

Developer Introduction to Power BI



Course Prerequisites

- The workshop assumes attendees are comfortable with...
 - Working with the Power BI platform
 - Creating PBIX projects with Power BI Desktop
 - Developing with Visual Studio, C# and ASP.NET MVC
 - Programming with JavaScript and/or TypeScript
 - Programming against APIs based on REST and ODATA
- The course assumes attendees are new to...
 - Developing with Microsoft Azure in the new Azure portal
 - Developing with Node.js, npm and Visual Studio Code
 - The new Power BI App Model and developing in App Workspaces



Agenda

- Introduction to Power BI
- Creating PBIX Projects with Power BI Desktop
- Developer Opportunities in Power BI
- Developing for Power BI Embedded
- Creating a Power BI Development Environment



Student Introductions

- Basic Info
 - What's your name?
 - Where do you work? (optional)
 - How long have you been a developer?
- List skills with which you already feel comfortable
 - Working with the Power BI platform
 - Creating PBIX projects with Power BI Desktop
 - Programming with JavaScript and/or TypeScript
 - Working with the R platform
 - Developing with C# and ASP.NET MVC
 - Programming against REST and ODATA web APIs
 - Developing with Microsoft Azure



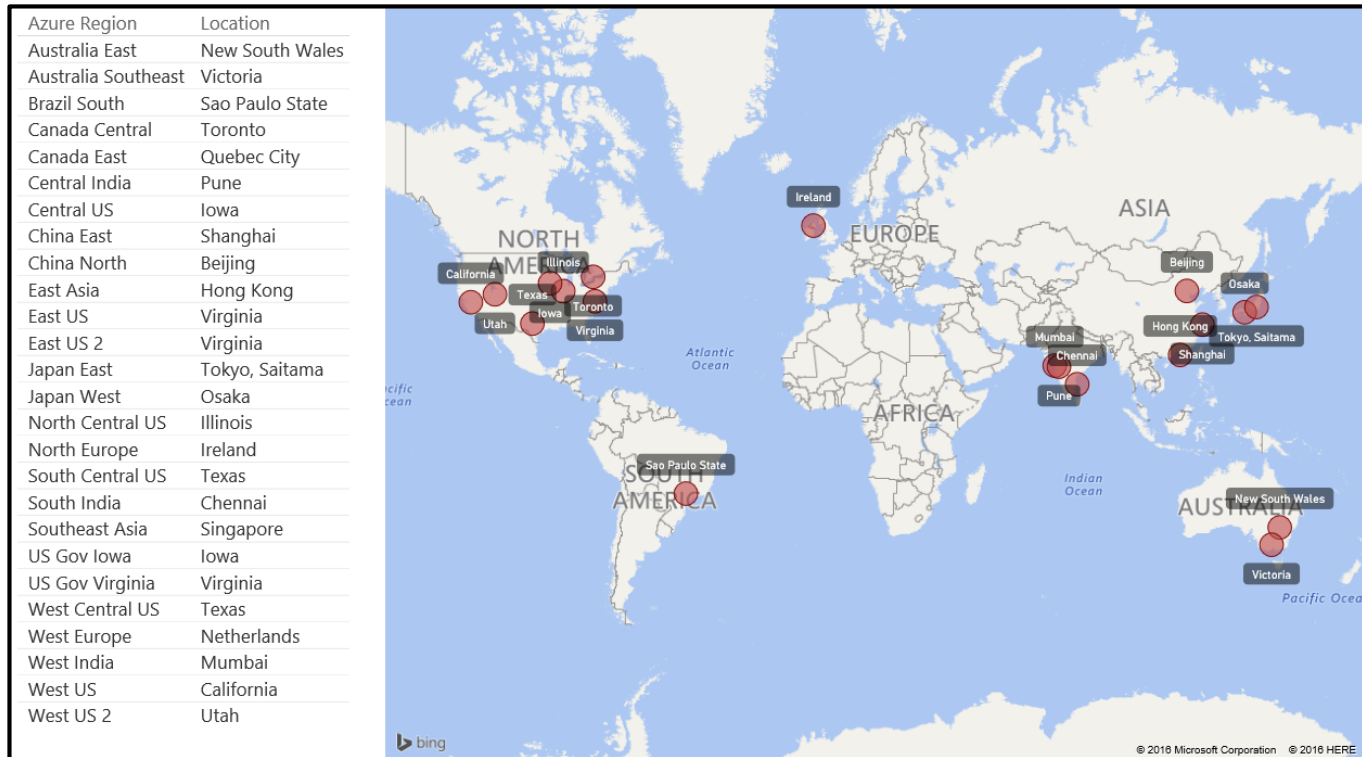
What is Power BI?

- What is Power BI?
 - Cloud-based subscription service
 - Environment which promotes self-service BI *to the end user*
 - BI Platform to assists with data import, analysis and visualization
- Power BI benefits from being a cloud-based service
 - It takes only 5 seconds to subscribe to the Power BI service
 - New users can create something significant in 5 minutes or less



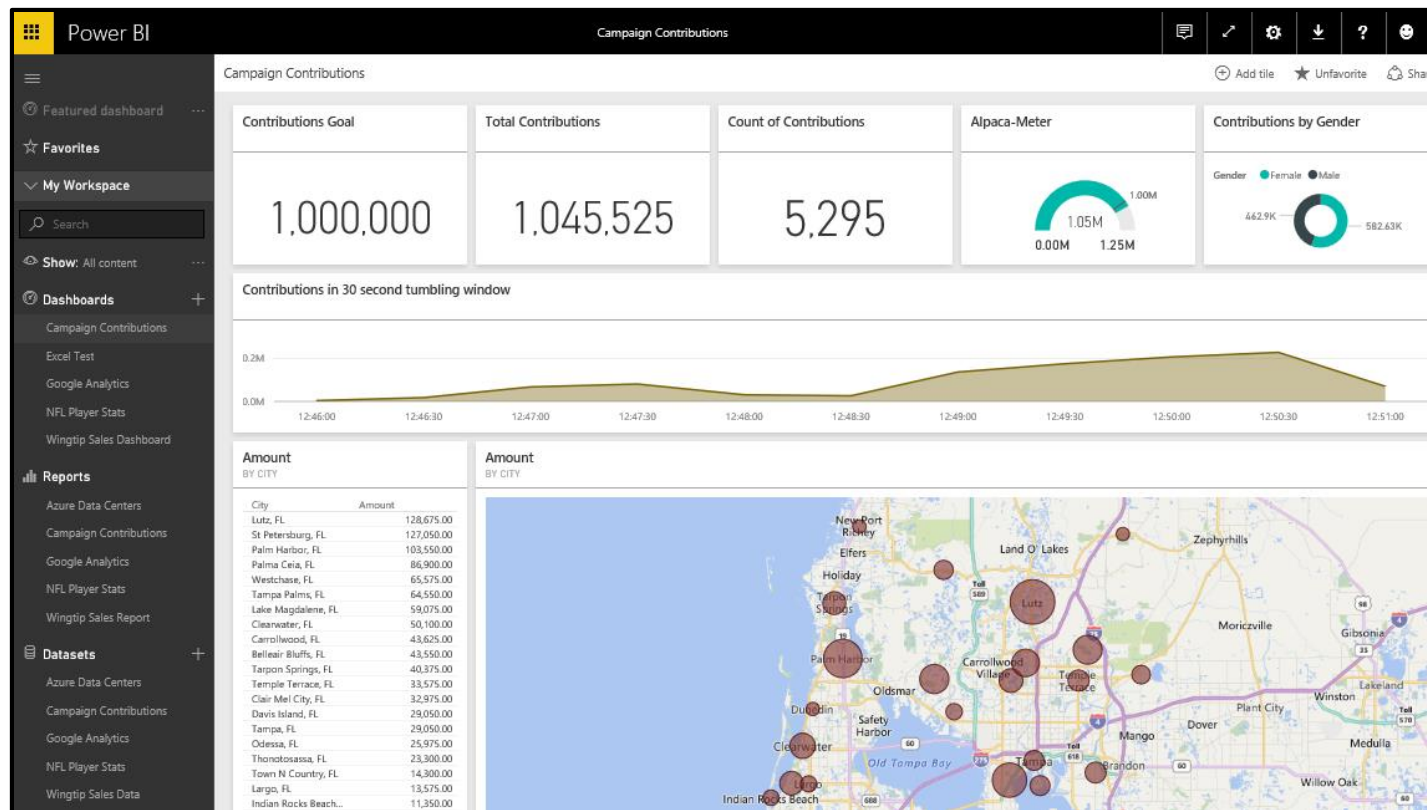
Power BI Benefits from Microsoft Azure

- Power BI is built on top of Microsoft Azure
 - Power BI solutions can be scaled as required
 - Power BI solutions have global reach



