

Getting Started with Power BI Development



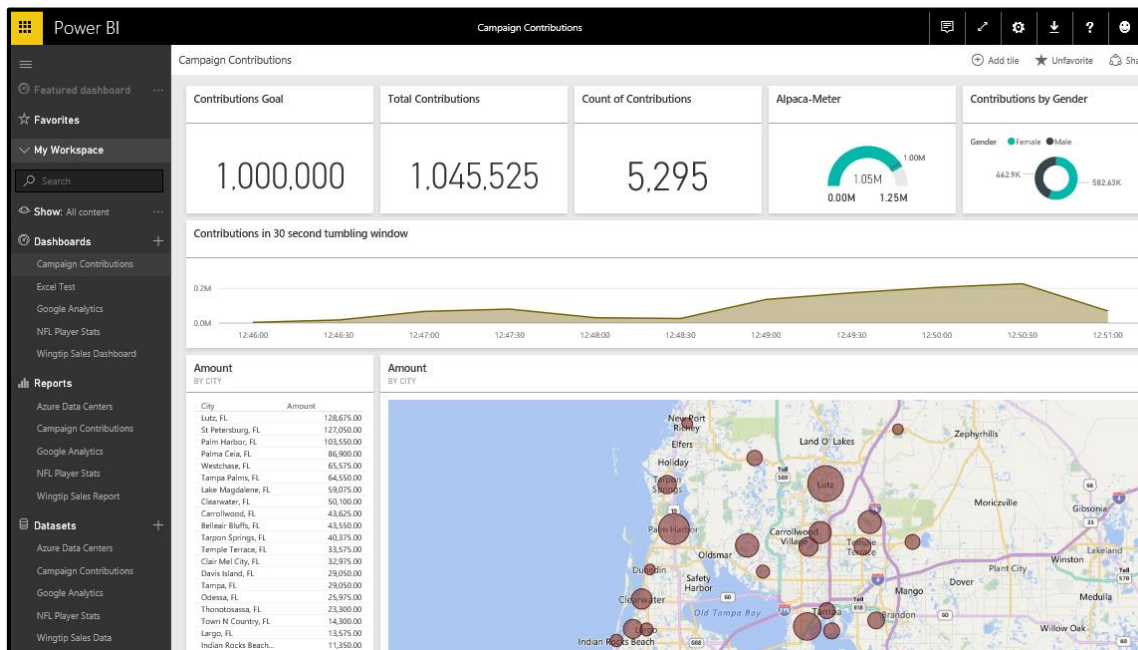
Agenda

- Power BI as a Development Platform
- Setting Up a Power BI Dev Environment
- Working with Power BI Desktop and PBIX Files
- Developing with Power BI Embedding
- Understanding Workspaces and Capacities



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>



Developer Opportunities in Power BI

1. Developing Custom Visuals
2. Programming the Power BI Service API
3. Embedding Reports in Custom Applications
4. Developing Solutions with Real-time dashboards
5. Developing Custom Solutions using R
6. Developing Custom Connectors using M



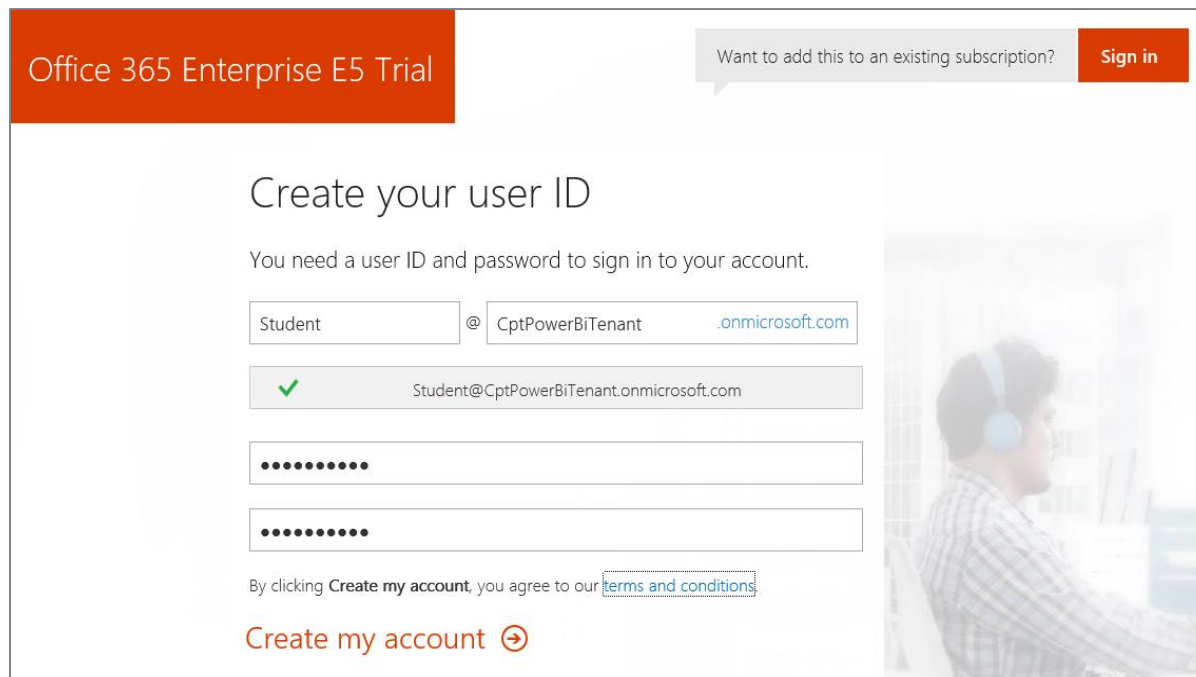
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Creating a Power BI Dev Environment

