

# Developer Introduction to Power BI



# 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



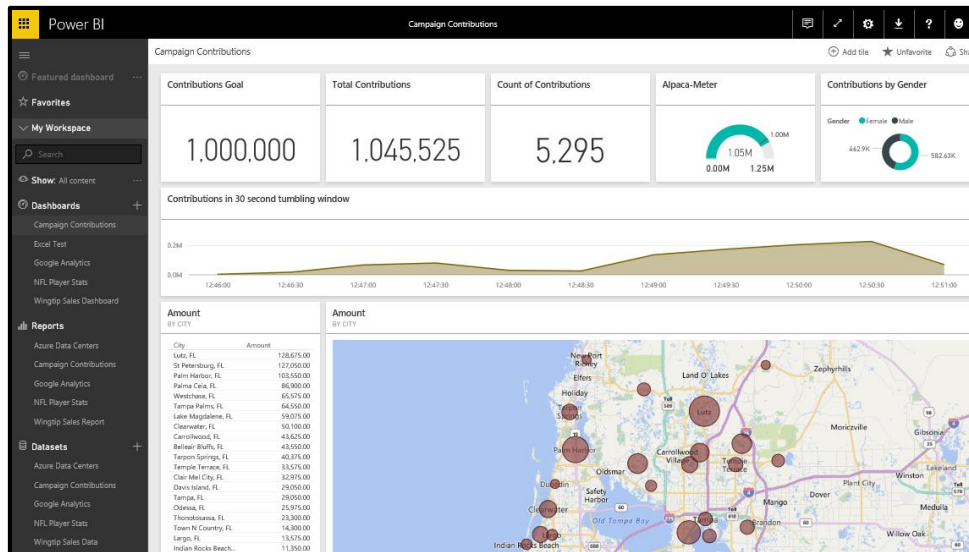
# Agenda

- Power BI as a Development Platform
- Setting Up a Power BI Dev Environment
- Working with Power BI Desktop and PBIX Files
- Developer Opportunities in Power BI
- Understanding Workspaces and Capacities
- Power BI Developer Resources



# The Power BI Service – Who Is It For?

- Provides SaaS service used by web and mobile users
  - Power BI portal accessible to browsers at <https://app.powerbi.com>
  - Power BI mobile accessible to users on mobile phones & devices
- Provides PaaS service used by software developers
  - Power BI Service API accessible at <https://api.powerbi.com>



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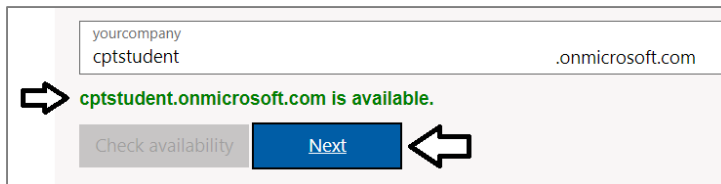


# Creating a Power BI Lab Environment

- Sign up for an Office 365 E5 trial account
  - Sign up process creates new Azure AD tenant
  - Tenant created with user account which is Global tenant admin
  - Tenant gets 30-day trial subscription for 25 Office 365 E5 licenses



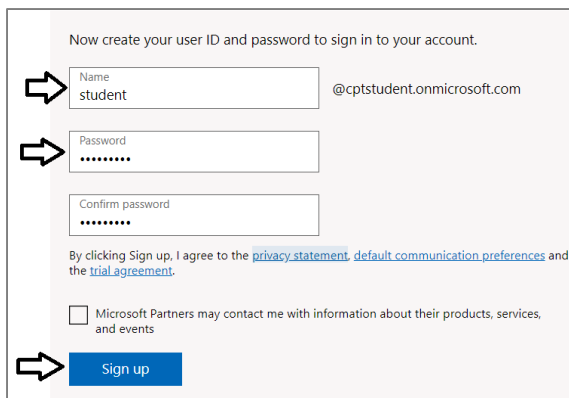
yourcompany  
cptstudent .onmicrosoft.com



yourcompany  
cptstudent .onmicrosoft.com

→ cptstudent.onmicrosoft.com is available.

Check availability Next →



Now create your user ID and password to sign in to your account.

→ Name student @cptstudent.onmicrosoft.com

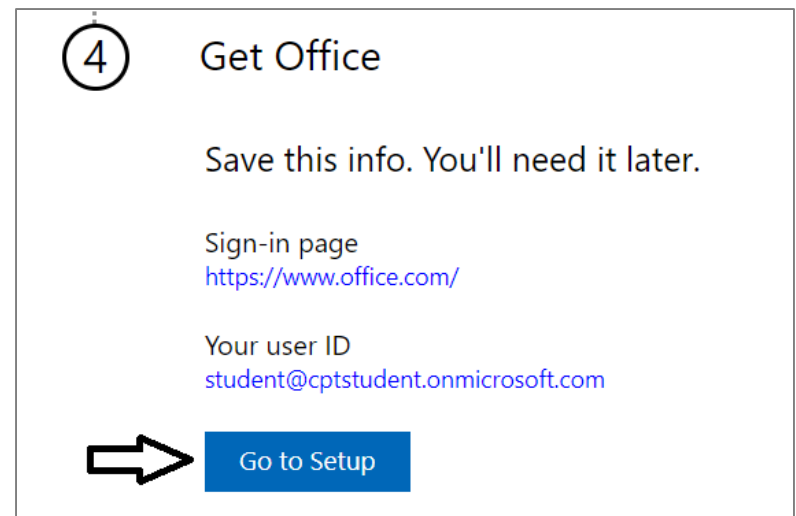
→ Password .....

Confirm password .....

By clicking Sign up, I agree to the [privacy statement](#), [default communication preferences](#) and the [trial agreement](#).

☐ Microsoft Partners may contact me with information about their products, services, and events

→ Sign up



④ Get Office

Save this info. You'll need it later.

Sign-in page  
<https://www.office.com/>

Your user ID  
[student@cptstudent.onmicrosoft.com](#)

→ Go to Setup



# Creating User Accounts for Testing

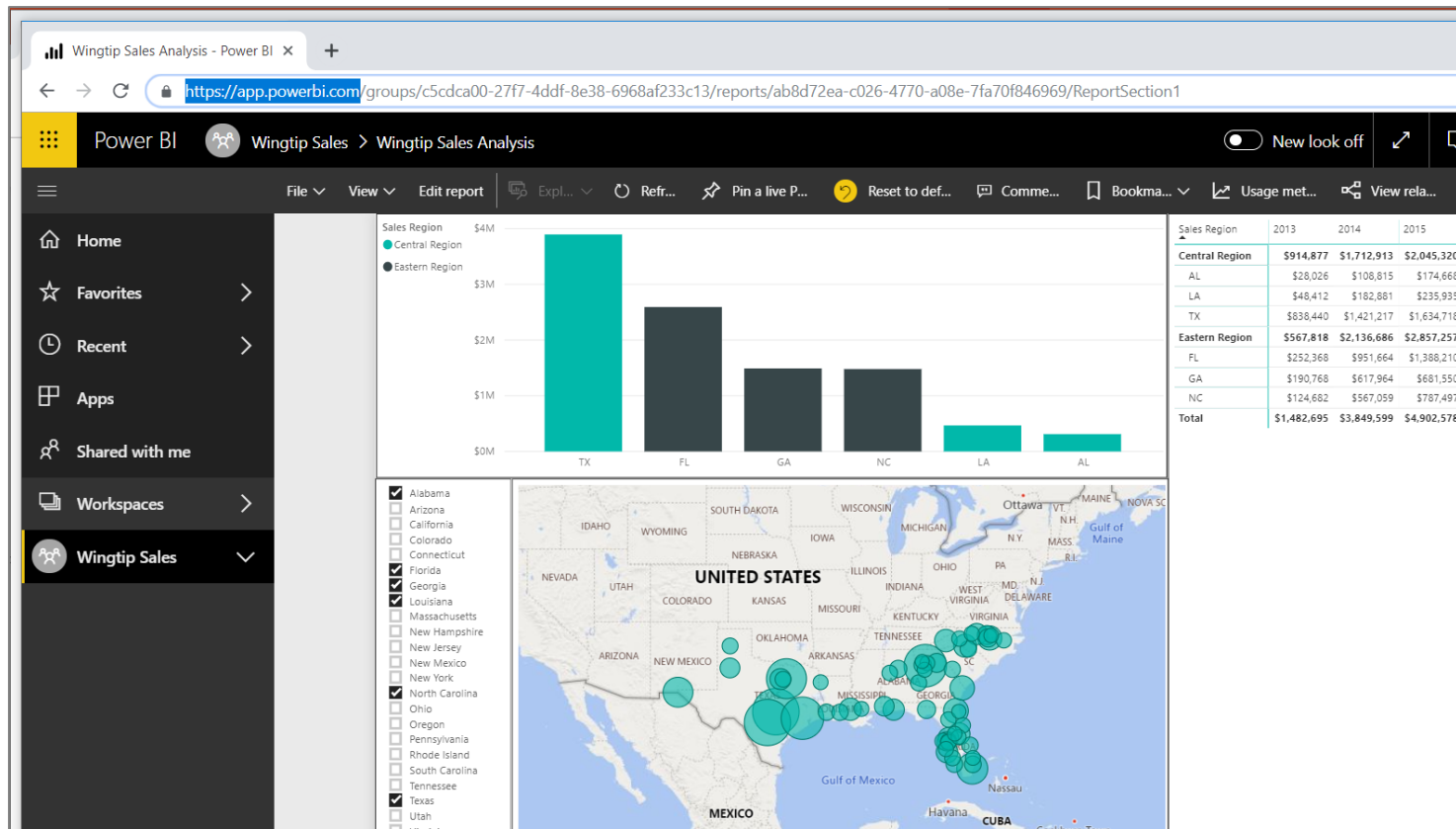
- Can be accomplished in Microsoft 365 Admin center
- Can be automated using PowerShell

```
CreateUserAccountsFromCSV.ps1 X
27
28 $mailNickname = $firstNameClean + $lastNameClean.SubString(0,1)
29 $userPrincipalName = $mailNickname + "@" + $classroomDomain
30
31 $password = "pass@word1"
32 $passwordProfile = New-Object -TypeName Microsoft.Open.AzureAD.Model.PasswordProfile
33 $passwordProfile.Password = $password
34 $passwordProfile.EnforceChangePasswordPolicy = $false
35 $passwordProfile.ForceChangePasswordNextLogin = $false
36
37 # Create new user account for student
38 $newUser = New-AzureADUser `
39     -DisplayName $displayName `
40     -GivenName $firstName `
41     -Surname $lastName `
42     -MailNickName $mailNickname `
43     -PasswordProfile $passwordProfile `
44     -PasswordPolicies "DisablePasswordExpiration, DisableStrongPassword" `
45     -UserPrincipalName $userPrincipalName `
46     -UsageLocation "US" `
47     -AccountEnabled $True
48
```



