

### More Power BI Training from Critical Path Training

- PBI365 - Data Analytics and Reporting with Power BI and Office 365**
  - Three-day Instructor-led training course with hands-on lab exercises
  - Attend this course in person in London or Tampa or attend remotely

Upcoming Offerings

Date	Location	Instructor
Feb-17	London, UK	Ted Pattison
Mar-7	Tampa, FL	Ted Pattison

Module 01: Introduction to the Power BI Platform
Module 02: Getting Started with Power BI Desktop
Module 03: Extracting and Shaping Data using Power Query
Module 04: Modeling Data for Analytics using Power Pivot
Module 05: Extending Datasets to Support Time Intelligence
Module 06: Creating Dashboards and Reports in Power BI
Module 07: Creating Dashboards for Mobile Devices
Module 08: Creating and Deploying Power BI Content Packs
Module 09: Leveraging the New BI Features in Excel 2016
Module 10: Creating BI Solution using Excel Online

- Check out <https://www.criticalpathtraining.com> for more info
- Email [info@criticalpathtraining.com](mailto:info@criticalpathtraining.com) if you have questions

## Introduction to Power BI

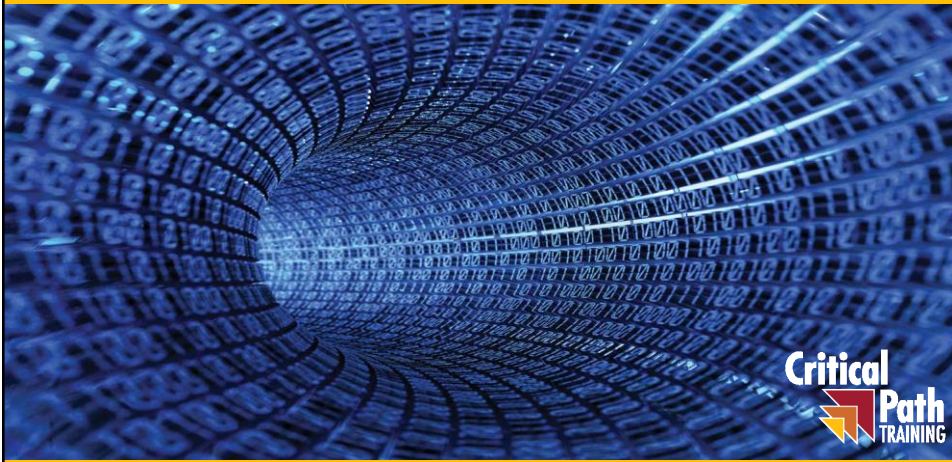
- This course consists of three presentations
  1. Introduction to the Power BI Service
  2. Creating Power BI solutions using Power BI Desktop
  3. Designing and Deploying Reports and Dashboards



## Let's Get Started...



## Introduction to the Power BI Service



## Agenda

- Introduction to the Power BI Platform
- Introduction to the Power BI Service
- Creating Datasets, Reports and Dashboards
- Loading a Sample Content Pack
- Power BI Real-time Dashboard Demo



## Brief History of Microsoft's BI Platform

1985 - Microsoft Excel

1993 - SQL Server Database Engine

2000 - SQL Server Analysis Services (SSAS) - Multidimensional Model

2005 - SQL Server Reporting Services (SSRS)

2005 - SQL Server Integration Services (SSIS)

2007 - Excel Services in SharePoint Server 2007

2007 - Performance Point for SharePoint Server

2008 - SQL Server Analysis Services - Tabular Model

2010 - Power Pivot as an Excel Add-in

2010 - Power Pivot as a SharePoint Add-in

2010 - Power View as a SharePoint Add-in

2013 - Power View as an Excel Add-in

2013 - Power Query as an Excel Add-in

2014 - Power BI for Office (aka Power BI 1.0)

2015 - Power BI (aka Power BI 2.0)

2015 - Power BI Desktop

2015 - Excel 2016

2015 - Excel Online in Office 365

2016 - SQL Server Reporting Services 2016

## Microsoft BI Technology Winners

- Which BI products are strategic moving forward?
  - Microsoft Excel
  - SQL Server, SSAS, SSIS, SSRS
  - Tabular Databases, Power Pivot and DAX language
  - Power Query
  - Power BI Service (aka Power BI 2.0 or what they call the "New Experience")
  - Power BI Desktop
  - Excel Online (no longer considered part of SharePoint)
  - SQL Server 2016 – especially SSAS and SSRS



## Microsoft BI Technology Losers

- Technologies in which Microsoft is no longer investing
  - Power BI for Office 365 (aka Power BI v1.0)
  - Power View
  - Performance Point Services
  - Excel Services in SharePoint Server
  - SharePoint as place to surface reports & dashboards



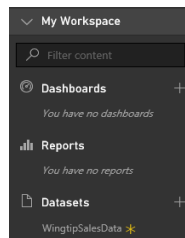
## What is Power BI?

- What is Power BI?
  - Collection of online services and features
  - Environment created to promote self-service BI *to the end user*
  - Environment created to support Power Query and Power Pivot
  - Something to assist with data import, analysis and visualization
- The Power BI service
  - Accessible to subscribed users through <https://app.powerbi.com>
  - User has access to personal workspace and group workspaces
  - Workspaces contain datasets, reports and dashboards
  - Supports Power Query features for data import and transformation
  - Supports Power Pivot and DAX used for data modeling
  - Provides authoring environment for reports and dashboards



## Power BI Workspaces

- Power BI manages user context using workspaces
  - User is always running within the scope of a specific workspace
  - Personal workspace (i.e. My Workspace) created for each user
  - Group workspaces can be created for team-based authoring
  - Creating group workspace creates unified group in Office 365
- Workspace is container with three collections
  - Dashboards
  - Reports
  - Datasets



## Central Power BI Concepts

- Workspace
  - Provides user context (personal workspaces & group workspaces)
- Dashboard
  - Dashboard provides consolidated view into reports and datasets
  - Provides entry point in custom solution for Power BI consumers
- Report
  - Report is a collection of pages containing visuals
  - Report visual can be pinned to a dashboard
- Dataset
  - A data model containing one or more tables
  - Can be very simple or very complex



## Power BI Tools

- Power BI service using a standard web browser
  - Import datasets
  - Design reports and dashboards
  - Create content packs
  - No dataset authoring tools
- Power BI Desktop
  - Create datasets using Power Query
  - Model datasets using Power Pivot and DAX
  - Design reports
  - Publish PBIX files from local desktop to Power BI service
- Microsoft Excel 2016
  - Similar feature set to Power BI Desktop for Power Query and Power Pivot
  - Contains extra features, charts and visuals not supported Power BI
  - An complete BI solution can be embedded in a Excel workbook file



## Creating a Power BI Testing Environment

- Sign up for an Office 365 trial account
  - Creates a new Office 365 tenant
  - Sign up account you use becomes tenant administrator
  - You can add up to 25 user accounts
  - User can be configured trial licenses for Office 365 and Power BI

Office 365 sign-in page  
<https://portal.office.com>

Your user ID  
[Student@CpPowerBILabs.onmicrosoft.com](mailto:Student@CpPowerBILabs.onmicrosoft.com)

Office 365 sign-in page  
<https://portal.office.com>

Your user ID  
[Student@CpPowerBILabs.onmicrosoft.com](mailto:Student@CpPowerBILabs.onmicrosoft.com)

You're ready to go... ➔

Setup Guide for Creating a Test Environment for Power BI Projects

- Setup Task 1: Create a new Office 365 Trial Tenant
- Setup Task 2: Verify You Have Access to Office 365 Mail
- Setup Task 3: Upload a Workbook with Sample Data to OneDrive for Busi...
- Setup Task 4: Add Trial User Licenses for Power BI Pro
- Setup Task 5: Create a Second User Account for Testing Purposes
- Setup Task 6: Use the Power BI Service to Import a New Dataset
- Setup Task 7: Create a New Power BI Report with Multiple Pages
- Setup Task 8: Create and Share a Power BI Dashboard

# Agenda

- ✓ Introduction to the Power BI Platform
- Introduction to the Power BI Service
  - Creating Datasets, Reports and Dashboards
  - Loading a Sample Content Pack
  - Power BI Real-time Dashboards

# Power BI Service

- Power BI service is accessible through browser
  - Logged in user runs in context of a specific workspace
  - Provides user with access to dashboards, reports and datasets

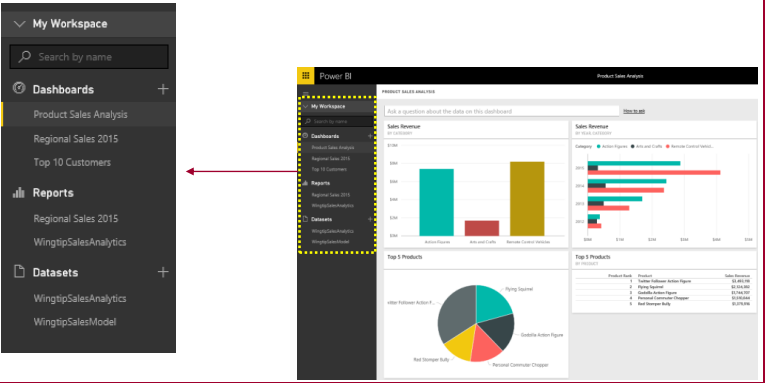
The screenshot displays the Power BI Service interface. On the left is a navigation pane with sections for 'My Workspace', 'Dashboards', 'Reports', and 'Datasets'. The main area shows a dashboard titled 'Product Sales Analysis' with a search bar and a 'Ask a question' prompt. The dashboard contains several visualizations: a bar chart for 'Sales Revenue by Category', a horizontal bar chart for 'Sales Revenue by Year and Category', a pie chart for 'Top 5 Products', and a table for 'Top 5 Products'. The table lists products and their sales revenue.

Product Rank	Product	Sales Revenue
1	Thunder Boltstorm Action Figure	\$5,491,188
2	Flying Saucer	\$4,743,802
3	Godzilla Action Figure	\$3,764,707
4	Personal Commuter Chopper	\$3,553,844
5	Real Stomper Bully	\$1,379,036



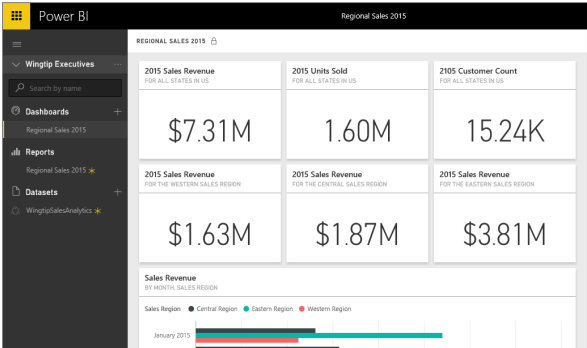
# The Navigation Pane

- Navigation pane is central to user experience
  - Displays links to visible dashboards, reports and datasets
  - Allows user to move between workspaces
  - Allows user to create new group workspace



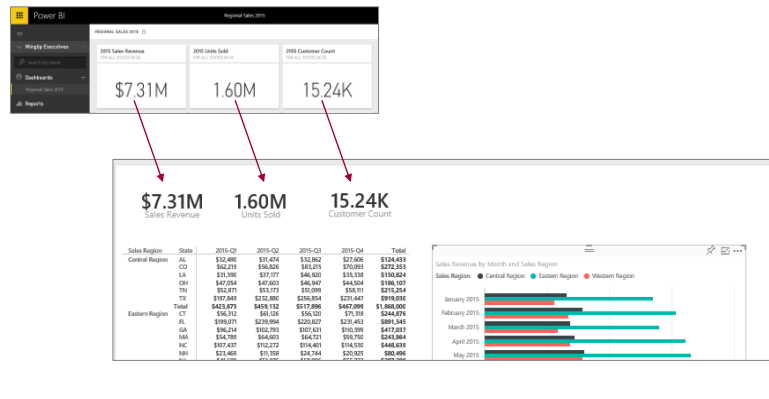
# Dashboards and Tiles

- Dashboard is a collection of tiles
  - Tile can be created by pinning visual from a report
  - Tile can be created by pinning query result from dataset



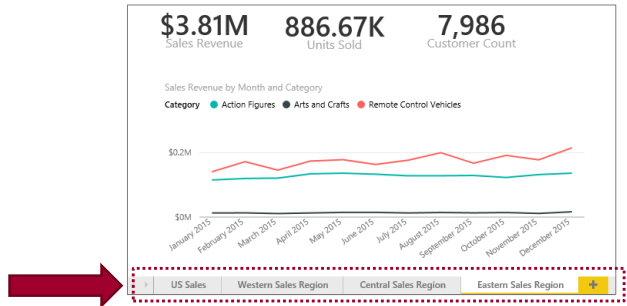
## Dashboards and Reports

- Dashboards link users to reports
  - Dashboard tiles designed to provide high-level view
  - Clicking tiles drills down into report to see more detail