The Power BI Service

- The Power BI Service
 - Provides cloud-based foundation for Power BI platform
 - Accessible through browser at <https://app.powerbi.com>



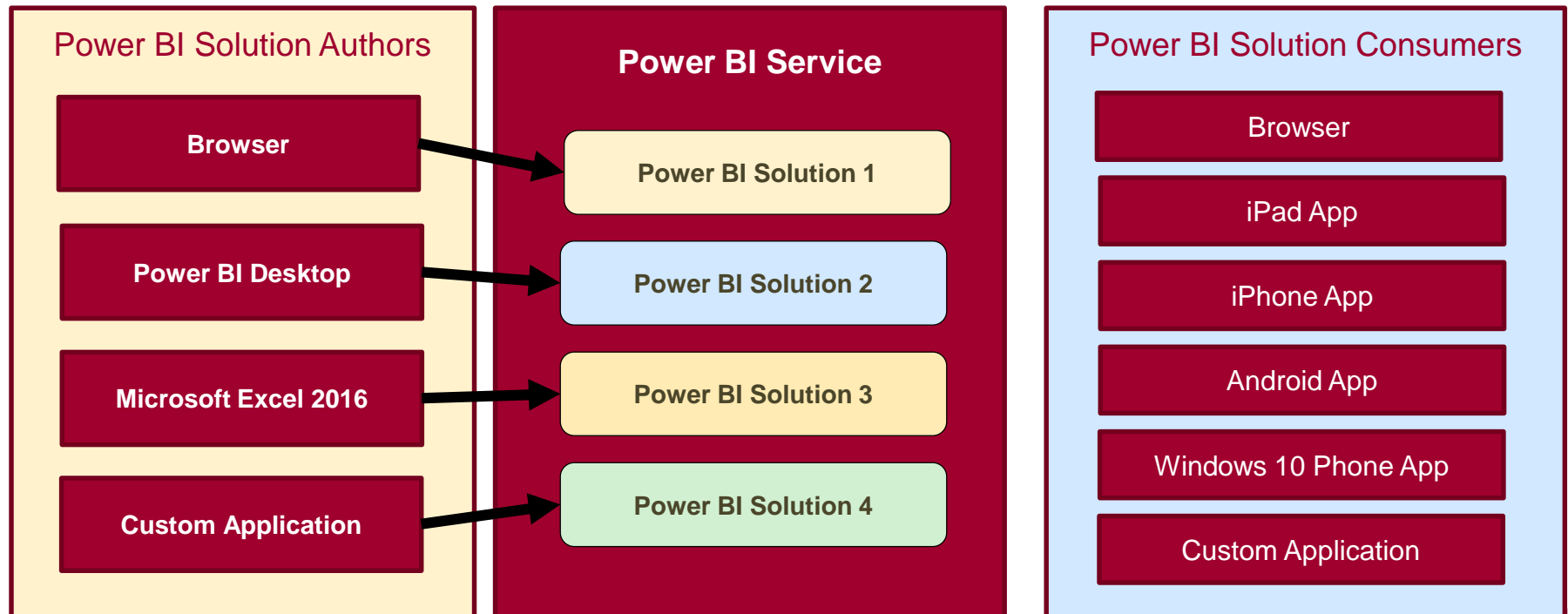
Power BI Licensing

- Microsoft initially offered two Power BI licensing options
 - Power BI Free license
 - Power BI Pro license (\$10/month)
 - Everything has been running within a shared capacity
- Microsoft recently introduced Power BI Premium licensing
 - Power BI Premium customers can create dedicated capacities
 - Power BI Premium licensing has monthly fee for dedicated capacity
 - Dedicated capacity remove limits on upload size and # of refreshes
 - Dedicated capacity can serve Power BI content to non-licensed users
- More info at <https://powerbi.microsoft.com/en-us/pricing/>
 - Please ask questions about licensing offline and not during lectures

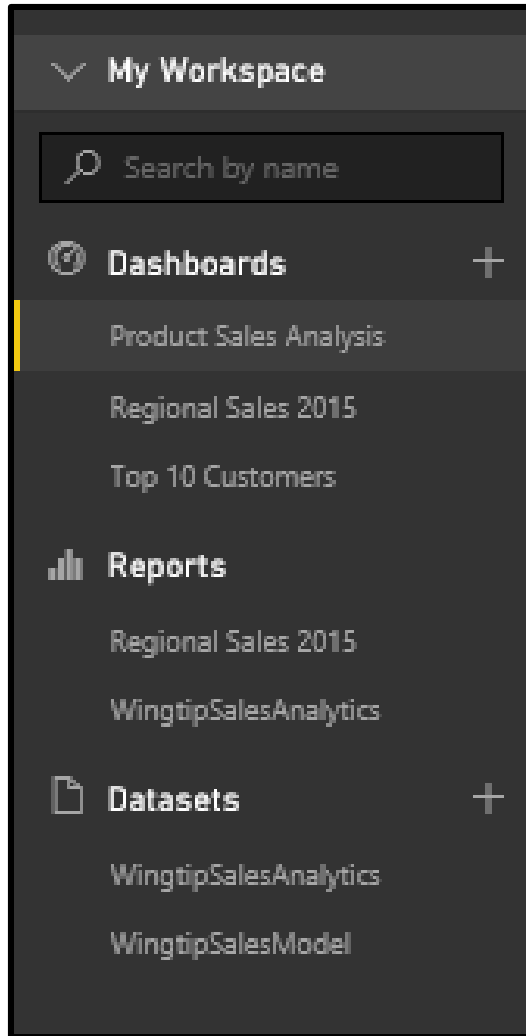


Power BI Service Architecture

- Power BI support for authors and consumers
 - BI solution authors have a choice in authoring tools
 - BI solutions consumers can use wide range of devices



