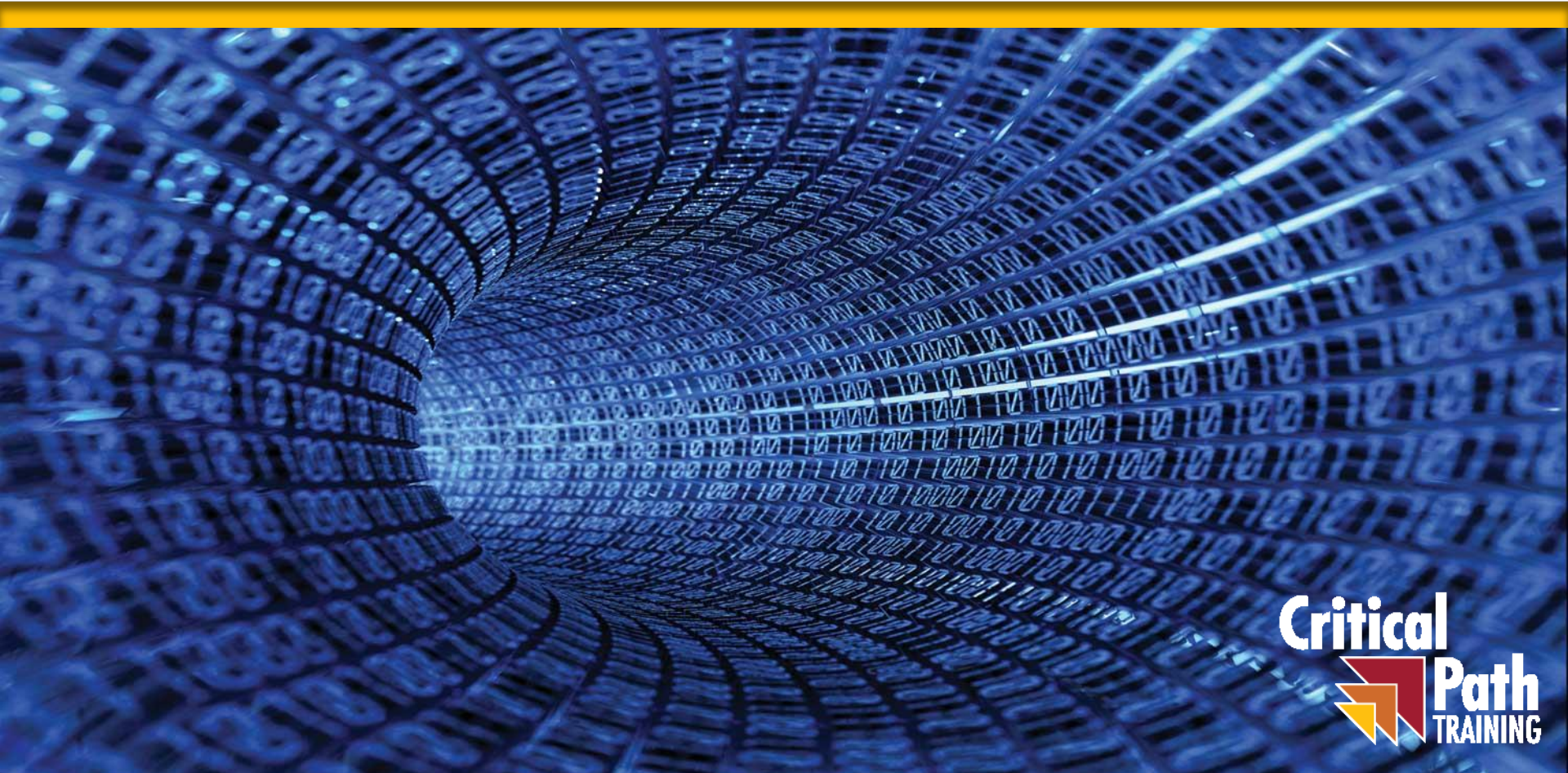


# **Power BI Embedded**

**Reports of My Death are Greatly Exaggerated**



# Code and Slides for this Session

- <https://github.com/CriticalPathTraining/PowerBIEmbedded>

The screenshot shows the GitHub repository page for `CriticalPathTraining/DailyReporterPro`. The browser address bar displays the URL `https://github.com/CriticalPathTraining/DailyReporterPro`. The repository description is "A sample app created with ASP.NET MVC to demonstrate 3rd party embedding with Power BI". The repository statistics show 4 commits, 1 branch, 0 releases, 1 contributor, and the MIT license. The file list includes `DailyReporterPro`, `.gitignore`, `DailyReporterPro.sln`, `LICENSE`, and `Power BI Embedded.pdf`.

Branch: master ▾ New pull request

Create new file Upload files Find file Clone or download ▾

TedPattison Updates		Latest commit 3cc061d a minute ago
DailyReporterPro	Updates for d.ts files	22 hours ago
.gitignore	Updates for d.ts files	22 hours ago
DailyReporterPro.sln	Initial Upload	a day ago
LICENSE	Initial commit	a day ago
Power BI Embedded.pdf	Updates	a minute ago



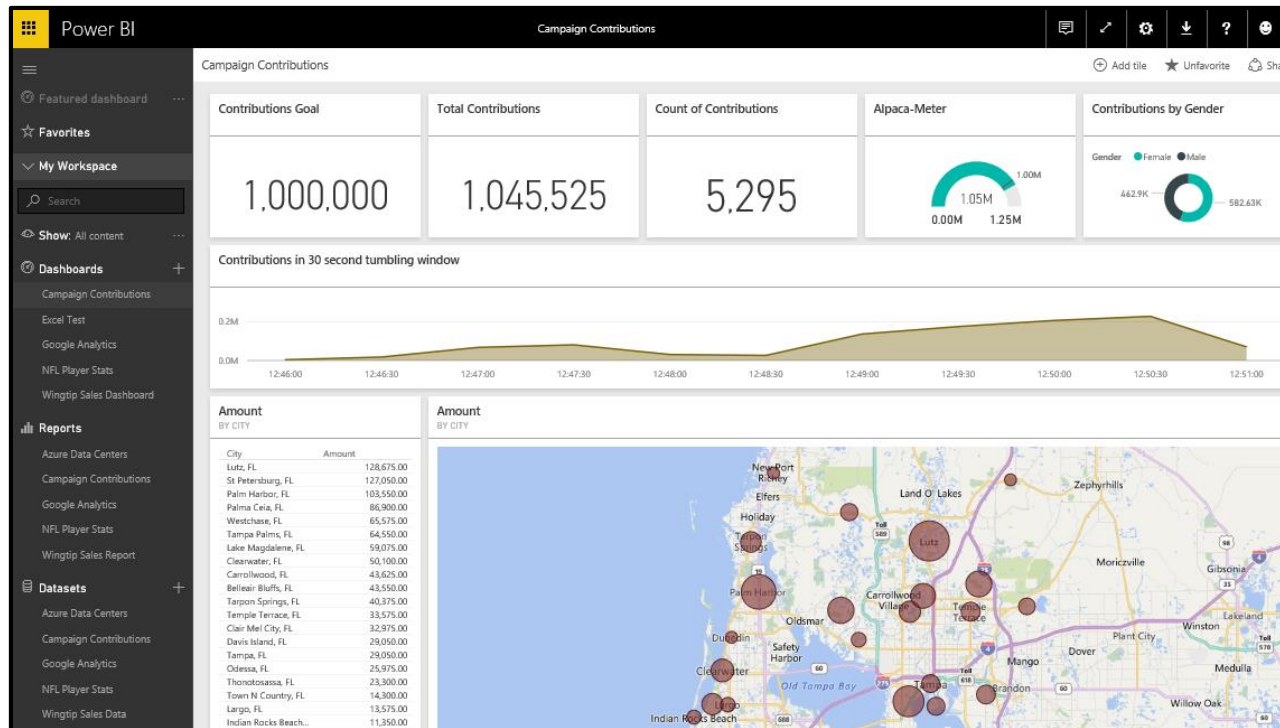
# Agenda

- Power BI Embedding Fundamentals
  - App Workspaces and Premium Capacities
  - Authentication with Azure Active Directory
  - Programming with Power BI Service API
  - Working with Embeddable Resources
  - Embedding with Power BI JavaScript API