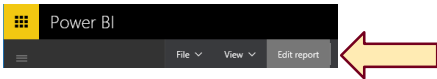
## Reports and Pages

- Reports contain one or more pages
  - A report can be designed with a single page
  - A report can be designed with many pages
  - Tabbed navigation located at bottom of report view

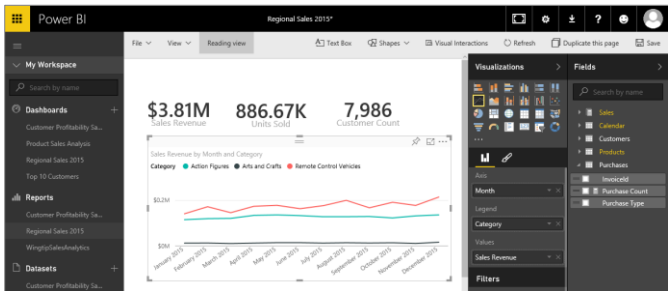


# Report Authoring

- Report initially opens in reading view
  - Click Edit report to switch to edit mode

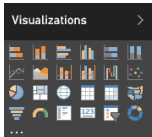


- Report design tools appear on right side of page

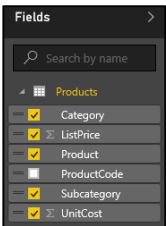


# Visuals (aka Visualizations)

- Reports are designed using visual (aka visualizations)
  - Each visuals is based on an underlying visualization type
  - Visualization type can be changed using **Visualizations** pane

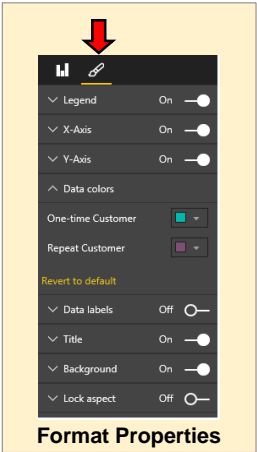
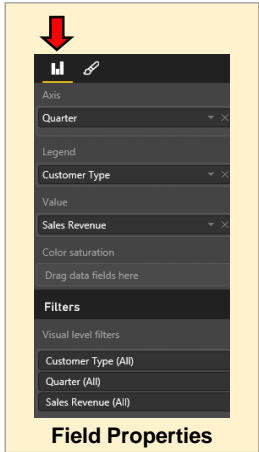


- Visuals creating by using fields from tables inside **Fields** list



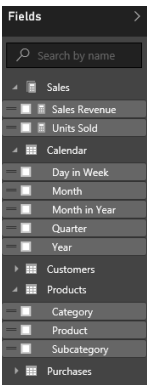
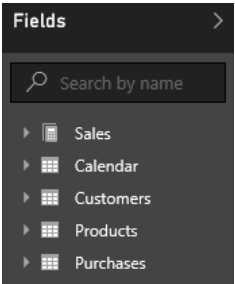
## Editing Visual Properties

- Visuals have Field properties and Format properties
  - Visual properties vary depending on visualization type



## Report and Datasets

- Each report is based on an underlying dataset
  - **Fields** list in report designer shows tables and fields
  - Report author sees tables & fields as dataset consumer



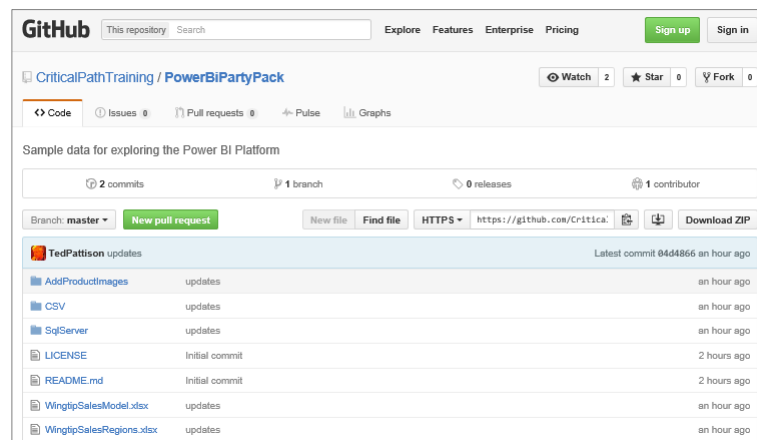
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- ✓ Creating a Power BI Test Environment
- ✓ Introduction to the Power BI Service
- Creating Datasets, Reports and Dashboards
  - Loading a Sample Content Pack
  - Power BI Real-time Dashboards



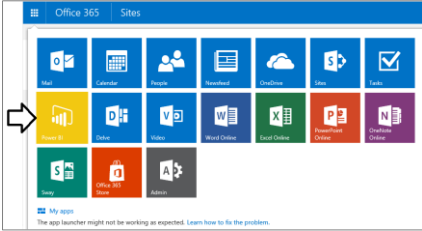
## Power BI Party Pack

- Sample data for exploring the Power BI platform
- <https://github.com/CriticalPathTraining/PowerBiPartyPack>

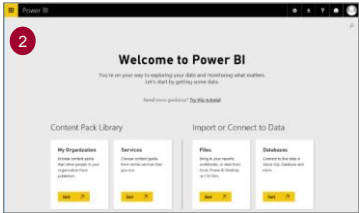


# Getting Started with the Power BI Service

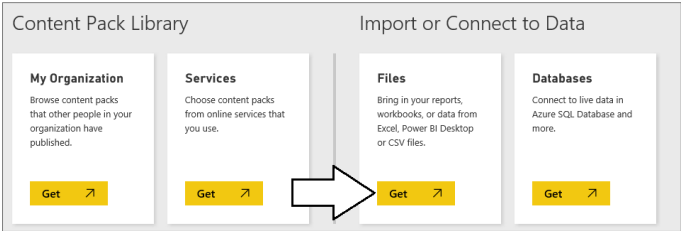
1



2

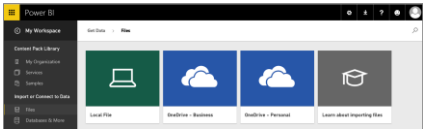


3



# Importing a Dataset

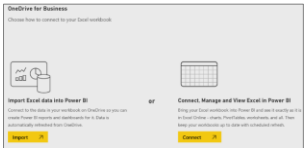
- Connect to files in OneDrive



- Select the file and click Connect

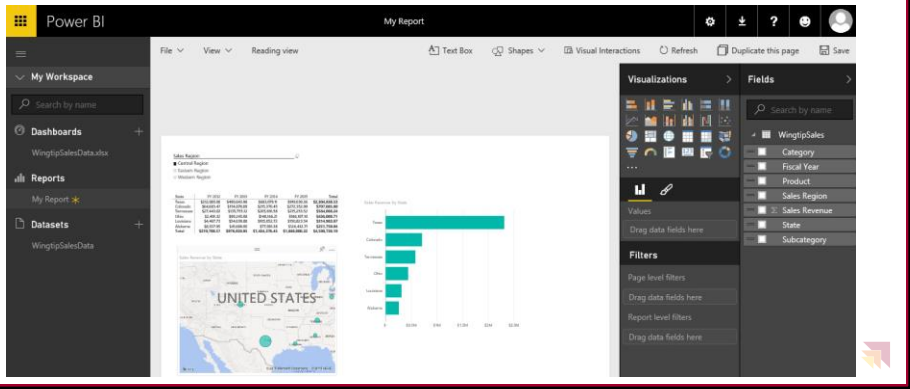


- Choose between Import or Connect



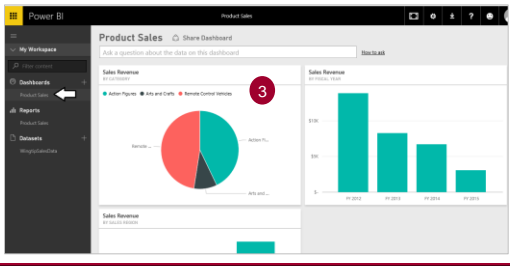
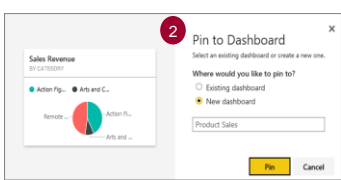
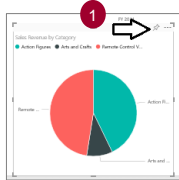
# Designing Reports

- Power BI service provides browser-based report designer
  - Report contains one or more pages
  - Pages contain visuals (aka visualizations)
  - Visuals display fields from underlying data model



# Creating Dashboards

- Dashboards contain tiles
  - Tiles created from visuals on report pages





## Agenda

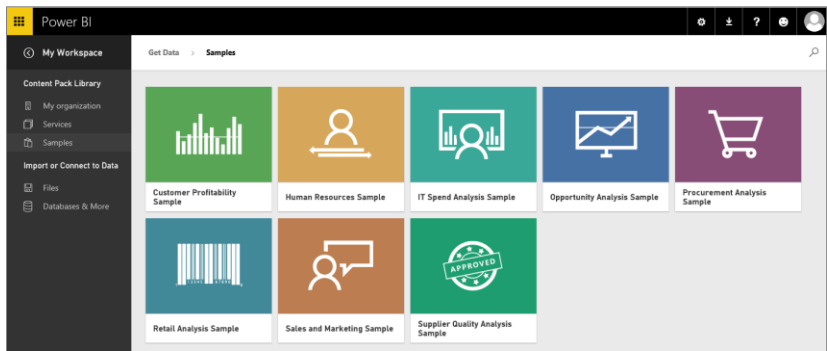
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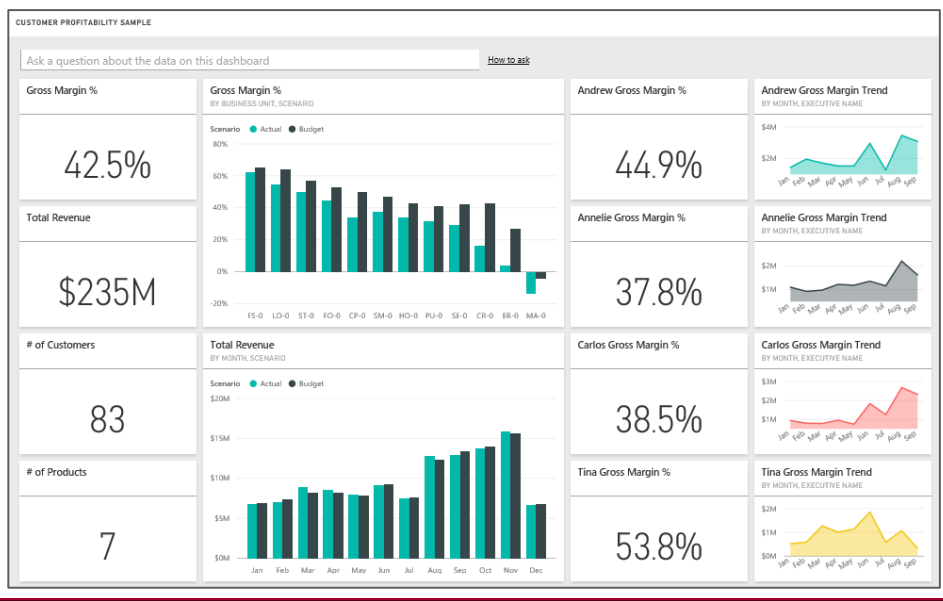


## Power BI Sample Content Packs

- Power BI service offers sample BI solutions
  - Each sample installs in seconds
  - Samples provide examples of dashboards, reports and datasets
  - Provides sample solutions for common BI solution scenarios



## Customer Profitability Dashboard Sample

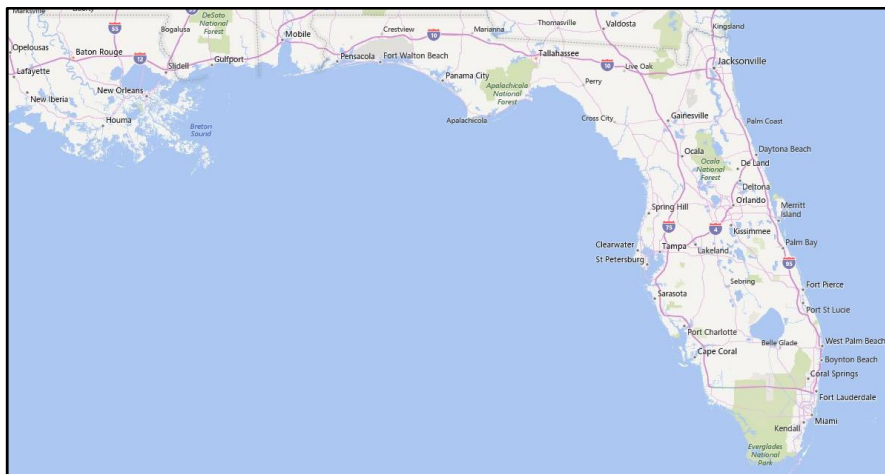


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## Our Scenario for Real-time Dashboard



### Our Scenario for Real-time Dashboard



### It all starts in an Alpaca farm in Lutz, FL





### A true defender of the alpaca

This alpaca hate speech is getting out of control. Alpacas are some of the finest animals that inhabit the earth. I call upon Donald Trump to issue an apology.

