

# What You Can Learn from the Power BI Activity Log & REST APIs

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# Melissa Coates



Owner of Coates Data Strategies

Data architect | Technical trainer | Consultant

Specialist in Power BI governance & administration

Microsoft Data Platform MVP

Co-author: [Planning a Power BI Enterprise Deployment whitepaper](#)

Author: [Power BI migration documentation](#)

## Power BI Deployment & Governance Workshop

10 live sessions over 5 weeks

Governance | Data Culture | Center of Excellence | Architecture | Deployment  
Trustworthiness | Security | Data Protection | Adoption | Administration

[CoatesDS.com/workshop](https://CoatesDS.com/workshop)

# Agenda



## What You Can Learn from the Power BI Activity Log & REST APIs



### **What & Why**

Why we need  
Power BI metadata

### **How**

Technical overview  
& demos

### **Getting Started**

Tips for getting  
started

### **Q&A**

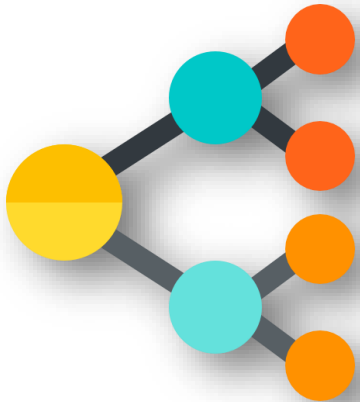
Wrap-up &  
open Q&A

# Where to Download Materials



## **Slides + Jupyter Notebook for Demos:**

[CoatesDS.com/presentations/#What-You-Can-Learn-From-Power-BI-Activity-Log](https://CoatesDS.com/presentations/#What-You-Can-Learn-From-Power-BI-Activity-Log)

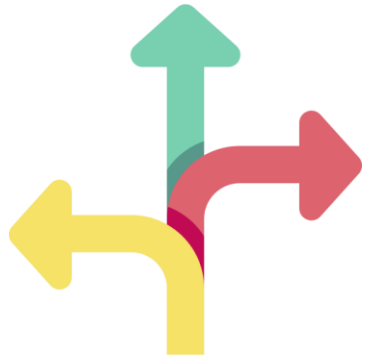


## **Power BI End-to-End Diagram:**

[CoatesDS.com/diagrams](https://CoatesDS.com/diagrams)



# Scope of this Session



## Main focus:

- Querying metadata from the Power BI Service and Data Gateway Service
- Understanding the kinds of metadata you can retrieve related to usage patterns and activities in the Power BI Service

## Out of scope:

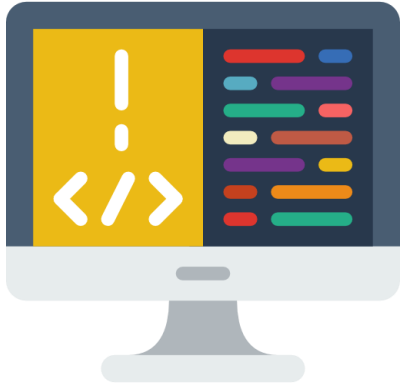
- Updating & managing the Power BI Service or Data Gateway
- XMLA endpoint
- Power BI Embedded
- Power BI Report Server
- PowerShell modules contributed by the community
- Microsoft 365 Management API
- Older PowerShell cmdlet (Search-UnifiedAuditLog)

## Minimal scope:

- Exact PowerShell script syntax & techniques
- Installation & setup
- Permissions setup & requirements



# Demos You'll See in this Session



## Demos are using:

- PowerShell [7.1.2 \(Core\)](#) running on Windows 10 machine
- Azure Data Studio [Notebook](#)
- Azure Data Studio [PowerShell Extension](#)
- Azure Data Studio [.NET Interactive Kernel](#) for PowerShell Extension

## PowerShell scripts:

- All scripts are demo snippets which are not production-ready
- The examples are realistic, but highly simplified for learning purposes

