
89	Adams, Jerrell	TE	6-5	247	23	R	South Carolina
24	Apple, Eli	CB	6-1	199	21	R	Ohio State
65	Beatty, Will	OT	6-6	319	31	7	Connecticut
13	Beckham Jr, Odell	WR	5-11	198	23	3	LSU
29	Berhe, Nat	S	6-0	194	25	3	San Diego State
96	Bromley, Jay	DT	6-3	306	24	3	Syracuse
5	Bullock, Randy	K	5-9	206	26	4	Texas A&M
52	Casillas, Jonathan	LB	6-1	227	29	8	Wisconsin
21	Collins, Landon	S	6-0	225	22	2	Alabama
80	Cruz, Victor	WR	6-0	204	29	7	Massachusetts
26	Dar kwa, Orleans	RB	6-0	215	24	3	Tulane
51	DeOssie, Zak	LS	6-4	249	32	10	Brown
84	Donnell, Larry	TE	6-6	265	27	4	Grambling
74	Flowers, Ereck	T	6-6	329	22	2	Miami (Fla.)
93	Goodson, B.J.	LB	6-1	242	23	R	Clemson
25	Hall, Leon	CB	5-11	195	31	9	Michigan
55	Hankins, Johnathan	DT	6-2	320	24	4	Ohio State
17	Harris, Devyne	WR	5-10	202	28	6	East Carolina
16	Harris, Jarvis	DT	6-4	255	22	5	Illinois

From Web

Basic Advanced

Enter a Web page URL.

URL

Open file as

OK Cancel

Query Input

	#	Name	Pos.	HT.	WT.	Age	Exp.	College
1	89	Adams, Jerrell	TE	6-5	247	23	R	South Carolina
2	24	Apple, Eli	CB	6-1	199	21	R	Ohio State
3	65	Beatty, Will	OT	6-6	319	31	7	Connecticut
4	13	Beckham Jr, Odell	WR	5-11	198	23	3	LSU
5	29	Berhe, Nat	S	6-0	194	25	3	San Diego State
6	96	Bromley, Jay	DT	6-3	306	24	3	Syracuse

Query Output

	Number	Last Name	First Name	Weight	Height	Age	Experience	Position	Category	Side	College
1	89	Adams	Jerrell	247	77	23	0	Tight End	Backs and Receivers	Offense	South Carolina
2	84	Donnell	Larry	265	78	27	4	Tight End	Backs and Receivers	Offense	Grambling
3	45	Tye	Will	262	74	24	1	Tight End	Backs and Receivers	Offense	Stony Brook
4	24	Apple	Eli	199	73	21	0	Cornerback	Defensive Backs	Defense	Ohio State
5	25	Hall	Leon	195	71	31	9	Cornerback	Defensive Backs	Defense	Michigan
6	20	Jenkins	Janoris	198	70	27	5	Cornerback	Defensive Backs	Defense	North Alabama
7	41	Rodgers-Cromartie	Dominique	205	74	30	8	Cornerback	Defensive Backs	Defense	Tennessee State
8	65	Beatty	Will	319	78	31	7	Offensive Tackle	Offensive Line	Offense	Connecticut
9	13	Beckham Jr	Odell	198	71	23	3	Wide Receiver	Backs and Receivers	Offense	LSU
10	80	Cruz	Victor	204	72	29	7	Wide Receiver	Backs and Receivers	Offense	Massachusetts