- 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
 - Office 365 E5 provides Power BI Pro license



The screenshot shows the Microsoft Office 365 Enterprise E5 Trial sign-up page. At the top, there's an orange banner with the text "Office 365 Enterprise E5 Trial". To the right, there's a link "Sign in" and a speech bubble asking "Want to add this to an existing subscription?". The main heading is "Create your user ID". Below it, a message states: "You need a user ID and password to sign in to your account." The form consists of three input fields: a first name field containing "Student", a last name field containing "CptPowerBiTenant", and a domain dropdown menu showing ".onmicrosoft.com". Below these fields, the email address "Student@CptPowerBiTenant.onmicrosoft.com" is displayed with a green checkmark. There are two password fields, each with a masked password of eight dots. At the bottom, there's a link to "terms and conditions" and a "Create my account" button with a right-pointing arrow.

Office 365 Enterprise E5 Trial

Want to add this to an existing subscription? [Sign in](#)

Create your user ID

You need a user ID and password to sign in to your account.

Student @ CptPowerBiTenant .onmicrosoft.com

✓ Student@CptPowerBiTenant.onmicrosoft.com

.....

.....

By clicking **Create my account**, you agree to our [terms and conditions](#)

Create my account ➔



Creating User Accounts for Testing

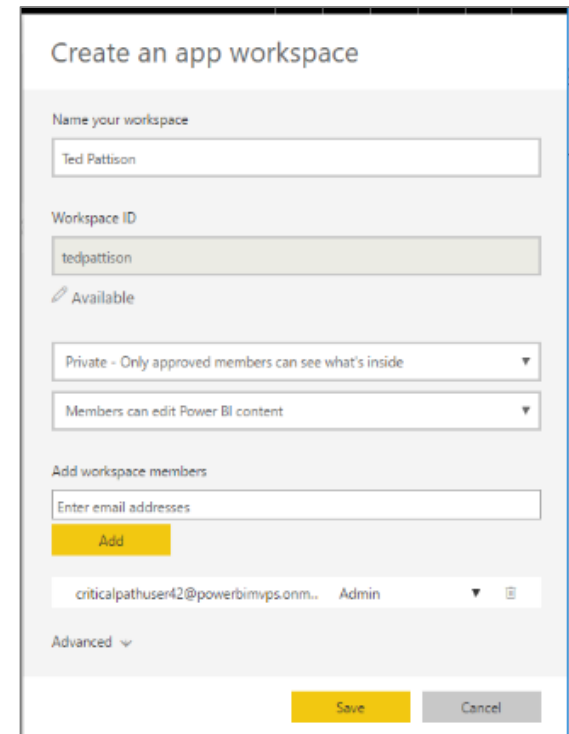
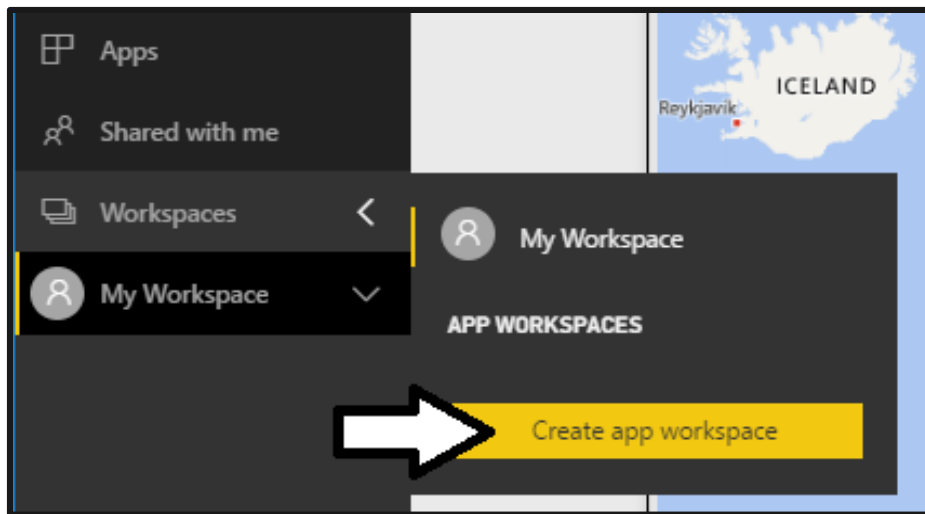
- Can be accomplished in Microsoft 365 Admin center
- Can be automated using PowerShell

```
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
```