Central Power BI Concepts

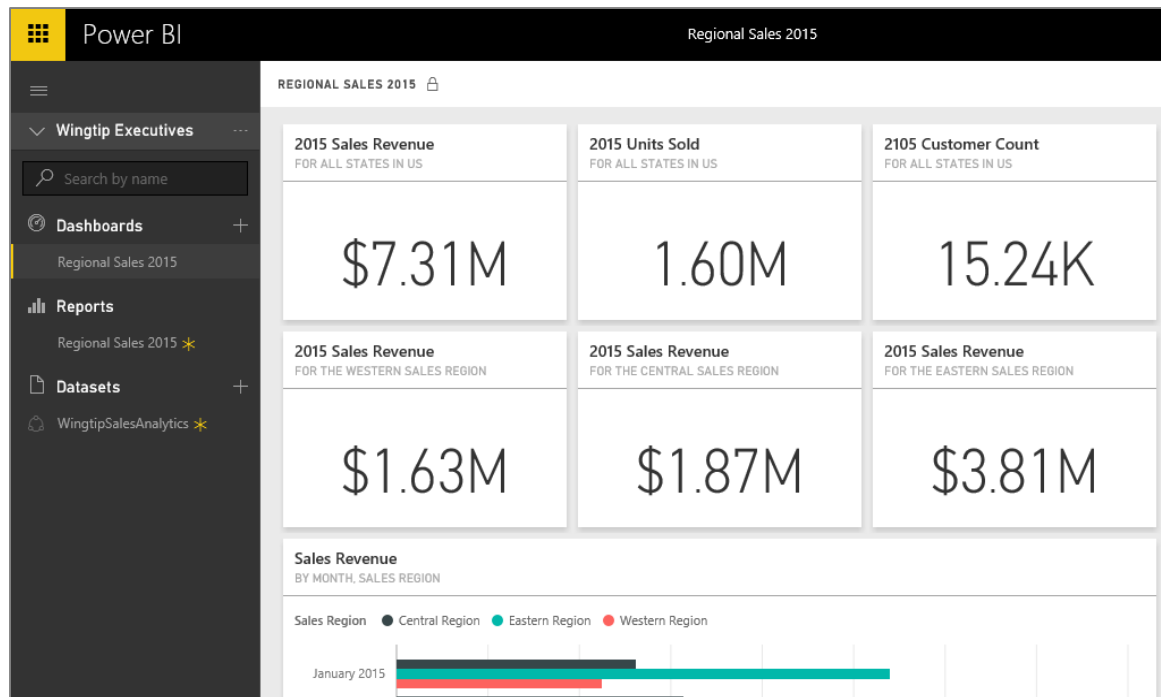


- **Workspace**
 - Provides user context and asset container
 - Every user has personal workspace
 - Team development requires group workspaces
- **Dashboard**
 - Consolidated view into reports and datasets
 - Custom solution entry point for mobile users
- **Report**
 - Collection of pages with tables & visualizations
 - Provides interactive control of filtering
- **Dataset**
 - Data model containing one or more tables
 - Can be very simple or very complex



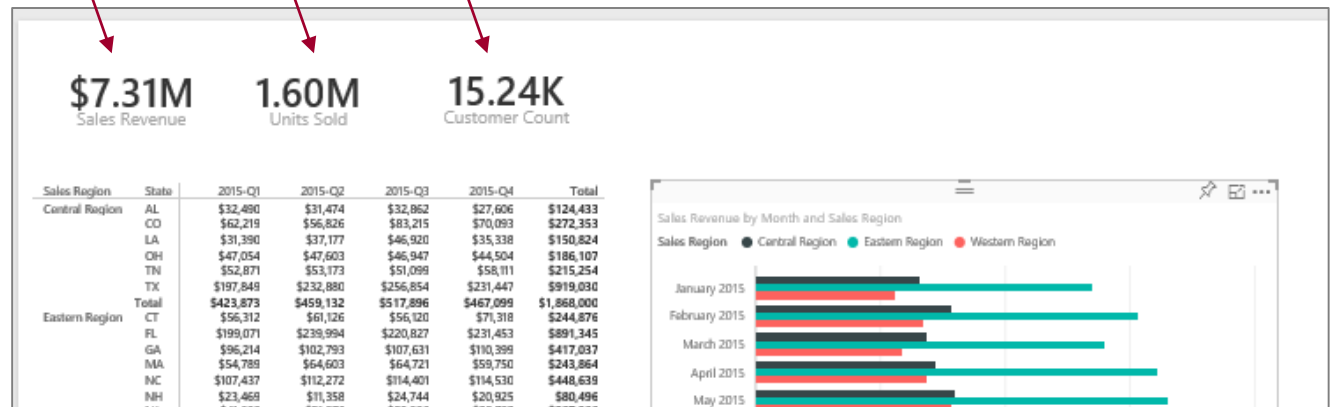
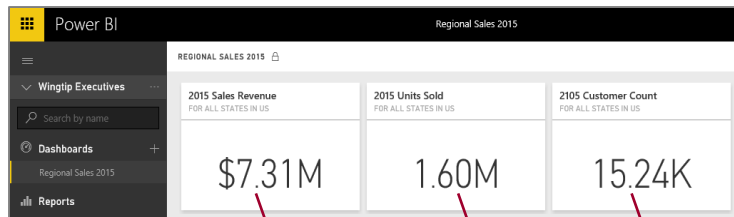
Dashboards and Tiles

- 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



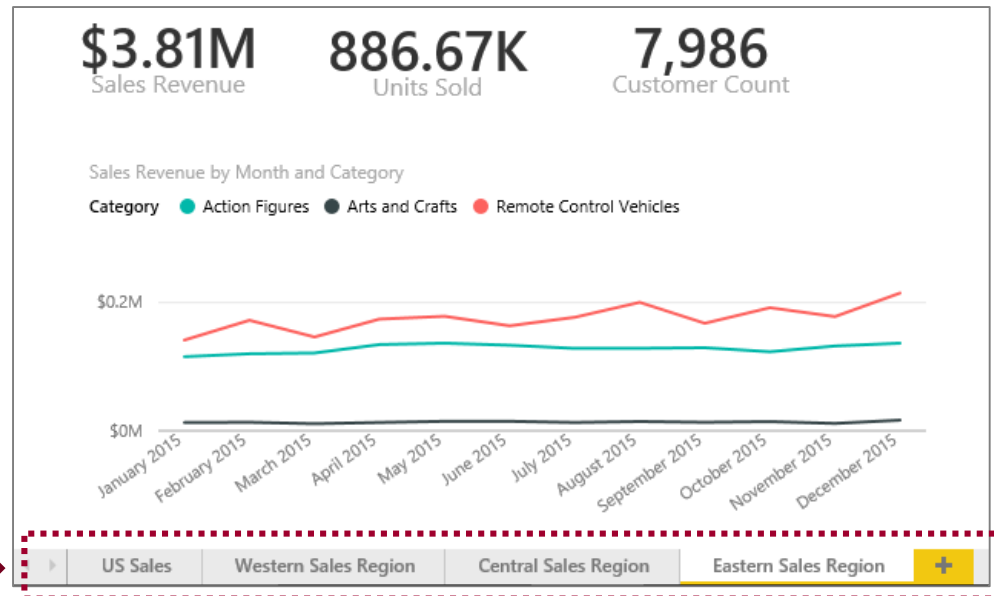
Dashboards and Reports

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



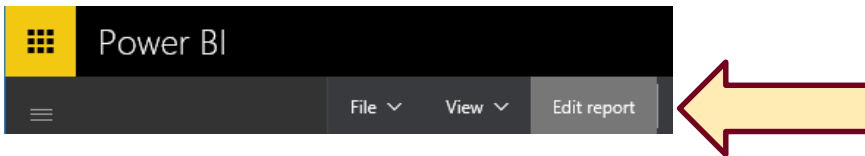
Reports and Pages

- 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
 - Each report is associated with exactly one dataset