# The Power BI Service

- Provides cloud-based foundation for Power BI platform
  - Accessible with browser through <https://app.powerbi.com>
  - Accessible through Power BI mobile apps
  - Accessible to developers through Power BI Service API





# What **is** was Power BI Embedded V1?

- Power BI Embedded V1 is an Azure Service
  - PBI Embedded service that was provisioned on-demand
  - Service provisioned in terms of workspace collections
  - Pricing model based on number of report sessions
  - Power BI Embedded was Sunset-ed Beginning in May 2017

Microsoft Azure cpt-demo Search resources

cpt-demo Power BI workspace collection

Search (Ctrl+ /)

Overview

Activity log

Access control (IAM)

Tags

Diagnose and solve problems

SETTINGS

Locks

Automation script

GENERAL

Move Delete

There's a new way to work with Power BI Embedded. [Learn more](#)

cpt-demo ^

Resource group  
powerbi-demo

Subscription Id  
f9abdf60-6f61-4917-bdbb-c0b426b77115

Summary

Workspaces  
POWER BI WORKSPACE

1 Workspaces

NAME	ID
1A366AF1-9E6B-4988-85CA-9BA34FCDAFC0	1a366af1-9e6b-4988-85ca-9ba34cdafc0



# Reflecting on Power BI Embedded V1?

- Good Points about Power BI Embedded V1
  - It eliminates need for Power BI license for each user
  - It decouples user security from app security
  - It opens up PBI platform to commercial applications
- Pain Points with Power BI Embedded V1
  - Requires developers to have Azure subscriptions
  - No out-of-box UX to upload and manage PBIX files
  - It uses separate APIs from Power BI Service API
  - Cannot estimate costs with per-session pricing model
  - It's deprecated and not available to new customers



# Power BI Embedded Version 2

- Power BI Embedded V2 has same good points as V1
  - It eliminates need for Power BI license for each user
  - It decouples user security from app security
  - It opens up PBI platform to commercial applications
- Power BI Embedded V2 significantly improves upon V1
  - Embedding features all available through Power BI Service API
  - Standard PBI UX used to upload and manage PBIX files
  - New pricing models allow for predictable costs per month
  - No need to create, manage and monitor any Azure services
- The term “Power BI Embedded” is now ambiguous
  - Better to refer to the “Embedding features in Power BI”



# The Power BI Service API

- The Power BI Service API goes by other names
  - The Power BI REST API
  - The Power BI API



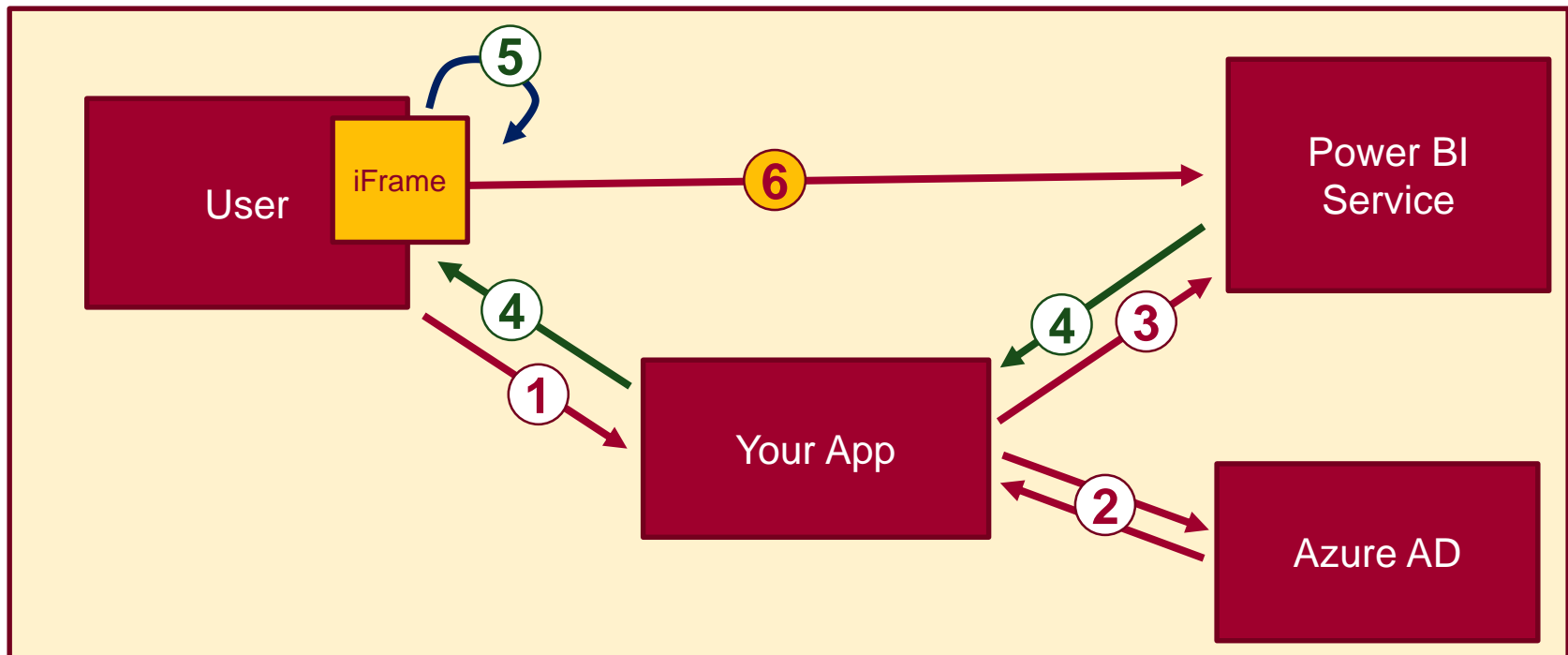
- Using the Power BI Service API
  - Accessible by making direct REST calls against service
  - Accessible by using Assembly DLL that abstracts away REST calls
  - Assembly DLL is named **Microsoft.PowerBI.Api.dll**
  - Assembly DLL part of NuGet package (**Microsoft.PowerBI.Api**)
  - Calling service requires authentication with Azure Active Directory