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

A screenshot of the 'Create an app workspace' dialog box. It contains the following fields and options:

- Name your workspace:** A text input field with 'Ted Pattison' entered.
- Workspace ID:** A text input field with 'tedpattison' entered.
- Available:** A checkbox that is checked.
- Private - Only approved members can see what's inside:** A dropdown menu.
- Members can edit Power BI content:** A dropdown menu.
- Add workspace members:** A section with a text input field for 'Enter email addresses' and an 'Add' button.
- criticalpathuser42@powerbimvps.onm... Admin:** A list of members with a dropdown arrow and an 'Add' button.
- Advanced:** A dropdown arrow.
- Save:** A yellow button.
- Cancel:** A gray button.

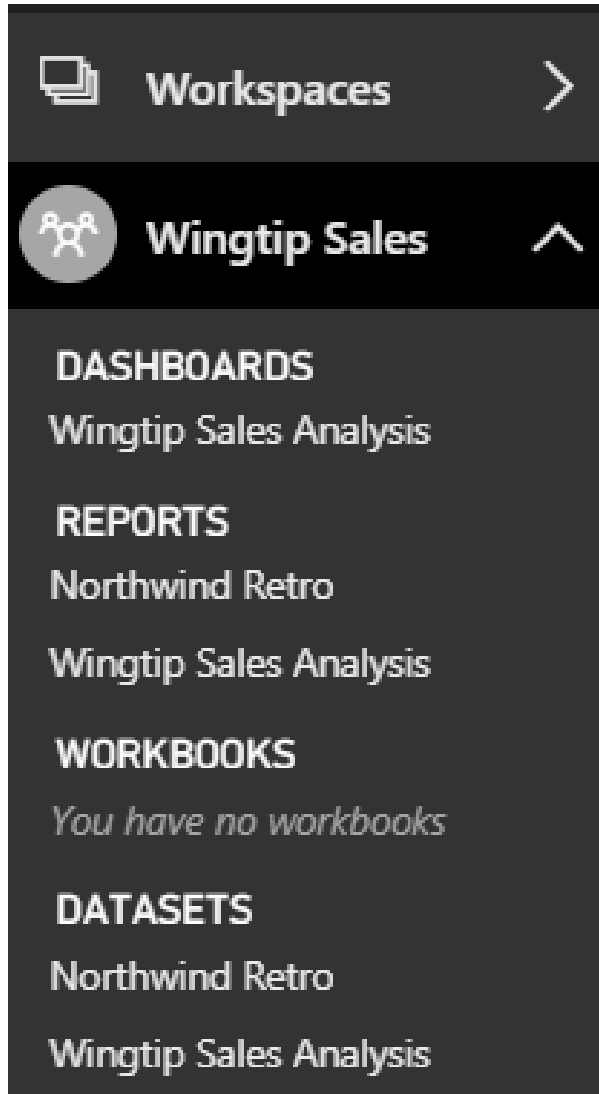


Power BI App Workspaces - V2

- 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**
 - Secure container for publishing content
 - Every licensed user gets a personal workspace
 - App workspaces created for custom solutions
- **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



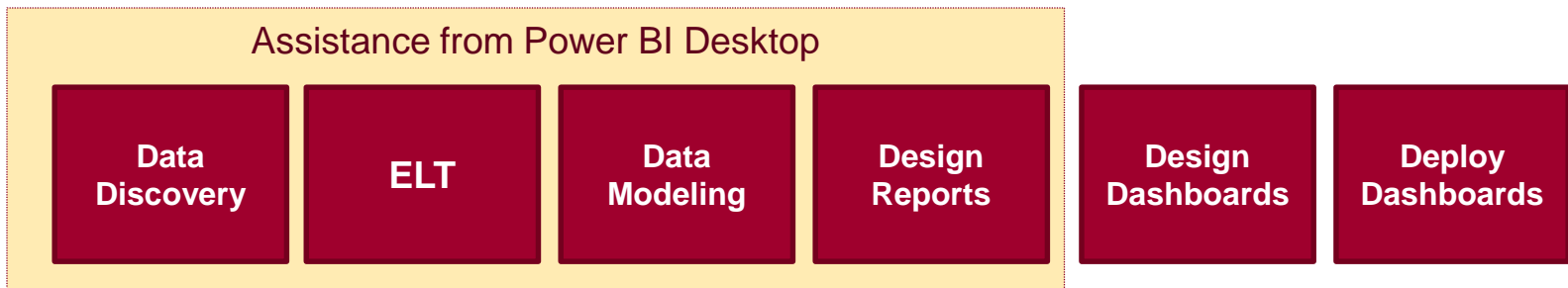
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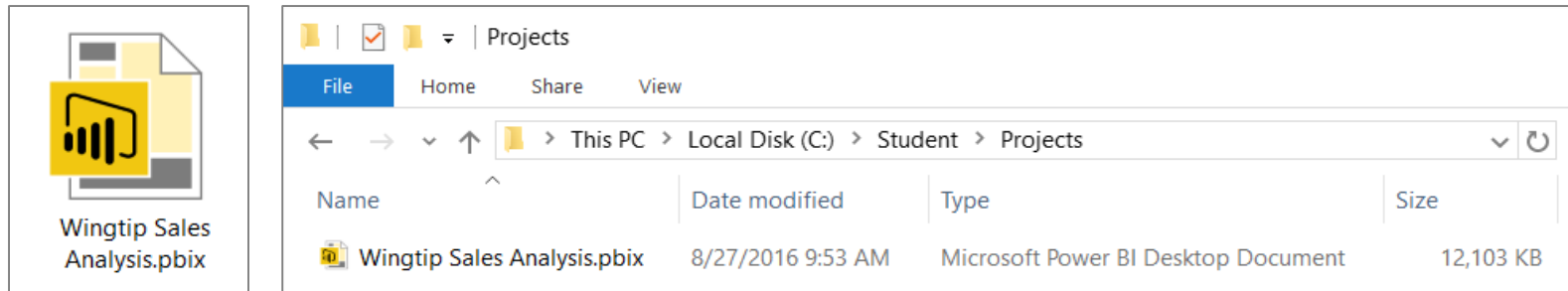
Working with Power BI Desktop