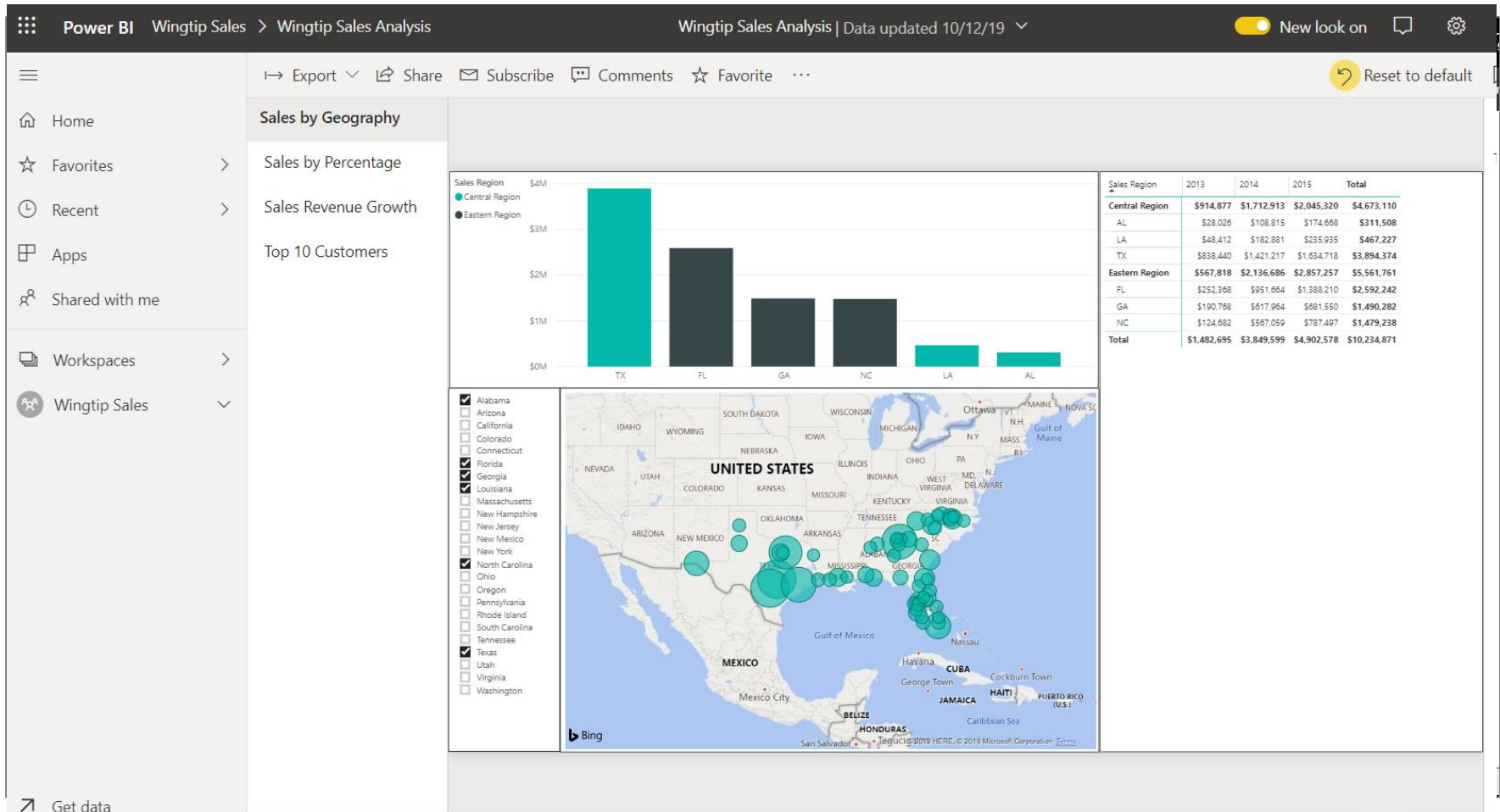
# The Power BI Service

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



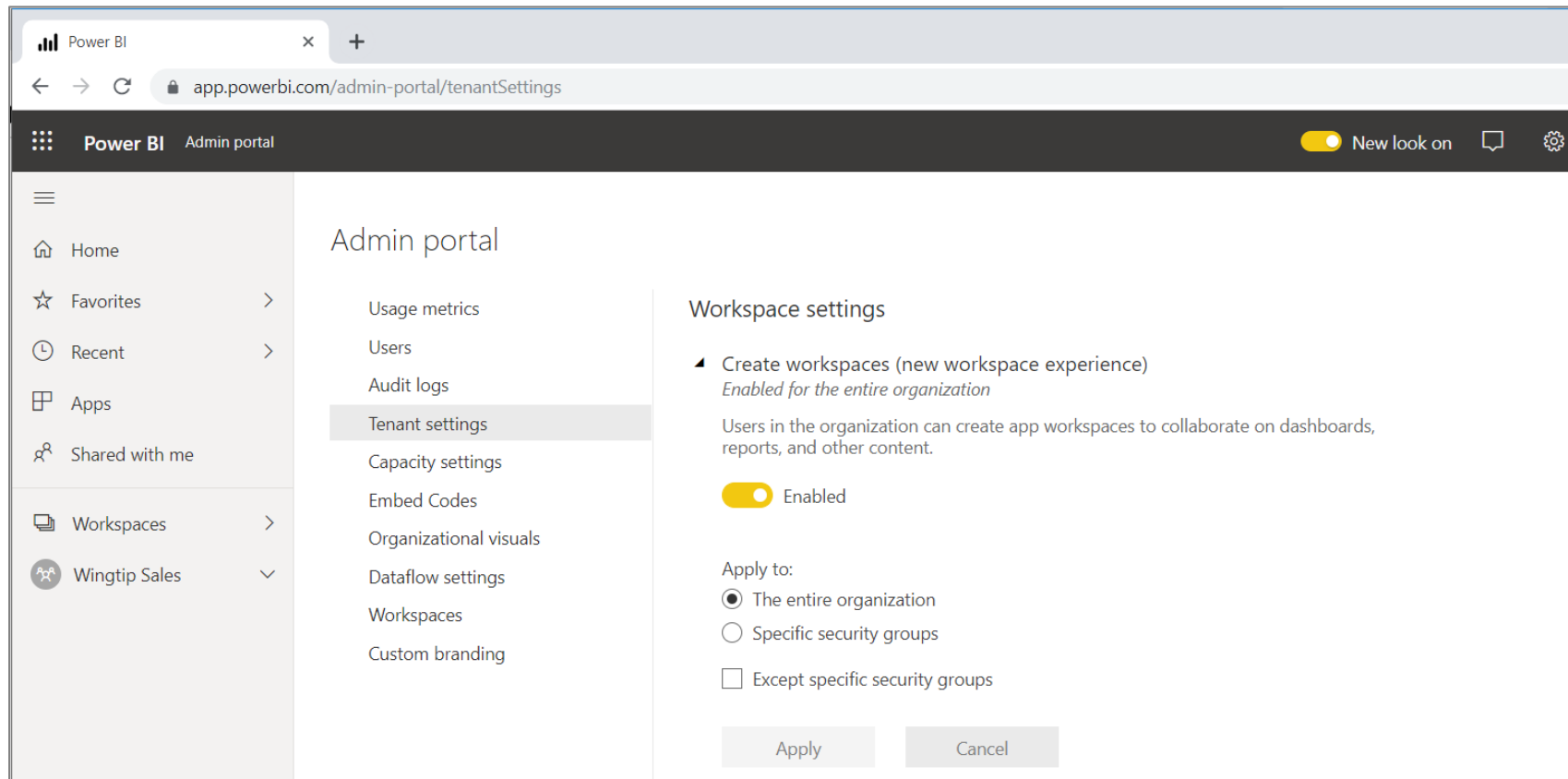


# Light Grey is the New Black



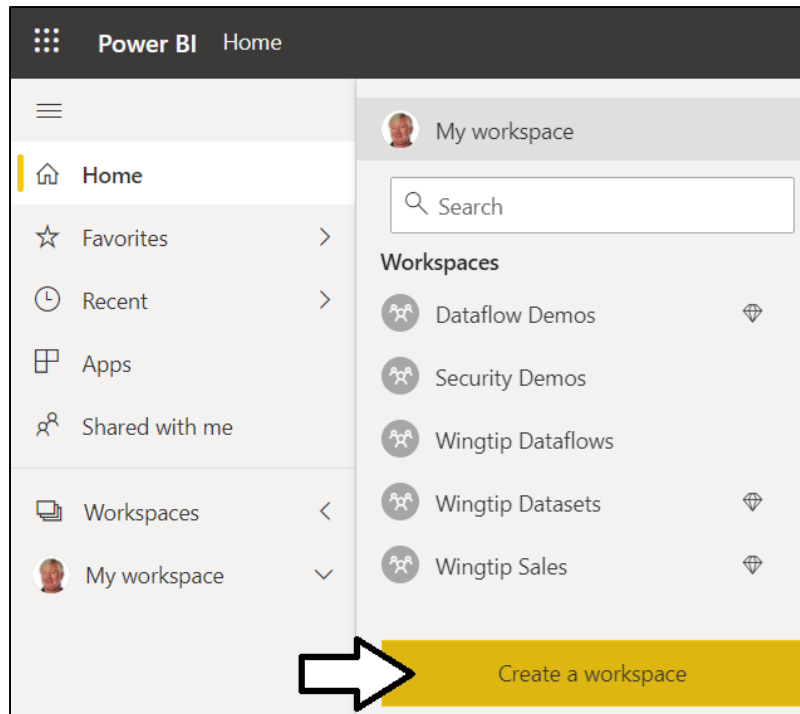
# The Power BI Admin Portal

- Admin portal used to configure tenant-level settings
  - Accessible at <https://app.powerbi.com/admin-portal>
  - Accessible by global tenant admins and Power BI Service admins



# Creating App Workspaces

- Power BI content published in app workspaces
  - Power BI Pro license required to author content in app workspace
  - Datasets & reports created by publishing PBIX project files
  - Dashboards must be created by hand



The screenshot shows the 'Create a workspace' form. At the top, it says 'Create a workspace'. Below this is a yellow banner with the text: 'YOU'RE CREATING AN UPGRADED WORKSPACE. Enjoy new features, better sharing options, and improved security controls. [Revert to classic](#) | [Learn more](#)'. The form has several fields: 'Workspace image' with an 'Upload' button and a 'Delete' icon; 'Workspace name' with a text input field containing 'My Data Science Project'; 'Available' (checked); and 'Description' with a text area containing 'This workspace is used to hold the Power BI resources for my new data science project'. At the bottom, there is a link 'Learn more about workspace settings' and an 'Advanced' dropdown. A large white arrow points to the 'Save' button at the bottom right.