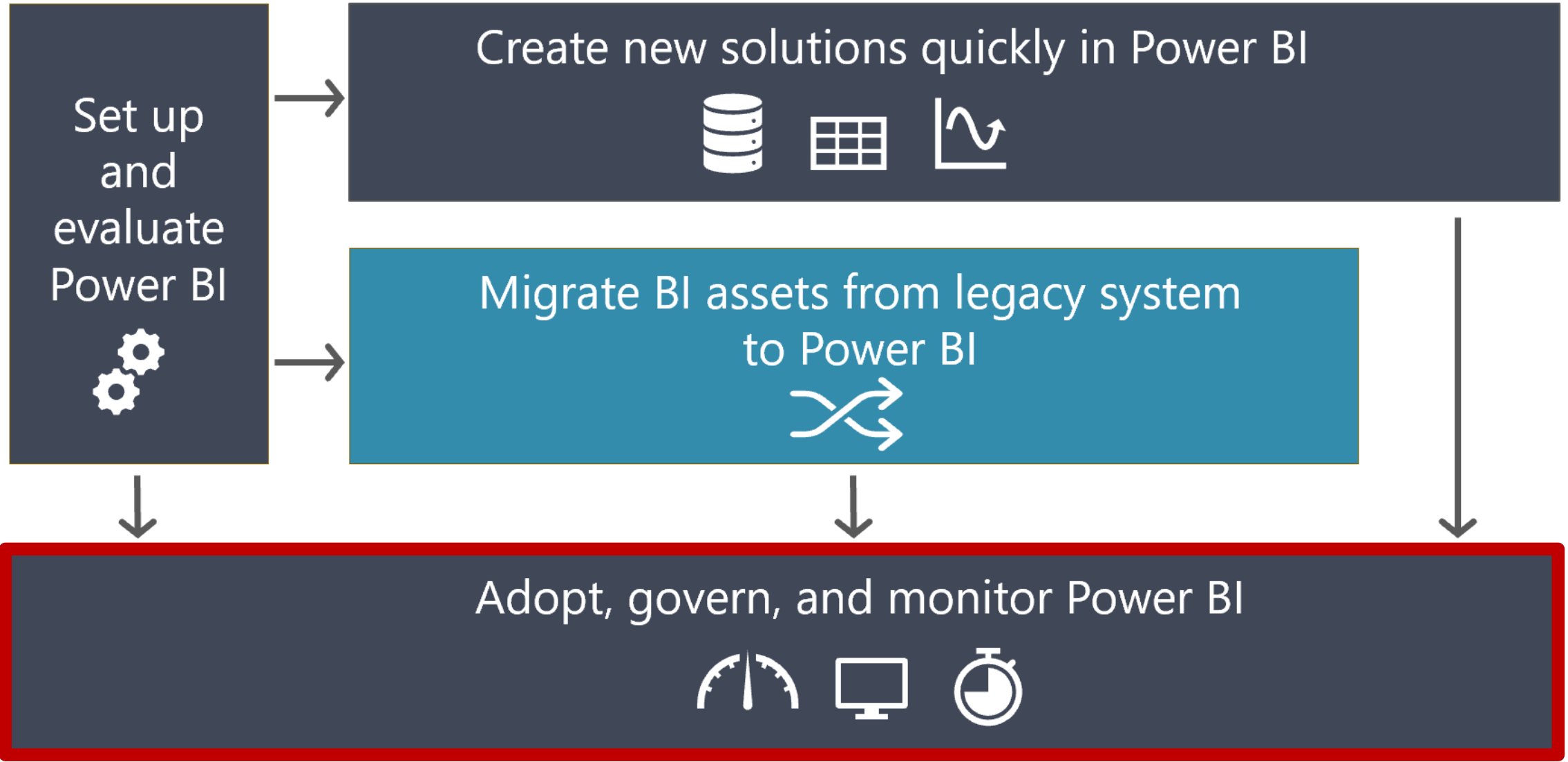
# What & Why

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Why we need  
Power BI metadata