- 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



Power BI Desktop 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



- PBIX files can be tracked in source control (e.g. github.com)
 - PBIX files is a versioned unit of work with 1 dataset and 1 report
 - Some Power BI resources (e.g. Dashboard) have no backing file support



Division of Labor with Power BI Embedding

- Content Management Team

- Build Power BI Desktop projects
- Publish reports & datasets via PBIX files
- Create dashboards in PBI Service
- Publish App Workspaces as Apps
- Monitor Power BI environment



- Application Development Team

- Develop web apps with PBI embedding
- Authenticate with Azure Active Directory
- Retrieve data using Power BI Service API
- Embed resources using Power BI JavaScript API
- This team sees PBIX files as black boxes



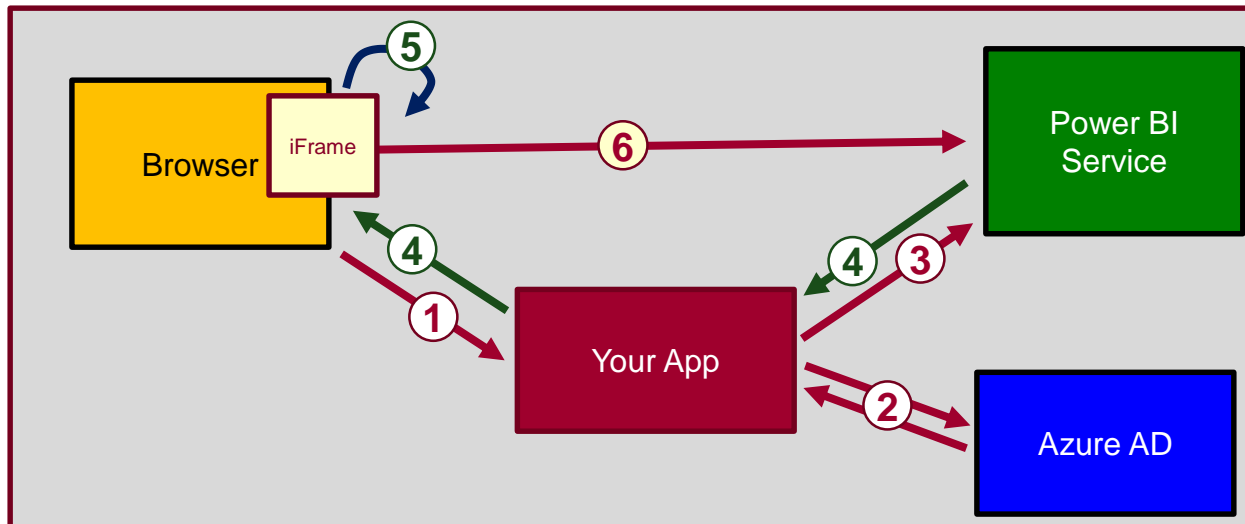
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Power BI Embedding – The Big Picture

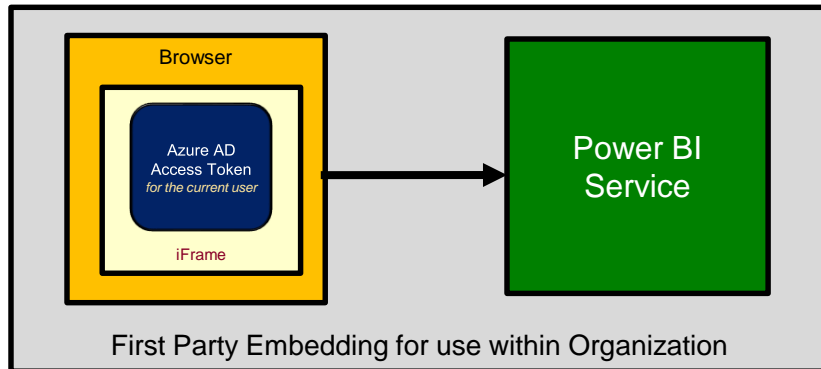
- User launches your app using a browser
- App authenticates with Azure Active Directory and obtains access token
- App uses access token to call to Power BI Service API
- App retrieves data for embedded resource and passes it to browser.
- Client-side code uses Power BI JavaScript API to create embedded resource
- Embedded resource session created between browser and Power BI service