# Power BI App Workspaces - V2

- Power BI transitioning between workspace models
  - V2 app workspaces just moved from preview to GA
  - Microsoft will soon force the migration from V1 to V2
- V1 workspaces built on top of Office 365 groups
  - Largely managed in Office 365 admin not Power BI
- V2 workspaces independent of Office 365 groups
  - Fully managed within Power BI admin portal
  - Provides more flexibility in assigning members



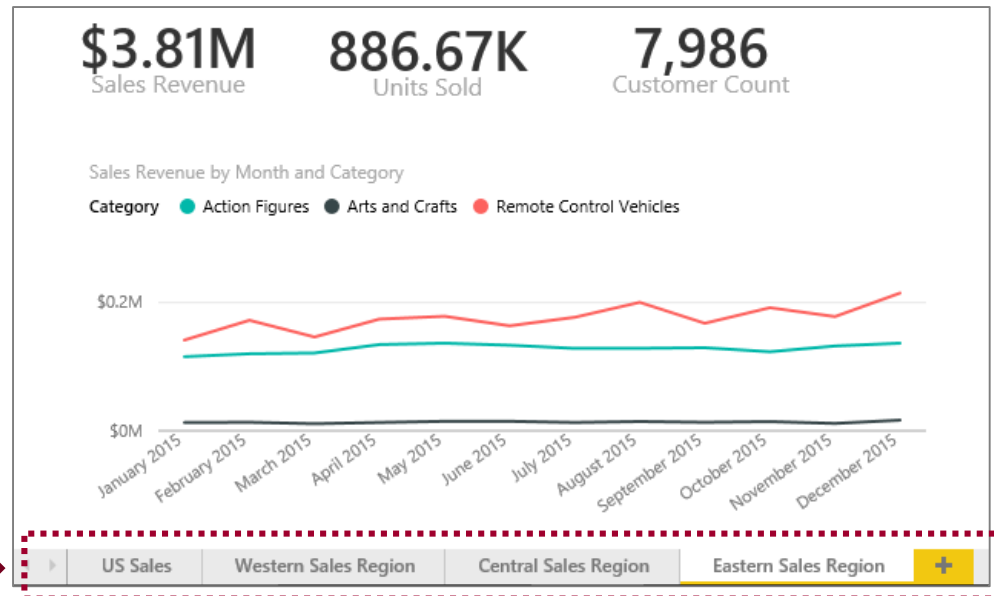
# Central Power BI Concepts

- Workspace
  - Secured container for Power BI resources
  - Created as personal workspaces and app workspaces
- Dashboard
  - Consolidated high-level view into reports and datasets
  - Provides great experience on mobile device (*e.g. iPhone, Android, tablet, etc.*)
- Report
  - Collection of one or more pages with tables & visualizations
  - Provides consumer with interactive control through filtering and bookmarks
- Dataset
  - In-memory data model containing one or more tables
  - Used to supply the underlying data to reports and dashboards
- Dataflows
  - Persistent data store used for more complex ETL requirements
  - Not required in most Power BI scenarios



# Reports and Pages

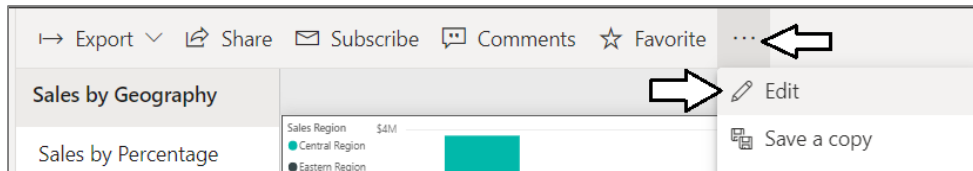
- Reports contain one or more pages
  - A report can be designed with a single page
  - A report can be designed with many pages
  - Tabbed navigation located at bottom of report view
  - Each report is associated with exactly one dataset