### On the Campaign Trial...

Alpaca Joe has got to go

Mr. Trump, recently you have made remarks about alpacas in a manner that the vast majority of the US population finds very offensive. Many on the far left are calling upon you to issue a public apology. How do you respond?

I have worked on amazing business deals with both odd-toed and even-toed mammals including camels, llamas, yaks and even gazelle. But I draw the line when it comes to doing business with alpacas. They're just not trustworthy.



### Things heat up on Twitter...





Donald J. Trump

@realDonaldTrump · 15m

Alpacas are filthy, worthless animals. They sit around doing nothing - providing no value - zero! Our country would be much better off without them. We should send them all back to South America and be done with them once and for all.

89.2K

294K

...



Alpaca Joe

@Vote4AlpacaJoe · 2m

Alpacas are very loyal. They mate for life. You certainly don't see alpacas trading in their wives every 10 years for a newer model as if they were negotiating a lease on a Mercedes. Alpacas also contribute significantly to the U.S. economy due to their wool which is used to make fine sweaters and coats.

89.2K

294K

...



Donald J. Trump

@realDonaldTrump · 15m

Nobody with class wears anything made from an alpaca. I mean, look at that hair. Would you vote for that hair?

89.2K

294K

...



Alpaca Joe

@Vote4AlpacaJoe · 2m

Funny that you (of all people) would make an issue over hair

Who wore it better?



89.2K

294K

...



### Deciding Whether to run for President...

Should I run for President?



Can I navigate today's political arena?



If we can raise \$1,000,000, I will run!

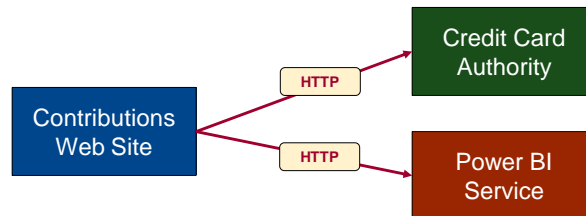


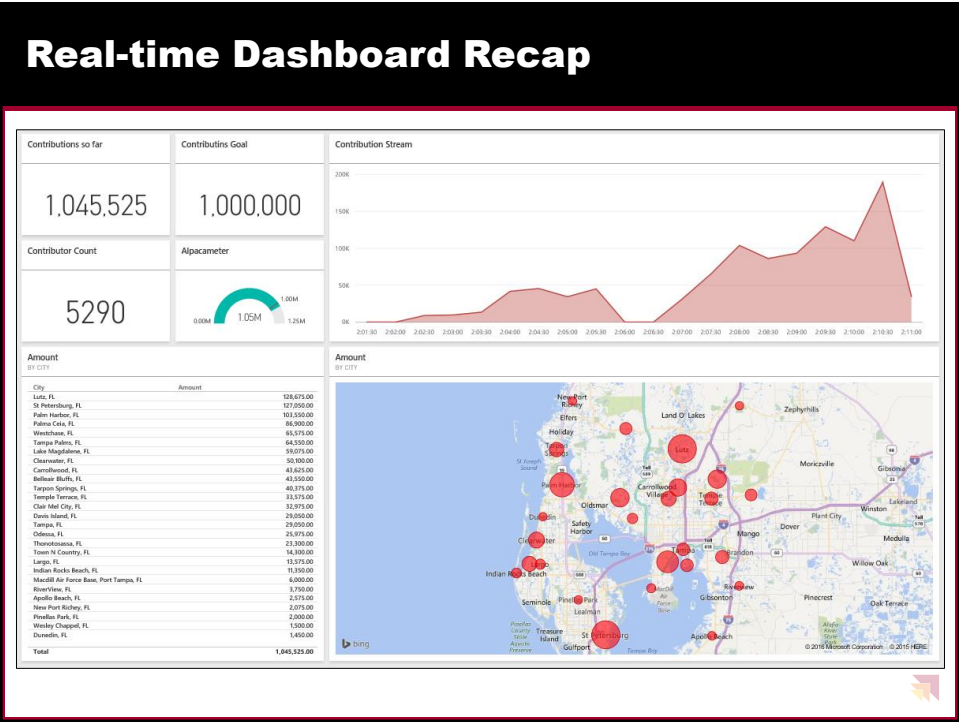
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## Alpaca Joe's Contribution Site

- Demo based on Power BI REST API
  - Developer can create dataset using HTTP requests
  - Developer can add table records using HTTP requests



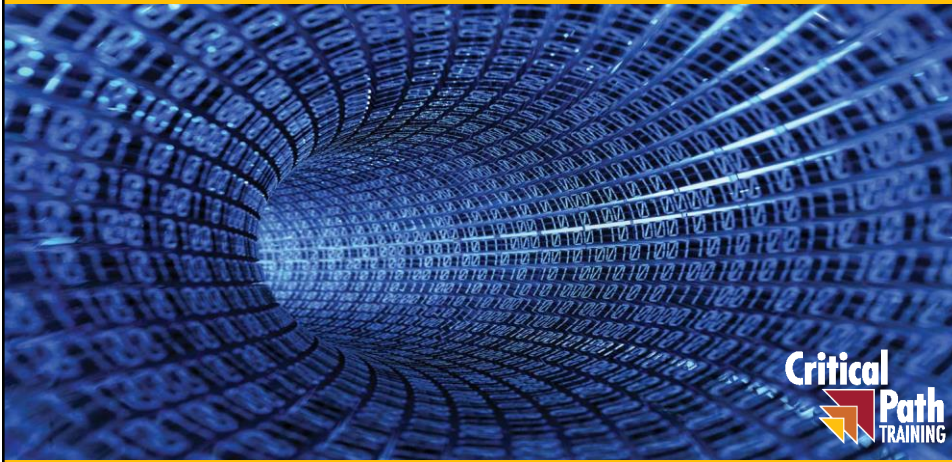


### Summary

- ✓ Introduction to the Power BI Platform
- ✓ Creating a Power BI Test Environment
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## Creating Power BI Solutions with Power BI Desktop



### Agenda

- The BI Project Lifecycle
- Getting Started with Power BI Desktop
- Using Power Query to Import Data
- Using Power Pivot to Model Data
- Publishing Power BI Desktop Projects



## Project Lifecycle for a Custom BI Solution

- Lifecycle of a typical BI project includes...
  - Discover where the data lives
  - Extract, transform and load (ETL) data
  - Model data to create dataset for analytics and reporting
  - Design and implement reports on top of dataset
  - Consolidate reports to one or more dashboards
  - Package project artifacts for deployment
  - Deploy to production environment

Typical BI Project Lifecycle

```
graph LR; A[Data Discovery] --> B[ETL]; B --> C[Data Modeling]; C --> D[Design Reports]; D --> E[Create Dashboards]; E --> F[Deploy Dashboards]
```

## Working with Power BI Desktop

- Power BI Desktop focuses on three phases
  - Power Query features used for ETL
  - Power Pivot and DAX used for data modeling
  - Report creation using the Power BI report designer

```
graph LR; A[Data Discovery] --> B[ETL]; B --> C[Data Modeling]; C --> D[Design Reports]; D --> E[Create Dashboards]; E --> F[Deploy Dashboards]
```

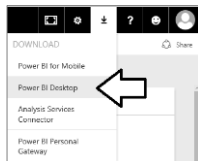
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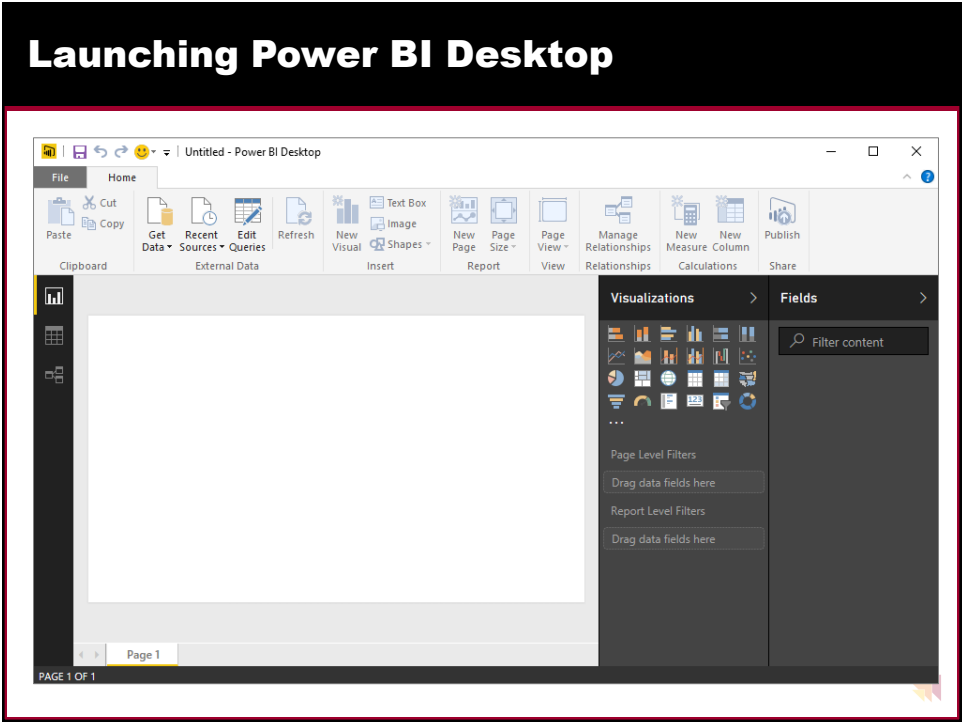


## Installing Power BI Desktop

- Power BI Desktop installs as click-once application
  - Can be installed when logged into Power BI service

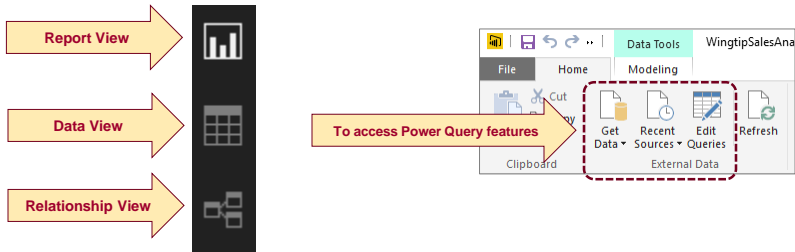


# Launching Power BI Desktop



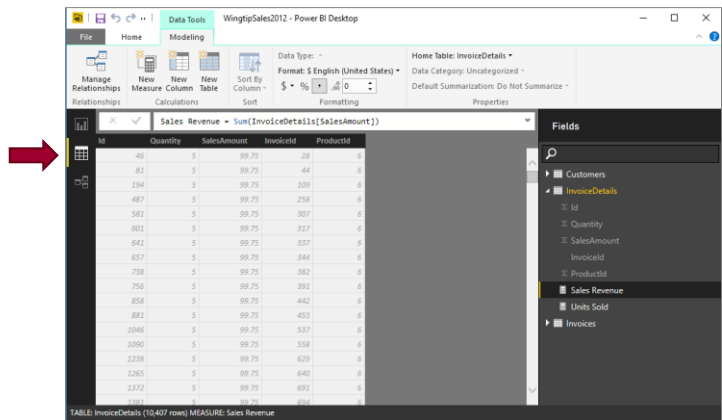
# Getting Around in Power BI Desktop

- What do you need to learn to use Power BI Desktop?
  - Power query features for importing data
  - Power Pivot features for modeling data
  - Report designer for creating reports
- Navigating between view modes



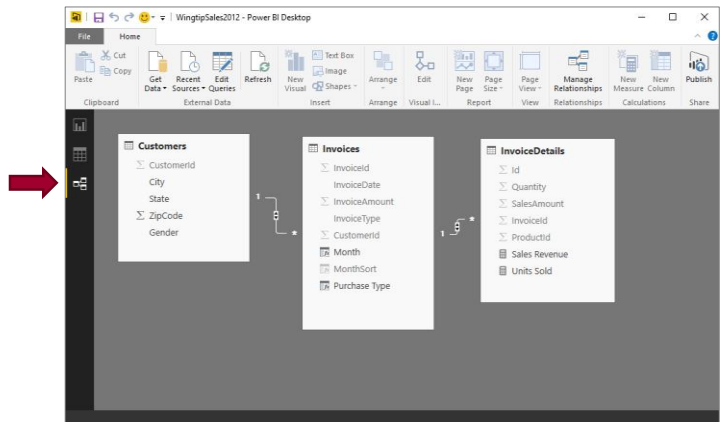
## Data View

- Primary view used when data modeling with Power Pivot
  - Data view displays columns and rows for each table
  - You can extend tables with calculated columns and fields