First Party Embedding vs Third Party Embedding

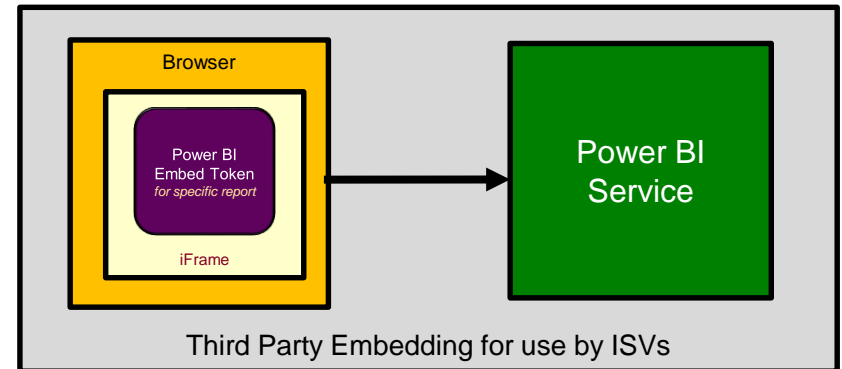
First Party Embedding

- Known as **User-Owns-Data** Model
- All users require a Power BI license
- Useful in corporate environments
- App authenticates as current user
- Your code runs with user's permissions
- User's access token passed to browser



Third Party Embedding

- Known as **App-Owns-Data** Model
- No users require Power BI license
- Useful for commercial applications
- App authenticates with master user account
- Your code runs with admin permissions
- Embed token passed to browser



Embeddable Resources

- Reports
- Dashboards
- Dashboard Tiles
- New Reports
- Q&A Experience
- Visuals in custom layout



DEMO



Embeddable Resources





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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 & 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 & 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 & mobile apps </p> <p>Office 365 services </p> <p>...</p>
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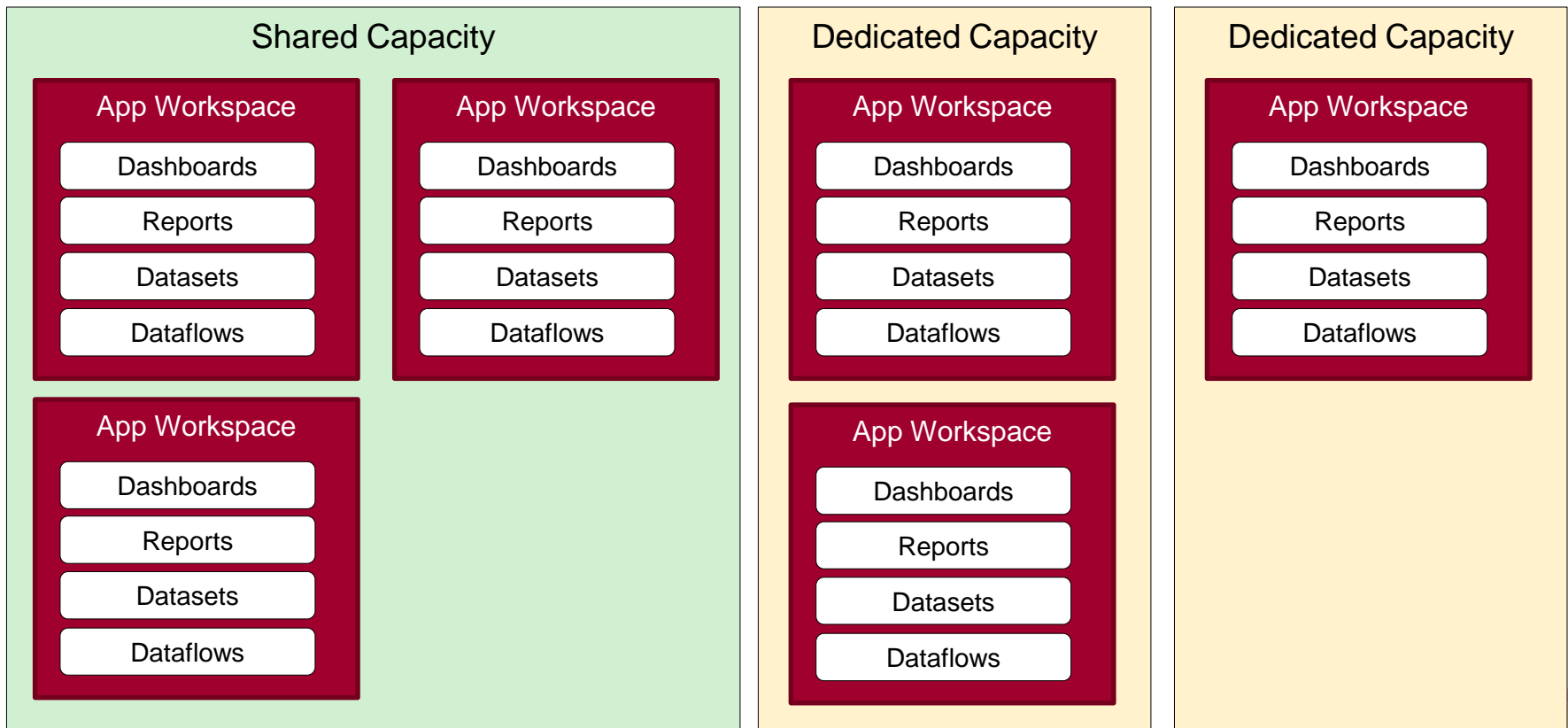
Capacity-based Licensing