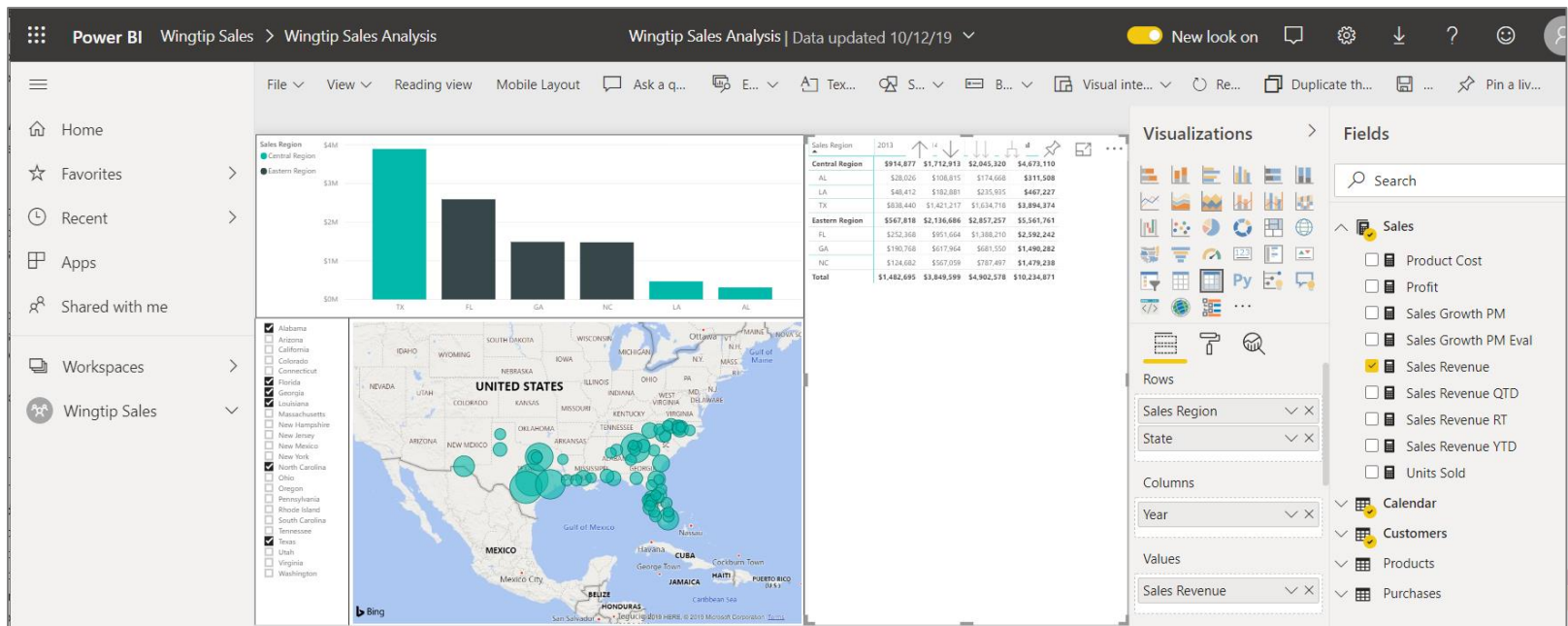


# Report Authoring

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

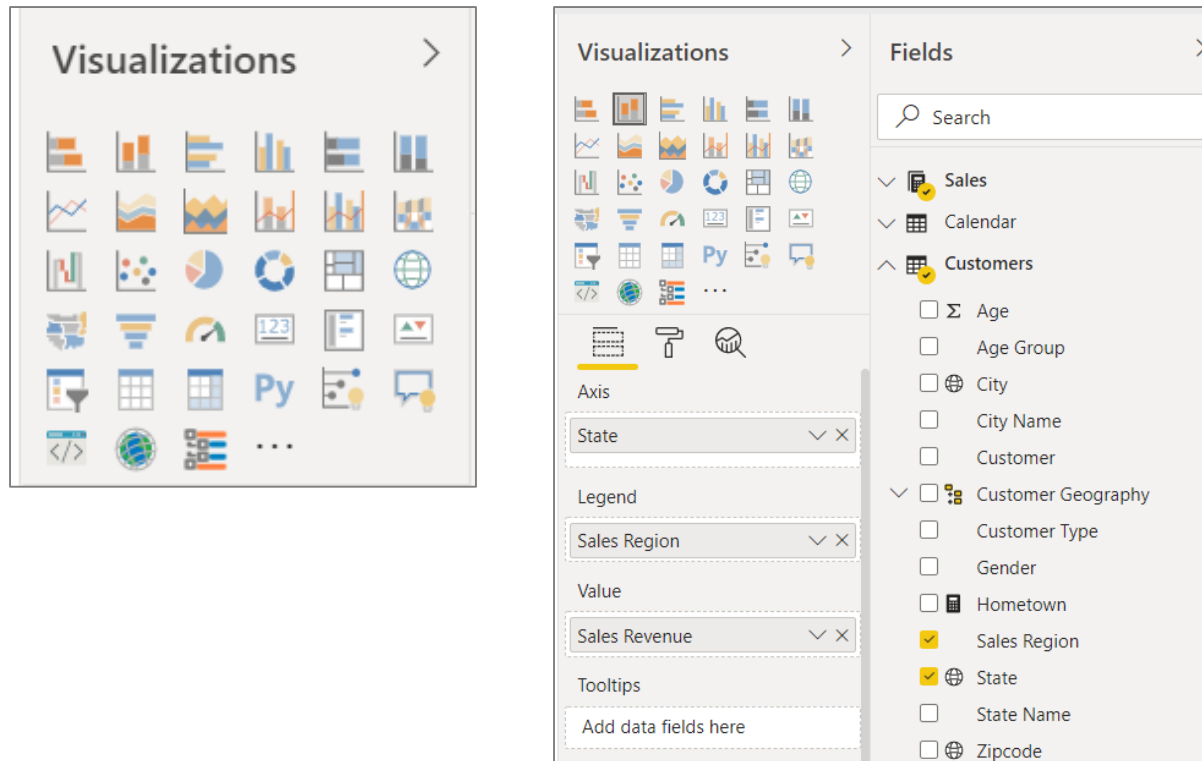


- Report design tools appear on right side of page



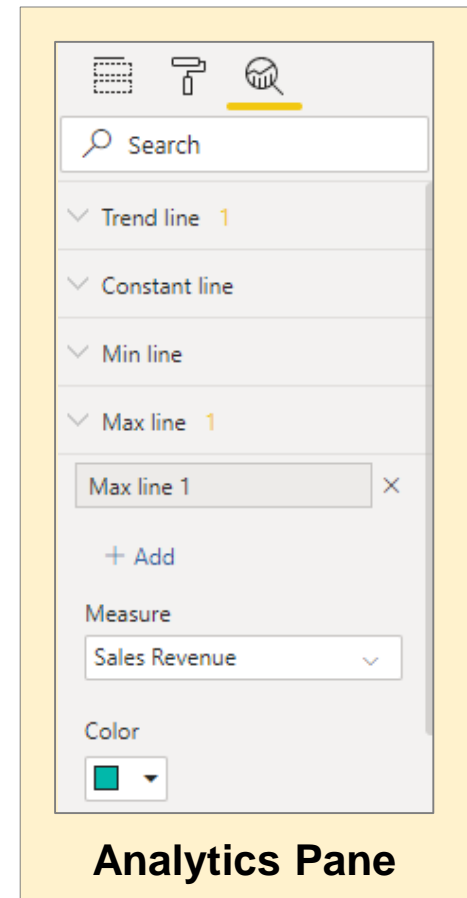
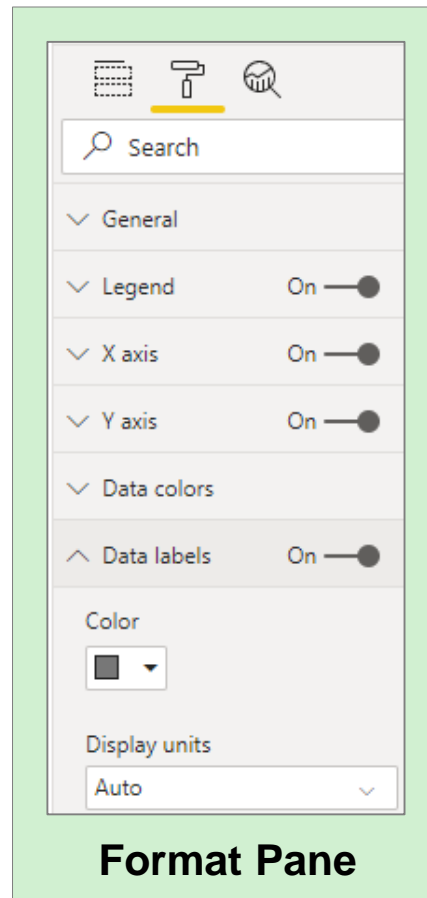
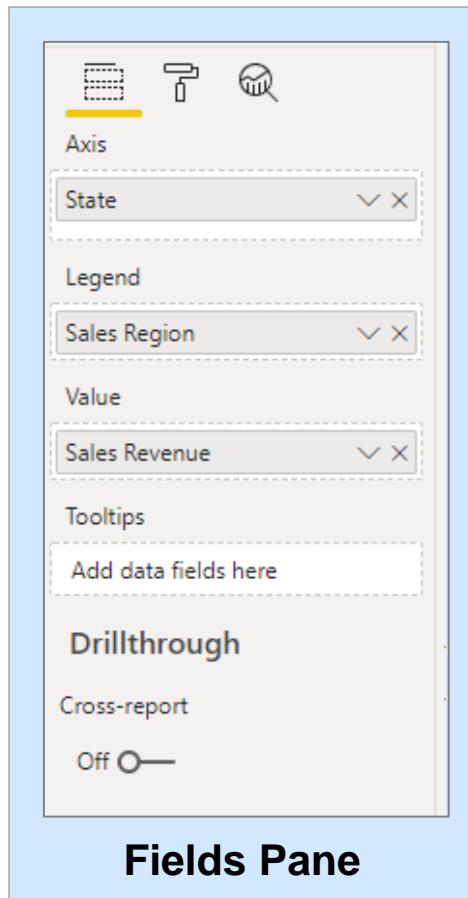
# Visuals (aka Visualizations)

- 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 configured using fields from tables in **Fields** list