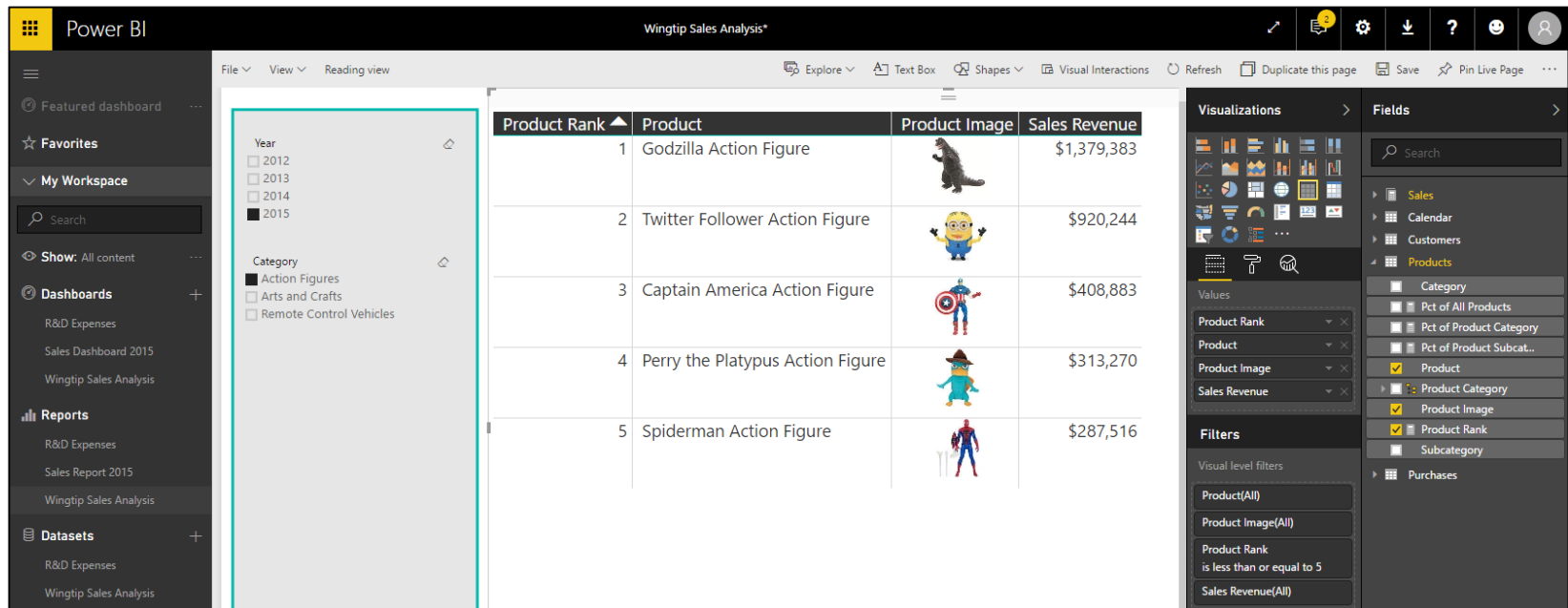







Report Authoring

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



- Report design tools appear on right side of page

A screenshot of the Power BI report authoring interface. The main area displays a table of product sales data. On the left, there is a sidebar with filters for 'Year' (2012, 2013, 2014, 2015) and 'Category' (Action Figures, Arts and Crafts, Remote Control Vehicles). On the right, there is a 'Visualizations' pane with various chart types and a 'Fields' pane with a search bar and a list of fields. The table data is as follows:

Product Rank	Product	Product Image	Sales Revenue
1	Godzilla Action Figure		\$1,379,383
2	Twitter Follower Action Figure		\$920,244
3	Captain America Action Figure		\$408,883
4	Perry the Platypus Action Figure		\$313,270
5	Spiderman Action Figure		\$287,516

Visuals (aka Visualizations)

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

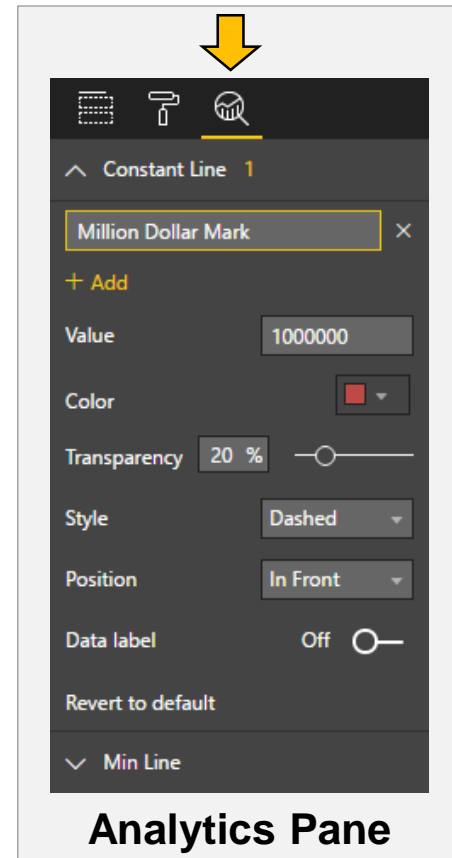
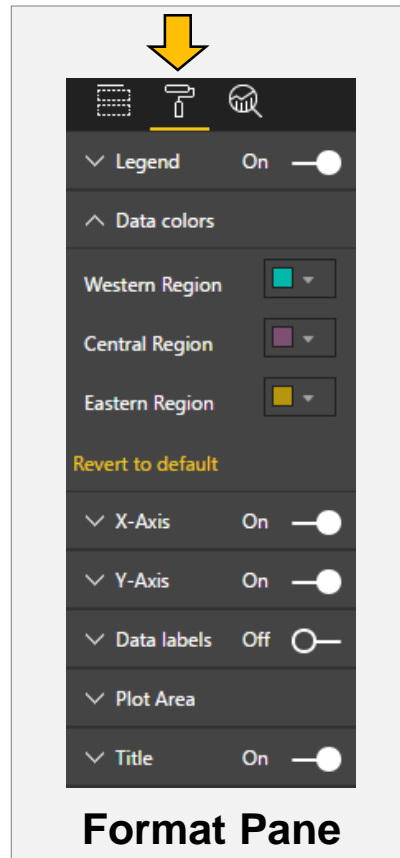
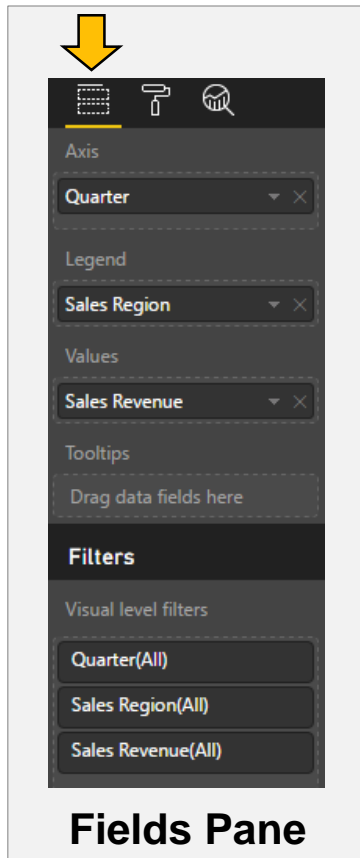


- Visuals creating by using fields from tables inside **Fields** list



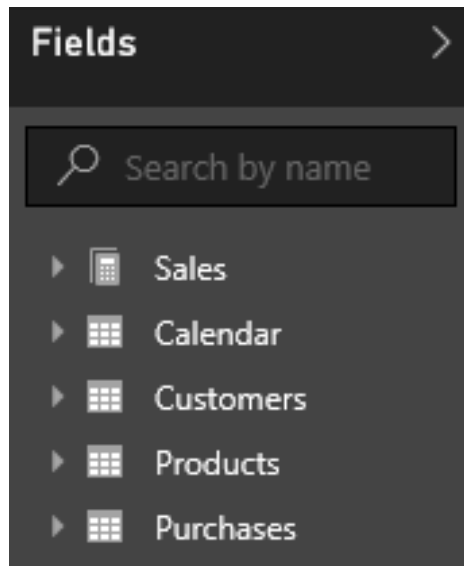
Editing Visual Properties

- Visual properties modified using three property panes
 - Visual properties vary greatly depending on type of visualization