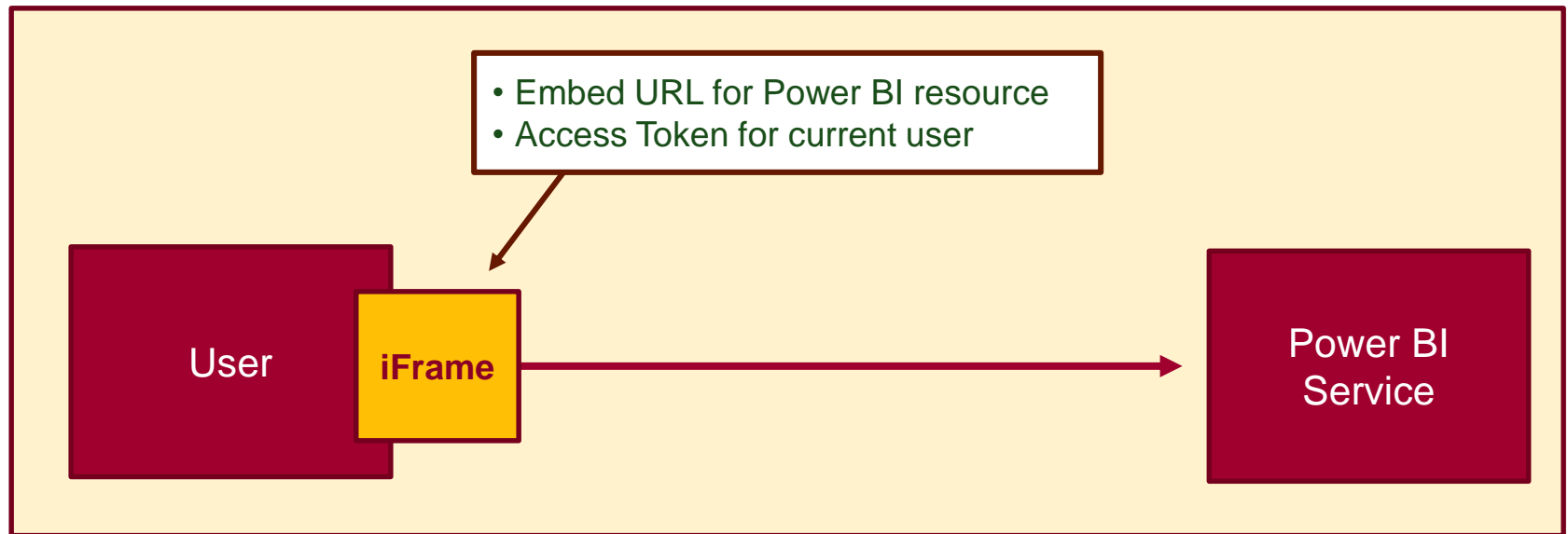
# Power BI Embedding – The Big Picture

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



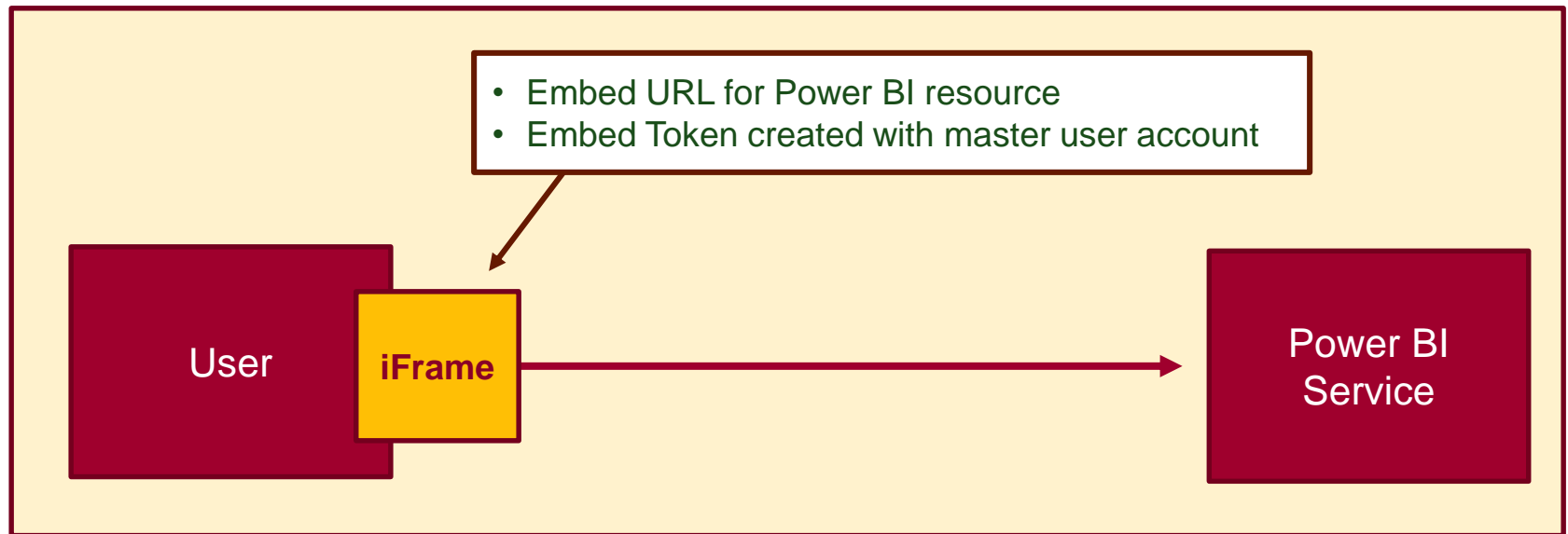
# First Party Embedding

- App authenticates current user with Azure AD
  - Your code accesses Power BI Service as current user
  - Embedding requires Azure AD access token for user
  - User requires Azure AD account and Power BI license
  - Your code has access to whatever user has access to



# Third Party Embedding

- App authenticates using Master User Account
  - Your code accesses Power BI Service as master user
  - Embedding uses embed token instead of access token
  - Users don't need AAD accounts and Power BI licenses
  - Your code has access to whatever master has access to



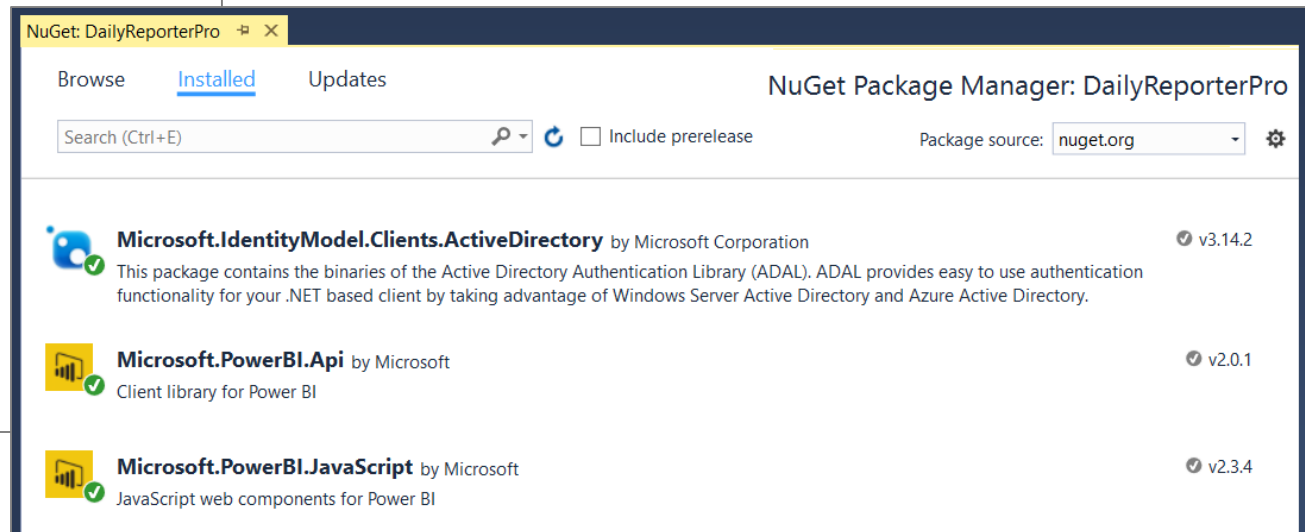
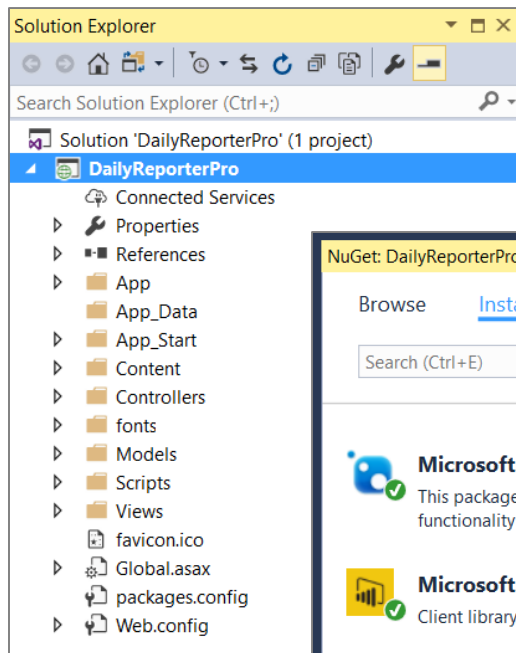
# First Party vs Third Party Embedding