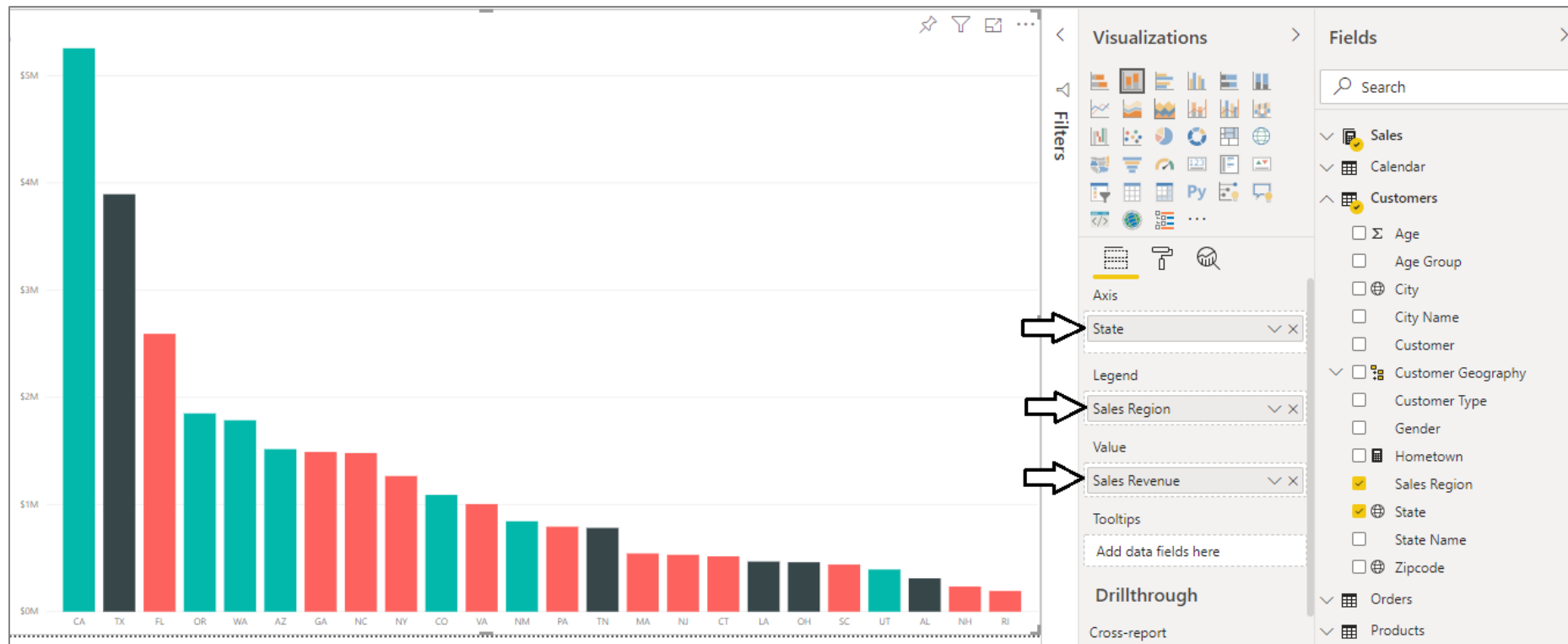
# Editing Visual Properties

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



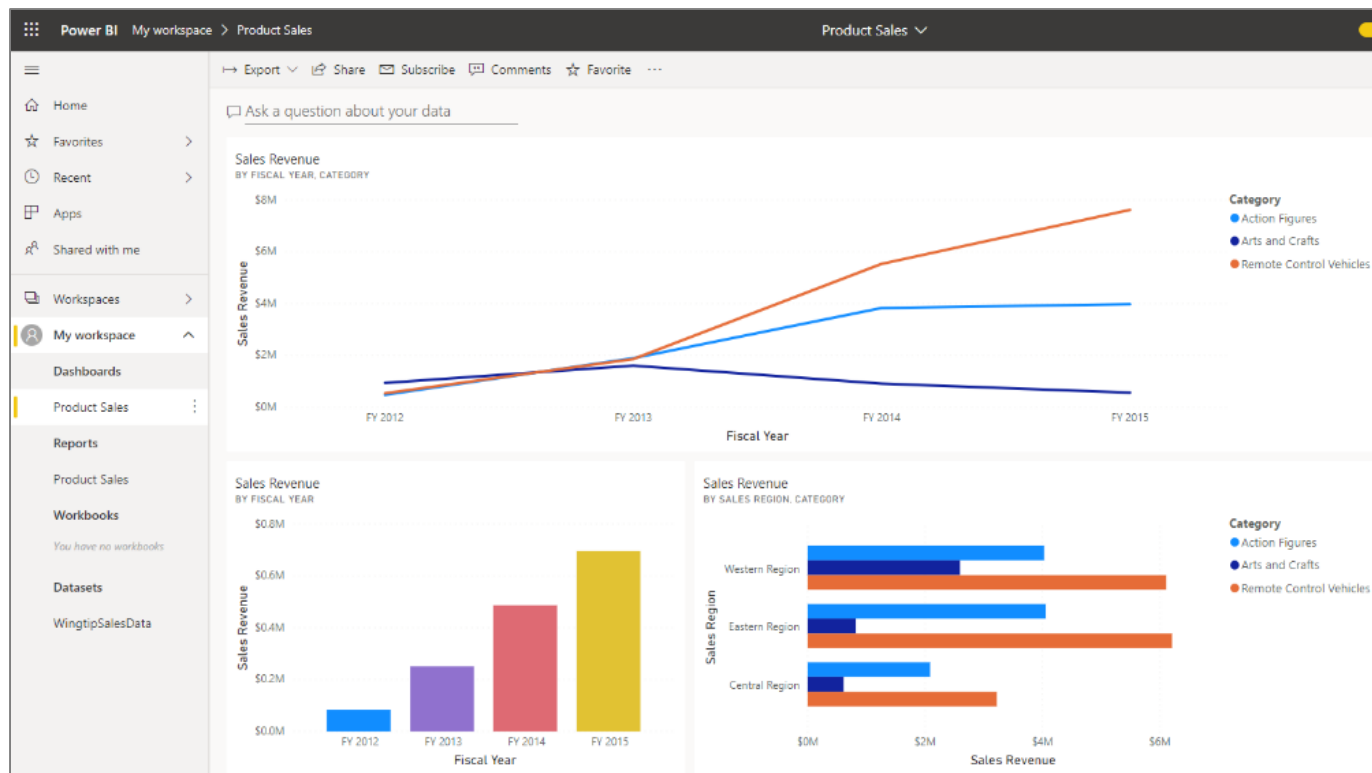
# Reports and Datasets

- Each report is based on single underlying dataset
  - **Fields list** in report designer shows tables and fields
  - Fields added to a visual's data roles in **Fields pane**



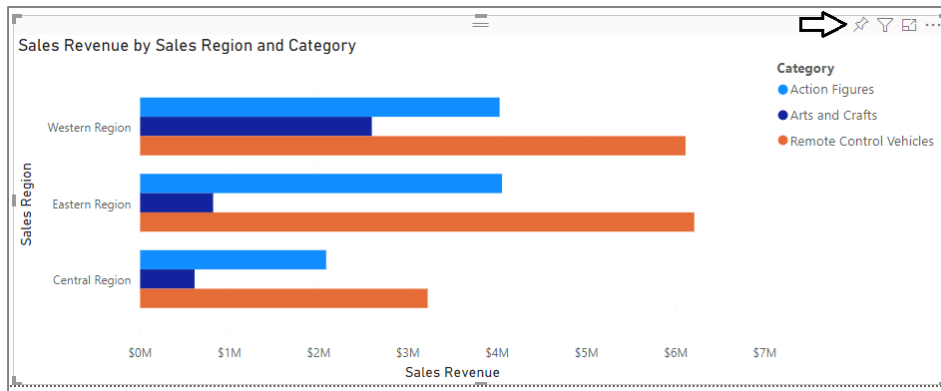
# Dashboards and Tiles

- Dashboard is a collection of tiles
  - Tiles can be created by pinning visual from a report
  - Tiles can be created by pinning Q&A search result

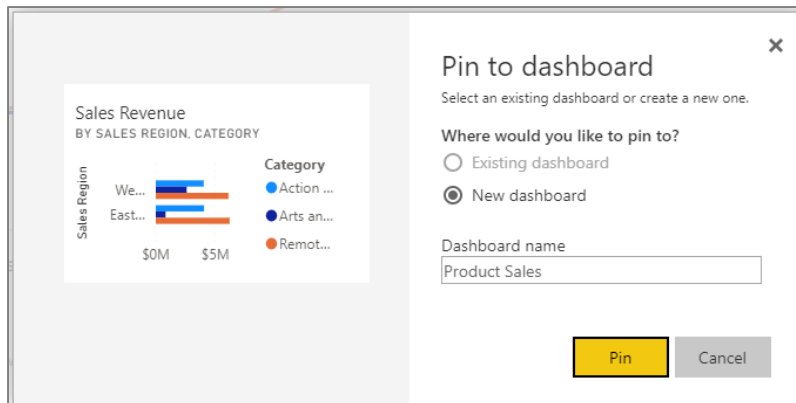


# Creating Dashboards

- Dashboards contain tiles
- Tiles created from visuals using thumbtack button



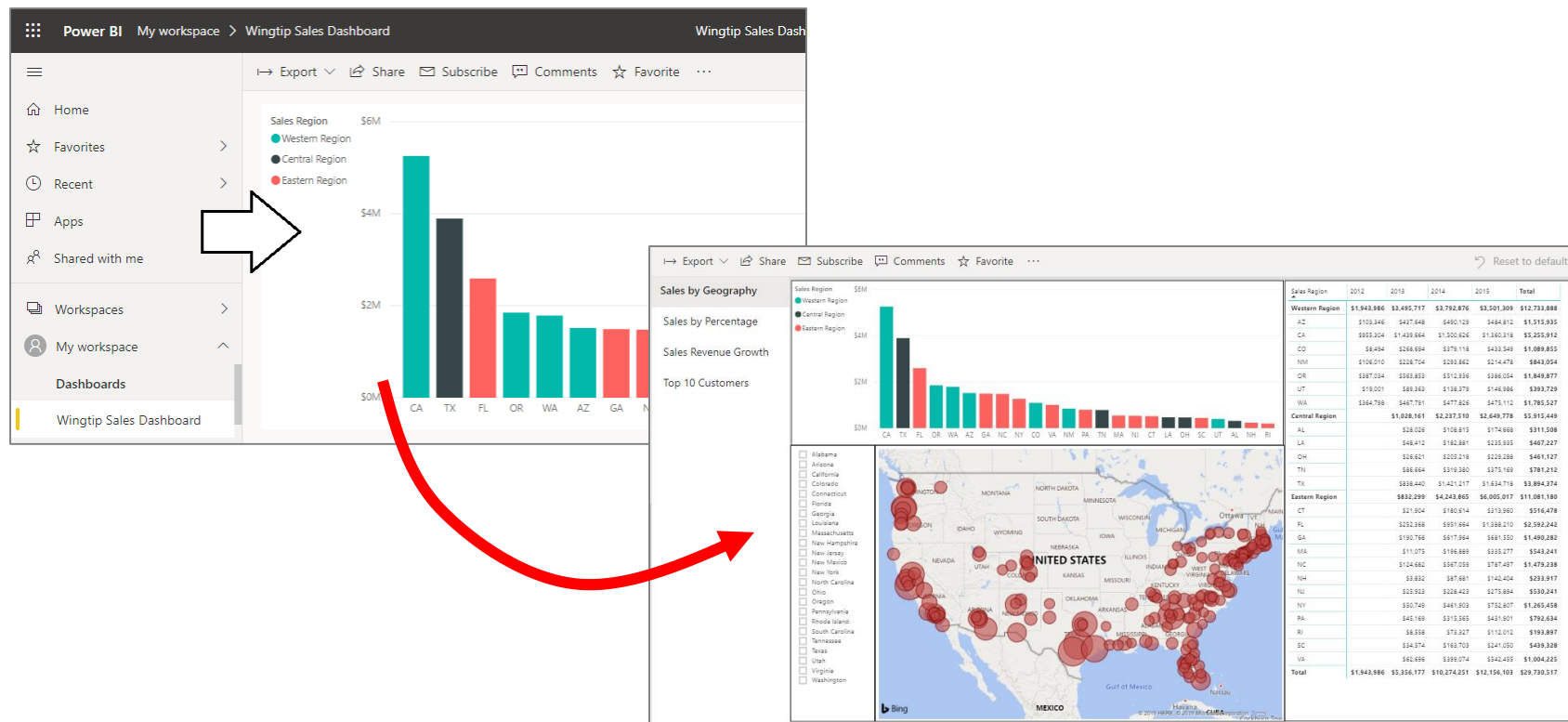
- New tiles can be added to new or existing dashboard