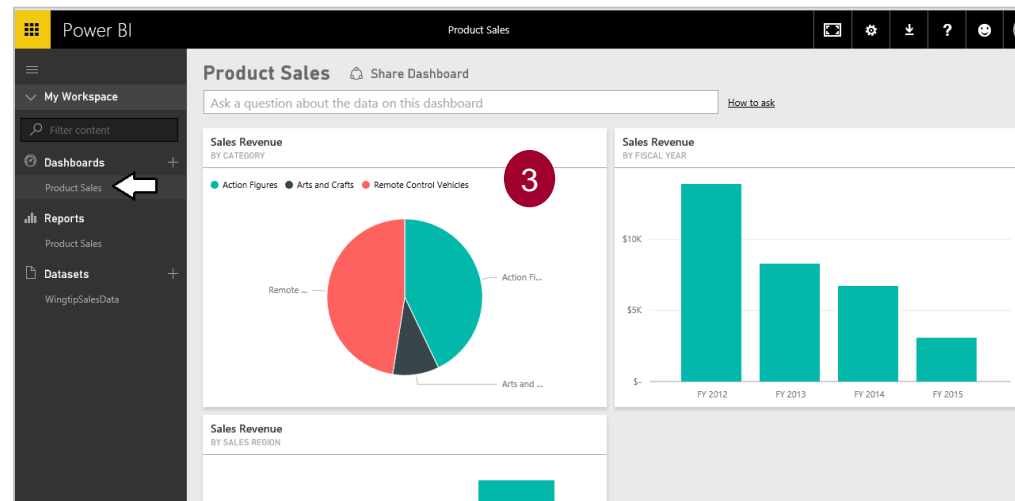
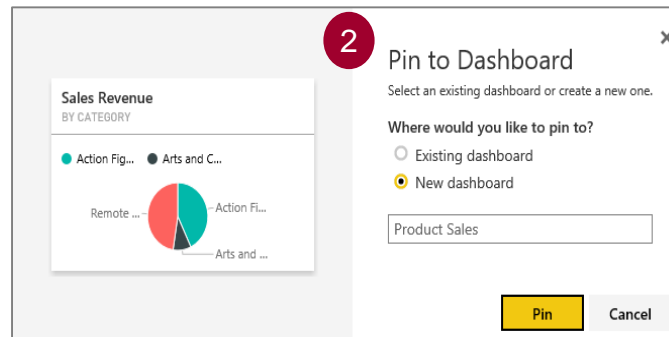
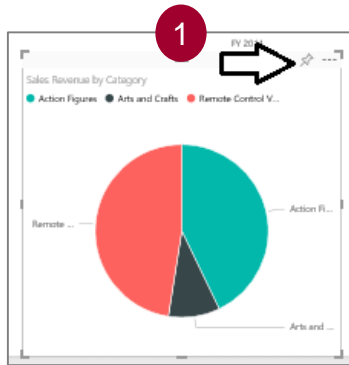
Report and Datasets

- 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



Creating Dashboards

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





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Getting started with Datasets, Reports and Dashboards

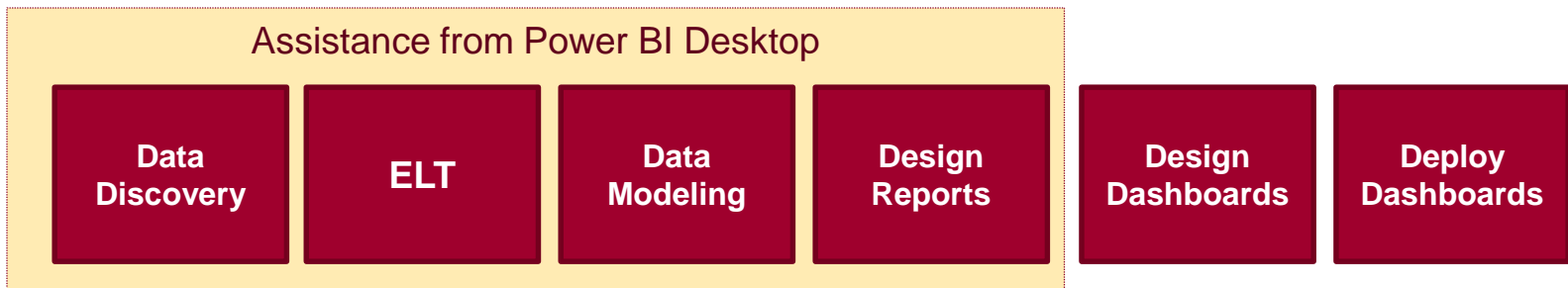
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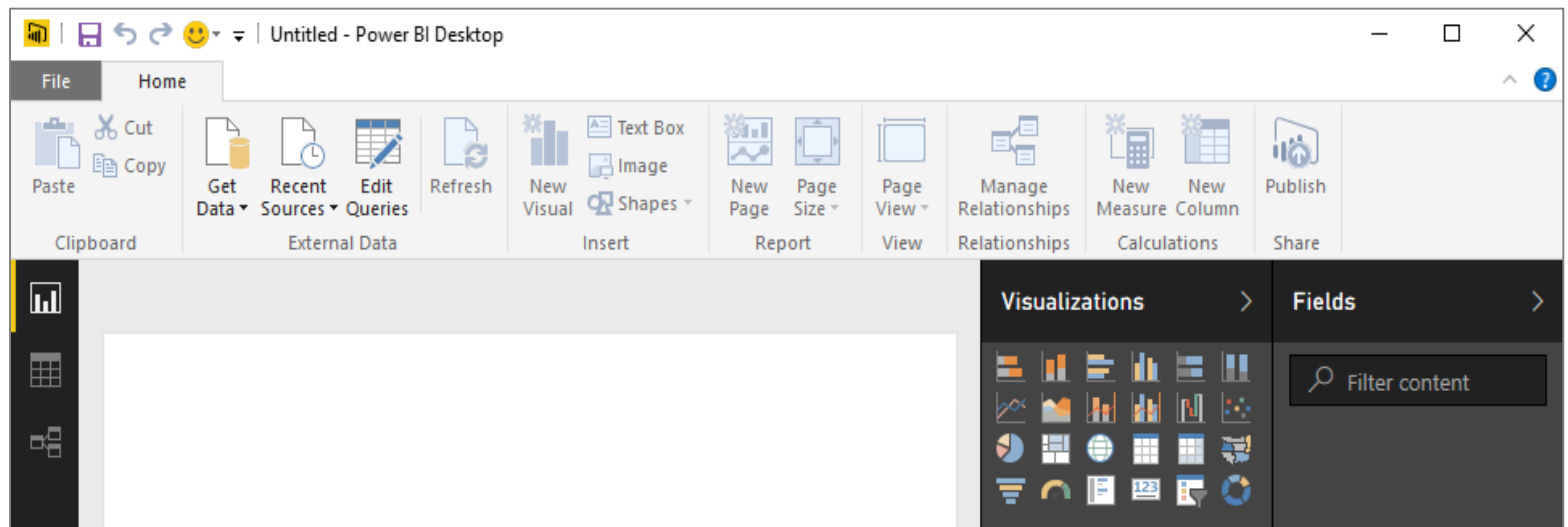
Working with Power BI Desktop

- Power BI Desktop focuses on first four phases
 - Query features for Data Discovery
 - Query features for ETL
 - Design features and DAX language for data modeling
 - Report design using a visual report designer
 - No support for designing dashboards
 - No support for packaging an entire solution



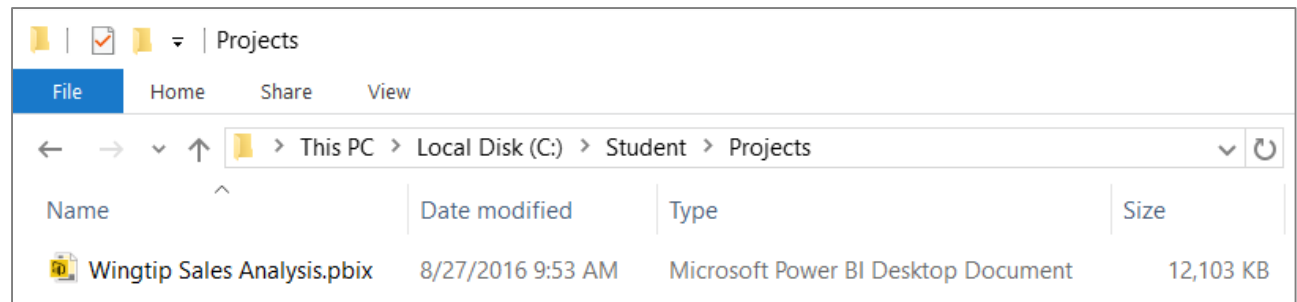
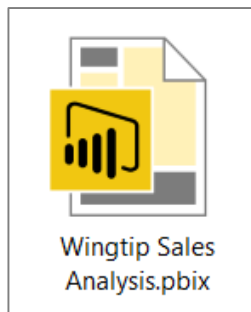
Working with Power BI Desktop