<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 & 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 & 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 & 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 & 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 & 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 & mobile apps Not included</p> <p>Office 365 services </p> <p>...</p>
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Capacities and Workspace Associations

- Every Power BI workspace runs in the context of a capacity
 - By default, app workspaces and personal workspace run in **shared capacity**
 - Organizations have the option of purchasing **dedicated capacities**



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



Managing Premium Capacities

- Dedicated capacities managed in Power BI Admin portal

The screenshot shows the Power BI Admin portal interface. On the left is a navigation sidebar with options: Favorites, Recent, Apps, Shared with me, Workspaces, and My Workspace. The main content area is titled 'Admin portal' and contains a list of settings: Usage metrics, Users, Audit logs, Tenant settings, Capacity settings (selected), Embed Codes, and Organization visuals. The 'Capacity settings' section is active, showing tabs for 'Power BI Premium' and 'Power BI Embedded'. Under 'Power BI Premium', it displays 'V-CORES' as '8 of 8 used' with a yellow progress bar and '0 available'. A 'Set up new capacity' button is present. Below this is a table titled 'PREMIUM CAPACITIES' with columns: CAPACITY NAME, CAPACITY ADMINS, ACTIONS, SKU, V-CORES, REGION, and STATUS. The table contains one entry: P1, managed by Charles Sterling, duryan, with 8 v-cores in the East US 2 region, status Active.

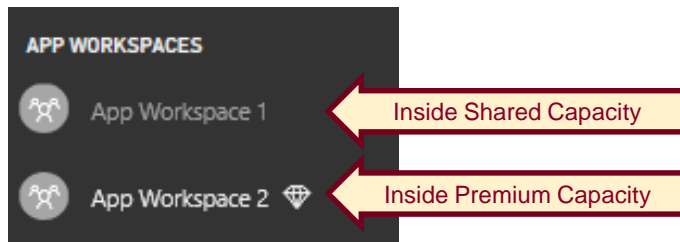
CAPACITY NAME	CAPACITY ADMINS	ACTIONS	SKU	V-CORES	REGION	STATUS
P1	Charles Sterling, duryan		P1	8	East US 2	Active

This screenshot shows the detailed view of a Power BI Premium P1 capacity. The top section, 'USAGE IN THE LAST 7 DAYS', includes four metrics: CPU (Exceeded 80% utilization 0 times), Memory Thrashing (Exceeded 80% utilization 0 times), Memory Usage (Average: 2GB), and Direct Query (Exceeded 80% utilization 0 times). Below this, the 'CAPACITY SIZE' section states 'This capacity is a P1, which is 8 v-cores.' and provides a 'Change capacity size' button. The 'REGION' is listed as 'East US 2'. Under 'USER PERMISSIONS', 'Capacity admins' are listed. The 'WORKSPACES (53)' section contains a table with columns: WORKSPACE NAME, WORKSPACE ADMINS, ACTIONS, and STATUS. Two workspaces are shown: 'Adventure Works' and 'ChucksAADGroup', both assigned to 'View admins' and in an 'Assigned' status. At the bottom right of the workspace table are links to 'Remove all' and 'Assign workspaces'.

