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Creating Custom BI Solutions with Power BI Embedded

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Microsoft Azure MVP and Microsoft RD
PASS CEE Regional Mentor
mihail@Mateev.net

About the speaker

- Mihail Mateev is a Technical Consultant, Community enthusiast, PASS RM for CEE, chapter lead, Microsoft Azure MVP, Microsoft RD
- Senior Solutions Architect at EPAM
- Mihail works in various areas related to Microsoft technologies : Windows Platform, ASP.Net MVC, MS SQL Server and Microsoft Azure

Agenda

- Introduction to Power BI Embedded
- Key capabilities
- Business advantages for choosing Power Bi Embedded
- Power BI for Developers Overview
- Create a Custom Visual
- Scenarios & use cases
- Demos

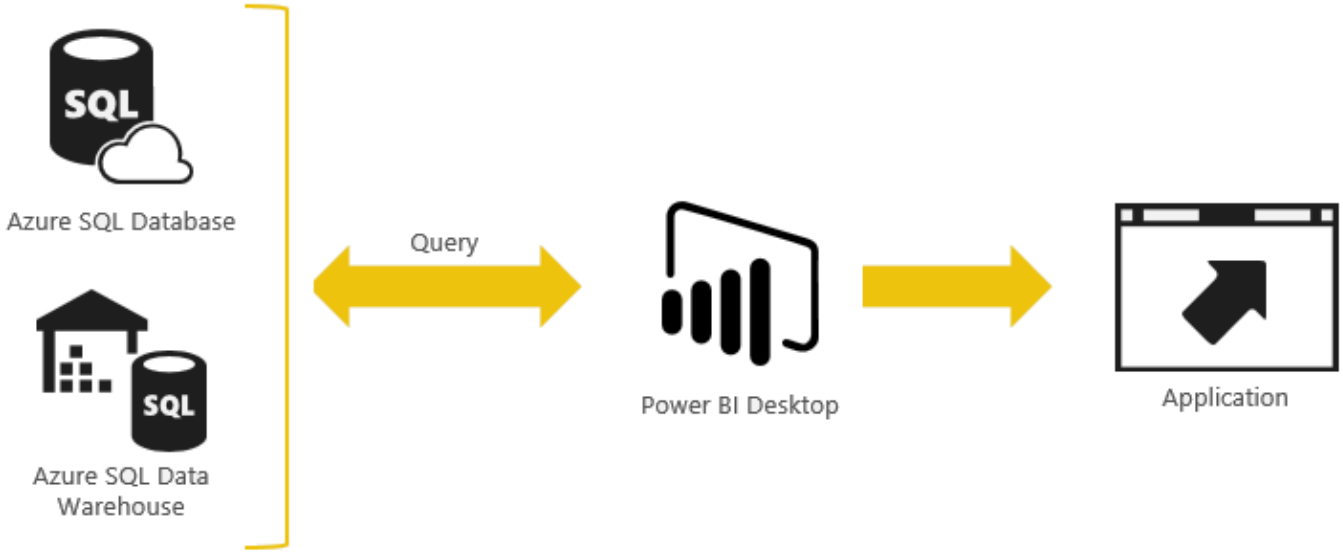
Introduction to Power Bi Embedded

What is Microsoft Power BI Embedded?

- Integrates Power BI reports right into your web or mobile applications
- Power BI Embedded is an Azure service
  - Enables ISVs and app developers to surface Power BI data experiences within their applications
- Users don’t need a Power BI account to use your app

Introduction to Power Bi Embedded

What is Microsoft Power BI Embedded?



Introduction to Power Bi Embedded

Who would want to use Microsoft Power BI Embedded?

- Application developers that want to offer interactive data visualization experiences for their users across any of their devices without having to build it themselves.
- Developers can deliver always-up-to-date views with Direct Query
- Developers can also programmatically deploy and manage automate Power BI with the Azure ARM APIs and Power BI APIs
- The Power BI Embedded service features a Pay-as-you-go consumption based pricing model

Introduction to Power Bi Embedded

How does Power BI Embedded relate to the Power BI service?

- The Power BI Embedded and the Power BI service are separate offerings.
- Power BI Embedded features a consumption-based billing model, is deployed through the Azure portal and is designed to enable ISVs to embed data visualizations in application
- The Power BI service is billed and deployed through the O365 portal offering primarily targeted at enterprise internal use

Introduction to Power Bi Embedded

Power BI Embedded offers easy integration of Self-Service BI solutions in your custom applications

Introduction to Power Bi Embedded

Can Power BI Embedded be used to create internal applications?

- It is not possible to use The Power BI Embedded to create internal applications.
- Power BI Embedded is only intended for use by external users and should not be used within internal business applications
- To embed Power BI content for use in internal business applications, you should use the Power BI service (not Power BI Embedded)

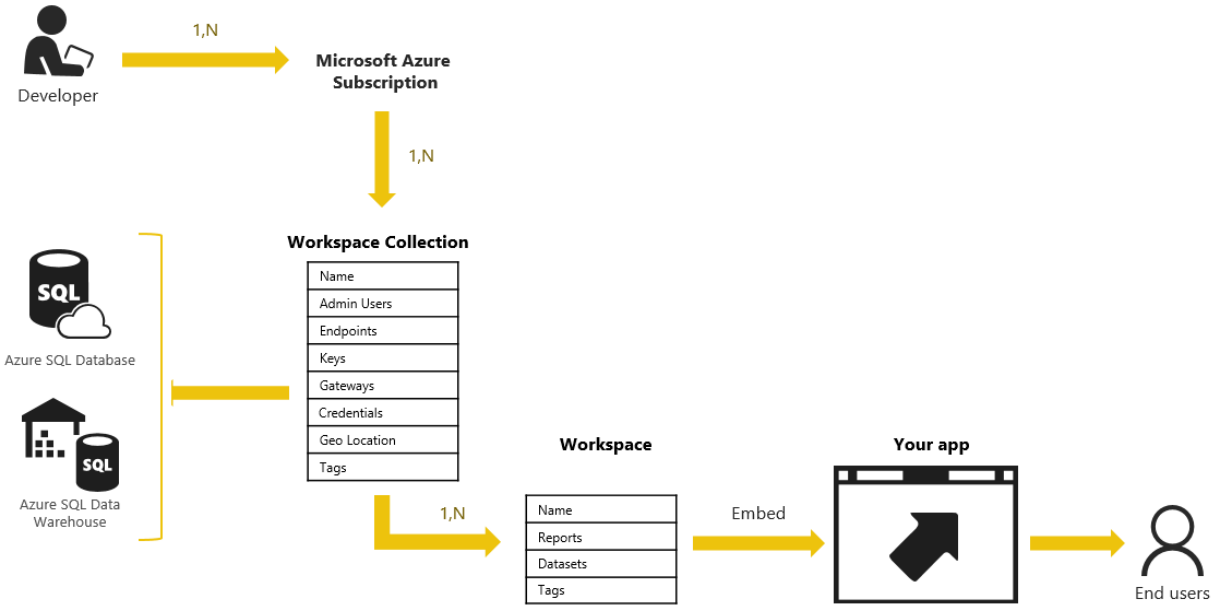
Licensing for Microsoft Power BI Embedded

- In the **Microsoft Power BI Embedded** usage model, licensing for Power BI is not the responsibility of the end-user.