- Power BI Desktop is a Windows application
 - Work is saved and published in terms of projects
 - You can work on multiple projects at once
 - Each project runs in its own Power BI Desktop instance
 - Power BI Desktop can freeze up or act buggy
 - Quit & restart Power BI Desktop if it acts strangely



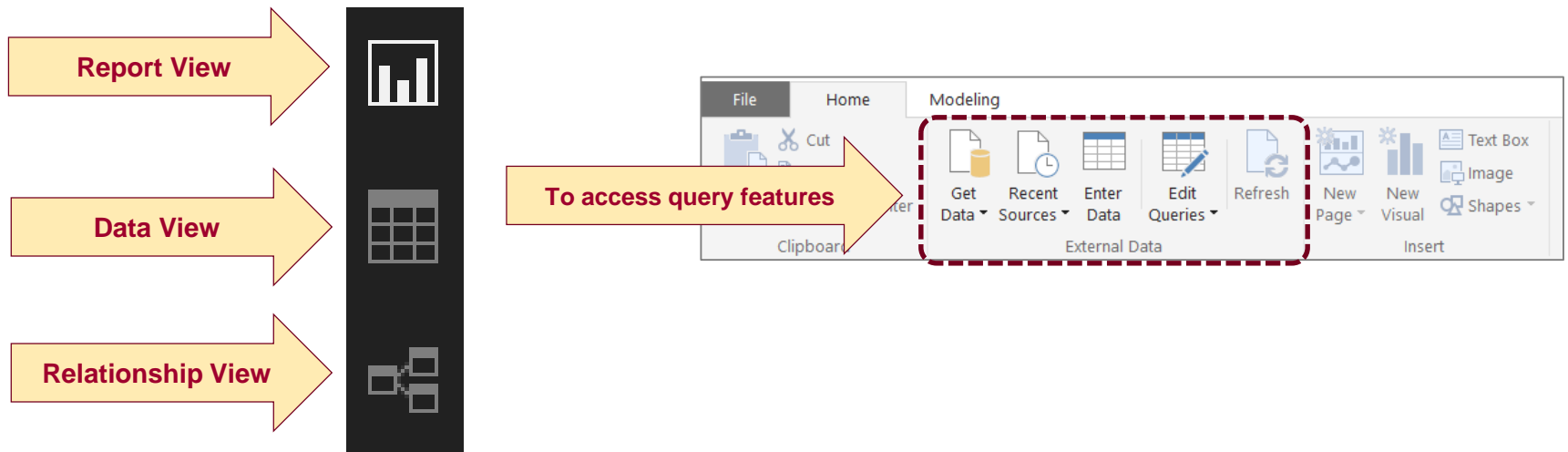
Projects and PBIX Files

- Power BI Desktop projects saved using PBIX files
 - PBIX file contains data source definitions
 - PBIX file contains query definitions
 - PBIX file contains data imported from queries
 - PBIX file contains exactly one data model definition
 - PBIX file contains exactly one report
 - PBIX file never contains data source credentials



Getting Around in Power BI Desktop

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





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Getting Up and Running with Power BI Desktop

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Developer Opportunities in Power BI

1. Developing Custom Visuals
2. Writing and Integrating Code Written in R
3. Programming the Power BI REST API
4. Embedding Power BI Reports in Websites
5. Developing Solutions using Power BI Embedded
6. **NEW:** Creating Custom Data Connectors



Developing Custom Visuals

- What is involved?
 - Learning to program in TypeScript instead of JavaScript
 - Learning to use graphics libraries such as D3.js
 - Getting up to speed on the cross-platform toolchain
 - Creating and debugging custom visuals using Node.js
 - Packaging custom visuals for distribution



What is R?

- What is R?
 - Platform for statistics, data analysis and visualization
 - Free, cross-platform, open source software
 - Programming language + Runtime layer + Libraries
 - R code distributed and versioned using packages
 - Flourishing ecosystem of R package authors
- Why do you need it?
 - Analyzing data and generating statistics
 - Creating rich graphs and charts
 - Fitting statistical models for predictive analysis



Writing and Testing R Code in Scripts

```
01_GettingStarted.R ×
← → |   ☐ Source on Save |   
1 # use <- for variable assignment
2 message <- "Hello world"
3
4 print(message)
5
6 # create vector using the c function
7 vector1 <- c(2, 4, 6, 8)
8
9 # create vectors using sequence
10 vector2 <- 1:10
11 vector3 = letters[1:5]
12 vector4 = LETTERS[24:26]
13 vector6 = 2^(1:8)
14
15 # create vector with election years
16 election.years <- seq(from = 1996, to = 2016, by = 4)
17
18 # enumerate through election years using for loop
19 for (year in election.years){
20   print(paste(year, "is an election year"))
21 }
22
23 # remove all objects from workspace
24 rm(list=objects())
```



Where Can You Use R Code in PBIDT?

- As a data source to a query
 - You can use R code to import and reshape data
- Within a Query Applied Step
 - You can use R code to add transforms to a query
- Inside an R Visual in a Power BI Report
 - You can use R code to creates charts from your data



Developing with the Power BI REST API

- Used to develop web and desktop applications
 - Requires registering app with Azure Active Directory
- What can you do with the Power BI REST API?
 - Upload PBIX files and configure data sources
 - Embed PBI reports and dashboard tiles into web apps
 - Create streaming dataset for real-time dashboards



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What is Power BI Embedded?

- Power BI Embedded is an Azure Service
 - PBI Embedded service can be provisioned on-demand
 - Service provisioned in terms of workspace collections
 - PBI Embedded service requires an Azure subscription
- What is the core value of Power BI Embedded?
 - It eliminates need for Power BI license for each user
 - It eliminates need for Office 365 account for each user
 - It decouples user security from app security
 - It opens up PBI platform to commercial applications



PowerBI.com versus Power BI Embedded

PowerBI.com

- Accessed via <https://app.powerbi.com>
- Requires Office 365 accounts
- Requires Power BI License
- Custom development not required
- Azure subscription not required

Power BI Embedded

- Accessed via custom URL
- No Office 365 accounts required
- No Power BI user licenses required
- Requires custom development
- Requires Azure subscription



The Big Picture for Power BI Embedded

1. Create > Design > Test a PBIX project file on local PC
 - Done using Power BI Desktop
 - Note that Power BI Desktop only runs on Windows
2. Provision Azure resources for Power BI Embedded
 - Create a Power BI workspace collection
 - Create Power BI workspaces
3. Upload PBIX file to Power BI Embedded workspace
 - Use PowerShell, Power BI CLI or Azure REST API
4. Develop Web App with Embedded Power BI Reports
 - Most easily accomplished using ASP.NET MVC