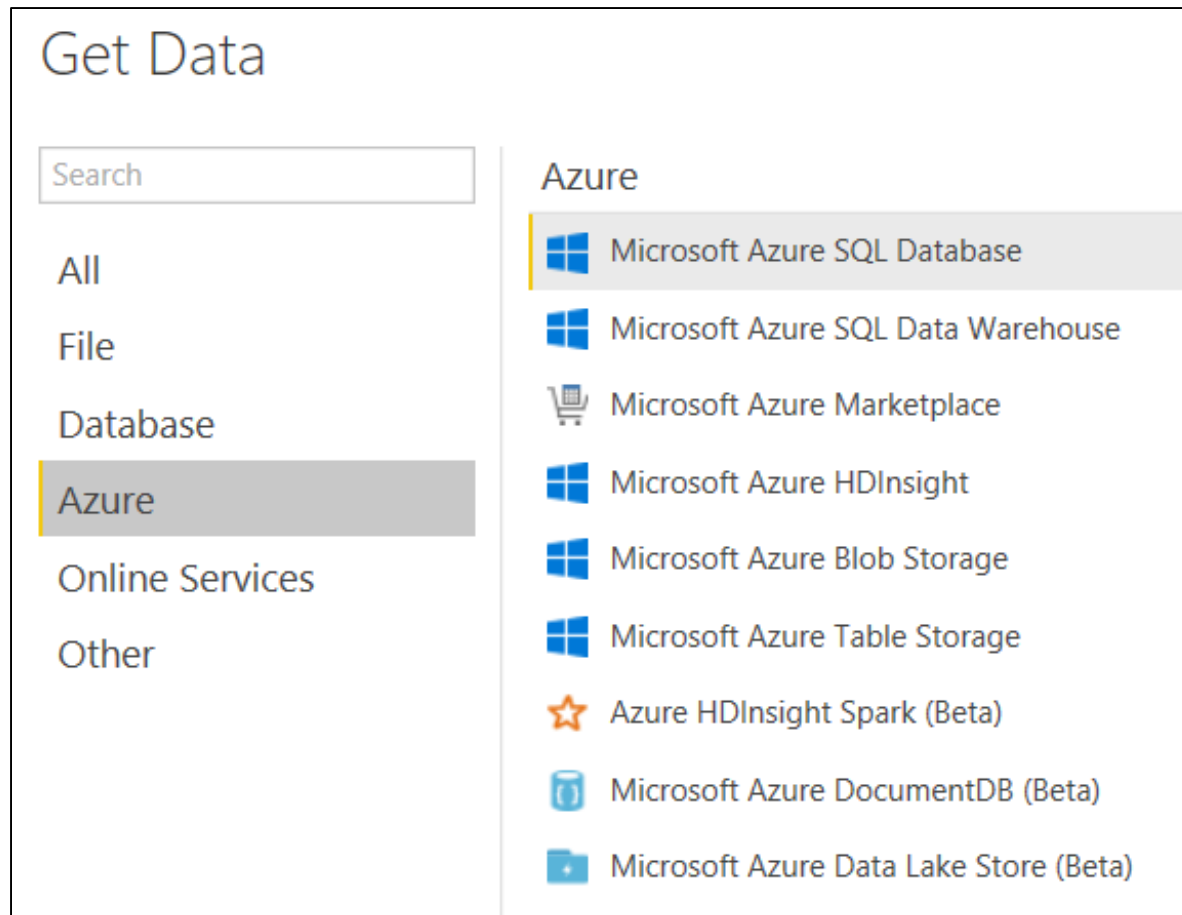


**DEMO**

# Scraping Data from a Web Page

# Azure Data Sources

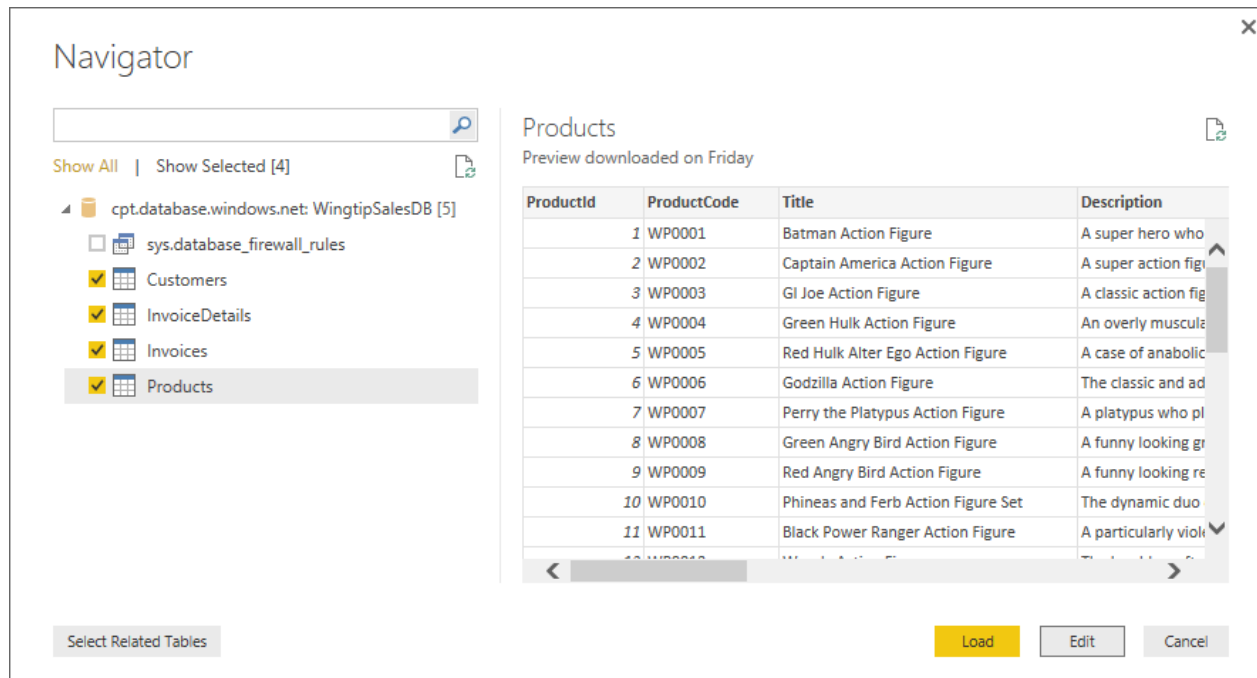
- Power BI Desktop supports many Azure data sources





# Selecting Tables from a SQL Database

- Power BI Desktop provides Navigator dialog
  - Allows you to select tables
  - Navigator understands existing table relationships
  - Clicking **Load** will run query and import data
  - Clicking **Edit** will open queries in Query Editor window





**DEMO**

## **Creating Queries to Import Data from an Azure SQL Database**

# Agenda

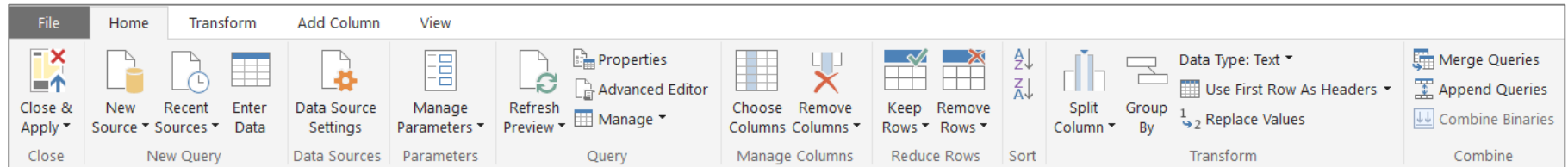
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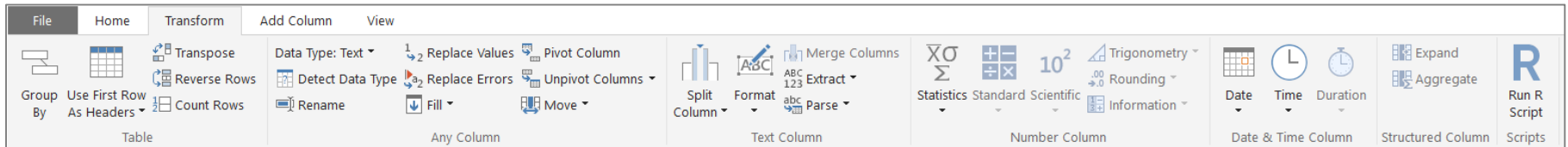


# Query Editor Ribbon Tabs

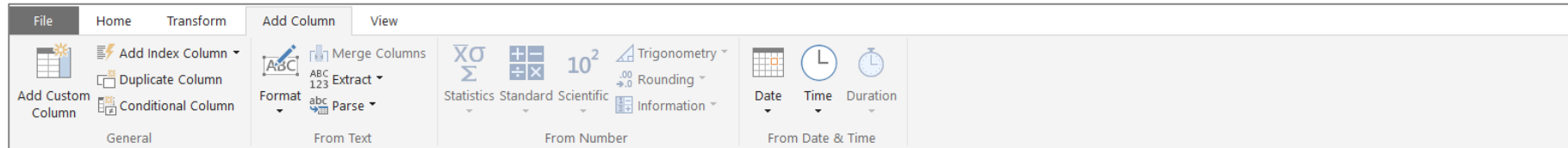
## Home tab



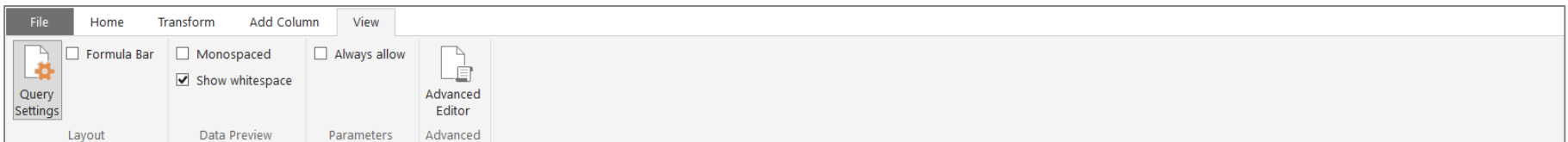
## Transform tab



## Add Column tab



## View tab





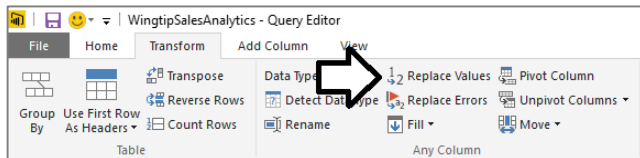
# Examples of Basic Power BI Desktop Steps

- Rename column
- Convert column type
- Format column values
- Reorder columns
- Replace column values
- Expanding related column
- Merging columns
- Splitting columns



# Replacing Values

- Used to substitute values during import



**Replace Values**

Replace one value with another in the selected columns.