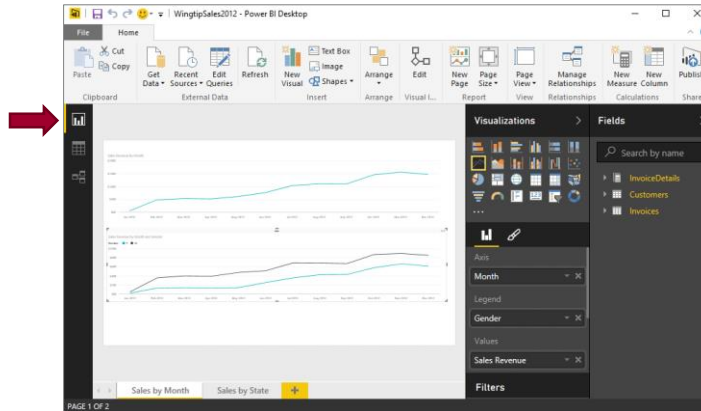
## Relationship View

- Displays tables, fields and relationships
  - Used to view tables, fields and relationships in project's dataset
  - Used to create relationships when importing new tables



## Report View

- Report view displays report of current project
  - Report designer is the same as in the Power BI service
  - Dataset appears in consumer mode - not author mode



## Projects and PBIX Files

- Power BI Desktop projects saved using PBIX files
  - PBIX file contains queries created with Power Query
  - PBIX file contains data imported using queries
  - PBIX file contains data modeling definitions
  - PBIX file contains reports



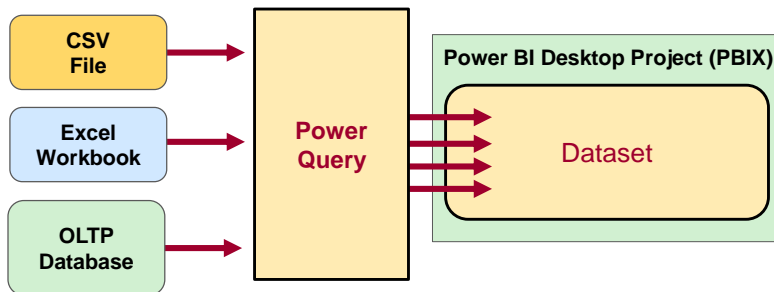
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- ✓ Getting Started with Power BI Desktop
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  - Using Power Pivot to Model Data
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## Power Query is an ETL Tool

- 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



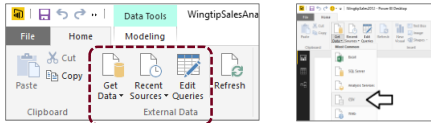
## Data Discovery

- Data can live in a variety of sources
  - Files (e.g. CSV file, Excel workbook)
  - OLTP Databases
  - OLAP Databases
  - SaaS Applications
  - Web services



# Creating Queries with Power Query

- Power BI Desktop support Power Query features
  - Creating a new query



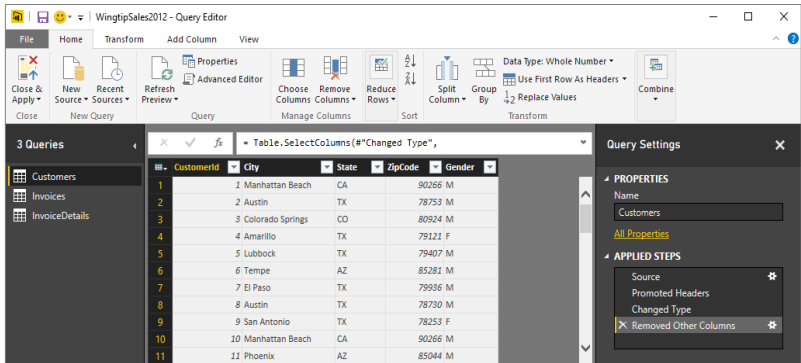
- The difference between Load versus Edit
  - **Load** command creates the query and runs it as is
  - **Edit** command creates query & opens it in Query Editor window

Customers.csv

CustomerId	FirstName	LastName	Company	Email
1	Santiago	Hultberg	Volvo Airlines	Santia
2	Nancy	Ross	Hyattsville	Nancy
3	Kirk	Seaton	Comcast	Kirk.S
4	Ragnia	Mayer	Rovers Return	Ragnia
5	Curt	Mathews	Ecumenia	Curt.R
6	Kirk	Baister	Springfield Nuclear Power Plant	Kirk.S
7	Tracy	Christensen	Clayco's Softwear	Tracy
8	Renee	Glover	Doublemint Palace	Renee
9	Julia	Medina	W.C. Briggs & Co.	Julia.S
10	Tommaso	Hanning	Tricall	Tommaso

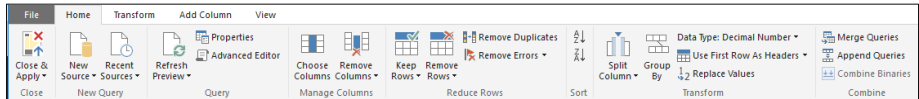
# Query Editor Window

- Power BI Desktop provides Query Editor window
  - Provides Power Query features for designing queries
  - Displays list of all queries in project on the left
  - Displays properties and step for selected query on right

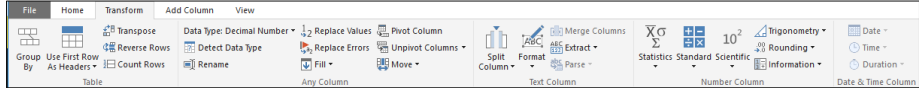


# Query Editor Ribbon Tabs

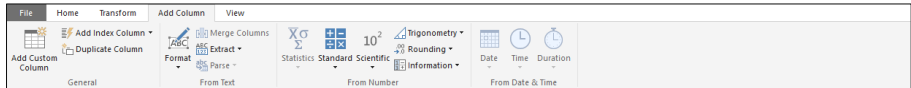
## Home tab



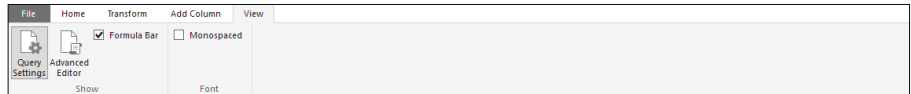
## Transform tab



## Add Columns tab



## View tab



# Examples of Basic Power Query Steps

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



## Agenda

- ✓ The BI Project Lifecycle
- ✓ Getting Started with Power BI Desktop
- ✓ Using Power Query to Import Data
- Using Power Pivot to Model Data
- Publishing Power BI Desktop Projects



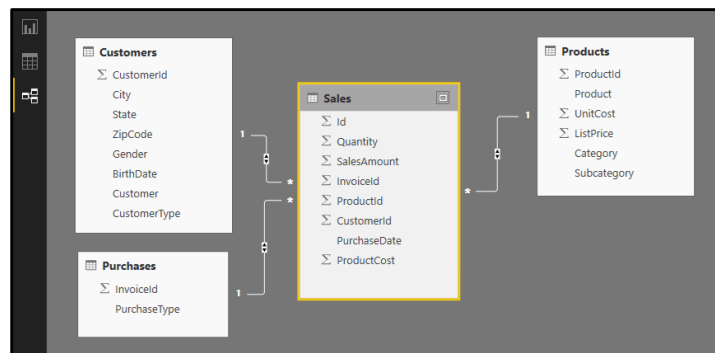
## Building a Data Model with Power Pivot

- Steps to create a data model with Power Pivot
  - Create relationships between tables
  - Modify columns (rename, set formatting, convert type)
  - Create calculated columns
  - Create measures
- Features not yet supported by Power BI Desktop
  - Creating dimensional hierarchies
  - Creating key performance indicators (KPIs)



## Table Relationships

- Tables in data model associated with relationships
  - Relationships based on single columns
  - Tabular model supports [1-to-1] and [1-to-many] relationships
  - Relationships based on single column in each table



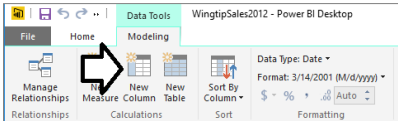
## The Project's Data Model

- Each PBIX project has a data model
  - Data model contains tables and table relationships
- Tables contain three different types of fields
  - Native columns
  - Calculated columns
  - Measures



## Creating Calculated Columns

- Calculated column can be added to table



- Calculated columns created with DAX expressions

```
Purchase Type =  
SWITCH(Invoices[InvoiceType],  
    "InPerson", "Store Purchase",  
    "MailOrder", "Mail Order Purchase",  
    "Online", "Online Purchase"  
)
```

InvoiceId	InvoiceDate	InvoiceAmount	InvoiceType	CustomerId	Month	MonthSort	Purchase Type
202	2/19/2012	559.05	InPerson	10	Feb 2012	201202	Store Purchase
10	1/29/2012	20.65	InPerson	10	Jan 2012	201201	Store Purchase





## Calculated Column as a Row Label

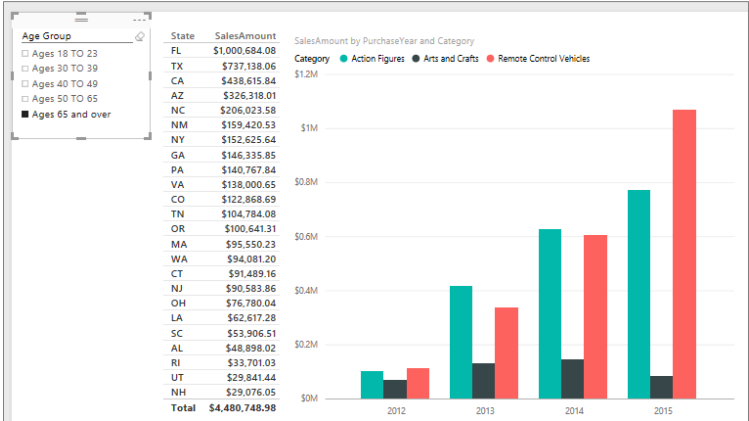
- Age Group can now be used as row label

Age Group	Count of CustomerId	Quantity	SalesAmount
Ages 50 TO 65	7974	1,143,644	\$4,904,342.59
Ages 65 and over	7569	1,050,879	\$4,480,748.98
Ages 40 TO 49	5103	713,453	\$3,083,964.23
Ages 30 TO 39	4547	646,121	\$2,798,053.19
Ages 18 TO 23	3278	478,405	\$1,985,991.24
Total	28471	4,032,502	\$17,253,100.23



## Calculated Column used in a Slicer

- Calculated column can populate slicer values



# Creating Measures

- Measure defined as DAX expression with format settings

Manage Relationships

New Measure

New Column

New Table

Sort By Column

Sort

Data Type: ▾

Format: \$ English (United States) ▾

\$ ▾ % ▾ .00 0 ▾

Formatting

Home Table: InvoiceDetails ▾

Data Category: Uncategorized ▾

Default Summarization: Do Not Summarize ▾

Properties

×

✓

Sales Revenue = Sum(InvoiceDetails[SalesAmount])

Id	Quantity	SalesAmount	InvoiceId	ProductId
46	5	99.75	28	6
81	5	99.75	44	6
194	5	99.75	109	6
487	5	99.75	258	6
581	5	99.75	307	6
601	5	99.75	317	6
641	5	99.75	337	6
657	5	99.75	344	6
738	5	99.75	382	6
756	5	99.75	391	6
858	5	99.75	442	6
881	5	99.75	453	6
1046	5	99.75	537	6

Fields

Customers

InvoiceDetails

Id

Quantity

SalesAmount

InvoiceId

ProductId

Sales Revenue

Units Sold

Invoices

# Benefits of Measures over Calculated Columns

- Calculated columns can be aggregated in visual
  - However, aggregation details are stored in visual
  - Visual doesn't offer control over name and formatting

Values

Count of CustomerId ▾ ×

Quantity ▾ ×

SalesAmount ▾ ×

Age Group	Count of CustomerId	Quantity	SalesAmount
Ages 50 TO 65	7974	1,143,644	\$4,904,342.59
Ages 65 and over	7569	1,050,879	\$4,480,749
Ages 40 TO 49	5103	713,453	\$3,083,964.23
Ages 30 TO 39	4547	646,121	\$2,798,053.19
Ages 18 TO 23	3278	478,405	\$1,985,991.24
Total	28471	4,032,502	\$17,253,100.23