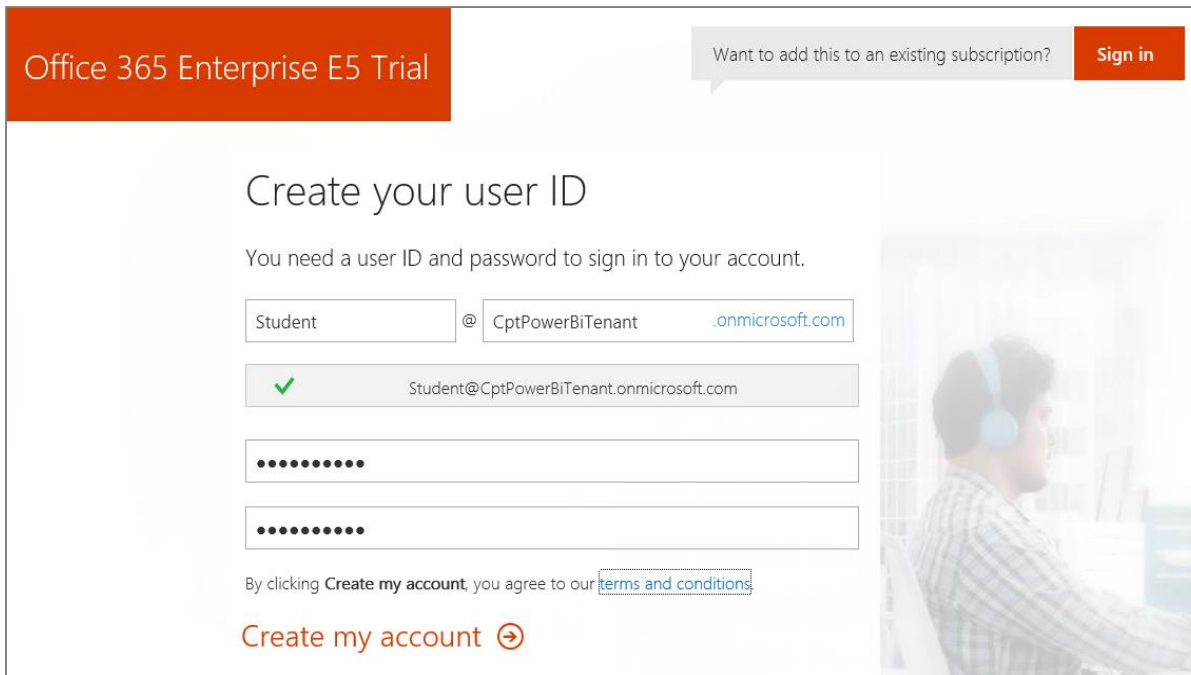
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Creating a Power BI Dev Environment

- Sign up for an Office 365 Enterprise E5 trial account
 - Creates a new Office 365 tenant
 - Creates an account which is tenant administrator
 - You can create 25 user accounts for testing purposes
 - You can create and test Office 365 unified groups



The screenshot shows the 'Office 365 Enterprise E5 Trial' sign-up page. At the top left, there is an orange banner with the text 'Office 365 Enterprise E5 Trial'. To the right of this banner, there is a grey box with the text 'Want to add this to an existing subscription?' and an orange 'Sign in' button. The main heading is 'Create your user ID'. Below this, it says 'You need a user ID and password to sign in to your account.' There are two input fields: the first contains 'Student' and the second contains 'CptPowerBiTenant.onmicrosoft.com'. Below these fields is a green checkmark icon and the text 'Student@CptPowerBiTenant.onmicrosoft.com'. There are two more input fields, both containing dots, representing password fields. At the bottom, it says 'By clicking Create my account, you agree to our [terms and conditions](#)'. Below this is an orange 'Create my account' button with a right arrow icon. On the right side of the page, there is a blurred image of a person wearing a headset and working at a computer.



Office 365 admin center

- Chores to accomplish in Office 365 admin center
 - Learn how to add secondary user accounts for testing
 - Learn how to view and manage groups

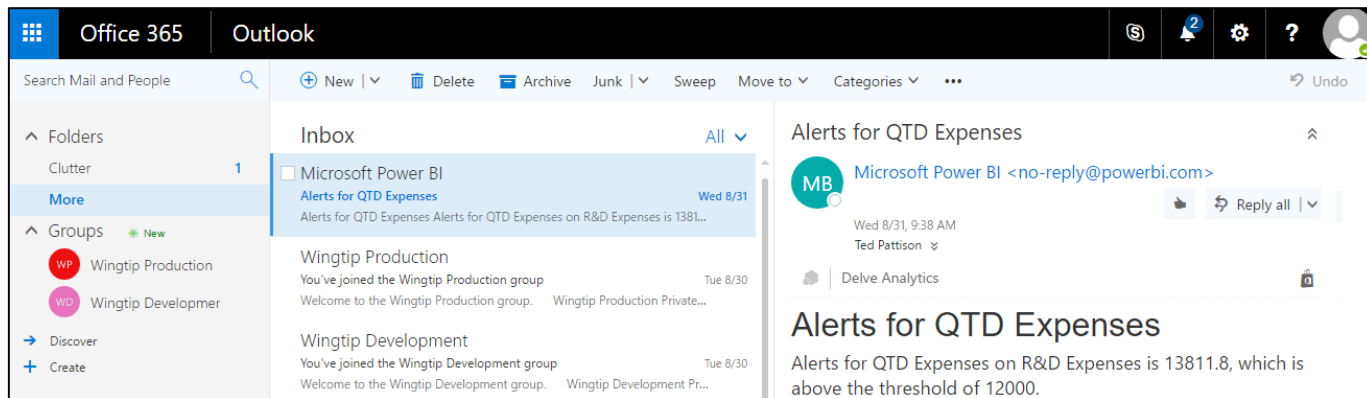
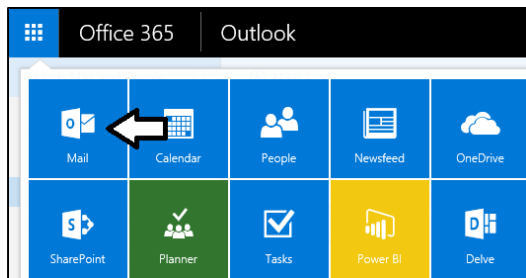
The screenshot displays the Office 365 Admin Center interface. The left-hand navigation pane includes links for Home, Users, Active users (selected), Contacts, Deleted users, Data migration, Groups, and Resources. The main content area is titled 'Home > Active users' and shows a list of active users. At the top of the list, there are buttons for '+ Add a user', 'More', and a 'Filters' dropdown menu currently set to 'All users'. A search bar and an 'Export' button are also present. The user list contains two entries: James Bond and Ted Pattison, both with Office 365 Enterprise E5 status. Below the list, there are three informational cards: '+ User' (explaining that users are people in the organization), 'Types of users' (explaining different user types), and 'Filters' (explaining how filtering helps manage the list).

	Display name	User name	Status
<input type="checkbox"/>	James Bond	JamesB@PowerBiBootcamp.onmicrosoft.com	Office 365 Enterprise E5
<input type="checkbox"/>	Ted Pattison	Student@PowerBiBootcamp.onmicrosoft.com	Office 365 Enterprise E5



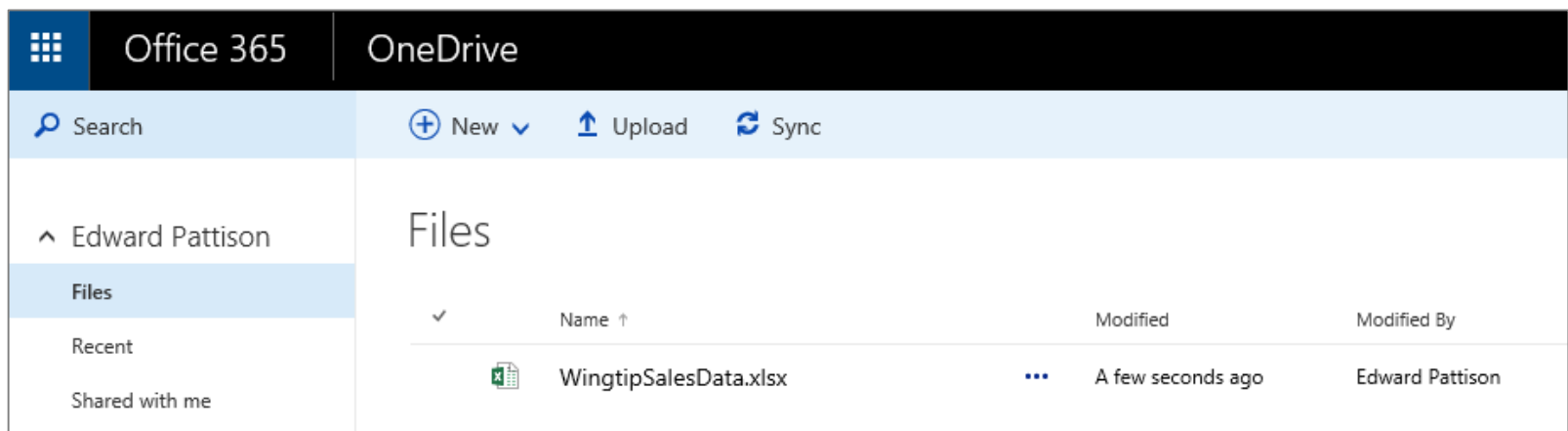
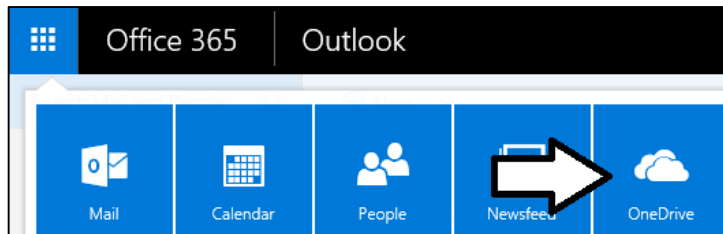
Accessing Your Office 365 Mailbox