Value To Find  
M

Replace With  
Male

Advanced options

OK Cancel

**Query Settings**

**PROPERTIES**

Name  
Customers

[All Properties](#)

**APPLIED STEPS**

Source

Navigation

Removed Other Columns

Merged Columns

Reordered Columns

Replaced Value

Replaced Value1

ZipCode	Gender	BirthDate	FirstPurchase
90266	Male	2/24/1966 12:00:00 AM	1/28
78753	Male	2/3/1941 12:00:00 AM	1/28
80924	Male	10/20/1954 12:00:00 AM	1/28
79121	Female	11/4/1974 12:00:00 AM	1/28
79407	Male	8/14/1954 12:00:00 AM	1/28
85281	Male	6/11/1971 12:00:00 AM	1/28
79936	Male	4/25/1974 12:00:00 AM	1/28
78730	Male	10/2/1944 12:00:00 AM	1/28
78253	Female	10/26/1956 12:00:00 AM	1/28
90266	Male	10/2/1955 12:00:00 AM	1/28
85044	Male	1/11/1945 12:00:00 AM	1/28
95630	Female	2/1/1956 12:00:00 AM	1/28
98052	Male	5/13/1990 12:00:00 AM	1/28
97701	Female	5/14/1958 12:00:00 AM	1/28

**Replace Values**

Replace one value with another in the selected columns.

Value To Find  
F

Replace With  
Female











Advanced options

OK Cancel



# Converting Column Types

- Transform data to make it more reliable
  - Convert date-time column to date column
- Transform data to make it more efficient
  - Convert decimal to fixed decimal number for currency

 PurchaseDate		 Quantity		 SalesAmount		 ProductCost	
1/28/2012		1		2.95		1.2	Decimal Number
1/28/2012		6				\$	Fixed Decimal Number
1/28/2012		1		19.95		1 <sup>2</sup> / <sub>3</sub>	Whole Number
1/28/2012		5		249.75			Date/Time
1/28/2012		1		2.95			Date

- Beware: Conversion can have destructive effect on data



# Expanding Related Columns

- Used to pull data from related tables
  - Saves you from performing SQL joins or VLOOKUP

SalesAmount	Invoices	
119.8	Value	Value
29.95	Value	Value
59.9	Value	Value
399.6	Value	Value
29.9	Value	Value
59.8	Value	Value

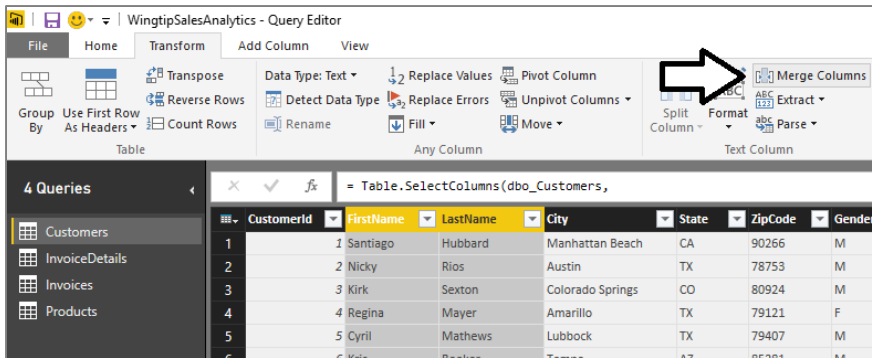
Id	InvoiceId	ProductId	Quantity	SalesAmount	Invoices	Products
1	1	1				Value
2	2	1				Value
3	3	2				Value
4	4	3				Value
5	5	3				Value
6	6	3				Value
7	7	4				Value
8	8	5				Value
9	9	6				Value
10	10	6				Value
11	11	7				Value
12	12	7				Value
13	13	8				Value
14	14	9				Value

Id	InvoiceId	ProductId	Quantity	SalesAmount	InvoiceDate	CustomerId	Products
1	1	1	22	4	119.8	1/28/2012 12:00:00 AM	1 Value
2	2	1	22	1	29.95	1/28/2012 12:00:00 AM	1 Value
3	3	2	22	2	59.9	1/28/2012 12:00:00 AM	2 Value
4	4	3	17	8	399.6	1/28/2012 12:00:00 AM	3 Value
5	5	3	18	2	29.9	1/28/2012 12:00:00 AM	3 Value
6	6	3	18	4	59.8	1/28/2012 12:00:00 AM	3 Value
7	7	4	16	1	2.95	1/28/2012 12:00:00 AM	4 Value



# Merging Columns

- Merge two columns into a single column



WingtipSalesAnalytics - Query Editor

File Home Transform Add Column View

Group By Use First Row As Headers Count Rows

Transpose Reverse Rows

Data Type: Text Replace Values Replace Errors

Pivot Column Unpivot Columns

Rename Fill Move

Split Column Format

Merge Columns Extract Parse

Table Any Column Text Column

4 Queries

Customers InvoiceDetails Invoices Products

Table.SelectColumns(dbo\_Customers,

	CustomerId	FirstName	LastName	City	State	ZipCode	Gender
1	1	Santiago	Hubbard	Manhattan Beach	CA	90266	M
2	2	Nicky	Rios	Austin	TX	78753	M
3	3	Kirk	Sexton	Colorado Springs	CO	80924	M
4	4	Regina	Mayer	Amarillo	TX	79121	F
5	5	Cyril	Mathews	Lubbock	TX	79407	M
6	6	Kris	Booker	Tampa	FL	33601	M

Merge Columns

Choose how to merge the selected columns.

Separator

Space

New column name (optional)

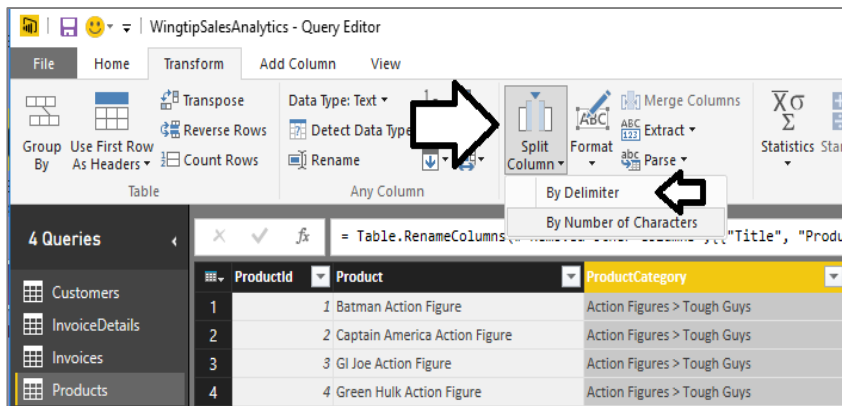
Customer

OK Cancel

	CustomerId	Customer
1	1	Santiago Hubbard
2	2	Nicky Rios
3	3	Kirk Sexton
4	4	Regina Mayer
5	5	Cyril Mathews
6	6	Kris Booker
7	7	Tracy Christensen
8	8	Reed Glover

# Splitting Columns

- Split a single column up into two columns



Split Column by Delimiter

Specify the delimiter to split the text column.