- What scenarios use first party embedding?
  - Organizations where users have Power BI licenses
  - Users can already access Power BI with browser
  - Development should go beyond out-of-box experience
- What scenarios use third party embedding?
  - Scenarios where users don't have Power BI licenses
  - Applications which have custom identity providers
  - Applications which use identity provider other than AAD



# NuGet Packages Required in MVC Project

- NuGet Packages used in DailyReporterPro sample app
  - Azure Active Directory Library (ADAL) for .NET
  - Power BI Service API
  - Power BI JavaScript API







**DEMO**

# **The Daily Reporter Pro Sample App**



# Agenda

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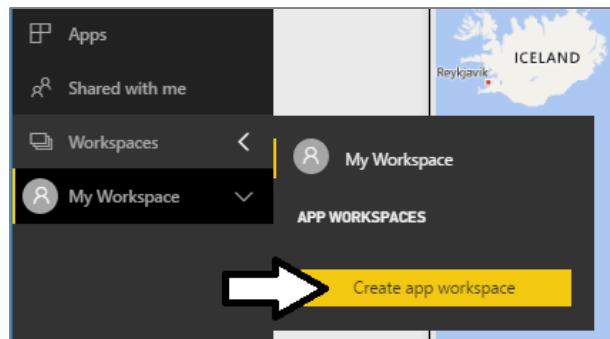
# Power BI Premium SKUs

- Microsoft initially offered two Power BI licensing options
  - Power BI Free license
  - Power BI Pro license (\$10/month)
  - All Power BI resources and processing runs in shared capacity
- In May 2017, Microsoft introduced Power BI Premium licensing
  - Power BI Premium customers can create premium capacities
  - Premium capacities useful to organization with many read-only users
  - Premium capacities used by ISVs to reach non-licensed users
- Power BI Premium details and pricing are in flux
  - More info at <https://powerbi.microsoft.com/en-us/pricing/>



# Understanding App Workspaces

- App workspaces used to deploy custom solutions
  - App workspaces required for team-based development
  - App workspace can be secured using private membership
  - App workspace used to publish apps for licensed users
- App workspaces required for 3<sup>rd</sup> party embedding
  - App workspace must be added to premium capacity
  - Master user account must be configured as app workspace admin

A screenshot of the 'Create an app workspace' form. The form has the following fields and options:

- Name your workspace:** A text input field containing 'Ted Pattison'.
- Workspace ID:** A text input field containing 'tedpattison'.
- Available:** A checkbox that is checked.
- Privacy:** A dropdown menu set to 'Private - Only approved members can see what's inside'.
- Members can edit Power BI content:** A dropdown menu set to 'Members can edit Power BI content'.
- Add workspace members:** A section with a text input for 'Enter email addresses' and an 'Add' button.
- Member list:** A list showing 'criticalpathuser42@powerbimaps.onm...' as an 'Admin'.
- Buttons:** 'Save' and 'Cancel' buttons at the bottom.



# Dedicated Capacities

- Power BI workspaces run in two possible environments
  - Shared Capacities
  - Dedicated Capacities
    - Power BI Premium Capacities
    - Power BI Embedded Capacities
- Dedicated capacity acts as dedicated resource
  - Dedicated capacity only used by single organization
  - PBIX file uploads not limited to 1GB
  - Data refresh frequency can exceed 8 times per day
  - Each dedicated capacity defines its own set of admins



# P SKUs (P is for Premium)

- All-in version which allows greatest flexibility
  - Used to provide free users with access to apps
  - Used to provide free users with access to shared dashboards
  - It's also by far the most expensive starting point

Name	Virtual cores	Memory (GB)	Peak renders/hr	Cost
P1	8	25	1-300	\$4,995/mo
P2	16	50	301-600	\$9,995/mo
P3	32	100	601-1,200	\$19,995/mo



# EM SKUs (EM is for Embedded)

- SKUs for Embedding in SaaS Applications
  - SaaS applications include SharePoint and Teams
  - Does not provide user access to PowerBI.com

Name	Virtual cores	Memory (GB)	Peak renders/hr	Cost
EM1	1	3	1-300	\$625/mo
EM2	2	5	301-600	\$1,245/mo
EM3	4	10	601-1,200	\$2,495/mo





# A SKUs (A is for Azure)

- A SKU is a Platform-as-a-Service
  - Used by ISVs as the data visualization layer
  - Allows for PBI Embedding into Custom Applications
  - Only supports App-Owns-Data model

Name	Virtual cores	Memory (GB)	Peak renders/hour	Cost/hour
A1	1	3	300	~\$1
A2	2	5	600	~\$2
A3	4	10	1,200	~\$4
A4	8	25	2,400	~\$8
A5	16	50	4,800	~\$16
A6	32	100	9,600	~\$32



# PBI Capacity SKU Decoder Ring

	P SKUs	EM SKU	A SKUs
Purchase	Office	Office	Azure
Embed content in custom application	Yes	Yes	Yes
Share content with free PBI users outside PowerBI.com	Yes	Yes	No
Share content with free PBI users inside PowerBI.com	Yes	No	No
Billing	Monthly	Monthly	Hourly
Commitment	Monthly/Yearly	Yearly	None
Turn it off when your not using it	No	No	Yes



# Great Blog Explanation by John White

- <https://whitepages.unlimitedviz.com/2017/09/understanding-the-power-bi-capacity-based-skus/>

## The White Pages

Random musings and thoughts on SharePoint, Business Intelligence, Microsoft technology, and occasionally even diving from John White

### Understanding the Power BI Capacity Based SKUs

[15 Replies](#)

Power BI licensing has changed again. This week at Microsoft Ignite, Microsoft introduced a new capacity based SKU for Power BI Embedded, intended for ISVs and developers: The A SKU. This brings the number of capacity based SKUs to 3, with each category having numerous sub categories. This means that there are a number of ways to embed content by using Power BI Pro, Power BI Embedded, or Power BI Premium. The trick is to know what will be needed for what circumstances. This post will attempt to help with the distinctions.

The SKUs are additive in nature, with A (Power BI Embedded) providing a set of APIs for developers, EM (Power BI Premium) additional ad-hoc embedding features for organizations, and P (Power BI Premium) providing a SaaS application that contains everything that the Power BI service offers. For some background, the EM SKU was initially introduced to serve the needs of both Independent Software Vendors (ISVs) and of organizations that needed to do some simple sharing within the organization, and give them access to the latest Power BI features. However, ISVs have a different business model than enterprises, which is why the A series was introduced.



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# Tenants and Organizational Accounts

- Azure AD used to authenticate users and apps
  - PBI licenses are assigned to Azure AD user accounts
  - Organization owns a tenant (i.e. directory)
  - AAD tenant contains user accounts and groups
  - AAD tenant contains set of registered applications
- You must register your application with Azure AD
  - Requirement of calling to Power BI service API
  - Applications registered as Web app or Native app
  - Registered applications are assigned GUID for client ID
  - Application is configured with permissions



# Creating an Azure AD Application

The image shows a sequence of three overlapping screenshots from the Microsoft Azure portal, illustrating the process of creating and configuring an Azure AD application.

**Top Screenshot: Create Application**  
The "Create" dialog is open in the "premium demo tenant - App registrations" section. The "Name" field is filled with "My Native App" and has a green checkmark. The "Application type" is set to "Native". The "Redirect UR" field is partially visible with the value "https://local". A "Create" button is at the bottom.

**Middle Screenshot: Application Overview**  
The "My Native App" page is shown, titled "Registered app". It has tabs for "Settings", "Manifest", and "Delete". Under the "Essentials" section, the following information is displayed:

Property	Value
Display name	My Native App
Application ID	7802d697-c0d5-480f-8f30-5039226f02a7
Application type	Native
Home page	Managed application in local directory <a href="#">My Native App</a>

An "All settings" link with a right arrow is at the bottom right.