# 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





**DEMO**

# Getting started with Datasets, Reports and Dashboards

# Agenda

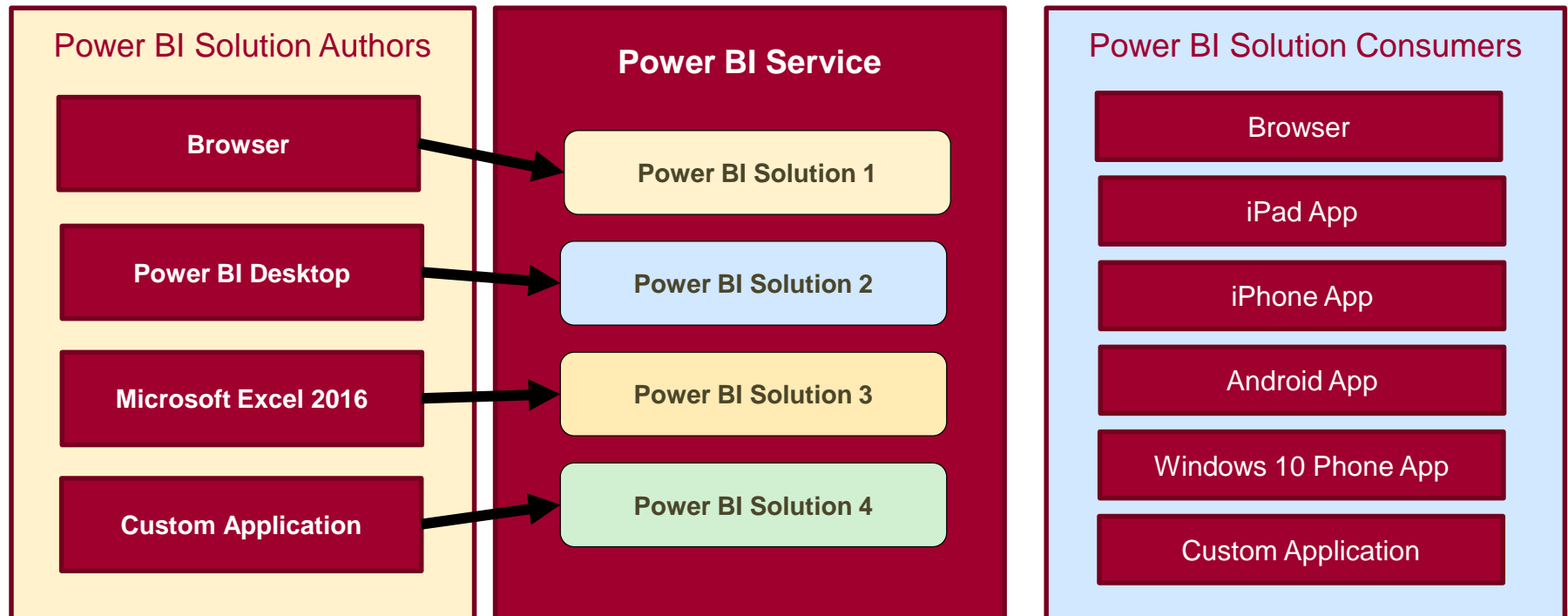
- ✓ Power BI as a Development Platform
- ✓ Setting Up a Power BI Dev Environment
- Working with Power BI Desktop and PBIX Files
  - Developer Opportunities in Power BI
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  - Power BI Developer Resources





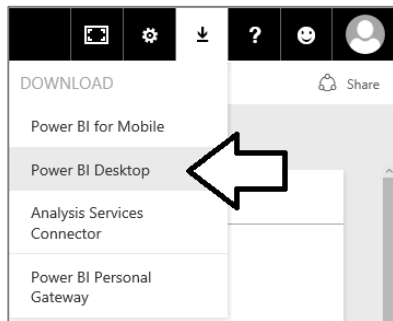
# Power BI Builder Tools

- 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



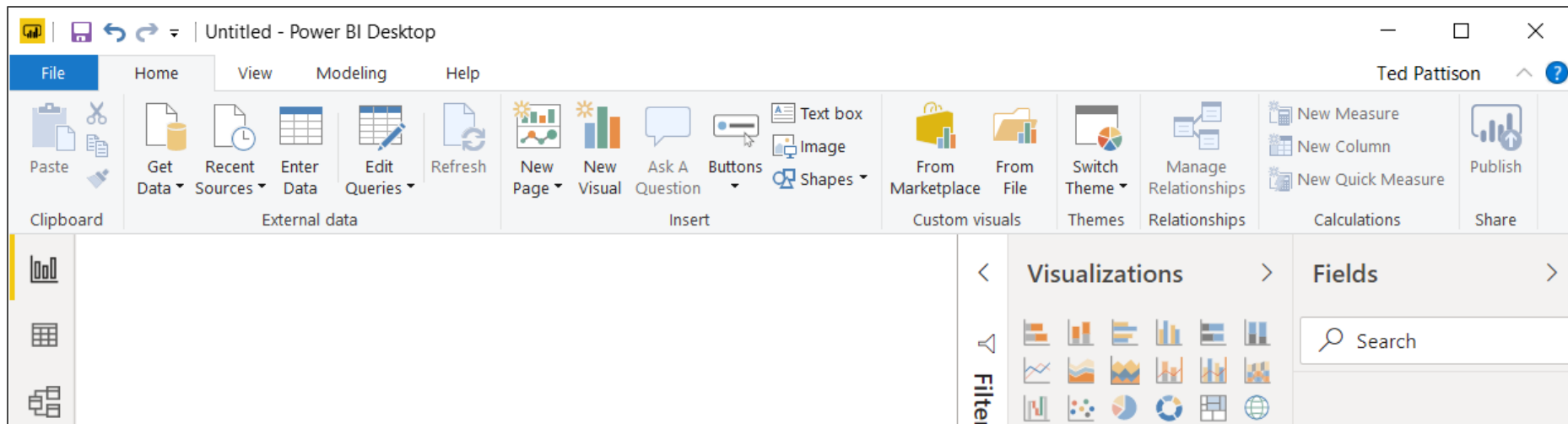
# Installing Power BI Desktop

- Power BI Desktop quick & easy to install over the Internet
  - Select Power BI Desktop option from Power BI Download menu
  - Power BI Desktop downloads & installs in less than a minute



# Working with Power BI Desktop

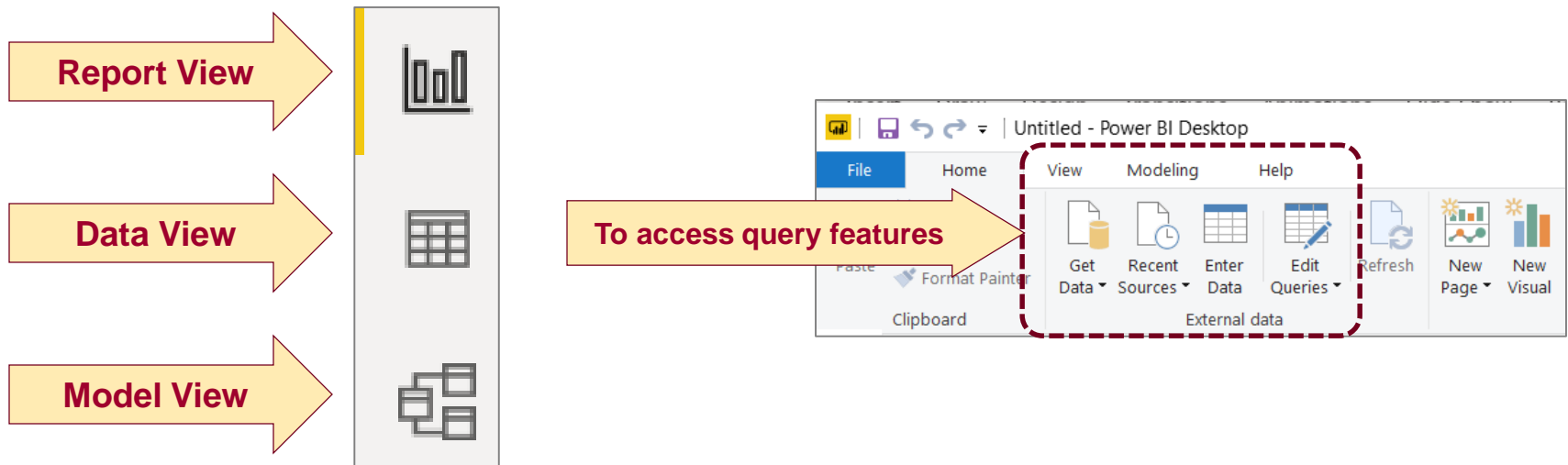
- Power BI Desktop is a Windows application
  - Work is saved and published in terms of PBIX projects
  - You can work on multiple projects at once
  - Each project runs in its own Power BI Desktop instance
  - Power BI Desktop can freeze up or act buggy
  - Quit & restart Power BI Desktop if it acts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