- Instead, **renders** are purchased by the developer of the app that is consuming the visuals, and are charged to the subscription that owns those resources.

Microsoft Power BI Embedded Architecture

Microsoft Power BI Embedded Conceptual Model



Microsoft Power BI Embedded Architecture

Workspace Collection:

A **top-level Azure container** for resources that contains 0 or more Workspaces

- Access Keys
- Users – Azure Active Directory (AAD) users that have administrator rights to manage the Power BI Workspace Collection through the Azure portal or ARM API.
- Region

Microsoft Power BI Embedded Architecture

Workspace :

- A **Workspace** is a container of Power BI content, which can include datasets, reports and dashboards.

- A Workspace is empty when first created. During Preview, you'll author all content using Power BI Desktop and you'll upload it to one of your workspaces using the Power BI REST APIs.

Microsoft Power BI Embedded Architecture

Cached Datasets :

- Cached datasets can be used in Preview.
- However, you cannot refresh cached data once it has been loaded into **Microsoft Power BI Embedded**.

Microsoft Power BI Embedded Architecture

Authentication and authorization with app tokens:

- Microsoft Power BI Embedded defers to your application to perform all the necessary user authentication and authorization.
- There is **no explicit requirement that end users be customers of Azure AD**.

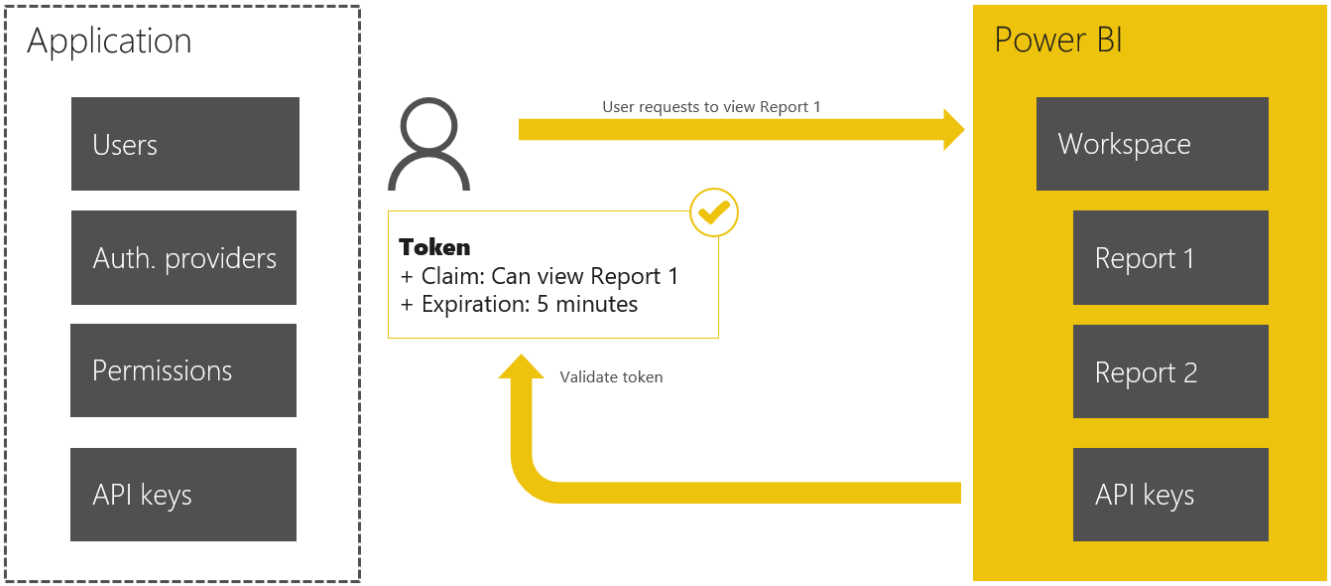
Microsoft Power BI Embedded Architecture

Authentication and authorization with app tokens:

- Instead, your application expresses to **Microsoft Power BI Embedded authorization** to render a Power BI report by **using App Tokens**)
- App **Tokens** are created as needed when your app wants to render a report.

Microsoft Power BI Embedded Architecture

Authentication and authorization with app tokens:



Microsoft Power BI Embedded Architecture

Authentication and authorization with app tokens:
There are three types of **App Tokens**:

1.Provisioning Tokens - Used when provisioning a new **Workspace** into a **Workspace Collection**

2.Development Tokens - Used when making calls directly to the **Power BI REST APIs**

3.Embedding Tokens - Used when making calls to render a report in the embedded iframe

Microsoft Power BI Embedded Architecture

Authenticating and authorizing with Power BI Embedded:

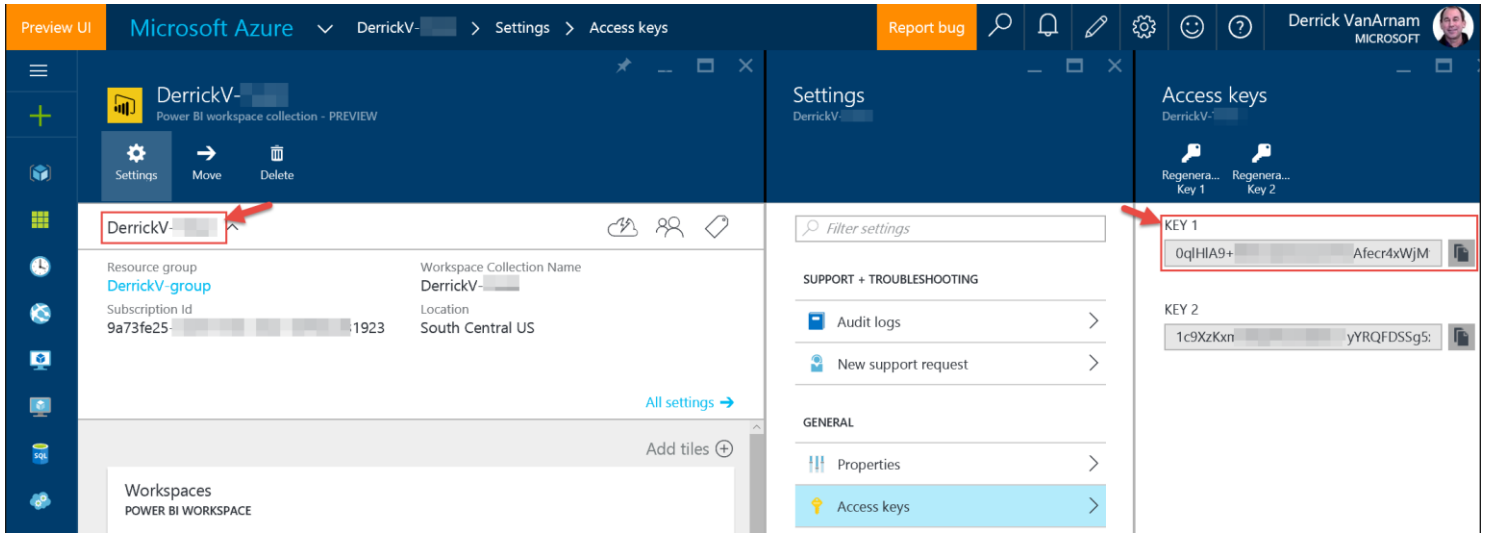
Two ways to authenticate:

1.Key - You can use keys for all Power BI Embedded REST API calls.

2.App token - App tokens are used for all embedding requests. App tokens are a JWT (JSON Web Token) that is signed by one of your keys.

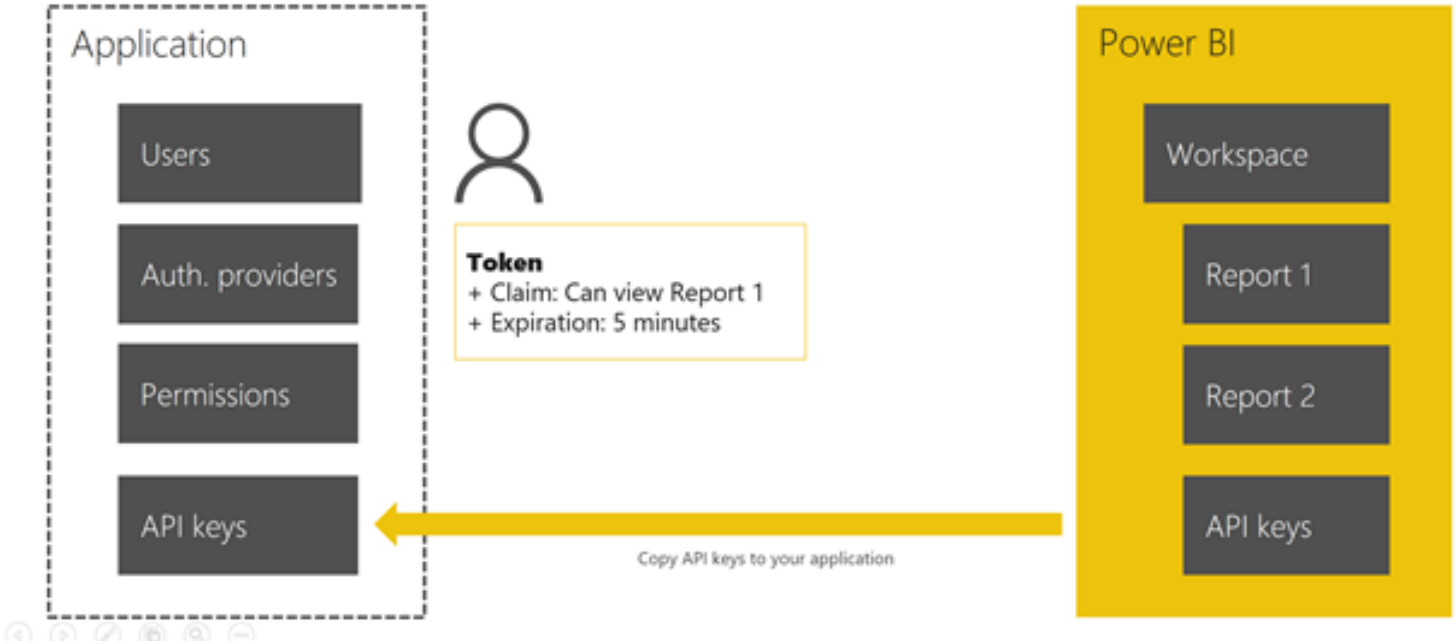
Power BI Embedded Authenticating

1.Copy the API keys to your application. You can get the keys in Azure Portal.



Power BI Embedded Authenticating

2.Token asserts a claim and has an expiration time



Power BI Embedded Authenticating

3. Token gets signed with an API access keys

Power BI Embedded Authenticating

4. User requests to view a report

Power BI Embedded Authenticating

5. Token is validated with an API access keys.

Power BI Embedded Authenticating

6. Power BI Embedded sends a report to user

Power BI for Developers Overview

Power BI is Microsoft's self-service cloud based BI offering.