**Bottom Screenshot: Settings Page**  
The "Settings" page for the application is shown. It has a search bar labeled "Filter settings". The settings are organized into sections:

- GENERAL**
  - Properties (with a right arrow)
  - Redirect URIs (with a right arrow)
  - Owners (with a right arrow)
- API ACCESS**
  - Required permissions (with a right arrow)
  - Keys (with a right arrow)





# Power BI App Registration Page

- <https://app.powerbi.com/apps>

The image shows the 'Power BI for Developers' registration page and an overlay window for a registered app.

**Power BI for Developers**

## Register an Application for Power BI

Register a new application that can be used to call Power BI APIs

**Step 1** Login to your Power BI account  
Welcome, TedP! (Wrong account? No problem, logout)

**Step 2** Tell us about your app  
Let's start with some basic details.

App Name:  
My Other Native App

App type:  
Specify the type of app. Use 'Server-side Web app' for web apps or Web APIs, or Native app for native apps.  
Native app

Redirect URL:  
A valid URL.  
<https://localhost/app2345>

**Step 3** Choose APIs to access  
Select the APIs and the level of access your app needs.

**Dataset APIs**

- ☒ Read All Datasets
- ☒ Read and Write All Datasets

**Report and Dashboard APIs**

- ☒ Read All Reports
- ☒ Read All Dashboards
- ☒ Read and Write All Reports
- ☒ Read and Write All Dashboards

**Step 4** Register your app  
Once you've set everything the way you want it, click the button below and we'll register your app. Your client ID and secret (for web apps only) will appear below. Be sure to copy the values into your app. By clicking the Register App button, you have accepted the [terms of use](#).

[Register App](#)

Client ID:

**My Other Native App**  
Registered app

Settings Manifest Delete

**Essentials** ^

Display name	Application ID
My Other Native App	f1936246-b123-4389-b0ac-fe4254b20f52
Application type	Object ID
Native	711c3c2f-d957-4f73-82b7-1b7fb5784f50
Home page	Managed application in local directory
	Log on to the app to create a local instance

[All settings →](#)



# Application Permissions

- Applications can be granted permissions to other applications
  - Application permissions are app-only permissions
  - Delegated permissions are (app + user) permissions
  - Delegated permissions requires 1-time consent from user

**Required permissions**

**+ Add** **Grant Permissions** ←

API	APPLICATION PERMI...	DELEGATED PERMIS...
Windows Azure Active Directory	6	
Power BI Service	0	

**DELEGATED PERMISSIONS** **REQUIRES ADMIN**

<input checked="" type="checkbox"/> Add data to a user's dataset (preview)	No
<input checked="" type="checkbox"/> View all Dashboards (preview)	No
<input checked="" type="checkbox"/> View all Datasets	No
<input checked="" type="checkbox"/> Read and Write all Datasets	No
<input checked="" type="checkbox"/> View content properties (preview)	No
<input checked="" type="checkbox"/> Create content (preview)	No
<input checked="" type="checkbox"/> View all Reports (preview)	No
<input checked="" type="checkbox"/> View all Groups	No
<input checked="" type="checkbox"/> View users Groups	No
<input checked="" type="checkbox"/> Read and Write all Reports	No



# Authentication Flows

- **Client Credentials Grant Flow** (*confidential client*)
  - Authentication based on SSL certificate with public-private key pair
  - Used to obtain access token when using app-only permissions
- **Authorization Code Grant Flow** (*confidential client*)
  - Client first obtains authorization code then access token
  - Server-side application code never sees user's password
- **Implicit Grant Flow** (*public client*)
  - Used in SPAs built with JavaScript and AngularJS
  - Application obtains access token w/o acquiring authorization code
- **User Credentials Flow** (*public client*)
  - Used in Native clients to obtain access code
  - Requires passing user name and password







**DEMO**

# Registering an App with Azure AD

# 1<sup>st</sup> Party Embedding vs 3<sup>rd</sup> Party Embedding

	1st Part Embedding	3rd Party Embedding
Authentication flow	Authentication Code Flow or Implicit Flow	Direct User Credentials
Identity used to call Power BI	Current User	Master User Account
Access to personal workspace	Yes	No
Access to app workspaces	Yes	Yes
Ability to reach non-licensed users	No	Yes
Supported Power BI Capacity SKUs	P* and EM* SKUs	P*, EM* and A* SKUs



# PbiEmbeddingManger Class

- PbiEmbeddingManger Class responsibilities
  - Get access tokens from Azure AD
  - Retrieve embedding data from Power BI service
  - Pass embedding data to browser using MVC view models

```
public class PbiEmbeddingManager {  
    "AAD Authentication Constants"  
  
    static string GetAccessToken() ...  
  
    static PowerBIClient GetPowerBiClient() ...  
  
    public static async Task<HomeViewModel> GetHomeViewModel() ...  
  
    public static async Task<DatasetsViewModel> GetDatasetsViewModel() ...  
  
    public static async Task<ReportsViewModel> GetReportsViewModel(string reportId, string datasetId) ...  
  
    public static async Task<DashboardsViewModel> GetDashboardsViewModel(string dashboardId) ...  
}
```





# Data Required for AAD Authentication

```
<configuration>
  <appSettings>
    <add key="clientId" value="23f6d66f-9a9a-4dba-9b7c-ff8aedadb831" />
    <add key="appWorkspaceId" value="4baab6c0-87c5-4a2a-a73e-1f97adcc6123" />

    <!-- consider a secure approach for password management such as Azure Key Vault -->
    <add key="pbiUserName" value="MasterUser@YourTenant.onMicrosoft.com" />
    <add key="pbiUserPassword" value="hackMEeyeDairU" />

  </appSettings>
```

```
public class PbiEmbeddingManager {

  #region "AAD Authentication Constants"

  static string aadAuthorizationEndpoint = "https://login.windows.net/common/oauth2/authorize";
  static string resourceUriPowerBi = "https://analysis.windows.net/powerbi/api";
  static string urlPowerBiRestApiRoot = "https://api.powerbi.com/";

  static string clientId = ConfigurationManager.AppSettings["clientId"];
  static string appWorkspaceId = ConfigurationManager.AppSettings["appWorkspaceId"];
  static string pbiUserName = ConfigurationManager.AppSettings["pbiUserName"];
  static string pbiUserPassword = ConfigurationManager.AppSettings["pbiUserPassword"];

  #endregion
```



# Getting an Access Token for the Master User

```
static string GetAccessToken() {  
    AuthenticationContext authContext = new AuthenticationContext(aadAuthorizationEndpoint);  
    var userCredentials = new UserPasswordCredential(pbiUserName, pbiUserPassword);  
  
    // this call will fail if permission consent has not be granted to master user account  
    string aadAccessToken =  
        authContext.AcquireTokenAsync(resourceUriPowerBi, clientId, userCredentials).Result.AccessToken;  
  
    // return Azure AD access token for master user account  
    return aadAccessToken;  
}
```