- Make sure you can access your Exchange Inbox
 - Accessible in browser using Outlook Web App (OWA)
 - View messages sent by Power BI service
 - View and interact with Office 365 groups



Uploading Data Files to OneDrive for Business

- Preferred location for data files consumed by Power BI service
 - Excel workbooks
 - CSV files
 - PBIX files created using Power BI Desktop





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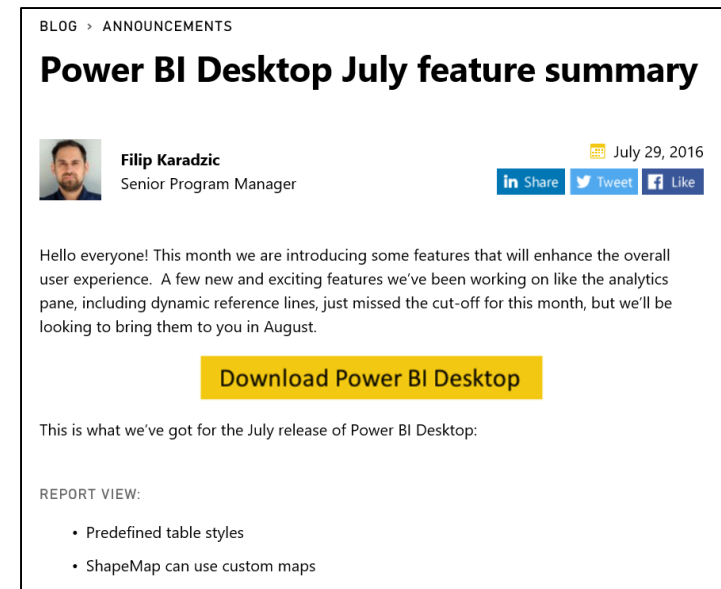
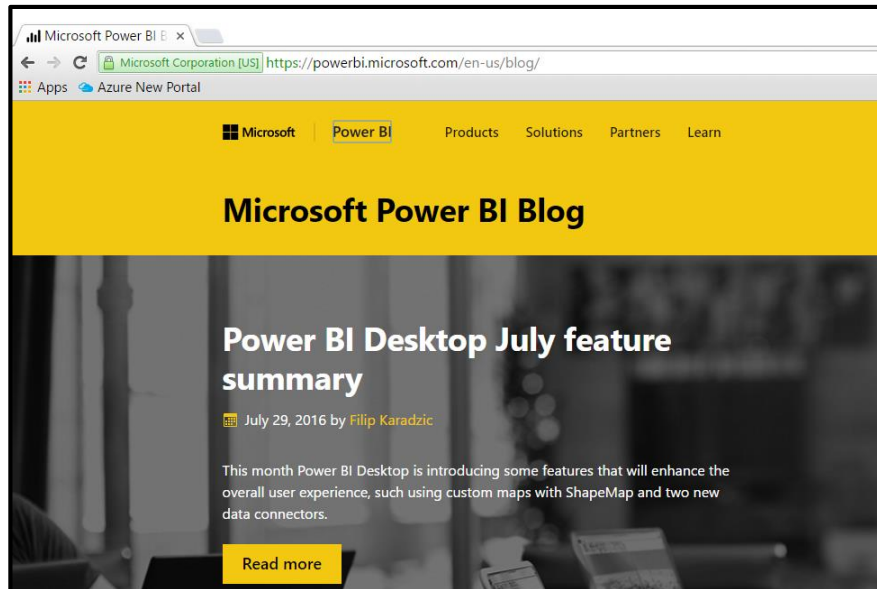
Managing Users and Subscriptions in the Office 365 admin center

Power BI Team Blog

- Power BI Team Blog is an Essential Resource

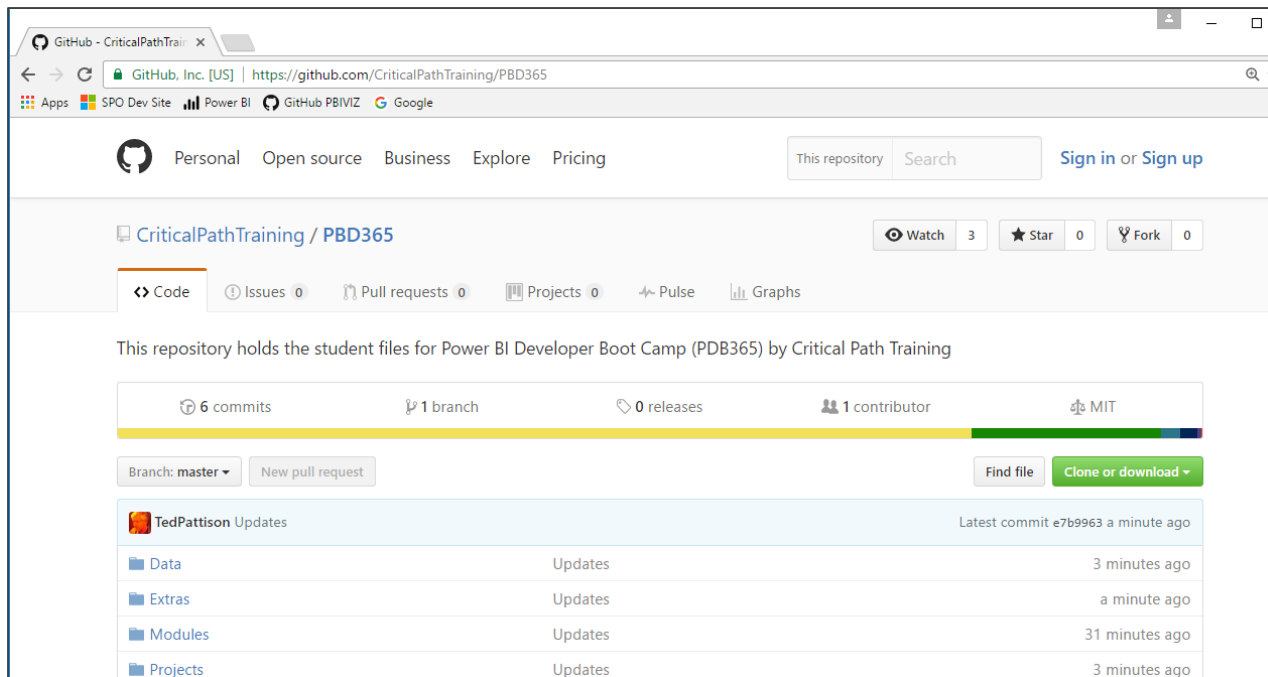
<https://powerbi.microsoft.com/en-us/blog/>

- Be on the lookout for monthly updates



Live Labs for PBD365

- Student files for this course maintained in GitHub
 - Students files updated on a monthly basis
 - Lab write-ups available in PDF and XPS formats
 - Go to <https://github.com/CriticalPathTraining/PBD365>



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