Consumer: Desktop, Web, Mobile, Gateway,
Publish to Web, Data Stories, Visuals Gallery

Developer: Embedded, REST APIs, Custom Visuals, SDKs

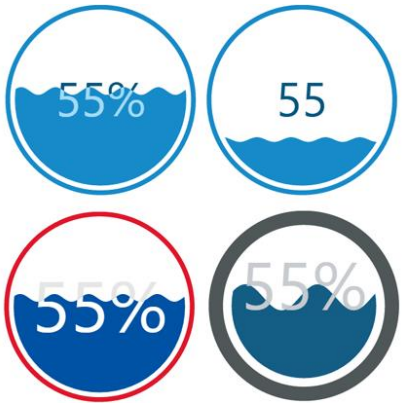
http://bit.ly/pbiindex

http://dev.powerbi.com

Create a Custom Visual

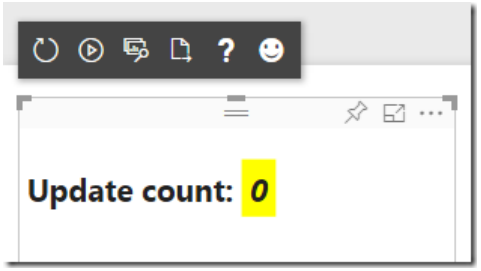
New Node.js SDK Released in July
https://github.com/Microsoft/PowerBI-visuals-tools

Big improvement
over previous custom
visuals tools.
https://bit.ly/pbicustomviz



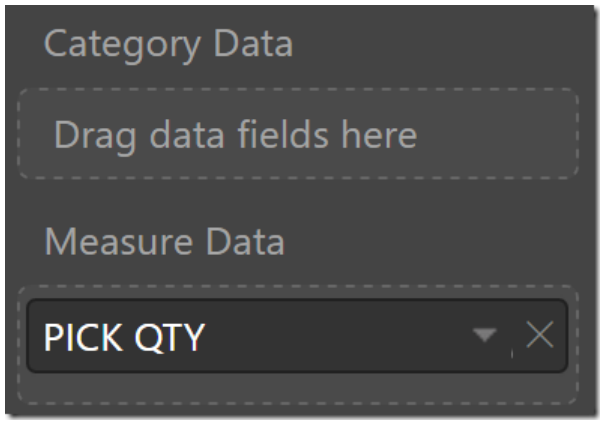
Create a Custom Visual – Dev Env Setup

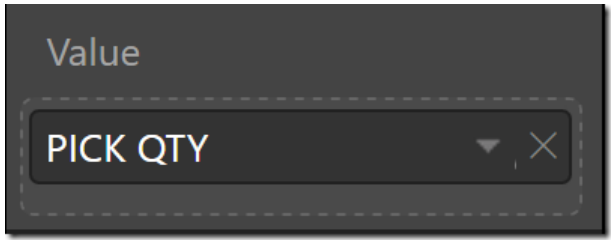
- Install Node.js
- Install Power BI Visuals SDK
- Install Local Cert
- Enable Developer Visual
- Create Sample Visual
- Test Sample Visual on PowerBI.com



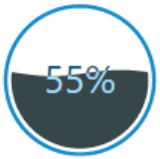
Create a Custom Visual – Capabilities

Simplify dataRoles & dataViewMappings





Create a Custom Visual – Format Properties



- Define Property Metadata
- Set Property Value - enumerateObjectInstances
- Get Property Value – getValue<T>
- Pass Property Values to Instantiation Code
- Package & Test Visual

Common Power BI Embedded scenarios

- **Fully interactive reports** that were **authored in the Power BI Desktop** can be **embedded within your own application**

- To **build customer facing applications** can use the **Power BI Embedded service**, and the **Power BI SDK**, to embed interactive reports.

- As a developer, you can use the **Power BI visualization framework** to create **custom visualizations that can be used in your own app**.

Power BI REST API (IFRAME Impromentation)

No need any specific references for Power BI

- Using System.Net.Http…
  - ✓ System.Web.WebRequest
  - ✓ System.Net.HttpWebResponse
- Receive EmbedURL…
- Manage via JavaScript the iframe.scr:var iframe = document.getElementById('iFrameEmbedReport'); iframe.src = embedUrl;

Power BI JavaScript API

How does embedding with Power BI work?

- Embedding a Power BI report in your application is done with an iframe, which **is hosted as part of the app**.
- The iframe acts as a **boundary** between your application and the Power BI report.
- By default the **report cannot interact with your application** and **your application can't interact with the report**