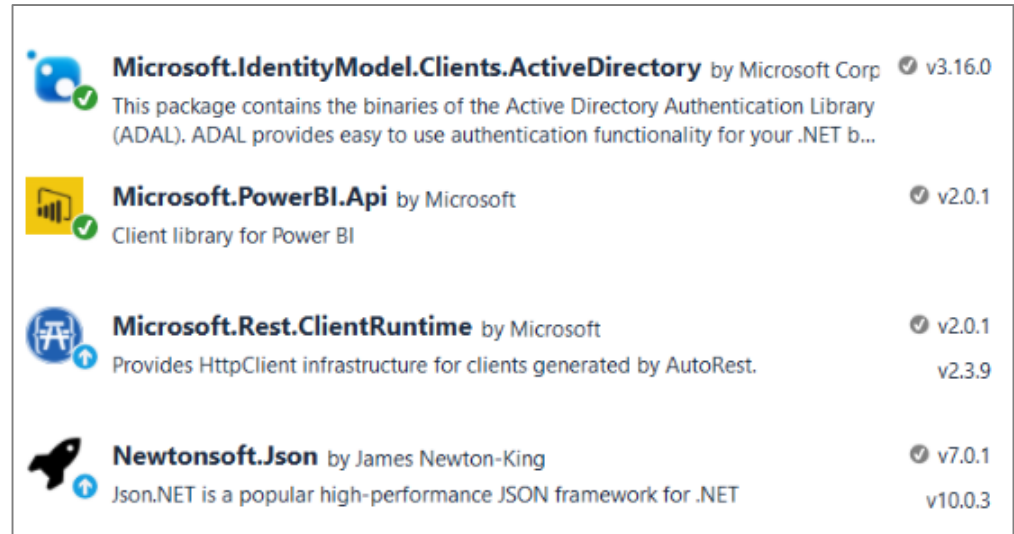
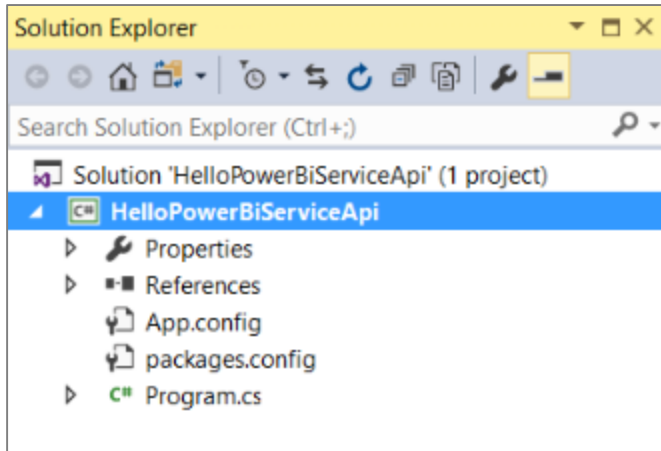
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# HelloPowerBiServiceApi Demo

- Let's get started with a simple C# console app
  - NuGet packages added for ADAL and Power BI Service API



# The Power BI Service API

```
Microsoft.PowerBI.Api
├── Microsoft.PowerBI.Api.V1
├── Microsoft.PowerBI.Api.V1.Models
└── Microsoft.PowerBI.Api.V2
    ├── Dashboards
    ├── DashboardsExtensions
    ├── Datasets
    ├── DatasetsExtensions
    ├── Gateways
    ├── GatewaysExtensions
    ├── Groups
    ├── GroupsExtensions
    ├── IDashboards
    ├── IDatasets
    ├── IGateways
    ├── IGroups
    ├── IImports
    ├── Imports
    ├── ImportsExtensions
    ├── IPowerBIClient
    ├── IReports
    ├── ITiles
    ├── PowerBIClient
    ├── Reports
    ├── ReportsExtensions
    ├── Tiles
    └── TilesExtensions
```

```
Microsoft.PowerBI.Api
├── Microsoft.PowerBI.Api.V1
├── Microsoft.PowerBI.Api.V1.Models
├── Microsoft.PowerBI.Api.V2
└── Microsoft.PowerBI.Api.V2.Models
    ├── BasicCredentials
    ├── BindToGatewayRequest
    ├── CloneReportRequest
    ├── Column
    ├── ConnectionDetails
    ├── CredentialDetails
    ├── Dashboard
    ├── Dataset
    ├── DatasetMode
    ├── Datasource
    ├── EmbedToken
    ├── Gateway
    ├── GatewayDatasource
    ├── GatewayPublicKey
    ├── GenerateTokenRequest
    ├── Group
    ├── GroupCreationRequest
    ├── GroupUser
    ├── GroupUserAccessRight
    ├── Import
    ├── ImportConflictHandlerMode
    ├── ImportInfo
    ├── MemberAdminAccessRight
    ├── ODataResponseListDashboard
    ├── ODataResponseListDataset
    ├── ODataResponseListDatasource
    ├── ODataResponseListGateway
    ├── ODataResponseListGatewayDatasource
    ├── ODataResponseListGroup
    ├── ODataResponseListGroupUserAccessRight
    ├── ODataResponseListImport
    ├── ODataResponseListRefresh
    ├── ODataResponseListReport
    ├── ODataResponseListTable
    ├── ODataResponseListTile
    ├── ODataResponseListUserAccessRight
    ├── PublishDatasourceToGatewayRequest
    ├── RebindReportRequest
    ├── Refresh
    ├── Report
    ├── Row
    ├── Table
    ├── Tile
    ├── TokenAccessLevel
    ├── UpdateDatasourceRequest
    ├── UserAccessRight
    └── UserAccessRightEnum
```



# Initializing a Instance of PowerBIClient

- PowerBIClient object serves as top-level object
  - Used to execute calls against Power BI Service
  - Initialized with function to retrieve AAD access token

```
static string GetAccessToken() ...

static PowerBIClient GetPowerBiClient() {
    var tokenCredentials = new TokenCredentials(GetAccessToken(), "Bearer");
    return new PowerBIClient(new Uri(urlPowerBiRestApiRoot), tokenCredentials);
}

static void Main() {
    PowerBIClient pbiClient = GetPowerBiClient();
    var reports = pbiClient.Reports.GetReports().Value;
    foreach (var report in reports) {
        Console.WriteLine(report.Name);
    }
}
```







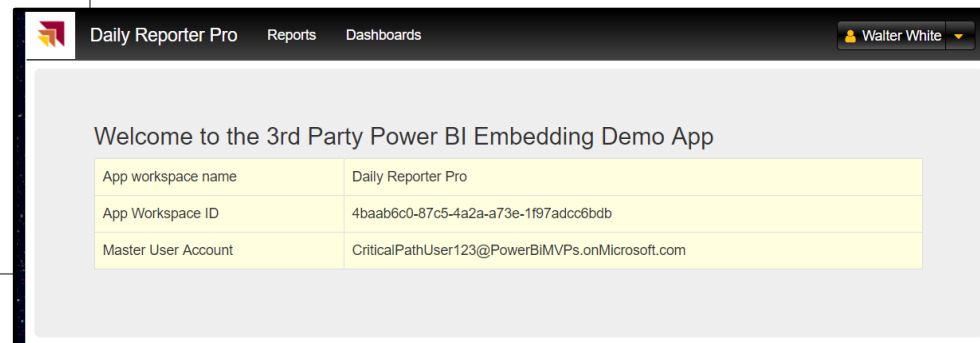
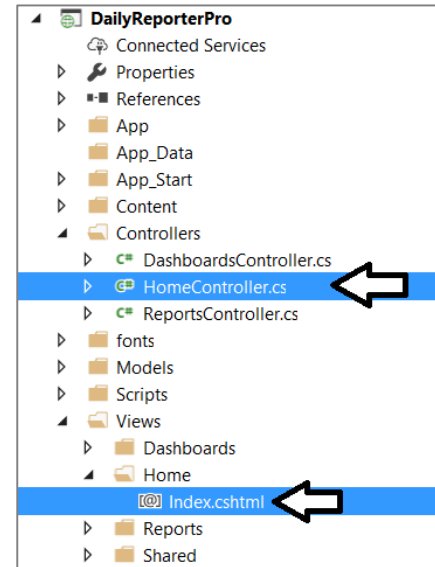
**DEMO**

# Programming the Power BI Service API

# MVC Controllers and Views

```
public class HomeController : Controller {  
  
    public async Task<ActionResult> Index() {  
        var viewModel = await PbiEmbeddingManager.GetHomeViewModel();  
        return View(viewModel);  
    }  
}
```

```
Index.cshtml  + x  
@model DailyReporterPro.Models.HomeViewModel  
  
<div id="home-view-container">  
    <div class="jumbotron">  
        <h3>Welcome to the 3rd Party Power BI Embedding Demo App</h3>  
  
        <table id="session-info-table" class="table table-bordered">  
            <tr>  
                <td>App workspace name</td>  
                <td>@Model.WorkspaceName</td>  
            </tr>  
            <tr>  
                <td>App Workspace ID</td>  
                <td>@Model.WorkspaceId</td>  
            </tr>  
            <tr>  
                <td>Master User Account</td>  
                <td>@Model.MasterUserAccount</td>  
            </tr>  
        </table>  
    </div>
```