Select or enter delimiter

--Custom--

>

Split

☐ At the left-most delimiter

☐ At the right-most delimiter

☒ At each occurrence of the delimiter

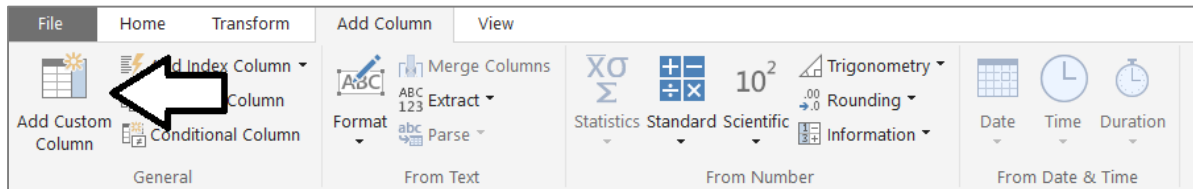
Advanced options

OK Cancel

ProductId	Product	Category	Subcategory
1	1 Batman Action Figure	Action Figures	Tough Guys
2	2 Captain America Action Figure	Action Figures	Tough Guys
3	3 GI Joe Action Figure	Action Figures	Tough Guys
4	4 Green Hulk Action Figure	Action Figures	Tough Guys
5	5 Red Hulk Alter Ego Action Figure	Action Figures	Tough Guys
6	6 Godzilla Action Figure	Action Figures	Tough Guys
7	7 Perry the Platypus Action Figure	Action Figures	Cute and Huggable
8	8 Green Angry Bird Action Figure	Action Figures	Cute and Huggable

# Adding a Custom Column

- Custom column provide custom logic
  - Logic must be written in M programming language



**Add Custom Column**

New column name:

Custom column formula:  

```
= if [FirstPurchaseDate]=[LastPurchaseDate]  
then "One-time Customer"  
else "Repeat Customer"
```

Available columns:  
CustomerId  
Customer  
State  
City  
ZipCode  
Gender  
BirthDate  
FirstPurchaseDate  
LastPurchaseDate  
CustomerType

<< Insert

[Learn about Power BI Desktop formulas](#)

✓ No syntax errors have been detected.

OK Cancel

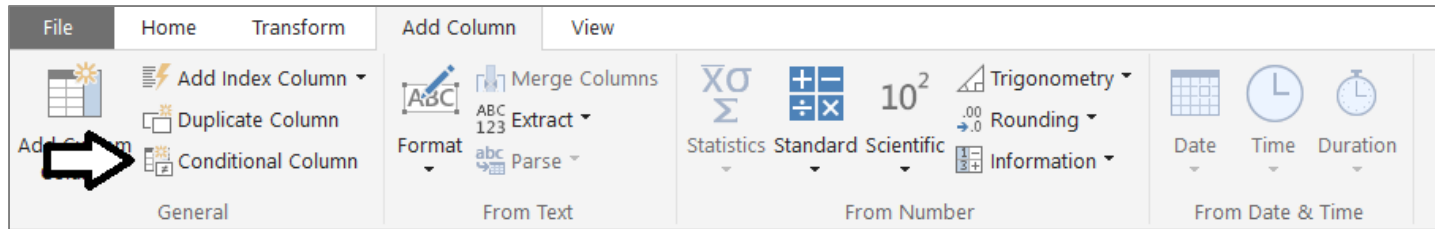
FirstPurchaseDate	LastPurchaseDate	CustomerType
1/28/2012	1/28/2012	One-time Customer
1/28/2012	1/28/2012	One-time Customer
1/28/2012	1/28/2012	One-time Customer
1/28/2012	1/28/2012	One-time Customer
1/28/2012	1/28/2012	One-time Customer
1/28/2012	1/28/2012	One-time Customer
1/29/2012	11/22/2015	Repeat Customer
1/29/2012	10/2/2015	Repeat Customer
1/29/2012	1/29/2012	One-time Customer
1/29/2012	5/6/2015	Repeat Customer
1/29/2012	1/29/2012	One-time Customer





# Adding a Conditional Column

- Abstracts away need to write M code



### Add Conditional Column

Add a conditional column that is computed from the other columns or values.

New column name

	Column Name	Operator	Value		Output
If	<input type="text" value="FirstPurchaseDate"/>	<input type="text" value="equals"/>	<input type="text" value="LastPurchaseDate"/>	Then	<input type="text" value="One-time Customer"/>

Otherwise

<input type="text" value="Repeat Customer"/>
--



**DEMO**

## **Using Queries to Transform Data During the Load Process**

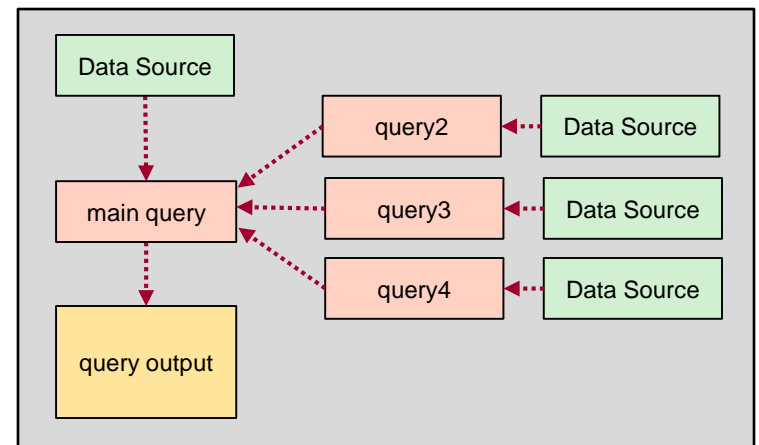
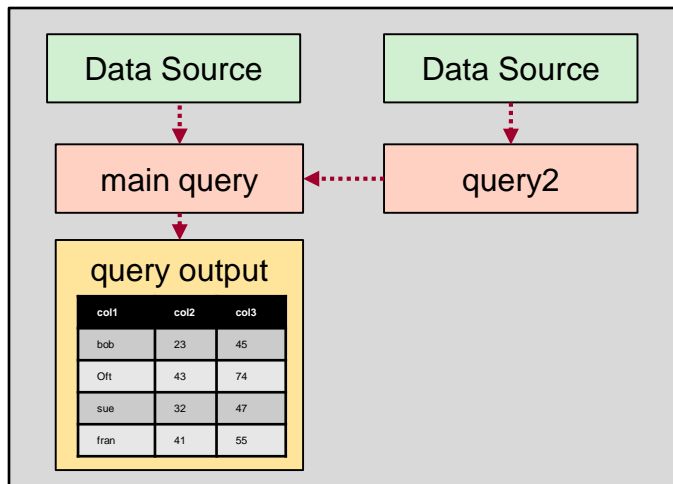
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# Combining Queries