- Measure defines name, aggregation and formatting
  - Work is done once and reused across many visuals
  - Makes data model more fool-proof for report designers

Values

Customer Count ▾ ×

Units Sold ▾ ×

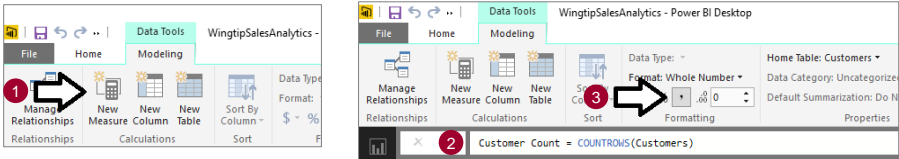
Sales Revenue ▾ ×

Age Group	Customer Count	Units Sold	Sales Revenue
Ages 50 TO 65	7,974	1,143,644	\$4,904,343
Ages 65 and over	7,569	1,050,879	\$4,480,749
Ages 40 TO 49	5,103	713,453	\$3,083,964
Ages 30 TO 39	4,547	646,121	\$2,798,053
Ages 18 TO 23	3,278	478,405	\$1,985,991
Total	28,471	4,032,502	\$17,253,100



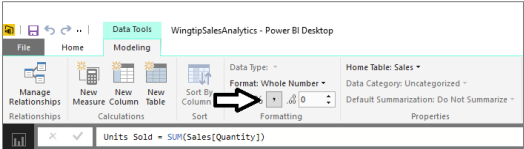
## Creating Measures

- Measures have advantage over calculated columns
  - They are evaluated based on the current evaluation context
- Creating a measure with Power BI Desktop
  1. Click New Measure button
  2. Give measure a name and write DAX expressions
  3. Configure formatting

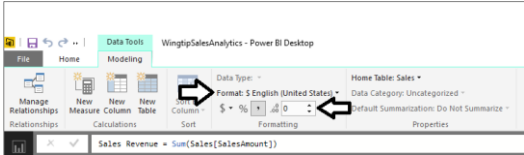


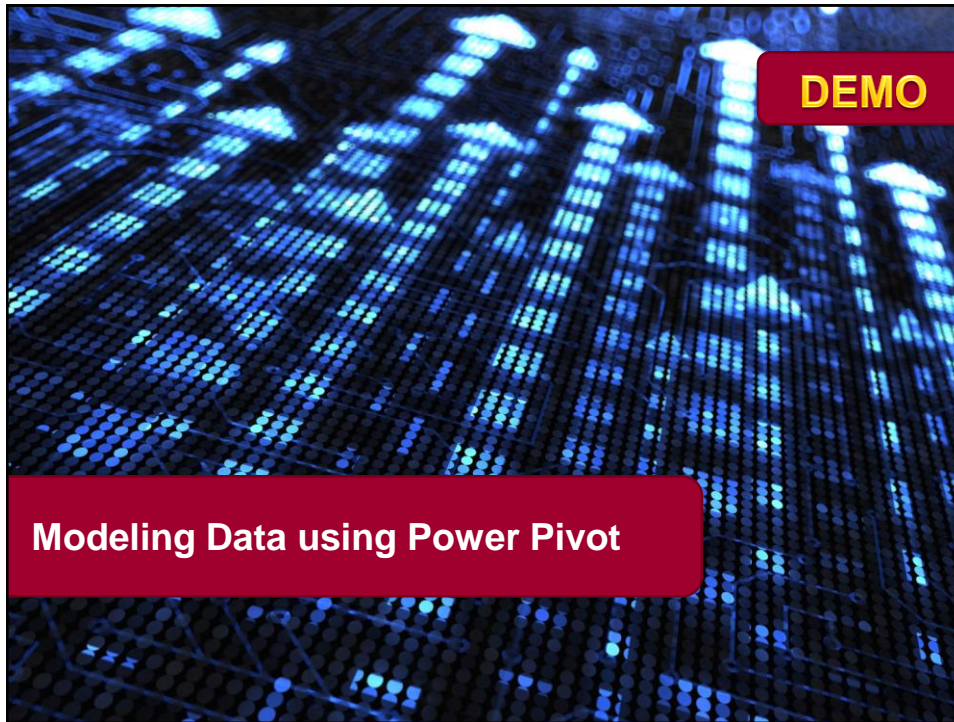
## Formatting Measures

- Format as whole number



- Format as currency





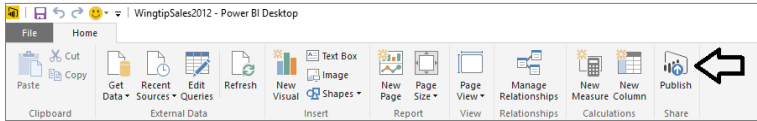
## Agenda

- ✓ The BI Project Lifecycle
- ✓ Getting Started with Power BI Desktop
- ✓ Using Power Query to Import Data
- ✓ Using Power Pivot to Model Data
- Publishing Power BI Desktop Projects



# Publishing a Power BI Desktop Project

- Power BI Desktop provides **Publish** command
- Used to publish project to Power BI service



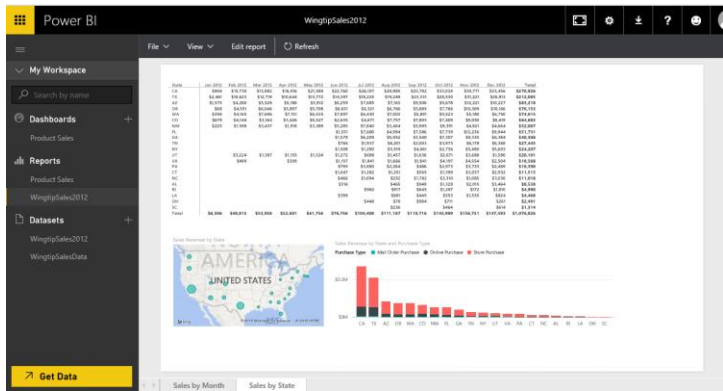
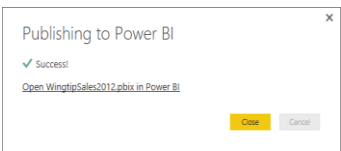
- Requires logging into your Office 365 account



- Published articles added to your personal workspace



# A Published Power BI Desktop Project



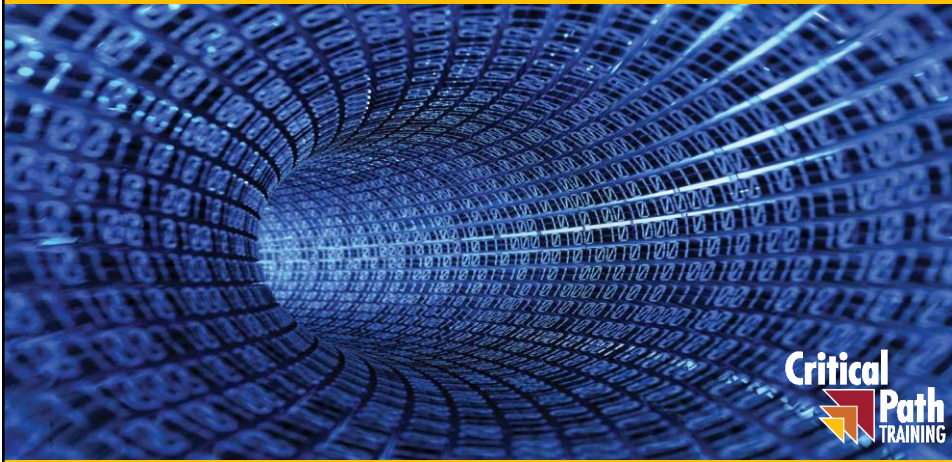


## Summary

- ✓ The BI Project Lifecycle
- ✓ Getting Started with Power BI Desktop
- ✓ Using Power Query to Import Data
- ✓ Using Power Pivot to Model Data
- ✓ Publishing Power BI Desktop Projects



## Designing and Deploying Reports and Dashboards



### Agenda

- Writing DAX Expressions for Reports
- Creating and Designing Dashboards
- Sharing Dashboards
- Deploying Dashboards using Content Packs
- Accessing Dashboards using Mobile Devices





## Evaluation Contexts for DAX Expressions

- DAX expressions evaluated using two context
  - Row context
  - Filter context
- Row Context
  - The current row in a table iteration
- Filter Context
  - The set of active rows in a calculation



## Understanding Filter Context

- Visuals apply various filters in evaluation contexts

Month in Year	2012	2013	2014	2015	Total
January	\$6,306	\$164,334	\$385,275	\$512,822	\$1,068,737
February	\$48,815	\$126,501	\$358,244	\$597,684	\$1,131,244
March	\$53,958	\$243,676	\$381,309	\$532,123	\$1,211,067
April	\$52,601	\$300,872	\$381,157	\$602,751	\$1,337,381
May	\$61,756	\$334,948	\$438,261	\$647,276	\$1,482,241
June	\$76,756	\$321,715	\$378,749	\$608,448	\$1,385,668
July	\$104,408	\$287,800	\$359,744	\$620,316	\$1,372,268
August	\$111,167	\$298,483	\$457,212	\$678,499	\$1,545,361
September	\$110,716	\$376,207	\$505,332	\$620,735	\$1,612,990
October	\$145,999	\$362,943	\$602,448	\$590,220	\$1,632,770
November	\$156,751	\$340,228	\$545,572	\$590,220	\$1,632,770
December	\$147,593	\$331,526	\$581,977	\$686,814	\$1,747,910
Total	\$1,076,826	\$3,489,234	\$5,375,379	\$7,311,660	\$17,253,100

**Filters on this evaluation**  
[Year] = 2015  
[Month in Year] = "October"

- Filter context also affected by slicers and other filters

Sales Region

Select All

Central Region

Eastern Region

Western Region

Customer Type

One-time customer

Repeat Customer

Month in Year

	2012	2013	2014	2015	Total
January	\$425	\$50,169	\$61,295	\$76,814	\$188,509
February	\$13,891	\$40,133	\$63,670	\$101,542	\$219,236
March	\$19,121	\$58,411	\$73,839	\$84,180	\$235,551
April	\$19,128	\$53,711	\$67,919	\$91,762	\$232,520
May	\$22,939	\$64,259	\$78,668	\$109,689	\$275,555
June	\$29,082	\$50,564	\$73,504	\$88,047	\$241,197
July	\$34,809	\$62,971	\$69,053	\$80,749	\$246,582
August	\$36,096	\$61,217	\$76,009	\$94,719	\$268,041
September	\$39,415	\$68,633	\$82,697	\$84,266	\$275,011
October	\$51,994	\$69,122	\$99,344	\$84,177	\$304,637
November	\$47,020	\$52,548	\$85,924	\$94,877	\$280,169
December	\$50,580	\$66,260	\$102,080	\$94,877	\$313,804
Total	\$364,500	\$698,018	\$934,009	\$1,075,771	\$3,072,298

Filters on this evaluation

[Year] = 2015

[Month in Year] = "October"

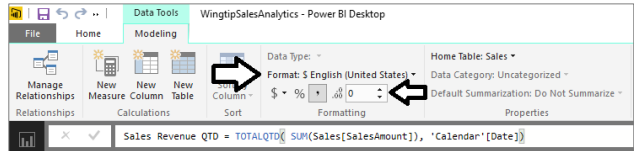
[Sales Region] = "Western Region"

[Customer Type] = "Repeat Customer"

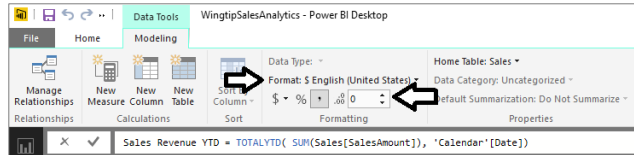


## Calculated Fields for QTD and YTD Sales

- TOTALQTD function calculates quarter-to-date totals

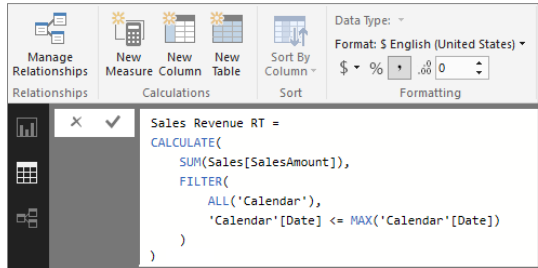


- TOTALYTD function calculates year-to-date totals



## Using the CALCULATE Function

- Calculate a running total of sales revenue across years



## Matrix Visual with To-Date Running Totals

- Running totals calculated using DAX

Year	Quarter	Month	Sales Revenue	Sales Revenue QTD	Sales Revenue YTD	Sales Revenue RT
2012	2012-Q1	Jan 2012	\$6,306	\$6,306	\$6,306	\$6,306
		Feb 2012	\$48,815	\$55,121	\$55,121	\$55,121
		Mar 2012	\$53,958	\$109,079	\$109,079	\$109,079
	2012-Q2	Apr 2012	\$52,601	\$52,601	\$161,680	\$161,680
		May 2012	\$61,756	\$114,357	\$223,436	\$223,436
		Jun 2012	\$76,756	\$191,113	\$300,192	\$300,192
	2012-Q3	Jul 2012	\$104,408	\$104,408	\$404,600	\$404,600
		Aug 2012	\$111,167	\$215,575	\$515,767	\$515,767
		Sep 2012	\$110,716	\$326,291	\$626,483	\$626,483
	2012-Q4	Oct 2012	\$145,999	\$145,999	\$772,483	\$772,483
		Nov 2012	\$156,751	\$302,750	\$929,234	\$929,234
		Dec 2012	\$147,593	\$450,343	\$1,076,826	\$1,076,826
2013	2013-Q1	Jan 2013	\$164,334	\$164,334	\$1,241,161	\$1,241,161
		Feb 2013	\$126,501	\$290,835	\$290,835	\$1,367,661