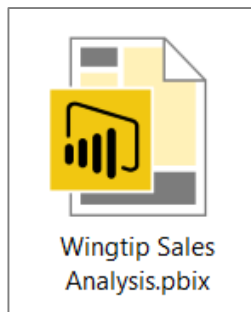
# Getting Around in Power BI Desktop

- What do you need to learn to use Power BI Desktop?
  - Query features for importing data
  - Designing data model & writing DAX expressions
  - Designing reports with Power BI Desktop report designer
- Navigating between view modes



# 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



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# Developer Opportunities in Power BI

1. Developing Template Apps
2. Programming the Power BI Service API
3. Embedding Reports in Custom Applications
4. Developing Solutions with Real-time dashboards
5. Developing Custom Visuals
6. Developing Custom Connectors using M
7. Developing Custom Solutions using R
8. Developing Custom Solutions using Python
9. Leveraging the Power BI features for AI



# Template Apps

- Used to Clone Workspace Template
  - Template App created creating using app workspace
  - App workspace configured as template app
  - Installing template app involves cloning workspace content
  - Installing template app involves creating new workspace
  - Template app workspace content cloned into new workspace
- Who developed template apps?
  - Mainly used by Independent Software Vendors (ISVs)
  - Not as common to use within a corporate



# Developing with the Power BI Service API

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





# 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



# Developing Custom Data Connectors

- Custom Connectors let you write reusable query logic
  - Custom connector is written using M programming language
  - Custom connector can be used across PBIX project files
- Common motivation for developing a custom connector
  - Creating a friendly view of a REST API for business analyst
  - Providing branding on top of existing connector
  - Exposing a limited/filtered view over your data source
  - Control how mashup engine authenticates against datasource
  - Implementing OAuth v2 authentication flow for a SaaS offering



# Integrating R with Power BI

- What is R?
  - Platform for statistics, data analysis and visualization
  - Programming language + Runtime layer + Libraries
  - Strong ability to generate statistics and visualizations
- Where can you use R code in Power BI?
  - Inside a query to perform data extraction and cleanup
  - Inside an R visual to generate rich visualizations



# Integrating Python with Power BI

- What is Python?
  - Platform for statistics, data analysis and visualization
  - Programming language + Runtime layer + Libraries
  - Strong ability to generate statistics and visualizations
- Where can you use Python code in Power BI?
  - Inside a query to perform data extraction and cleanup
  - Inside an Python visual to generate rich visualizations







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# Power BI Licensing Though Office 365

## User-based licensing

<p>Power BI (free)</p> <p>\$0.00 user/month</p> <p>A cloud-based business analytics service that enables anyone to visualize and analyze data with greater speed, efficiency, and understanding. It ...</p> <p>Office 2016 desktop &amp; mobile apps Not included</p> <p>Office 365 services </p> <p>...</p>	<p>Power BI Pro</p> <p>\$9.99 user/month</p> <p>A cloud-based business analytics service that enables anyone to visualize and analyze data with greater speed, efficiency, and understanding. Power BI ...</p> <p>Office 2016 desktop &amp; mobile apps Not included</p> <p>Office 365 services </p> <p>...</p>	<p>Office 365 Enterprise E5</p> <p>\$35.00 user/month</p> <p>The Office suite, plus email, instant messaging, HD video conferencing, 1 TB personal file storage and sharing, and advanced security, analytics and PSTN ...</p> <p>Office 2016 desktop &amp; mobile apps </p> <p>Office 365 services </p> <p>...</p>
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## Capacity-based Licensing

<p>Power BI Premium P1</p> <p>\$4,995.00 instance/month</p> <p>Power BI capacity dedicated to your organization, unlocking unlimited content distribution and dependable performance. P1 offers 8 virtual cores ...</p> <p>Office 2016 desktop &amp; mobile apps Not included</p> <p>Office 365 services </p> <p>...</p>	<p>Power BI Premium P2</p> <p>\$9,995.00 instance/month</p> <p>Power BI capacity dedicated to your organization, unlocking unlimited content distribution and dependable performance. P2 offers 16 virtual cores ...</p> <p>Office 2016 desktop &amp; mobile apps Not included</p> <p>Office 365 services </p> <p>...</p>	<p>Power BI Premium P3</p> <p>\$19,995.00 instance/month</p> <p>Power BI capacity dedicated to your organization, unlocking unlimited content distribution and dependable performance. P3 offers 32 virtual cores ...</p> <p>Office 2016 desktop &amp; mobile apps Not included</p> <p>Office 365 services </p> <p>...</p>	<p>Power BI Premium P4</p> <p>\$39,995.00 instance/month</p> <p>Power BI capacity dedicated to your organization, unlocking unlimited content distribution and dependable performance. P4 offers 64 virtual cores ...</p> <p>Office 2016 desktop &amp; mobile apps Not included</p> <p>Office 365 services </p> <p>...</p>	<p>Power BI Premium P5</p> <p>\$79,995.00 instance/month</p> <p>Power BI capacity dedicated to your organization, unlocking unlimited content distribution and dependable performance. P5 offers 128 virtual cores ...</p> <p>Office 2016 desktop &amp; mobile apps Not included</p> <p>Office 365 services </p> <p>...</p>	<p>Power BI Premium EM3 (Month to Month)</p> <p>\$2,495.00 instance/month</p> <p>Embed Power BI content in your custom application, powered by 4 virtual cores of dedicated capacity. Some Premium features are disabled ...</p> <p>Office 2016 desktop &amp; mobile apps Not included</p> <p>Office 365 services </p> <p>...</p>
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# Dedicated Capacities

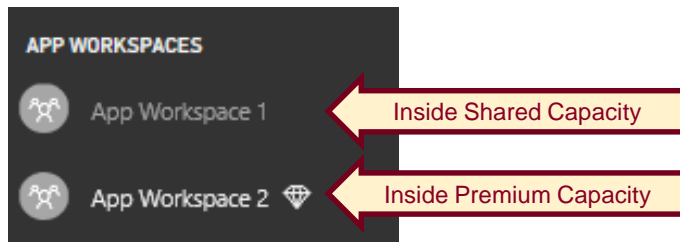
- Power BI workspaces run in one of two possible environments
  - Shared capacity
  - Dedicated capacity
- Dedicated capacity required for third party embedding
  - You pay Microsoft capacity-based fee for processors cores and RAM
  - No need to pay Microsoft for user licensing
- Dedicated capacity can be used for first party embedding
  - Allows users to have free license instead of Power BI Pro license
- Dedicated capacities come in two flavors
  - Power BI Premium capacities purchased through Office 365
  - Power BI Embedded capacities purchased through Azure SKU



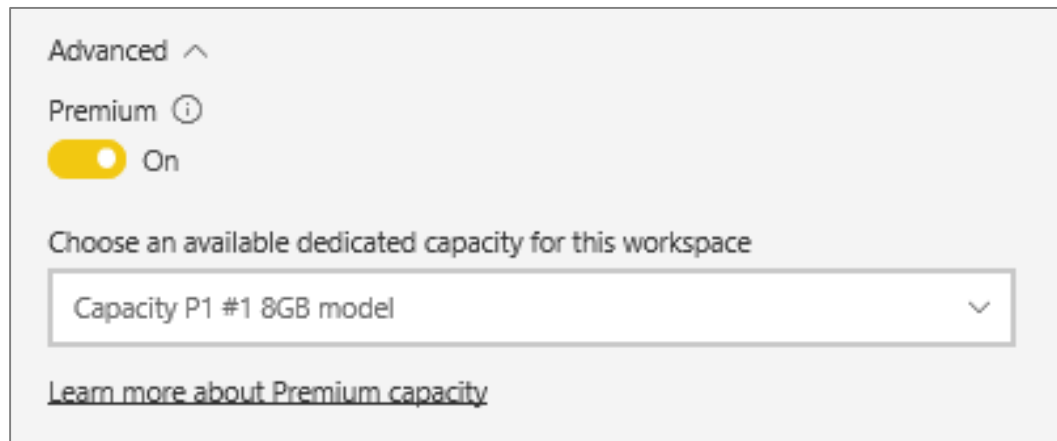
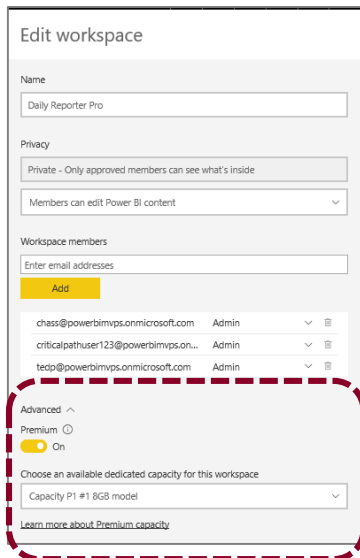


# Associating App Workspaces with a Capacity

- App Workspace in Premium Capacity has diamond icon



- App workspace moved into Premium capacity in Advanced settings



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# 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

## Power BI Service and Mobile June Feature Summary

Announcements

Features

📅 July 11, 2018 by Nikhil Gaekwad

The month of June flew by quickly for Power BI. With summer in the air and MBAS just around the corner, we are laser focused on planning another unforgettable conference for you in Seattle! There...