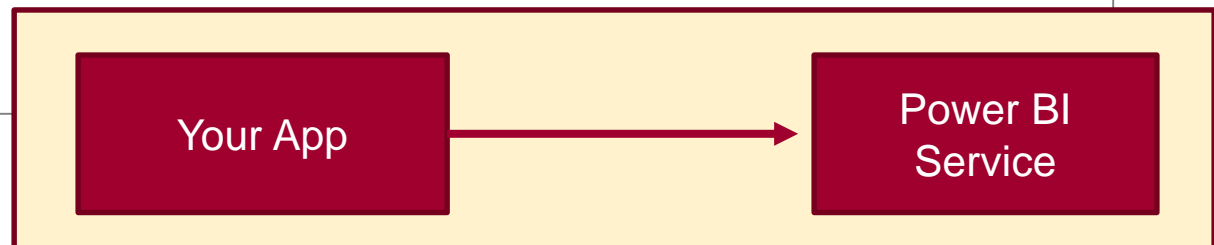




# Back to the DailyReporterPro Application

```
public class HomeViewModel {  
    public string WorkspaceName;  
    public string WorkspaceId;  
    public string MasterUserAccount;  
}
```

```
public static async Task<HomeViewModel> GetHomeViewModel() {  
    var client = GetPowerBiClient();  
    var workspaces = (await client.Groups.GetGroupsAsync()).Value;  
    var workspace = workspaces.Where(ws => ws.Id == appWorkspaceId).FirstOrDefault();  
    var viewModel = new HomeViewModel {  
        WorkspaceName = workspace.Name,  
        WorkspaceId = workspace.Id,  
        MasterUserAccount = pbiUserName  
    };  
    return viewModel;  
}
```



# MVC View Models

```
namespace DailyReporterPro.Models {  
    public class HomeViewModel ...  
    public class DatasetViewModel ...  
    public class DatasetsViewModel ...  
    public class ReportViewModel ...  
    public enum ReportMode ...  
    public class ReportsViewModel ...  
    public class DashboardViewModel ...  
    public class DashboardsViewModel ...  
}
```

```
public static async Task<HomeViewModel> GetHomeViewModel() ...  
public static async Task<DatasetsViewModel> GetDatasetsViewModel() ...  
public static async Task<ReportsViewModel> GetReportsViewModel(string reportId, string datasetId) ...  
public static async Task<DashboardsViewModel> GetDashboardsViewModel(string dashboardId) ...
```



# Agenda

- ✓ Power BI Embedding Fundamentals
- ✓ App Workspaces and Premium Capacities
- ✓ Authentication with Azure Active Directory
- ✓ Programming with Power BI Service API
- Working with Embeddable Resources
  - Embedding with Power BI JavaScript API



# Embeddable Resources

## 1. Reports

- Provides user with full interactive experience
- Allows editing existing reports & creating new reports

## 2. Dashboards

- Provides user with limited interactive experience
- Provides support for real-time dashboards

## 3. Dashboard Tiles

- Provides flexibility to embed selected tiles
- No support for tiles which receive real-time updates



# Report and Dataset Info

- Embed data required for an existing report

```
..... datasetId=9221313d-edc0-4c8a-b70e-ff0ac14f42be  
..... embedUrl=https://app.powerbi.com/reportEmbed?reportId=0dafe667-fd0b-4845-85d8-1  
..... id=0dafe667-fd0b-4845-85d8-136f93cfbde1  
..... isOriginalPbixReport=False  
..... isOwnedByMe=True  
..... modelId=0  
..... name=Northwind Retro  
..... webUrl=https://app.powerbi.com/groups/4baab6c0-87c5-4a2a-a73e-1f97adcc6bdb/repo
```

- Embed data for dataset required to create new

```
..... addRowsAPIEnabled=False  
..... configuredBy=TedP@powerbimvps.onmicrosoft.com  
..... id=9221313d-edc0-4c8a-b70e-ff0ac14f42be  
..... name=Northwind Retro
```



# Embed Tokens

- You can embed reports using master user AAD token, but...
  - You might want embed resource using more restricted tokens
  - You might want stay within the bounds of Power BI licensing terms
- Power BI service supports generating embed tokens
  - Embed token provides restrictions on whether user can view or edit
  - Each embed token created for one specific resource
  - Embed token can only be generated inside Power BI Premium capacity
  - Supports generating tokens using row-level security (RLS)

```
Report report = reports.Where(r => r.Id == reportId).First();  
var generateTokenRequestParameters = new GenerateTokenRequest(accessLevel: "edit");  
var token = client.Reports.GenerateTokenInGroupAsync(appWorkspaceId,  
                                                    report.Id,  
                                                    generateTokenRequestParameters).Result;
```



# View Model with Embed Data for Report

```
// create embed info for existing report
var embedConfig = new EmbedConfiguration() {
    EmbedToken = token,
    EmbedUrl = report.EmbedUrl,
    Id = report.Id
};
// add report data to view model
viewModel.CurrentReport = new ReportViewModel {
    Report = report,
    EmbedConfig = embedConfig
};
```



# Agenda

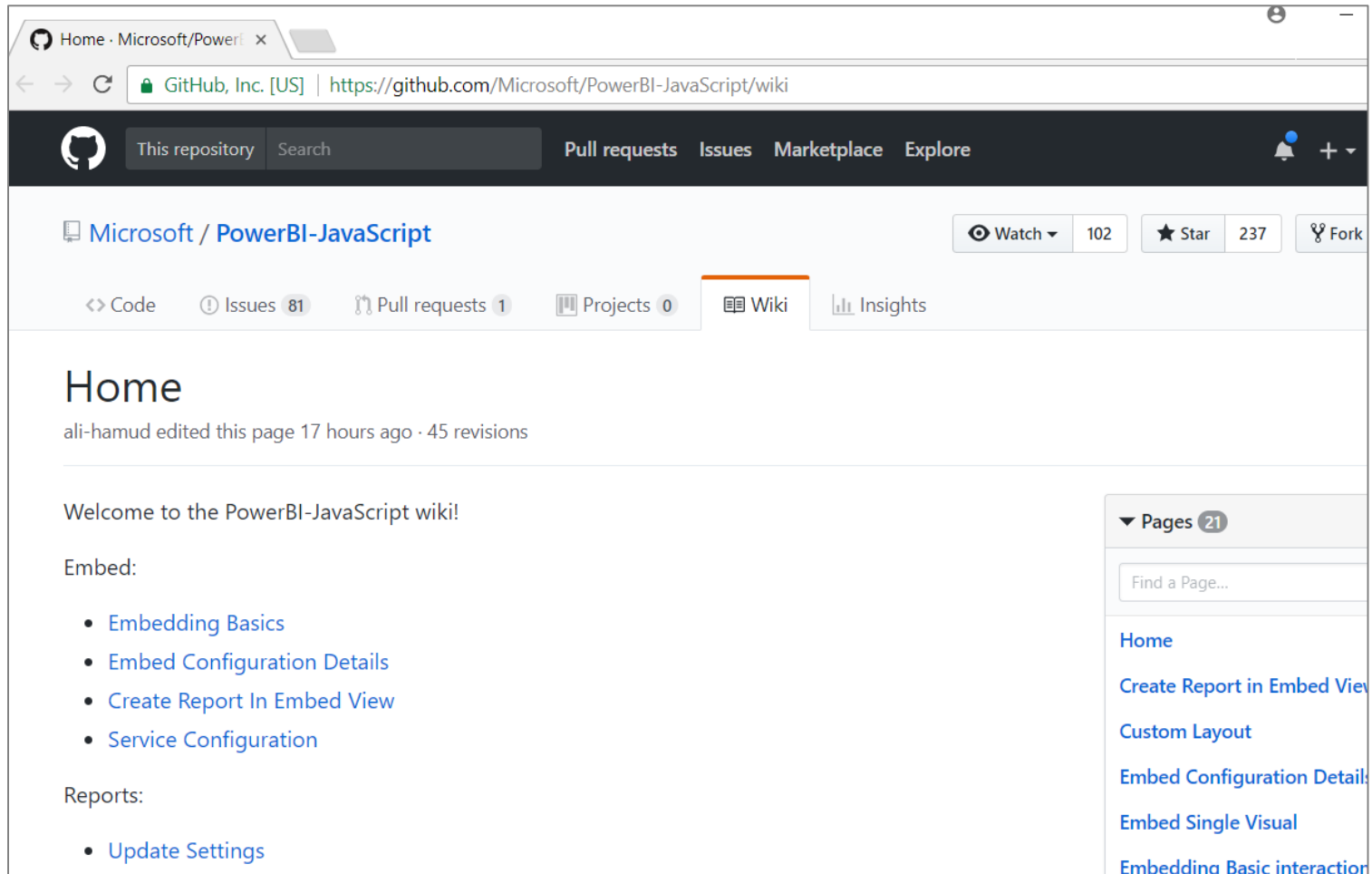
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# Power BI JavaScript API Wiki