- Question: when did company reach \$1,000,000 in sales

Nov 2012	\$156,751	\$302,750	\$929,234	\$929,234
Dec 2012	\$147,593	\$450,343	\$1,076,826	\$1,076,826
Jan 2013	\$164,334	\$164,334	\$164,334	\$1,241,161
Feb 2013	\$126,501	\$290,835	\$290,835	\$1,367,661



## Sales Growth PM Measure - First Attempt

- Create a measure named Sales Growth PM

```
Sales Growth PM =  
DIVIDE(  
    SUM(Sales[SalesAmount]) -  
    CALCULATE(  
        SUM(Sales[SalesAmount]),  
        PREVIOUSMONTH(Calendar[Date])  
    ),  
    CALCULATE(  
        SUM(Sales[SalesAmount]),  
        PREVIOUSMONTH(Calendar[Date])  
    )  
)
```

- Use measure in matrix evaluating month and quarter
  - Measure returns correct value for Month
  - Measure returns incorrect and erroneous value for Quarter

Year	Quarter	Month	Sales Revenue	Sales Growth PM
2015	2015-Q1	Jan 2015	\$512,822	-11.88 %
		Feb 2015	\$597,684	16.55 %
		Mar 2015	\$532,123	-10.97 %
	2015-Q2	Apr 2015	\$1,642,629	182.25 %
		May 2015	\$602,751	13.27 %
		Jun 2015	\$647,276	7.39 %
	2015-Q3	Jul 2015	\$608,448	-6.00 %
		Aug 2015	\$1,858,474	249.26 %
			\$620,316	1.95 %
			\$678,499	9.38 %





# Using the ISFILTERED Function

- ISFILTERED function used to determine when perform evaluation

```
Sales Growth PM = IF(
  ( ISFILTERED(Calendar[Month]) && ISFILTERED(Calendar[Date]) = FALSE() ),
  DIVIDE(
    SUM(Sales[SalesAmount]) -
    CALCULATE(
      SUM(Sales[SalesAmount]),
      PREVIOUSMONTH(Calendar[Date])
    ),
    CALCULATE(
      SUM(Sales[SalesAmount]),
      PREVIOUSMONTH(Calendar[Date])
    )
  ),
  BLANK()
)
```

- Expression returns Blank when evaluation context isn't appropriate

Year	Quarter	Month	Sales Revenue	Sales Growth PM
2015	2015-Q1	Jan 2015	\$512,822	-11.88 %
		Feb 2015	\$597,684	16.55 %
		Mar 2015	\$532,123	-10.97 %
	Total		\$1,642,629	
2015	2015-Q2	Apr 2015	\$602,751	13.27 %
		May 2015	\$647,276	7.39 %
		Jun 2015	\$608,448	-6.00 %
	Total		\$1,858,474	
2015	2015-Q3	Jul 2015	\$620,316	1.95 %
		Aug 2015	\$678,499	9.38 %

# Calculating Percentage of Product sales

File

Home

Modeling

Manage Relationships

New Measure Column

New Table

Sort By Column

Relationships

Calculations

Sort

Data Type: -

Format: Percentage

Sort By Column: %

2

Home Table: Products

Data Category: Uncategorized

Default Summarization: Do Not Summarize

Pct of All Products =

DIVIDE(

SUM( Sales[SalesAmount] ),

CALCULATE(

Sum (Sales[SalesAmount] ),

ALL(Products[Category], Products[Subcategory], Products[Product])

)

)

File

Home

Modeling

Manage Relationships

New Measure Column

New Table

Sort By Column

Relationships

Calculations

Sort

Data Type: -

Format: Percentage

Sort By Column: %

2

Home Table: Products

Data Category: Uncategorized

Default Summarization: Do Not Summarize

Pct of Product Category =

DIVIDE(

SUM( Sales[SalesAmount] ),

CALCULATE(

Sum (Sales[SalesAmount] ),

ALL( Products[Subcategory], Products[Product] )

)

)

File

Home

Modeling

Manage Relationships

New Measure Column

New Table

Sort By Column

Relationships

Calculations

Sort

Data Type: -

Format: Percentage

Sort By Column: %

2

Home Table: Products

Data Category: Uncategorized

Default Summarization: Do Not Summarize

Pct of Product Subcategory =

DIVIDE(

SUM( Sales[SalesAmount] ),

CALCULATE(

Sum (Sales[SalesAmount] ),

ALL(Products[Product])

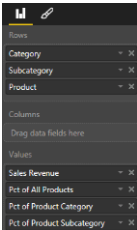
)

)

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Page 49

# The Product Revenue Breakdown Report



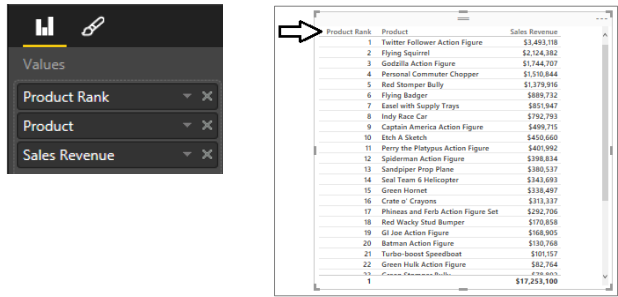
Category	Subcategory	Product	Sales Revenue	Pct of All Products	Pct of Product Category	Pct of Product Subcategory
Action Figures	Cute and Huggable	Black Power Ranger Action Figure	\$13,013	0.08 %	0.18 %	0.30 %
		Green Angry Bird Action Figure	\$23,295	0.14 %	0.31 %	0.53 %
		Perry the Platypus Action Figure	\$401,992	2.33 %	5.44 %	9.23 %
		Phineas and Ferb Action Figure Set	\$292,706	1.70 %	3.96 %	6.72 %
		Red Angry Bird Action Figure	\$61,654	0.36 %	0.83 %	1.42 %
	Tough Guys	Twitter Follower Action Figure	\$3,493,118	20.25 %	47.23 %	80.19 %
		Woody Action Figure	\$70,287	0.41 %	0.95 %	1.61 %
		Total	\$4,356,065	25.25 %	58.90 %	100.00 %
		Batman Action Figure	\$130,768	0.76 %	1.77 %	4.30 %
		Captain America Action Figure	\$499,715	2.90 %	6.76 %	16.44 %
Total	Total	GI Joe Action Figure	\$168,905	0.98 %	2.28 %	5.56 %
		Godzilla Action Figure	\$1,744,707	10.11 %	23.59 %	57.40 %
		Green Hulk Action Figure	\$82,764	0.48 %	1.12 %	2.72 %
		Red Hulk Alter Ego Action Figure	\$13,691	0.08 %	0.19 %	0.45 %
		Spiderman Action Figure	\$398,834	2.31 %	5.39 %	13.12 %
		Total	\$3,039,384	17.62 %	41.10 %	100.00 %
		Total	\$7,395,449	42.86 %	100.00 %	100.00 %

# Creating the Top 5 Products Report

- It starts with creating measure to rank products

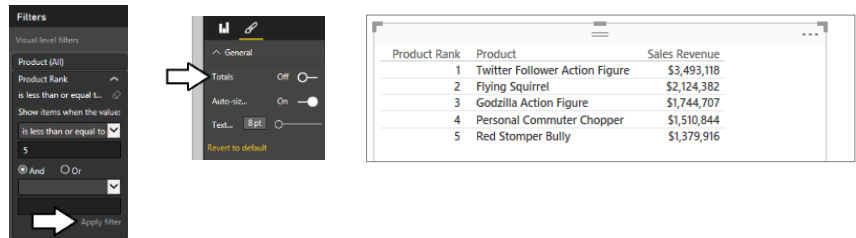
```
Product Rank =  
RANKX(  
    ALL(Products),  
    CALCULATE( SUM(Sales[SalesAmount]) )  
)
```

- Next, add **Product Rank** measure to table visual



## Next Steps

- Apply filter and remove Totals row

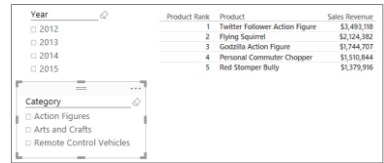


- Add slicer to make report interactive

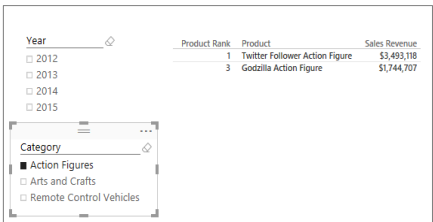


## There a Problem with Measure Filters

- Add a Slicer to filter on product category



- Top 5 products ranking measure is now broken



## Fixing the Problem

- Rewrite DAX using ALL function
  - Include columns which should not be filtered

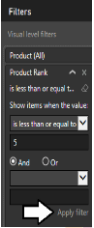
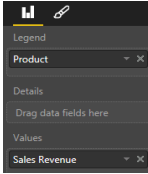
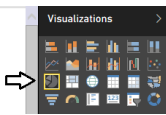
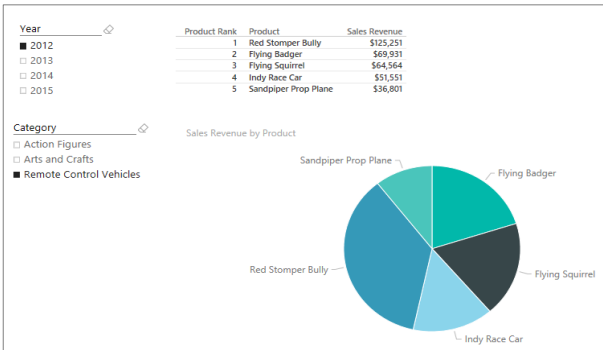
```
Product Rank =
IF(
    HASCONEVALUE(Products[Product]),
    RANKX(
        ALL( Products[Subcategory], Products[Product] ),
        CALCULATE(SUM(Sales[SalesAmount]) )
    )
)
```

- Top 5 products ranking now works as expected

Year	Product Rank	Product	Sales Revenue
2015	1	Flying Squirrel	\$2,124,382
2015	2	Personal Commuter Chopper	\$1,510,844
2015	3	Red Stomper Bully	\$1,379,916
2015	4	Flying Badger	\$889,732
2015	5	Indy Race Car	\$792,793

## Display Top 5 Products with Two Visuals

- Add pie chart
  - Filter by product rank



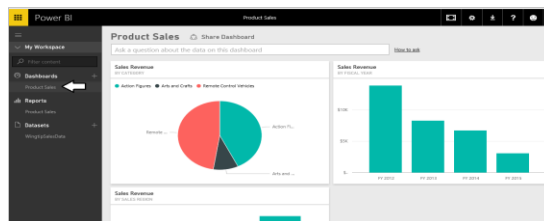
## Agenda

- ✓ Writing DAX Expressions for Reports
- Creating and Designing Dashboards
- Sharing Dashboards
- Deploying Dashboards using Content Packs
- Accessing Dashboards using Mobile Devices



## Dashboards in Power BI

- Dashboard is consolidated view of reports & datasets
  - Provides simpler, more intuitive entry point to reports and datasets
  - Simplicity and intuition key for users with tablets & mobile devices
- Dashboard represents unit of deployment and reuse
  - Dashboards can be deployed via dashboard sharing
  - Dashboards can be deployed using content packs
  - Dashboard represents security boundary to reports and datasets