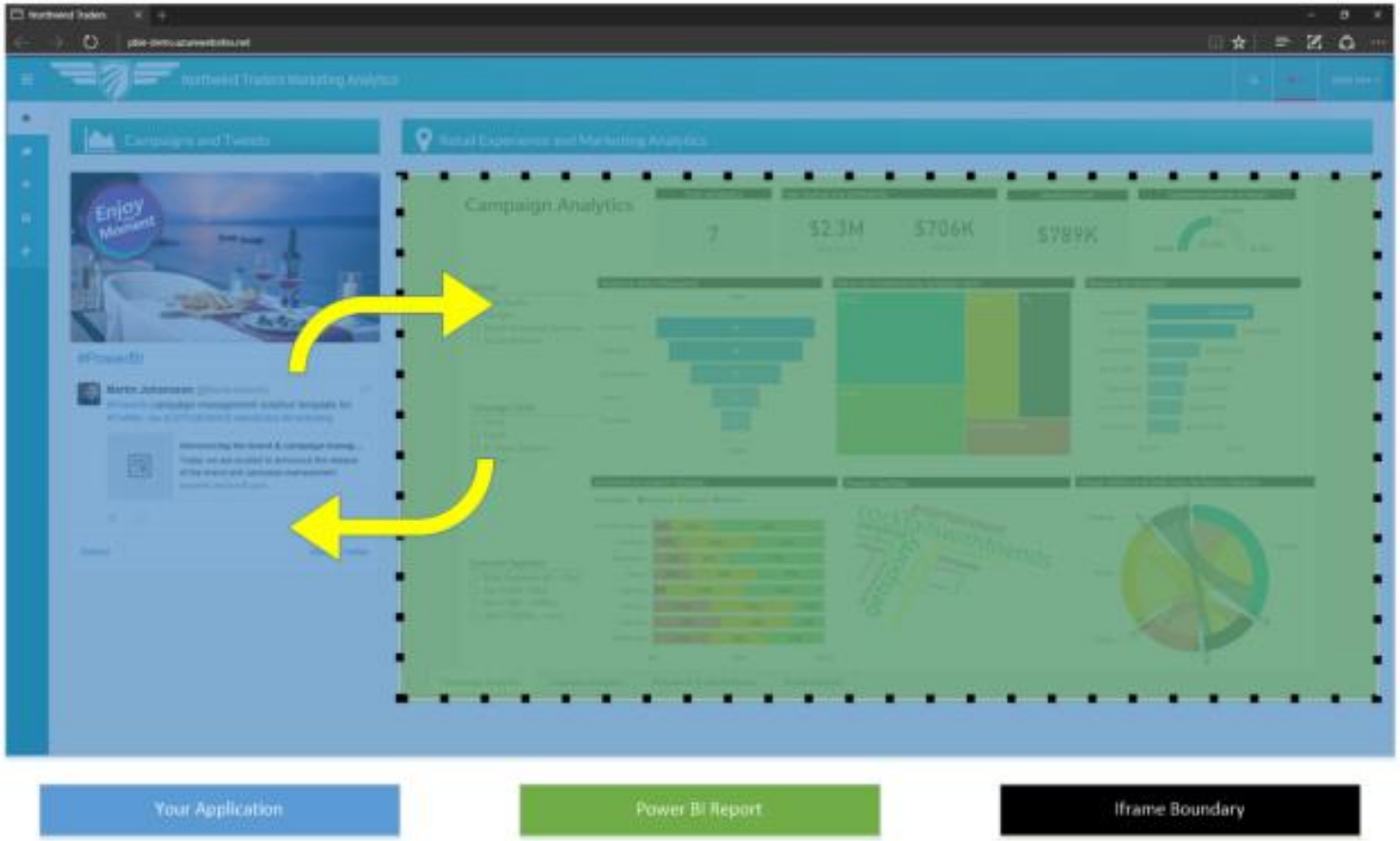
Power BI JavaScript API

Power BI JavaScript API

How does embedding with Power BI work?

- The Power BI JavaScript API will allow you to write code that can securely pass through the iframe boundary
- The application can programmatically perform an action in a report and listen for events from actions that users make

Power BI JavaScript API



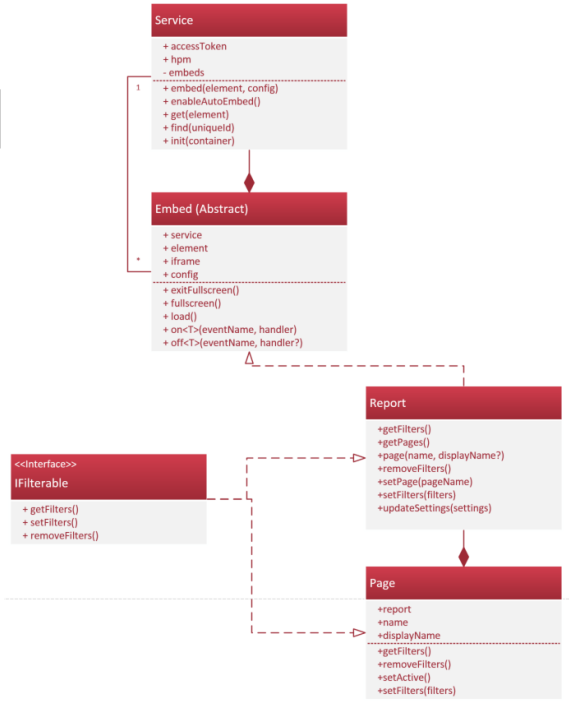
Power BI JavaScript API

What can you do with the Power BI JavaScript API?

- With the **JavaScript API** you can **manage reports**, navigate to pages in a report, filter a report, and handle embedding events.

Power BI JavaScript API

Structure of the Power BI JavaScript API?



Power BI JavaScript API

Manage Reports:
The **JavaScript API** enables you to **manage behavior**
at the **report** and **page level**

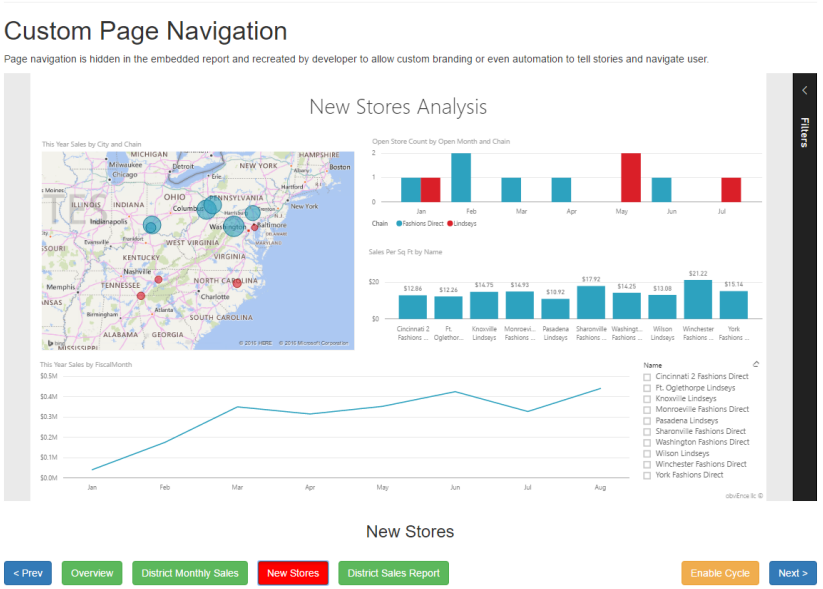
- Embed a specific Power BI Report securely in your application

  ✓ Set access token
  ✓ Enable and disable the filter pane and page navigation pane
  ✓ Set defaults for pages and filters

Power BI JavaScript API

Navigate to Pages in a Report:

The **JavaScript API** enables you to discover all pages in a report and to set the current page.



Power BI JavaScript API

Filter a Report:
The **JavaScript API** provides basic and advanced filtering capabilities for embedded reports and report pages.

- BASIC FILTERS
  - A **basic filter** is placed on a column or hierarchy level and contains a list of values to include or exclude.

Power BI JavaScript API

Filter a Report:

- BASIC FILTERS

```
const advancedFilter: pbi.models.IAdvancedFilter = {
  $schema: "http://powerbi.com/product/schema#advanced",
  target: {
    table: "Store",
    column: "Name"
  },
  logicalOperator: "Or",
  conditions: [
    {
      operator: "Contains",
      value: "Wash"
    },
    {
      operator: "Contains",
      value: "Park"
    } ]
}
```

Power BI JavaScript API

Handing Events:

Power BI Embedded application can :

- Sending information into the iframe
- Receive information on the events coming from the frame:
  - ✓ Embed
    - loaded
    - Error
  - ✓ Reports
    - pageChanged
    - dataSelected (coming soon)

Power BI JavaScript API

.Net Wrappers:

- Common Power BI libraries
  - ✓ Microsoft.PowerBI.Core
  - ✓ Microsoft.PowerBI.Api
- MVC Wrappers
  - ✓ Microsoft.PowerBI.AspNet.Mvc
- WebForms Wrappers
  - ✓ Microsoft.PowerBI.AspNet.WebForms