- Query can be merged or appended with another query
  - Merge operation allows you combine columns from two tables
  - Append operation allows you to combine rows from two tables
- Two queries are combined into single output for loading
  - Load settings of main query determines where output is loaded
  - Secondary query acts as source for main query
  - Secondary query can be created with connection-only load setting





# Merging Columns

Main Query Input

FirstName	LastName	JobTitle	Department	Email
Matthew	McDermott	IT Manager	Information Technology	matthewmcdermott@wingtip.com
Keith	Moon	System Administrator	Information Technology	keithmoon@wingtip.com
Spencer	Reed	Records Manager	Information Technology	spencerreed@wingtip.com
Paul	Schaefflein	Software Developer	Information Technology	paulschaefflein@wingtip.com
Scot	Hillier	CFO	Finance	scothillier@wingtip.com
Bernie	Madeoff	Accountant	Finance	berniemadeoff@wingtip.com
Andrew	Connell	Sales Director	Sales	andrewconnell@wingtip.com
Chandler	Bing	Sales Representative	Sales	chandlerbing@wingtip.com
Wilson	Picket	Sales Representative	Sales	wilsonpicket@wingtip.com
Christina	Wheeler	Marketing Director	Marketing	christinawheeler@wingtip.com
Katie	Bowman	Web Designer	Marketing	katiebowman@wingtip.com
Asif	Rehmani	Vice President of Product Development	Product Development	asifrehmani@wingtip.com
Ted	Pattison	Senior Toy Scientist	Product Development	tedpattison@wingtip.com
David	Mann	Toy Scientist	Product Development	davidmann@wingtip.com
Gary	Lapointe	Toy Scientist	Product Development	garylapointe@wingtip.com

Join Column

Merge Query Input

Email	City	State
matthewmcdermott@wingtip.com	Austin	TX
keithmoon@wingtip.com	Hollywood	CA
spencerreed@wingtip.com	Washington	DC
paulschaefflein@wingtip.com	St Paul	MN
scothillier@wingtip.com	Hartford	CT
berniemadeoff@wingtip.com	NY	NY
andrewconnell@wingtip.com	Jacksonville	FL
chandlerbing@wingtip.com	NY	NY
wilsonpicket@wingtip.com	San Francisco	CA
christinawheeler@wingtip.com	Atlanta	GE
katiebowman@wingtip.com	Autsin	TX
asifrehmani@wingtip.com	Chicago	IL
tedpattison@wingtip.com	Tampa	FL
davidmann@wingtip.com	Philidephia	PA
garylapointe@wingtip.com	Dever	CO

Join Column

Query Output

First Name	Last Name	Email	Job Title	Department	City	State
Matthew	McDermott	matthewmcdermott@wingtip.com	IT Manager	Information Technology	Austin	TX
Keith	Moon	keithmoon@wingtip.com	System Administrator	Information Technology	Hollywood	CA
Spencer	Reed	spencerreed@wingtip.com	Records Manager	Information Technology	Washington	DC
Paul	Schaefflein	paulschaefflein@wingtip.com	Software Developer	Information Technology	St Paul	MN
Scot	Hillier	scothillier@wingtip.com	CFO	Finance	Hartford	CT
Bernie	Madeoff	berniemadeoff@wingtip.com	Accountant	Finance	NY	NY
Andrew	Connell	andrewconnell@wingtip.com	Sales Director	Sales	Jacksonville	FL
Chandler	Bing	chandlerbing@wingtip.com	Sales Representative	Sales	NY	NY
Wilson	Picket	wilsonpicket@wingtip.com	Sales Representative	Sales	San Francisco	CA
Christina	Wheeler	christinawheeler@wingtip.com	Marketing Director	Marketing	Atlanta	GE
Katie	Bowman	katiebowman@wingtip.com	Web Designer	Marketing	Autsin	TX
Asif	Rehmani	asifrehmani@wingtip.com	Vice President of Product Development	Product Development	Chicago	IL
Ted	Pattison	tedpattison@wingtip.com	Senior Toy Scientist	Product Development	Tampa	FL
David	Mann	davidmann@wingtip.com	Toy Scientist	Product Development	Philidephia	PA
Gary	Lapointe	garylapointe@wingtip.com	Toy Scientist	Product Development	Dever	CO



# Appending Rows

Main Query Input

FirstName	LastName	Company	Email	City	State	ZipCode
Joe	Stephens	Initech	Joe.Stephens@initech.com	Sacramento	CA	95823
Basil	Frazier	Nordyne Defense Dynamics	Basil.Frazier@NordyneDefenseDynamics.com	Sacramento	CA	95823
Ignacio	Duran	Yoyodyne Propulsion Systems	Ignacio.Duran@YoyodynePropulsionSystems.com	Beaverton	OR	97005
Alvaro	Brock	W.C. Boggs & Co.	Alvaro.Brock@W.C.Boggs&Co..com	Beaverton	OR	97005
Alec	Miller	Krusty Burger	Alec.Miller@KrustyBurger.com	Vancouver	WA	98662
Maureen	Griffin	VersaLife Corporation	Maureen.Griffin@VersaLifeCorporation.com	Vancouver	WA	98662
Guillermo	Sykes	Soar Airlines	Guillermo.Sykes@SoarAirlines.com	Sacramento	CA	95818
Solomon	Warner	Wayne Enterprises	Solomon.Warner@WayneEnterprises.com	Seattle	WA	98125
Humberto	Petersen	W.C. Boggs & Co.	Humberto.Petersen@W.C.Boggs&Co..com	San Francisco	CA	94118
Keven	Griffith	Fabrikam	Keven.Griffith@Fabrikam.com	Bend	OR	97701