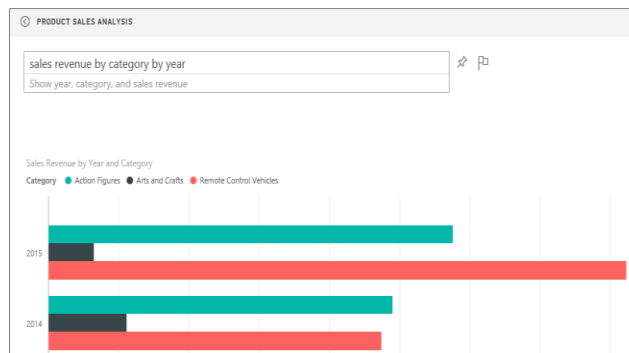
## Creating Dashboards

- Dashboard is a collection of tiles
  - Dashboard tiles can be created by pinning a visual from a report
  - Dashboard tiles can be created from Q&A search result
  - Each tile is snapshot of information from an underlying dataset
- Dashboard can be created two different ways
  - Click on (+) button in Dashboards section of navigation pane
  - Create new dashboard when pinning visual from report



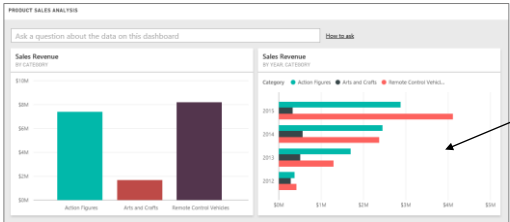
## The Q&A Search Box

- Used to execute natural language queries
  - Queries are executed against underlying dataset in workspace
  - Query results display using some type of Power BI visual
  - Power BI service selects visualization type based on result type



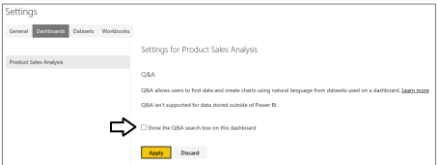
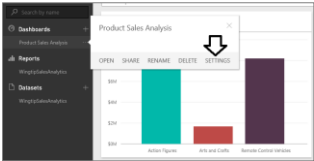
## Pinning Search Result to Dashboard

- Q&A search results can be pinned to dashboard
- Allows users to easily save visuals from query results



This tile was created from a visual on a report

## Removing the Q&A Search Box

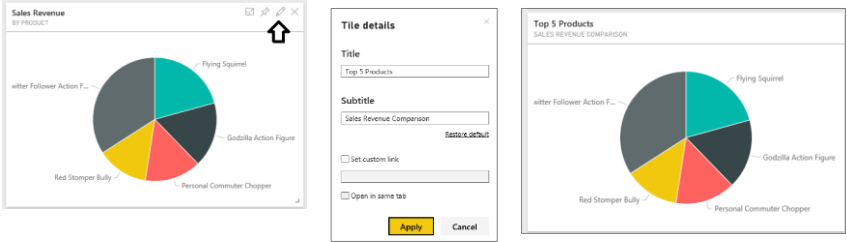


# Modifying Tile Details

- You can customize Title and Subtitle of tile
  - Default title and subtitle doesn't always provide enough clarity



- Click on Edit title edit icon button





## Agenda

- ✓ Writing DAX Expressions for Reports
- ✓ Creating Dashboards
- Sharing Dashboards
  - Deploying Dashboards using Content Packs
  - Accessing Dashboards using Mobile Devices

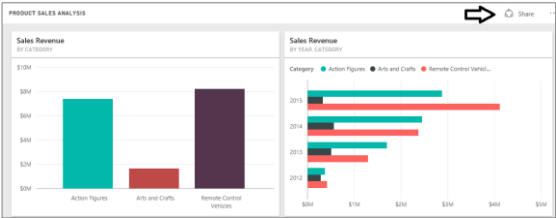


## Sharing Dashboards

- There are two types of Power BI workspaces
  - Personal workspaces
  - Group Workspaces
- To deploy reports and dashboards from a personal workspace
  - Create one or more reports in your personal workspace
  - Create a dashboard and pin report tiles to it
  - Share dashboard with other users
  - Dashboard sharing involves accepting invitation
  - Dashboard owner can see who has accepted invitation
- Deploying reports and dashboards from group workspace
  - Group workspace created using Unified Group in Office 365 tenant
  - Allows team of authors to work on a single BI project
  - Users can be added with authoring permission or read-only permissions



# Sharing a Dashboard



Share dashboard

Not shared with anyone

Invite Shared with

Andy Enduser X

Recipients will have access to the same data and reports as you have in this dashboard. [Learn more](#)

☒ Allow recipients to share your dashboard

☒ Send email notification to recipients

Share

# Viewing the Shared With List

Power BI Product Sales

Share Dashboard

Not shared with anyone

Invite Shared With

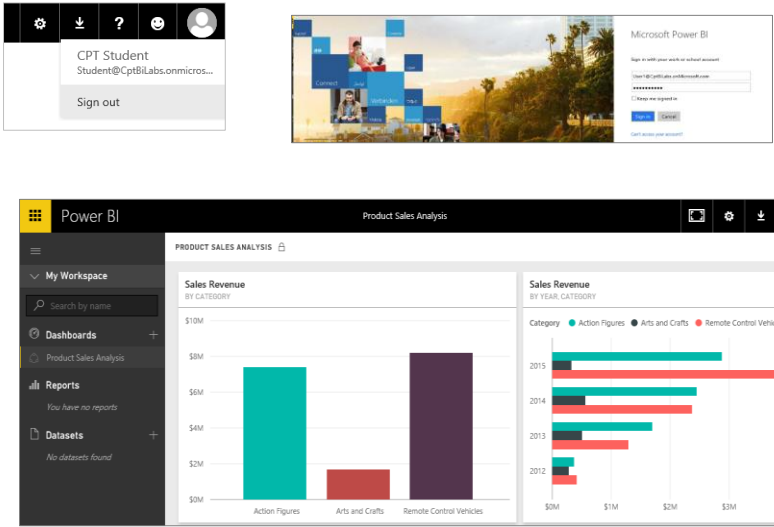
Share Link

<https://app.powerbi.com/groups/me/dashboards/ce0d0baa-be27-4f0c-9996-14b86392bbfc>

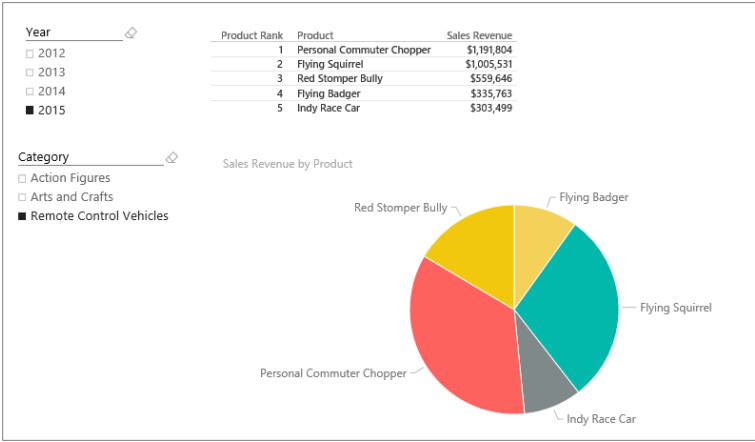
This dashboard has been shared with:

	Owner
CPT Student	
User1@CptBilabs.onmicrosoft.com	Cancel Invite

# Testing the Dashboard as a Consumer



# Drilling Down Into Reports



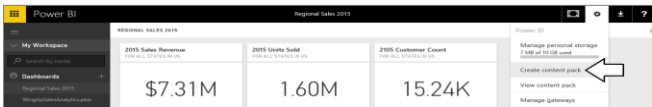


## Agenda

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# Creating a Content Pack



Create content pack

Choose who will have access to this content pack:

☐ Specific groups ☒ My entire organization

Title

Regional Sales 2015

Description

This is my first content pack, with 3 measures.



Upload an image or company logo

Image size: 45 KB or less, 4:3 aspect ratio, JPG or PNG format

[Use default](#)

Select items to publish

Dashboards

☐ WingtipSalesAnalytics.p...

☒ Regional Sales 2015

Reports

☒ Regional Sales 2015

☐ WingtipSalesAnalytics

Datasets

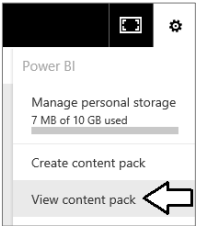
☒ WingtipSalesAnalytics

The content pack will be available in your organization's content gallery. [Learn more](#)

**Publish** Cancel

# Viewing and Managing Content Packs

- You can view existing content packs

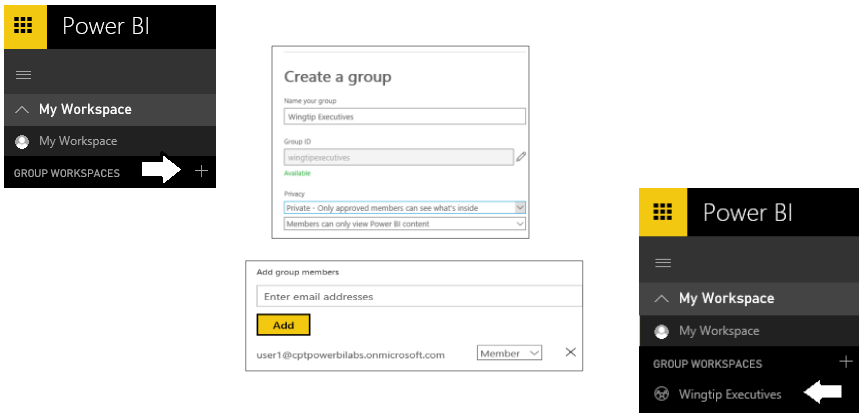


- You can delete a content pack or edit its properties

Name	Published To	Date published	Actions
Regional Sales 2015	My Organization	Dec 02, 2015	<a href="#">Edit</a>   <a href="#">Delete</a>

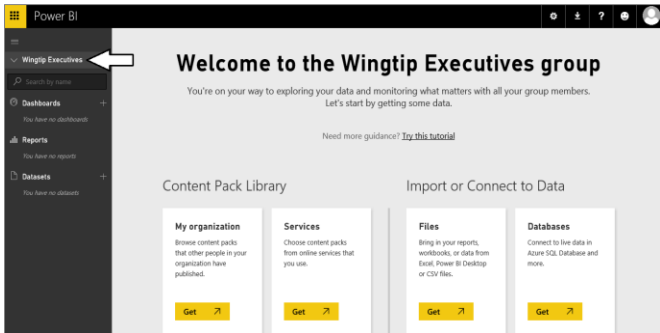
## Creating a Group Workspace

- Group Workspace can be created in Power BI service
  - This action created Office 365 unified group behind the scenes
  - Allow for shared authoring scenarios