- <https://github.com/Microsoft/PowerBI-JavaScript/wiki>



The screenshot shows the GitHub repository page for Microsoft/PowerBI-JavaScript. The browser address bar displays the URL <https://github.com/Microsoft/PowerBI-JavaScript/wiki>. The repository name is Microsoft / PowerBI-JavaScript, with 102 watches and 237 stars. The Wiki tab is selected, showing the 'Home' page. The page content includes a welcome message, an 'Embed:' section with links to Embedding Basics, Embed Configuration Details, Create Report In Embed View, and Service Configuration. A 'Reports:' section includes a link to Update Settings. A sidebar on the right lists 21 pages, including Home, Create Report in Embed View, Custom Layout, Embed Configuration Details, Embed Single Visual, and Embedding Basic interaction.

Home · Microsoft/PowerBI-JavaScript

GitHub, Inc. [US] | <https://github.com/Microsoft/PowerBI-JavaScript/wiki>

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## Home

ali-hamud edited this page 17 hours ago · 45 revisions

Welcome to the PowerBI-JavaScript wiki!

Embed:

- [Embedding Basics](#)
- [Embed Configuration Details](#)
- [Create Report In Embed View](#)
- [Service Configuration](#)

Reports:

- [Update Settings](#)

Pages 21

Find a Page...

- [Home](#)
- [Create Report in Embed View](#)
- [Custom Layout](#)
- [Embed Configuration Details](#)
- [Embed Single Visual](#)
- [Embedding Basic interaction](#)

# Embedding Data in MVC View

```
@if (Model.ReportMode == DailyReporterPro.Models.ReportMode.ExistingReport) {  
<script>  
    var embedReportId = "@Model.CurrentReport.EmbedConfig.Id";  
    var embedUrl = "@Html.Raw(Model.CurrentReport.EmbedConfig.EmbedUrl)";  
    var accessToken = "@Model.CurrentReport.EmbedConfig.EmbedToken.Token";  
    var reportContainer = document.getElementById('reportContainer');  
    // call embedReport utility function defined inside App.ts  
    PowerBIEmbeddingManagerClient.embedReport(embedReportId, embedUrl, accessToken, reportContainer);  
</script>  
}  
@if (Model.ReportMode == DailyReporterPro.Models.ReportMode.NewReport) {  
<script>  
    var embedDatasetId = "@Model.CurrentDataset.EmbedConfig.DatasetId";  
    var embedUrl = "@Html.Raw(Model.CurrentDataset.EmbedConfig.EmbedUrl)";  
    var accessToken = "@Model.CurrentDataset.EmbedConfig.EmbedToken.Token";  
    var reportContainer = document.getElementById('reportContainer');  
    // call embedReport utility function defined inside App.ts  
    PowerBIEmbeddingManagerClient.createReport(embedDatasetId, embedUrl, accessToken, reportContainer);  
</script>  
}
```

Solution Explorer

- App\_Data
- App\_Start
- Content
- Controllers
- fonts
- Models
- Scripts
- Views
  - Dashboards
  - Home
    - Index.cshtml
  - Reports
    - Index.cshtml
  - Shared
    - \_ViewStart.cshtml
    - WebResource

```
class PowerBIEmbeddingManagerClient {  
  
    static embedReport = (reportId, embedUrl, accessToken, reportContainer) => {  
        // ...  
    };  
  
    static createReport = (datasetId, embedUrl, accessToken, reportContainer) => {  
        // ...  
    };  
  
    static embedDashboard = (dashboardId, embedUrl, accessToken, reportContainer) => {  
        // ...  
    };  
}
```

# Loading an Embedded Report

```
static embedReport = (reportId, embedUrl, accessToken, reportContainer) => {  
  
    var report: Report;  
    var pages: IPageCollection;  
  
    var currentPage: Page = null;  
    var currentPageIndex: number = 0;  
  
    var models = window['powerbi-client'].models;  
  
    var config: embed.IEmbedConfiguration = {  
        type: 'report',  
        id: reportId,  
        embedUrl: embedUrl,  
        accessToken: accessToken,  
        tokenType: models.TokenType.Embed,  
        permissions: models.Permissions.All,  
        viewMode: models.ViewMode.Edit,  
        pageView: "fitToWidth",  
        settings: {  
            filterPaneEnabled: false,  
            navContentPaneEnabled: false  
        }  
    };  
  
    report = <Report>powerbi.embed(reportContainer, config);
```

**Read:** Allows view report only.

**ReadWrite:** Allows view, Edit and Save report.

**Copy:** Allows Save a copy of a report using Save As.

**Create:** Allows creating a new report.

**All:** Allows everything.

**View** - Opens report in View mode.

**Edit** - Opens report in Edit mode.

# Loading an Embedded Report

```
var models = window['powerbi-client'].models;  
  
var config: embed.IEmbedConfiguration = {  
  type: 'report',  
  id: reportId,  
  embedUrl: embedUrl,  
  accessToken: accessToken,  
  tokenType: models.TokenType.Embed,  
  permissions: models.Permissions.All,  
  viewMode: models.ViewMode.Edit,  
  pageView: "fitToWidth",  
  settings: {  
    filterPaneEnabled: false,  
    navContentPaneEnabled: false  
  }  
};
```

**Read:** Allows view report only.  
**ReadWrite:** Allows view, Edit and Save report.  
**Copy:** Allows Save a copy of a report using Save As.  
**Create:** Allows creating a new report.  
**All:** Allows everything.

**View** - Opens report in View mode.  
**Edit** - Opens report in Edit mode.

**fitToWidth:** Fit to width of host HTML element.  
**oneColumn:** Opens in single column.  
**actualSize:** Actual size as designed in report







**DEMO**

# Programming the Power BI JavaScript API

# Summary

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# Critical Path Training

<https://www.CriticalPathTrainig.com>

- **PBI365: Power BI Boot Camp – 4 Days**
  - Audience is Business Users, Analysts and Data Professionals
  - Provides hands-on introduction to the Power BI platform
  - Focuses on build solutions using Power BI Desktop
  - Query design, data modeling and report and dashboard design
  - Apps and App Workspaces
  - Learn about “import” vs “connect to” with Excel workbooks
- **PBD365: Power BI Developer Boot Camp – 4 Days**
  - Audience is Professional Developers
  - Teaches developing custom visuals with TypeScript and D3
  - Teaches R programming and integrating R with Power BI
  - Teaches programming with the Power BI APIs
  - Teaches developing with Power BI Embedded