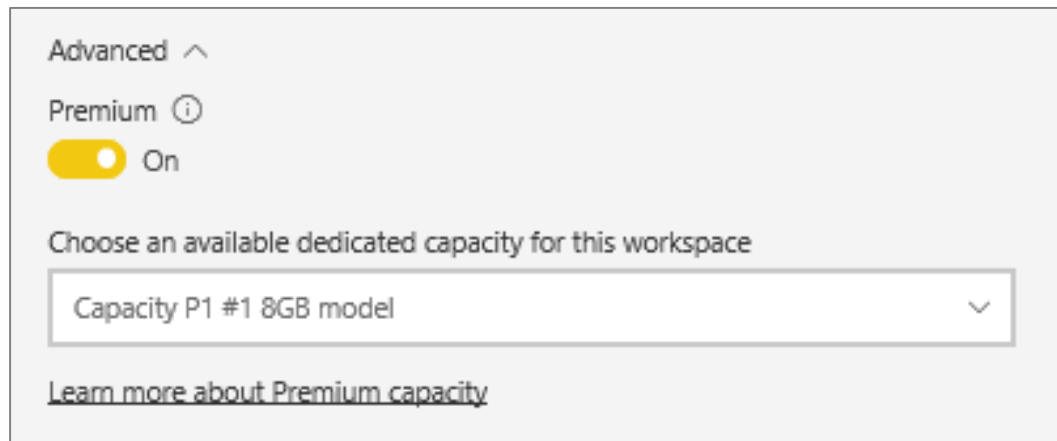
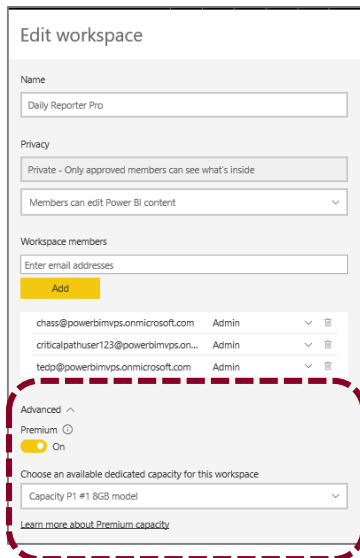
WORKSPACE NAME	WORKSPACE ADMINS	ACTIONS	STATUS
Adventure Works	View admins		Assigned
ChucksAADGroup	View admins		Assigned

Associating App Workspaces with a Capacity

- App Workspace in Premium Capacity has diamond icon

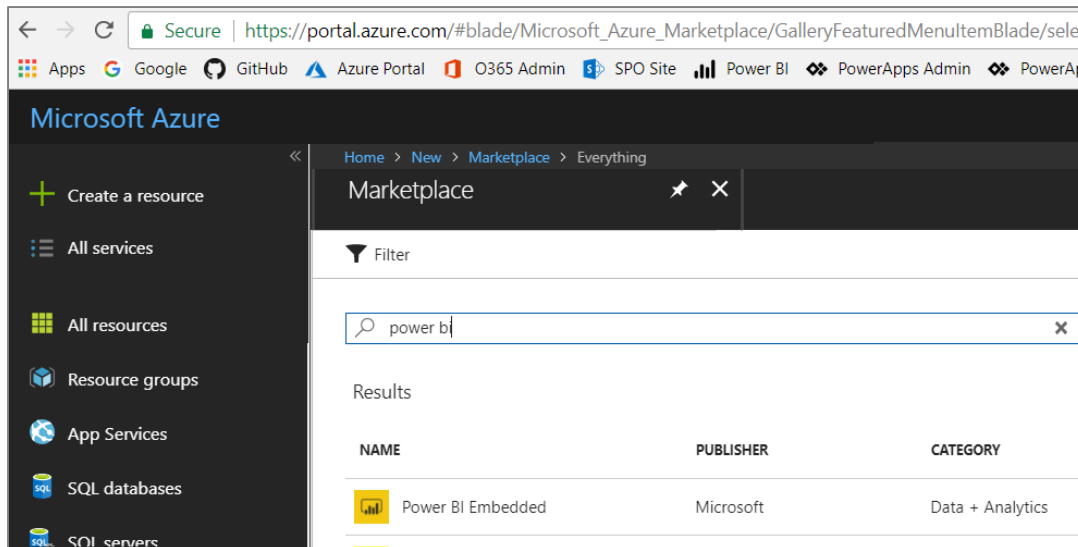


- App workspace moved into Premium capacity in Advanced settings



Creating the Power BI Embedded Service

- Power BI Embedded in an Azure on-demand service
 - Must be created in same location as Power BI Service for tenant
 - Can be created manually through the Azure portal
 - Can be created in automated fashion using PowerShell
 - Requires an Azure subscription *in same tenant*



The screenshot shows the 'Power BI Embedded' creation form. The form includes fields for Resource name, Subscription, Resource group, Power BI capacity administrator, Location, and Pricing tier. The 'Create' button is visible at the bottom.

Power BI Embedded

myfirstcapacity

Pay-As-You-Go

Create new Use existing

biz-app-summit-demos

Power BI capacity administrator (Select)

TedP@BizAppSummit.onmicrosoft.com

West US 2

A1 (1 V-Cores)

Create Automation options

Embedded Capacity Pricing Tiers

Home > myfirstcapacity

myfirstcapacity
Power BI Embedded

Search (Ctrl+)

Overview
Activity log
Access control (IAM)
Tags
Diagnose and solve problems

SCALE

Pricing tier

SETTINGS

Quick Start
Power BI capacity administrators
Properties
Locks
Automation script

MONITORING

Diagnostics logs
Metrics
Alerts

Pause Move Delete

Essentials

Resource group (change)
biz-app-summit-demos
Status
Active
Location
West US 2
Subscription name (change)
Pay-As-You-Go
Subscription ID
63bf3c07-a58b-4940-ab25-a6a66dda26dc