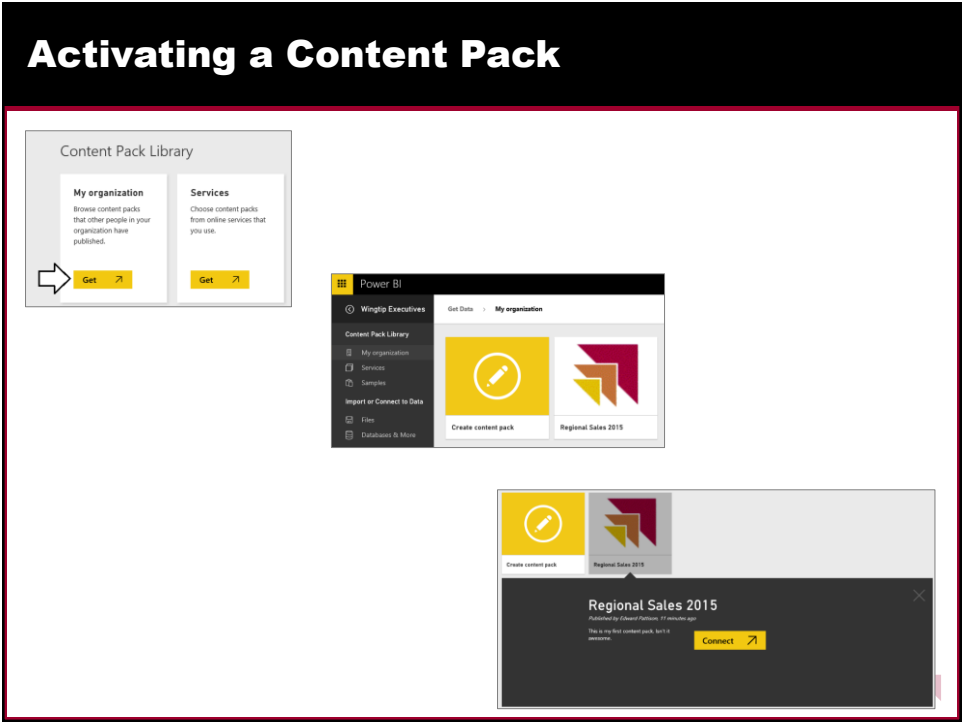


## Switching Over to the Group Workspace

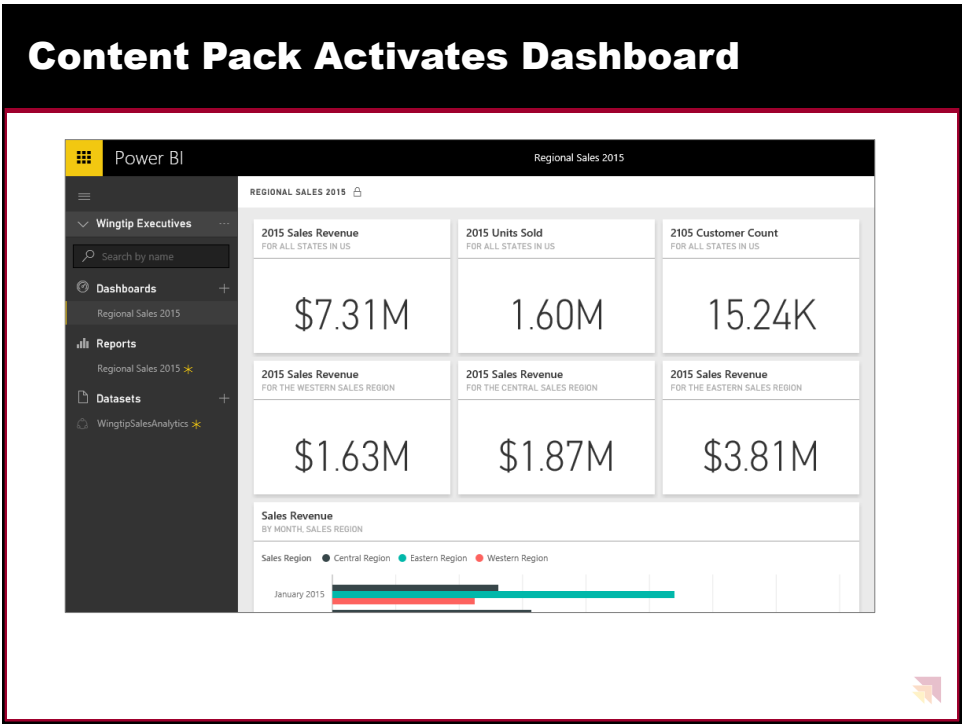
- Group workspace has its own collections
  - Dashboards
  - Reports
  - Datasets



# Activating a Content Pack



# Content Pack Activates Dashboard





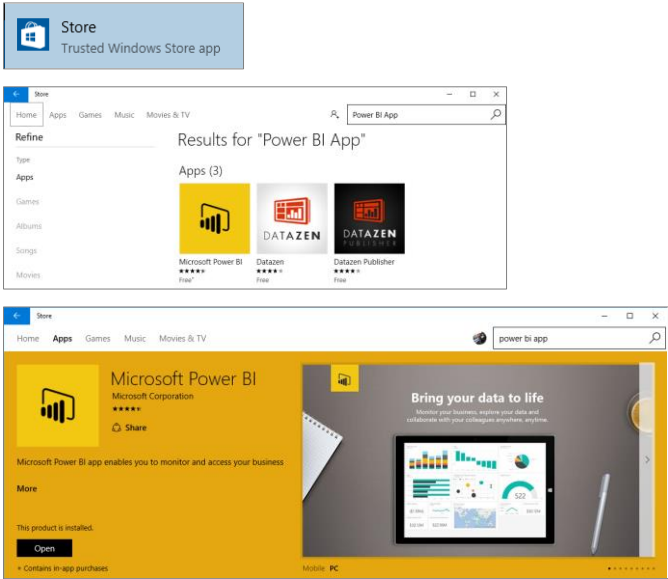
## Agenda

- ✓ Writing DAX Expressions for Reports
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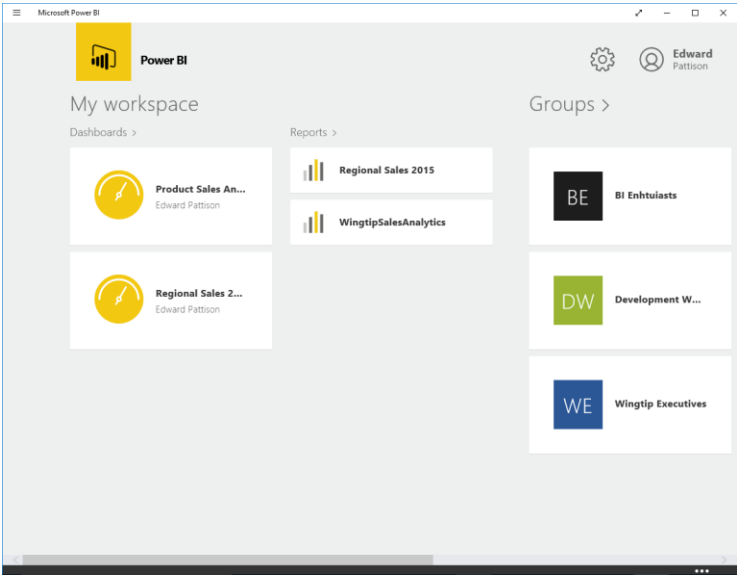




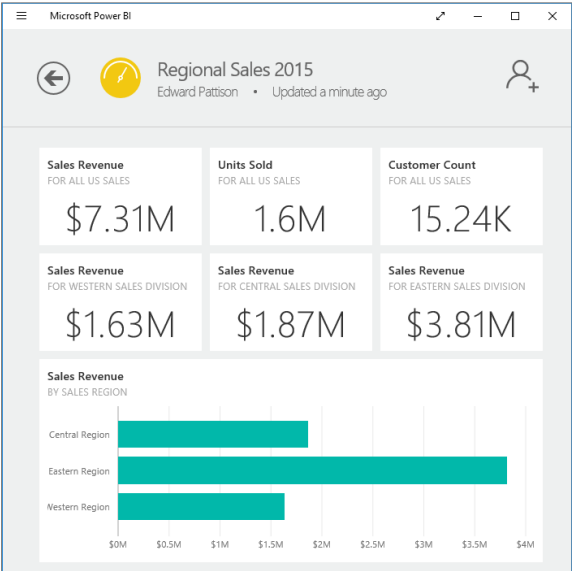
# Discovering and Installing the Power BI App



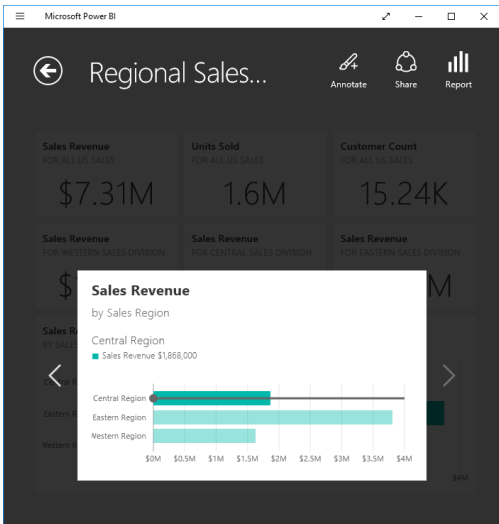
# Launching the Power BI App

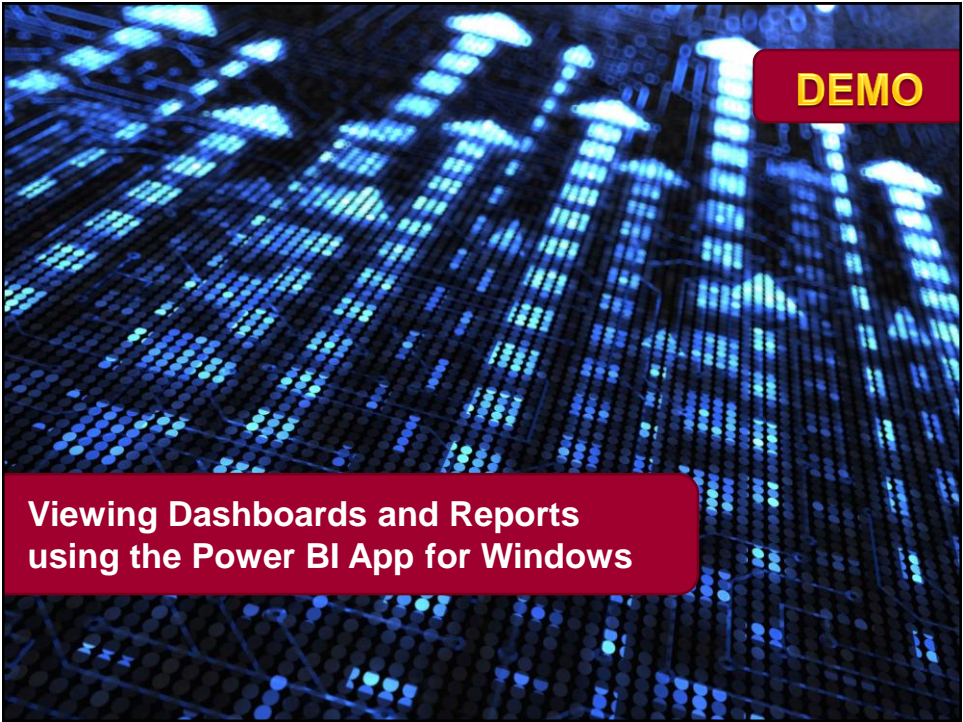
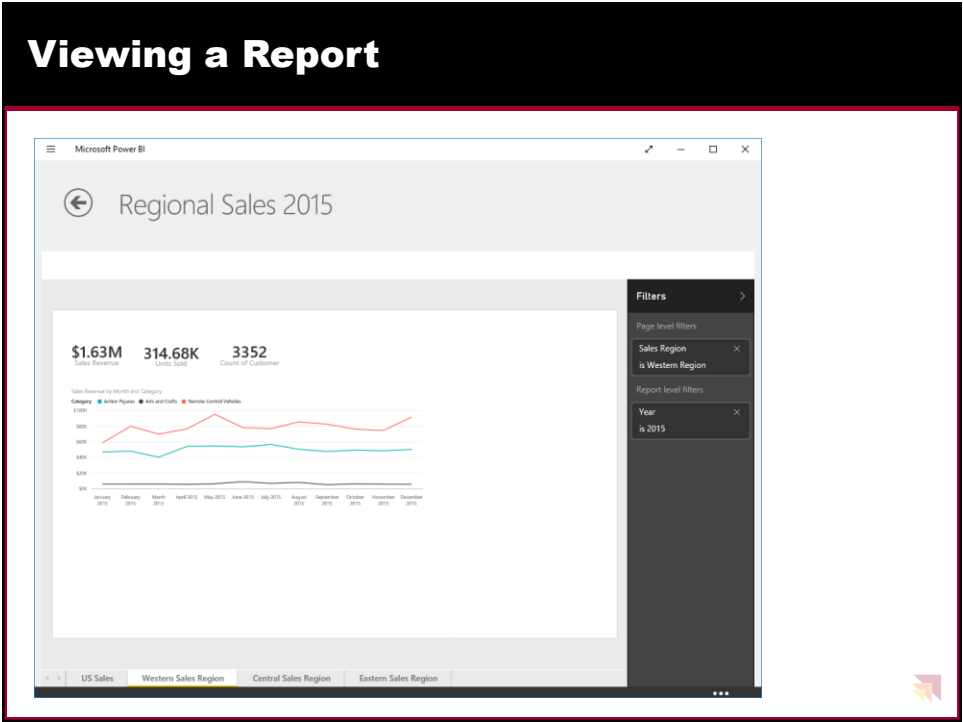


# Viewing a Dashboard



# Drilling Down on a Tile





## Summary

- ✓ Writing DAX Expressions for Reports
- ✓ Creating Dashboards
- ✓ Sharing Dashboards
- ✓ Deploying Dashboards using Content Packs
- ✓ Accessing Dashboards using Mobile Devices



## More Power BI Training from Critical Path Training

- **PBI365 - Data Analytics and Reporting with Power BI and Office 365**
  - Three-day Instructor-led training course with hands-on lab exercises
  - Attend this course in person in London or Tampa or attend remotely

### Upcoming Offerings

Date	Location	Instructor
Feb-17	London, UK	Ted Pattison
Mar-7	Tampa, FL	Ted Pattison

Module 01: Introduction to the Power BI Platform
Module 02: Getting Started with Power BI Desktop
Module 03: Extracting and Shaping Data using Power Query
Module 04: Modeling Data for Analytics using Power Pivot
Module 05: Extending Datasets to Support Time Intelligence
Module 06: Creating Dashboards and Reports in Power BI
Module 07: Creating Dashboards for Mobile Devices
Module 08: Creating and Deploying Power BI Content Packs
Module 09: Leveraging the New BI Features in Excel 2016
Module 10: Creating BI Solution using Excel Online

- Check out <https://www.criticalpathtraining.com> for more info
- Email [info@criticalpathtraining.com](mailto:info@criticalpathtraining.com) if you have questions