Power BI Core libraries

.Net Wrappers:

- Microsoft.PowerBI.Core
  - ✓ Microsoft.PowerBI
  - ✓ Microsoft.PowerBI.Security
    - PowerBIToken
    - TokenManager
- Microsoft.PowerBI.Api
  - ✓ Microsoft.PowerBI. Api.V1
    - Interfaces…
  - ✓ Microsoft.PowerBI. Api.V1.Models
    - ✓ Implementation

Power BI ASPNet MVP Wrapper

.Net Wrappers:

- Microsoft.PowerBI.AspNet.Mvc
  - ✓ Microsoft.PowerBI.AspNet.Mvc.Http
    - ReportExtensions
    - TokenExtensions

```
@Html.PowerBIReportFor(m => m.Report, new { style =
"height:85vh", powerbi_access_token =
Model.AccessToken })
```

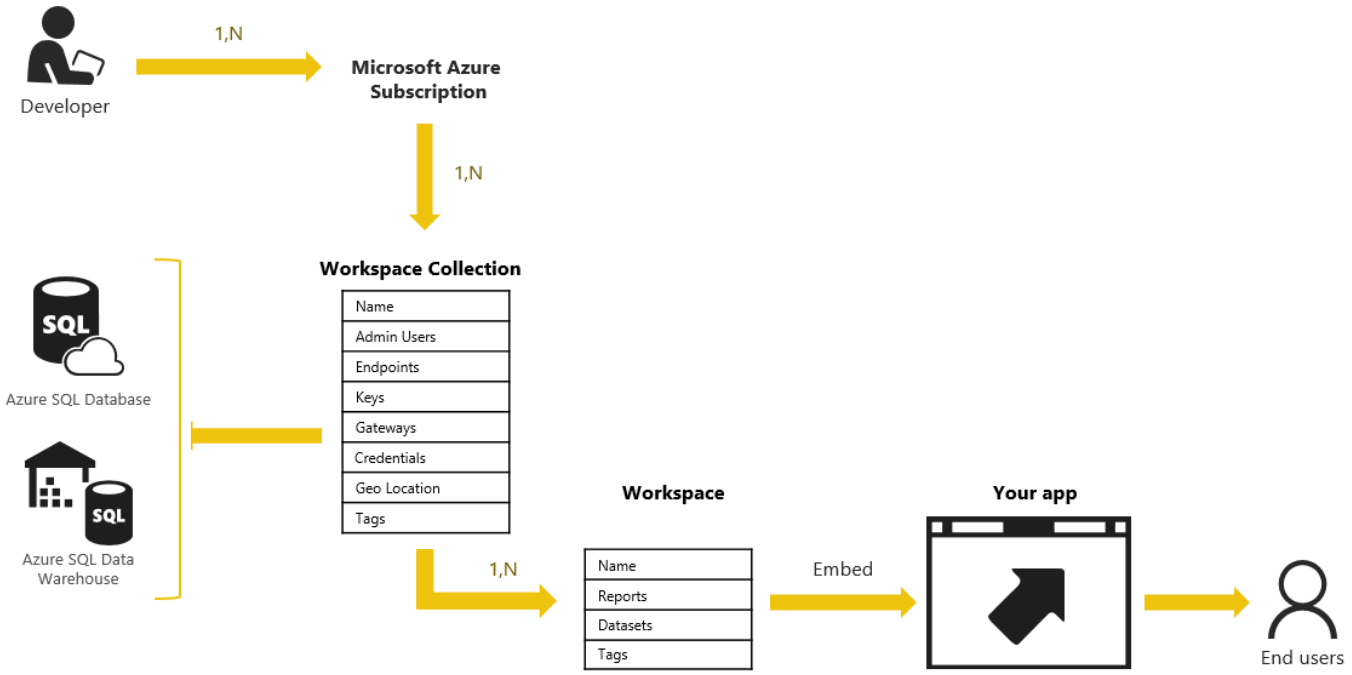
Get started with Microsoft Power BI Embedded

- Power BI Embedded **works with existing applications** without needing redesign or changing the way users sign in.

- Resources for Microsoft Power BI Embedded are provisioned through the Azure ARM APIs:
  ✓ Power BI Workspace Collection

Get started with Microsoft Power BI Embedded

✓ Power BI Workspace Collection



Get started with Microsoft Power BI Embedded

Create a workspace collection:

- A **Workspace Collection** is the **top-level Azure resource** and a **container for the content that will be embedded in your application**.

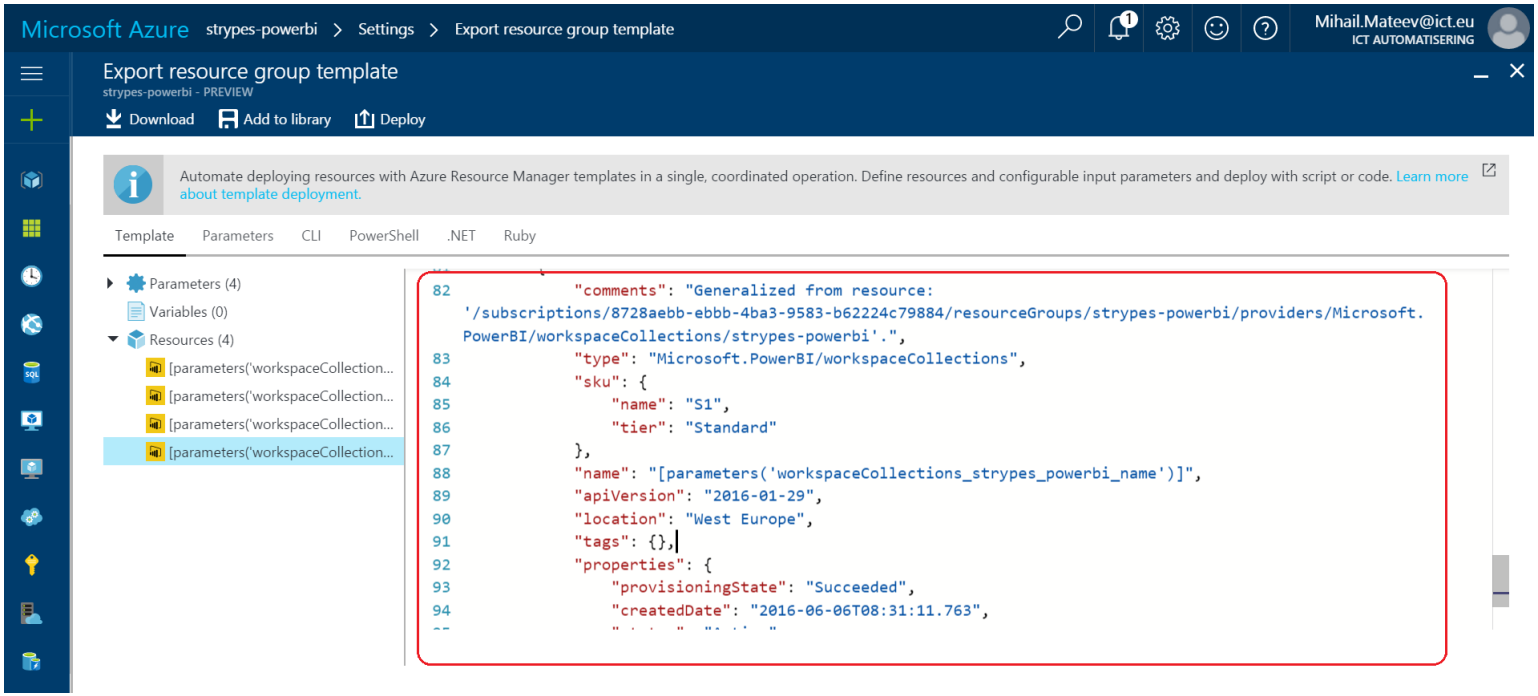
- A Workspace Collection can be created in two ways:

  ✓ **Manually** using the Azure Portal

  ✓ **Programmatically** using the Azure Resource Manager(ARM) APIs

Get started with Microsoft Power BI Embedded

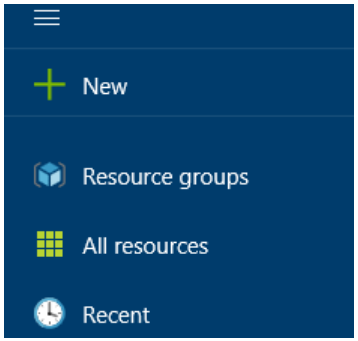
PowerBI Embedded Automation Script:

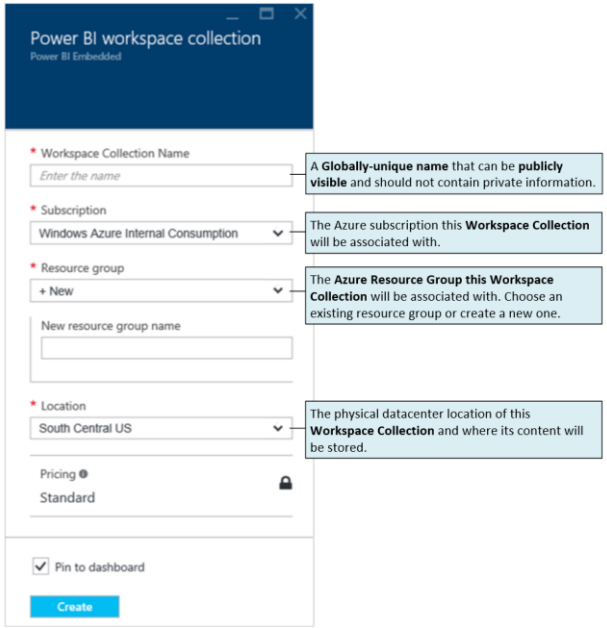


Get started with Microsoft Power BI Embedded

Create a workspace collection:

- ✓ Manually using the Azure Portal



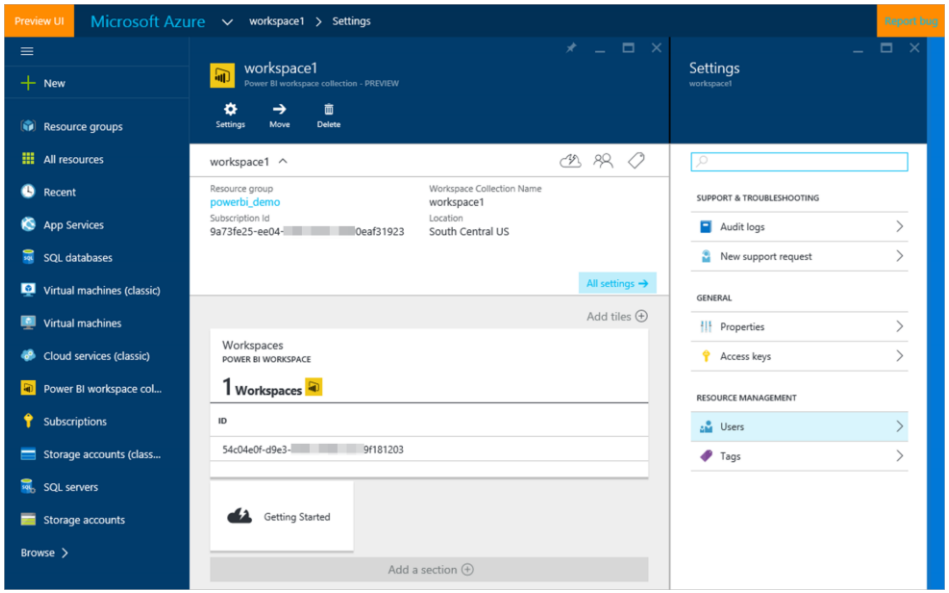


New->Data + Analytics->Power BI Embedded

Get started with Microsoft Power BI Embedded

Create a workspace collection:

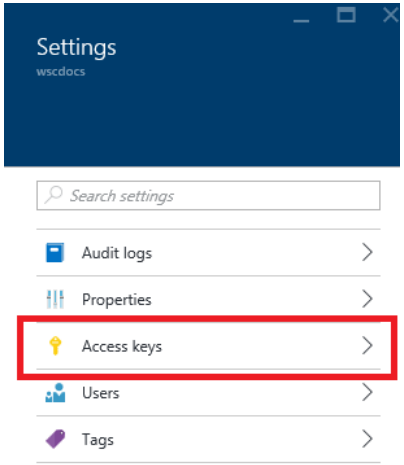
- ✓ Manually using the Azure Portal

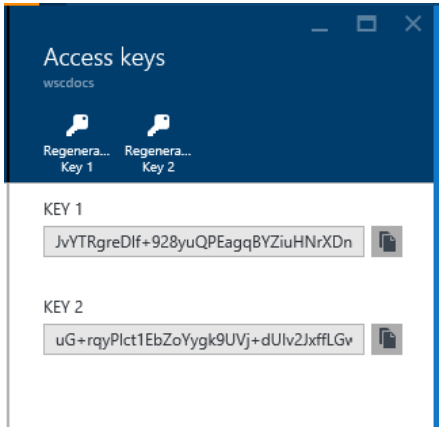


Get started with Microsoft Power BI Embedded

Create a workspace collection:

- ✓ Manually using the Azure Portal
  - Power BI API Access Keys:





Get started with Microsoft Power BI Embedded

Create Power BI datasets and reports to embed into an app:

- ✓ Install Power BI Desktop
- ✓ With Power BI Desktop, create a PBIX file
  - Connect to your data source by importing a copy of the data:
  - Connect directly to the data source using DirectQuery
- ✓ Import a PBIX file
- ✓ Create your application
  - Update connection strings and set credentials for your datasets.
  - Securely embed a report

Using Power BI Embedded SDK for provisioning

Create Workspace Collection:

References:

- ✓ Microsoft.PowerBI.Core
- ✓ Microsoft.PowerBI.Api

Using Power BI Embedded SDK for provisioning

Create Workspace Collection:

Using rest api:
apiEndpointUri = “https://api.powerbi.com”
azureEndpointUri =
https://management.azure.com
var url =….

Using Power BI Embedded SDK for provisioning

Create Workspace Collection:

```
var content = new StringContent( [service parameters …]
```

```
var request = new HttpRequestMessage(HttpMethod.Put, url);
request.Headers.Authorization = new
AuthenticationHeaderValue("Bearer", await
GetAzureAccessTokenAsync());
```

```
request.Content = content;
```

```
var response = await client.SendAsync(request);
```

Using Power BI Embedded SDK for provisioning

Create a Power BI Client:

```
static async Task<PowerBIClient> CreateClient()
    {
        if (accessKeys == null)
        {
            // input accessKey
            accessKeys = new WorkspaceCollectionKeys()
            {
                Key1 = accessKey
            };
        }
        var credentials = new TokenCredentials(accessKeys.Key1, "AppKey");
        var client = new PowerBIClient(credentials);
        // Override the api endpoint base URL.  Default value is https://api.powerbi.com
        client.BaseUri = new Uri(apiEndpointUri);
        return client;
    }
```

Using Power BI Embedded SDK for provisioning

Import PBIX Desktop file:

```
// Import PBIX file from the file stream
var import = await client.Imports.PostImportWithFileAsync(workspaceCollectionName, workspaceId,
fileStream, datasetName);

// Example of polling the import to check when the import has succeeded.
while (import.ImportState != "Succeeded" && import.ImportState != "Failed")
{
        import = await client.Imports.GetImportByIdAsync(workspaceCollectionName,
                workspaceId, import.Id);
        // manage output information…
}
```

Creating Custom BI Solutions with Power BI Embedded

Demos!

Power Bi Provisioning

Power BI Embedded for now is available only for some of Azure data centers:
(9 different regions around the glob)

Power BI Embedded Price

You may use the Power BI Embedded service in your applications that (1) add primary and significant functionality to our service and are not primarily a substitute for any Power BI service, and (2) are provided for third party use.

Power BI Embedded is not intended for use within your organization's internal business applications unless your internal users are also covered by a Power BI Pro User Subscription License (USL).

Pricing details

Power BI Embedded is now generally available and supported by an SLA.

TIER	FREE	STANDARD
Per Session	100 Sessions/mo	€4.2165/100 sessions

Typically a session is defined as anything viewed within that browsing session.

Power BI Embedded Price

Until the summer 2016 Power BI Embedded clients were charged per session
Now charging of Power BI Embedded clients is based on sessions

What is a render and how is it billed?

A render is a visual element that is displayed to an end user resulting in a query to the service (for example report with 4 visuals generates 4 renders)

If the user refreshes the report and more queries are sent to the service, it would result in more renders, equal of the visuals in the report.

What is a report session and how is it billed?

A session is a set of interactions between an end user and a Power BI Embedded report.
Each time a Power BI Embedded report is displayed to a user, a session is initiated
A session ends when either the user closes the report, or the session times out after one hour.

Power BI Embedded Price

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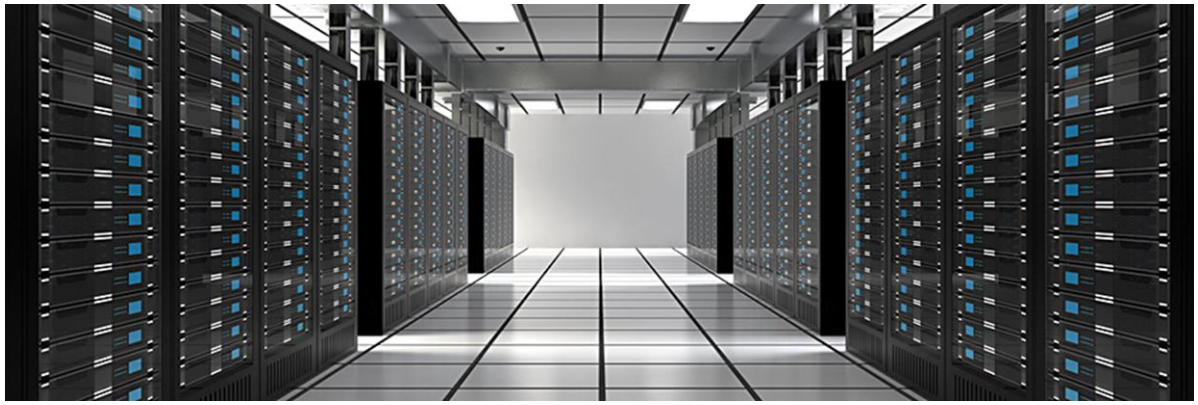
Azure Stream Analytics Outputting to Power BI Streaming Datasets

- Azure Stream Analytics outputting data to Power BI – April 2015
- Power BI Streaming Datasets in Power BI – August 2-16
- Azure Stream Analytics outputting is now available for Power BI Streaming Datasets
- Power BI Streaming Datasets Still not available for Power BI Embedded

Creating Custom BI Solutions with Power BI Embedded

Q & A



Dealing with Power BI Embedded

Thank you!

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