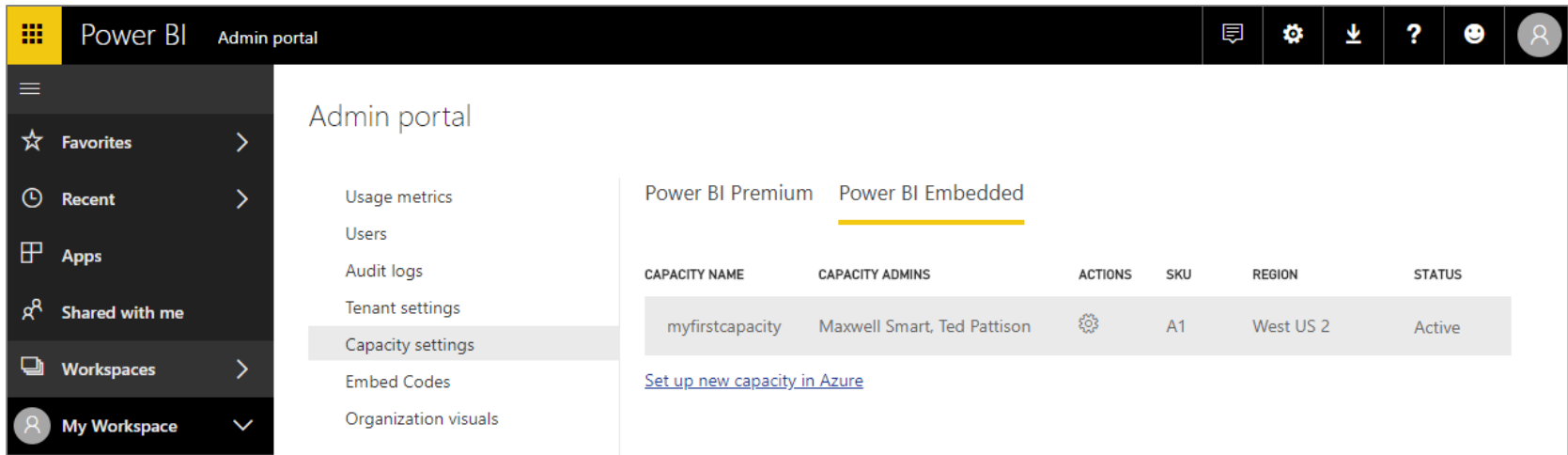
Resource name
myfirstcapacity
Pricing tier
A1

A1	A2	A3
1 V-Cores	2 V-Cores	4 V-Cores
Up to 3 GB Cache	Up to 5 GB Cache	Up to 10 GB Cache
Shared infrastructure	Shared infrastructure	Dedicated service
750.03 USD/MONTH (ESTIMATED)	1,494.03 USD/MONTH (ESTIMATED)	2,994.00 USD/MONTH (ESTIMATED)

A4	A5	A6
8 V-Cores	16 V-Cores	32 V-Cores
Up to 25 GB Cache	Up to 50 GB Cache	Up to 100 GB Cache
Dedicated service	Dedicated service	Dedicated service
5,994.04 USD/MONTH (ESTIMATED)	11,994.02 USD/MONTH (ESTIMATED)	23,994.45 USD/MONTH (ESTIMATED)

Managing Power BI Embedded Capacities

- Managing Power BI Embedded capacity done Azure portal
 - Use Azure portal to assign administrators & change pricing tier to scale
- Managing Power BI Embedded capacity in Power BI Admin portal
 - Power BI Admin portal to assign workspaces to capacities



The screenshot displays the Power BI Admin portal interface. The top navigation bar includes the Power BI logo, 'Admin portal', and several utility icons. A left-hand sidebar contains navigation options: Favorites, Recent, Apps, Shared with me, Workspaces, and My Workspace. The main content area is titled 'Admin portal' and features a sub-menu on the left with options like Usage metrics, Users, Audit logs, Tenant settings, Capacity settings (highlighted), Embed Codes, and Organization visuals. The main panel shows two tabs: 'Power BI Premium' and 'Power BI Embedded' (which is selected and underlined). Below the tabs is a table listing capacities.

CAPACITY NAME	CAPACITY ADMINS	ACTIONS	SKU	REGION	STATUS
myfirstcapacity	Maxwell Smart, Ted Pattison		A1	West US 2	Active

Below the table, there is a link: [Set up new capacity in Azure](#).



PBI Capacity SKU Decoder Ring

	P SKU	EM SKU	A SKU
Purchased through...	Office 365	Office 365	Azure
Supports Power BI embedding in custom applications	Yes	Yes	Yes
Supports 3 rd Party Embedding in custom applications	Yes	Yes	Yes
Supports 1 st Party Embedding in custom applications	Yes	Yes	Yes
Supports free users accessing content in Power BI portal	Yes	No	No
Supports free users accessing content in Power BI Mobile	Yes	No	No
Billing cycle	Monthly	Monthly	Hourly
Commitment	Monthly	Monthly/Yearly	None
Turn it off when your not using it	No	No	Yes



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