Append Query Input

FirstName	LastName	Company	Email	City	State	ZipCode
Rich	Pierce	The Regal Beagle	Rich.Pierce@TheRegalBeagle.com	Portland	OR	97216
Ronnie	Donaldson	Union Aerospace Corporation	Ronnie.Donaldson@UnionAerospaceCorporation.com	Vancouver	WA	98684
Willard	Frazier	Benthic Petroleum	Willard.Frazier@BenthicPetroleum.com	Portland	OR	97220
Marina	Caldwell	Ewing Oil	Marina.Caldwell@EwingOil.com	Portland	OR	97205
Milagros	Mercer	Hishii Industries	Milagros.Mercer@HishiiIndustries.com	Salem	OR	97301
Kirsten	Little	Binford	Kirsten.Little@Binford.com	Ventura	CA	93003
Terri	Ferrell	Black Mesa Research Facility	Terri.Ferrell@BlackMesaResearchFacility.com	Portland	OR	97205
Francine	Doyle	Peach Pit	Francine.Doyle@PeachPit.com	Vancouver	WA	98662
Dannie	Powers	Deon International	Dannie.Powers@DeonInternational.com	Issaquah	WA	98027
Noah	Best	Shinra Electric Power Company	Noah.Best@ShinraElectricPowerCompany.com	Portland	OR	97217
Keenan	Holmes	Biffco	Keenan.Holmes@Biffco.com	Portland	OR	97220
Douglas	Maynard	Cyberdyne Systems	Douglas.Maynard@CyberdyneSystems.com	San Francisco	CA	94118
Gerald	Harrington	Yoyodyne Propulsion Systems	Gerald.Harrington@YoyodynePropulsionSystems.com	Portland	OR	97217
Josue	Robinson	North Western Railway	Josue.Robinson@NorthWesternRailway.com	Beaverton	OR	97005

Query Output

FirstName	LastName	Company	Email	City	State	ZipCode
Joe	Stephens	Initech	Joe.Stephens@initech.com	Sacramento	CA	95823
Basil	Frazier	Nordyne Defense Dynamics	Basil.Frazier@NordyneDefenseDynamics.com	Sacramento	CA	95823
Ignacio	Duran	Yoyodyne Propulsion Systems	Ignacio.Duran@YoyodynePropulsionSystems.com	Beaverton	OR	97005
Alvaro	Brock	W.C. Boggs & Co.	Alvaro.Brock@W.C.Boggs&Co..com	Beaverton	OR	97005
Alec	Miller	Krusty Burger	Alec.Miller@KrustyBurger.com	Vancouver	WA	98662
Maureen	Griffin	VersaLife Corporation	Maureen.Griffin@VersaLifeCorporation.com	Vancouver	WA	98662
Guillermo	Sykes	Soar Airlines	Guillermo.Sykes@SoarAirlines.com	Sacramento	CA	95818
Solomon	Warner	Wayne Enterprises	Solomon.Warner@WayneEnterprises.com	Seattle	WA	98125
Humberto	Petersen	W.C. Boggs & Co.	Humberto.Petersen@W.C.Boggs&Co..com	San Francisco	CA	94118
Keven	Griffith	Fabrikam	Keven.Griffith@Fabrikam.com	Bend	OR	97701
Rich	Pierce	The Regal Beagle	Rich.Pierce@TheRegalBeagle.com	Portland	OR	97216
Ronnie	Donaldson	Union Aerospace Corporation	Ronnie.Donaldson@UnionAerospaceCorporation.com	Vancouver	WA	98684
Willard	Frazier	Benthic Petroleum	Willard.Frazier@BenthicPetroleum.com	Portland	OR	97220
Marina	Caldwell	Ewing Oil	Marina.Caldwell@EwingOil.com	Portland	OR	97205
Milagros	Mercer	Hishii Industries	Milagros.Mercer@HishiiIndustries.com	Salem	OR	97301
Kirsten	Little	Binford	Kirsten.Little@Binford.com	Ventura	CA	93003
Terri	Ferrell	Black Mesa Research Facility	Terri.Ferrell@BlackMesaResearchFacility.com	Portland	OR	97205
Francine	Doyle	Peach Pit	Francine.Doyle@PeachPit.com	Vancouver	WA	98662
Dannie	Powers	Deon International	Dannie.Powers@DeonInternational.com	Issaquah	WA	98027
Noah	Best	Shinra Electric Power Company	Noah.Best@ShinraElectricPowerCompany.com	Portland	OR	97217
Keenan	Holmes	Biffco	Keenan.Holmes@Biffco.com	Portland	OR	97220
Douglas	Maynard	Cyberdyne Systems	Douglas.Maynard@CyberdyneSystems.com	San Francisco	CA	94118
Gerald	Harrington	Yoyodyne Propulsion Systems	Gerald.Harrington@YoyodynePropulsionSystems.com	Portland	OR	97217
Josue	Robinson	North Western Railway	Josue.Robinson@NorthWesternRailway.com	Beaverton	OR	97005



# Pivoting Columns

- Pivot column adds its values are new columns
  - Create table layout like PivotTable

City	Year	Population
New York, NY	2010	8175133
New York, NY	2000	8008278
New York, NY	1990	7322564
Los Angeles, CA	2010	3792621
Los Angeles, CA	2000	3694820
Los Angeles, CA	1990	3485398
Chicago, IL	2010	2695598
Chicago, IL	2000	2896016
Chicago, IL	1990	2783726
Houston, TX	2010	2100263
Houston, TX	2000	1953631
Houston, TX	1990	1630553
Philadelphia, PA	2010	1526006
Philadelphia, PA	2000	1517550
Philadelphia, PA	1990	1585577
Phoenix, AZ	2010	1445632
Phoenix, AZ	2000	1321045
Phoenix, AZ	1990	983403



City	2010	2000	1990
New York, NY	8175133	8008278	7322564
Los Angeles, CA	3792621	3694820	3485398
Chicago, IL	2695598	2896016	2783726
Houston, TX	2100263	1953631	1630553
Philadelphia, PA	1526006	1517550	1585577
Phoenix, AZ	1445632	1321045	983403
San Antonio, TX	1327407	1144646	935933
San Diego, TX	1307402	1223400	1110549
Dallas, TX	1197816	1188580	1006877
San Jose, CA	945942	894943	782248





# Unpivoting Columns

- Unpivot columns to collapse them into single column
  - Removes PivotTable layout
  - Can be useful to prepare data for charting and analysis

City	2010	2000	1990
New York, NY	8175133	8008278	7322564
Los Angeles, CA	3792621	3694820	3485398
Chicago, IL	2695598	2896016	2783726
Houston, TX	2100263	1953631	1630553
Philadelphia, PA	1526006	1517550	1585577
Phoenix, AZ	1445632	1321045	983403
San Antonio, TX	1327407	1144646	935933
San Diego, TX	1307402	1223400	1110549
Dallas, TX	1197816	1188580	1006877
San Jose, CA	945942	894943	782248



City	Year	Population
New York, NY	2010	8175133
New York, NY	2000	8008278
New York, NY	1990	7322564
Los Angeles, CA	2010	3792621
Los Angeles, CA	2000	3694820
Los Angeles, CA	1990	3485398
Chicago, IL	2010	2695598
Chicago, IL	2000	2896016
Chicago, IL	1990	2783726
Houston, TX	2010	2100263
Houston, TX	2000	1953631
Houston, TX	1990	1630553
Philadelphia, PA	2010	1526006
Philadelphia, PA	2000	1517550
Philadelphia, PA	1990	1585577
Phoenix, AZ	2010	1445632
Phoenix, AZ	2000	1321045
Phoenix, AZ	1990	983403