# Power BI Community Forums

- Located at <https://community.powerbi.com/>
  - Great place to get answers to tough questions

Home - Microsoft Power

Secure | <https://community.powerbi.com>

Apps Google GitHub O365 Admin Power BI Azure Portal PowerApps OneDrive SPO Site

Microsoft | Power BI Products Solutions Partners Learn

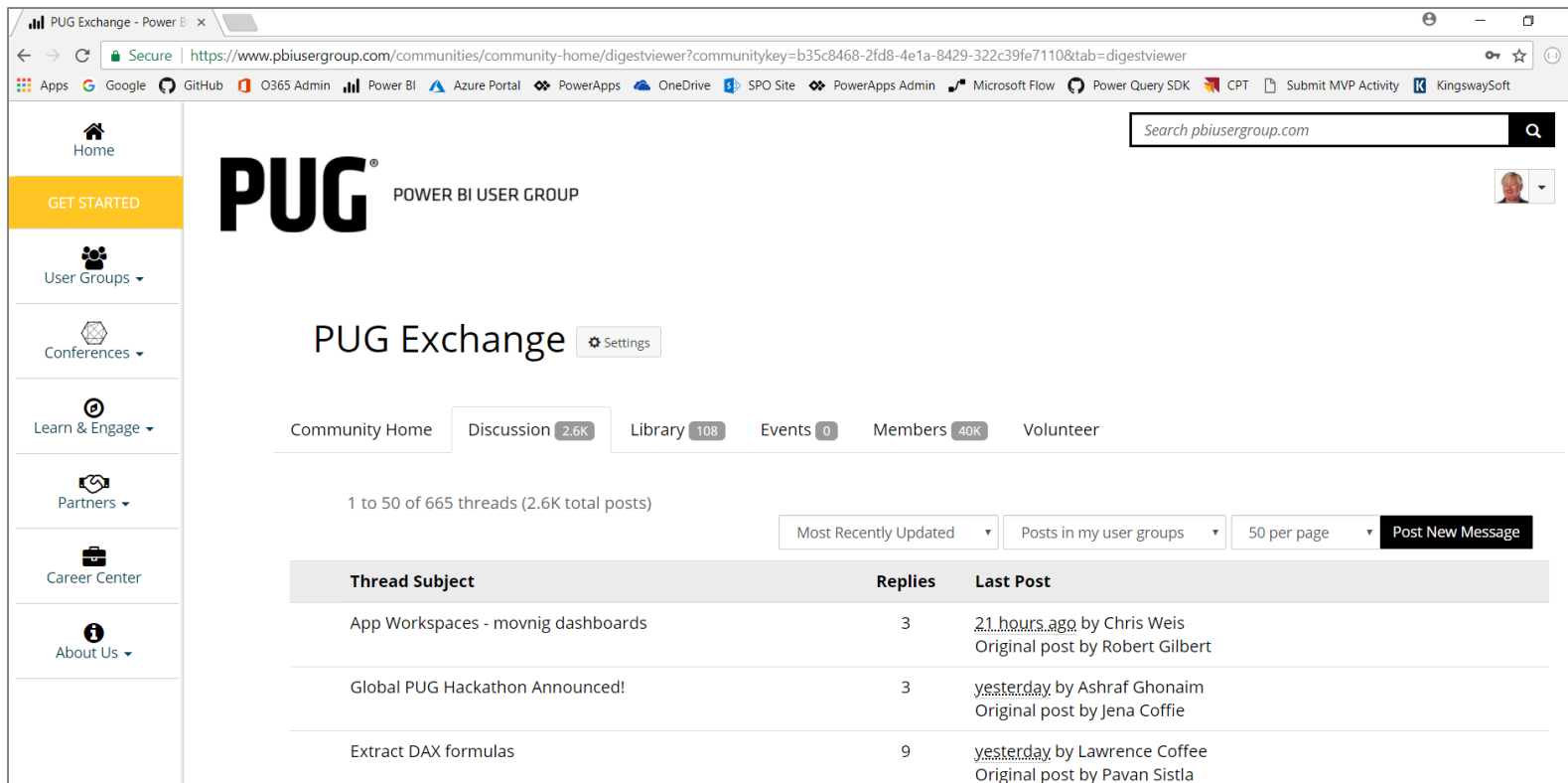
Forums (9 Items)

TITLE	POSTS
<b>Desktop</b> Data shaping, modeling, and report building in the Power BI Desktop app. Latest Topic - the traditional cultures - the Roma	174296
<b>Service</b> Dashboards, reports, sharing, and everything else you do at app.powerbi.com. Latest Topic - One dashboard multiple recipients with locked filt...	38336



# Power BI User Group (PUG)

- Located at <http://pbusergroup.com/>
  - PUG Exchange is another place to get questions answered
  - Also let's you find and connect with local Power BI User Groups



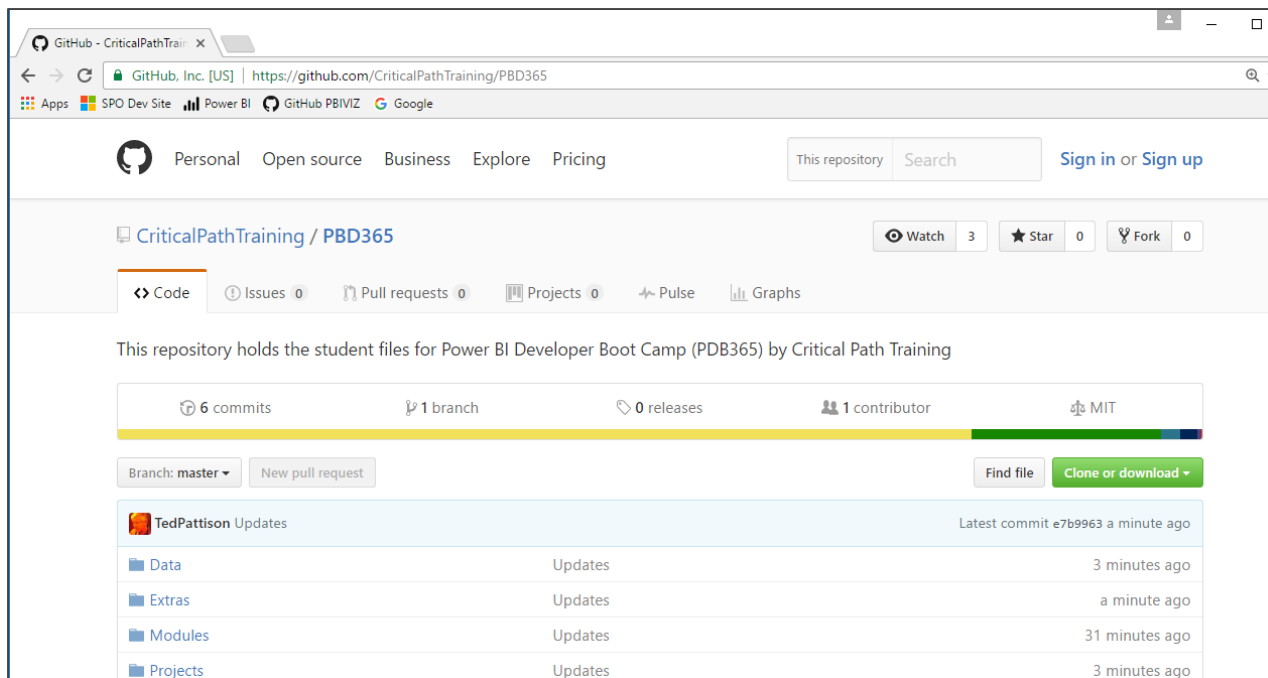
The screenshot shows the PUG Exchange website interface. The left sidebar contains navigation links: Home, GET STARTED, User Groups, Conferences, Learn & Engage, Partners, Career Center, and About Us. The main header features the PUG logo and the text "POWER BI USER GROUP". Below the header, the "PUG Exchange" section includes a "Settings" button and a navigation bar with links to Community Home, Discussion (2.6K), Library (108), Events (0), Members (40K), and Volunteer. The main content area displays a list of discussion threads, showing 1 to 50 of 665 threads (2.6K total posts). The threads are sorted by "Most Recently Updated" and show 50 posts per page. A "Post New Message" button is located at the bottom right of the thread list.

Thread Subject	Replies	Last Post
App Workspaces - movnig dashboards	3	21 hours ago by Chris Weis Original post by Robert Gilbert
Global PUG Hackathon Announced!	3	yesterday by Ashraf Ghonaim Original post by Jena Coffie
Extract DAX formulas	9	yesterday by Lawrence Coffee Original post by Pavan Sistla



# 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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