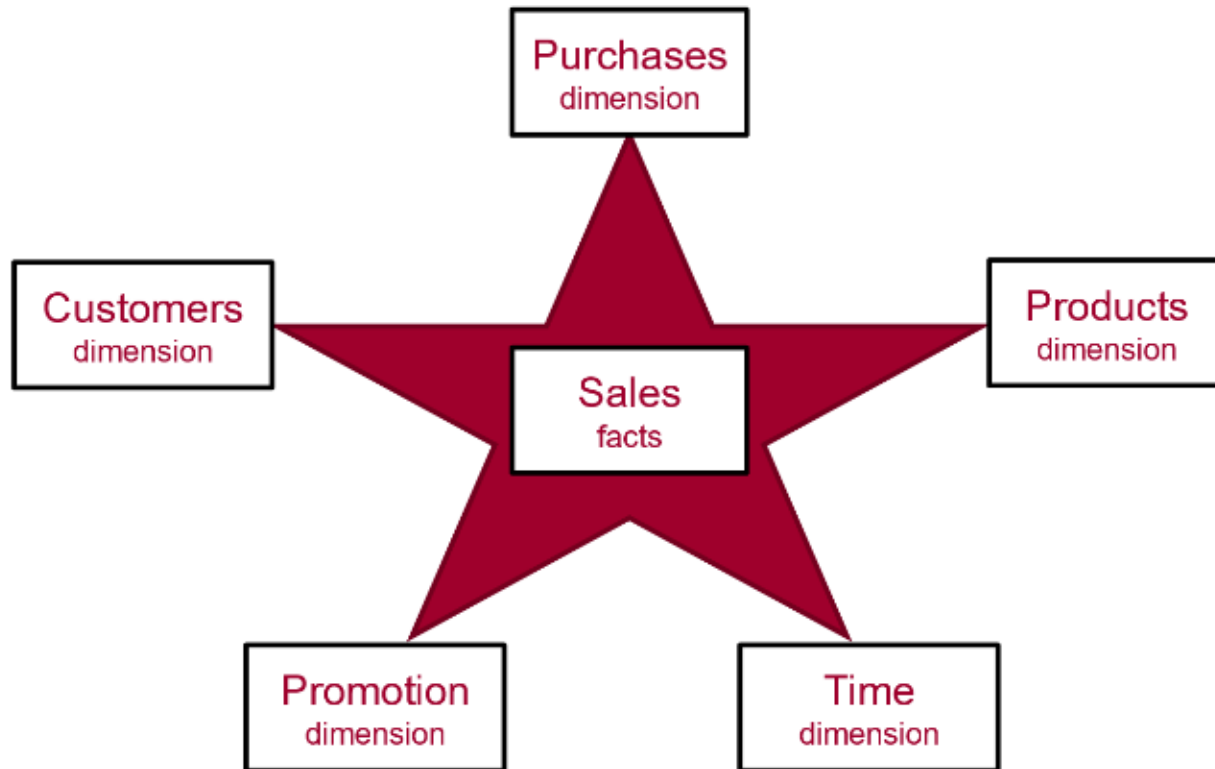
# Agenda

- ✓ Deciding What To Measure
- ✓ Understanding Queries in Power BI Desktop
- ✓ Working with the Query Editor Window
- ✓ Designing Advanced Combine Queries
- Importing OLTP Data Into a Star Schema
- Understanding Parameters and Template Files



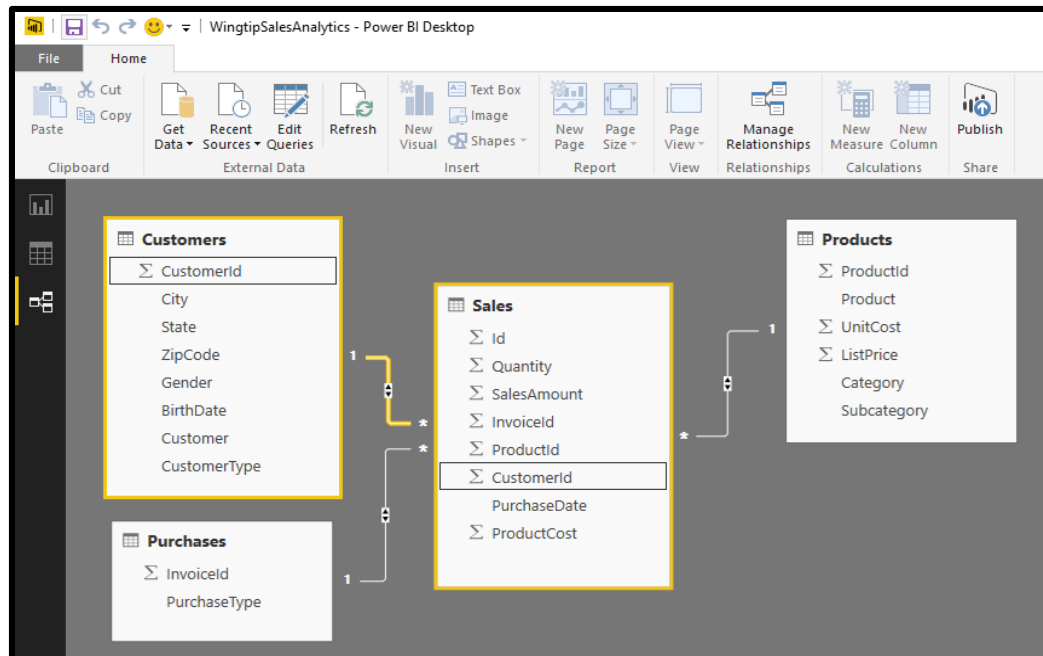
# Data Modeling using a Star Schema

- OLAP Modeling often based on Star Schema
  - Tables defined as fact tables or dimension tables
  - Fact tables related to dimension table using 1-to-many relationships



# Designing Queries to Build a Star Schema

- Converts OLTP Data Model to OLAP Data Model
  - Sales table is modeled as a OLAP Fact Table
  - Other tables are modeled as OLAP Dimension tables
  - Requires pulling CustomerId column into Sales table
  - All dimension tables should be directly related to fact table







**DEMO**

# Using Power BI Desktop to Import Data into a Star Schema

# Agenda

- ✓ Deciding What To Measure
- ✓ Understanding Queries in Power BI Desktop
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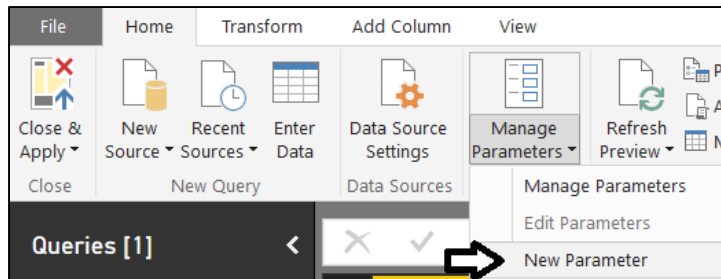
# Query Parameters

- What is a Query Parameter?
  - Configurable setting with project scope
  - Strongly-typed value to which you can apply restrictions
  - Can be referenced from a query
  - Can be referenced from DAX code in data model
- Where are Parameters commonly used
  - To parameterize data source connection details
  - To filter rows when importing data



# Creating Query Parameters

- Parameters can be created using **Manager Parameters** menu



- Parameter properties
  - Name
  - Description
  - Required
  - Allowed Values
  - Default Value
  - Current Value

Parameters

New

Customer State

Name: Customer State

Description: This parameter is used in the Customers query to filter the customer rows which are loaded into the dataset for the Power BI Desktop project.

☒ Required

Type: Text

Allowed Values: List of values

1	CA
2	OR
3	WA
4	AZ
5	TX
*	

Default Value: CA

Current Value: CA

OK Cancel



# Referencing Parameters in a Query

- Parameters can be referenced inside query
  - Next query execution uses current parameter value

The screenshot shows a 'Filter Rows' dialog box with a close button (X) in the top right corner. It has two tabs: 'Basic' (unselected) and 'Advanced' (selected). Below the tabs, it says 'Show rows where:'. There are two columns: 'And/Or' and 'Column'. The 'And/Or' column has a dropdown menu with 'And' selected. The 'Column' column has a dropdown menu with 'State' selected. The 'Operator' column has a dropdown menu with 'equals' selected. The 'Value' column has a dropdown menu with 'Customer State' selected. There is a '...' button to the right of the 'Value' dropdown. Below the filter rules, there is an 'Add Clause' button. At the bottom right, there are 'OK' and 'Cancel' buttons.

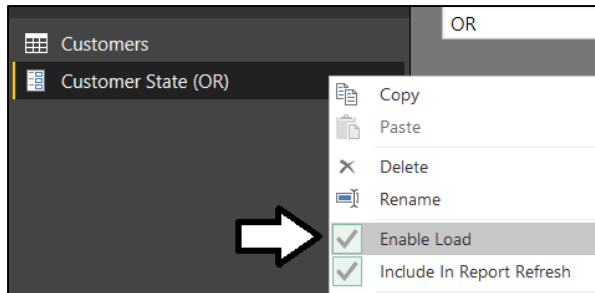
And/Or	Column	Operator	Value
	State	equals	Customer State
And	State		ABC

Buttons: Add Clause, OK, Cancel

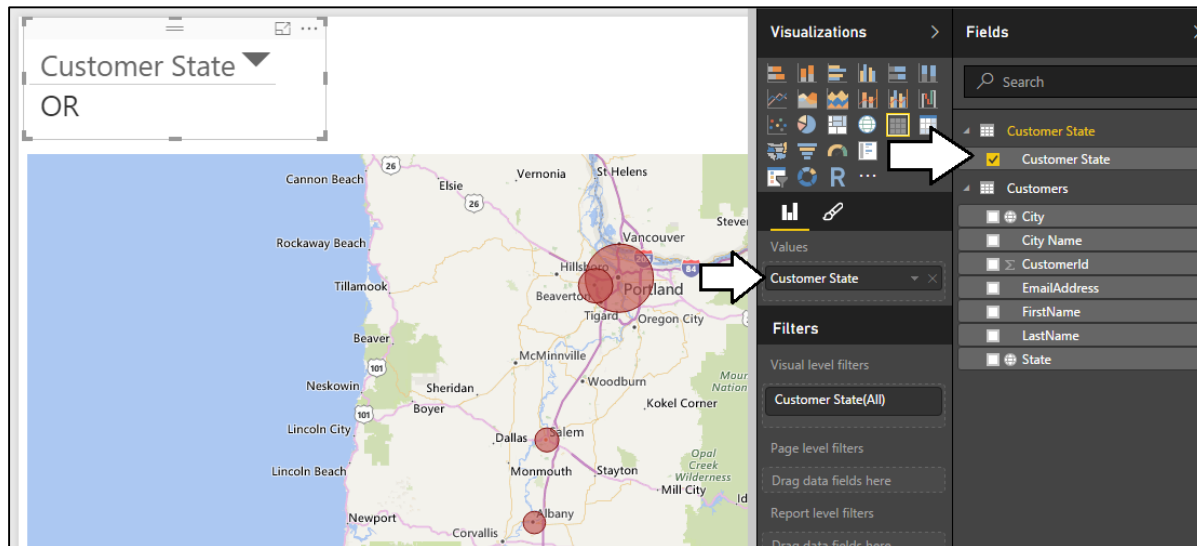


# Making Parameters Available to Data Model

- Configure parameter's Enable Load setting

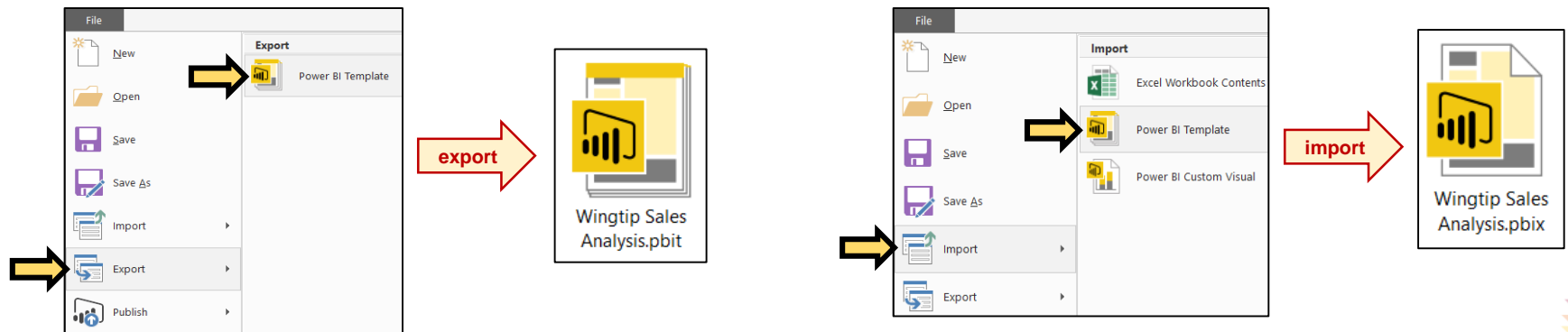


- Parameter becomes visible within fields list in report view



# Power BI Project Template Files

- PBIX project can be exported to project template file
  - Template file created with PBIT file extension
  - Generated template files contains everything except for the data
  - PBIT template file can be imported to create new PBIX projects
  - Template files are powerful when used together with parameters
- How are template files used?
  - Export PBIX project to create a PBIT template file
  - Import the PBIT template file to create a new PBIX project



# Summary

- ✓ Deciding What To Measure
- ✓ Understanding Queries in Power BI Desktop
- ✓ Working with the Query Editor Window
- ✓ Designing Advanced Combine Queries
- ✓ Importing OLTP Data Into a Star Schema
- ✓ Understanding Parameters and Template Files