# Adoption, Governance & Monitoring

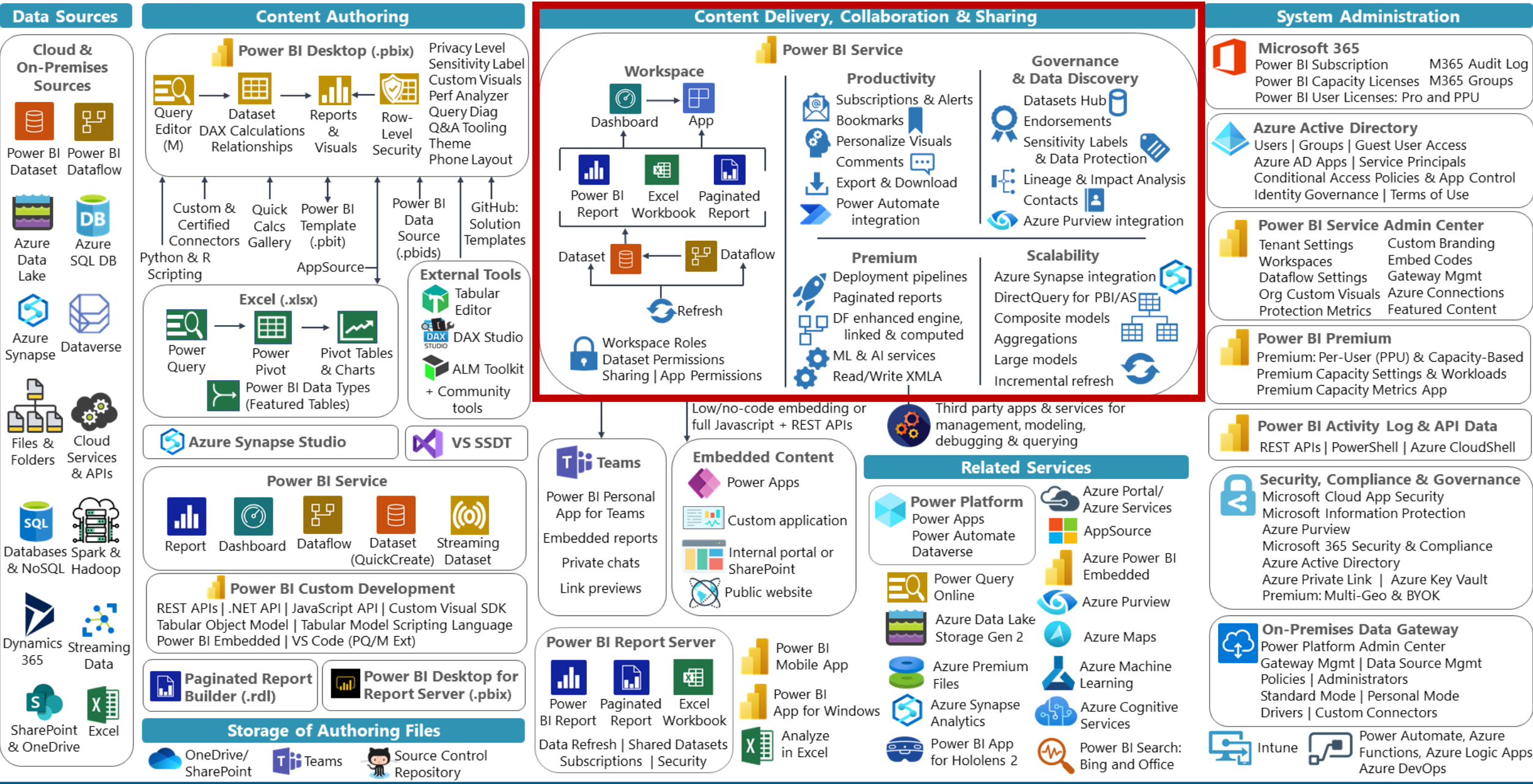


Source: <https://docs.microsoft.com/en-us/power-bi/guidance/powerbi-migration-overview>  
(Content authored by Melissa Coates published to Microsoft Docs)



# Power BI End-To-End: Top Features, Key Integration Points & Related Services

Last Updated: January 4, 2021



# What Can We Do With Power BI Metadata?



1 Adoption & usage patterns

2 Architecture overview & inventory

3 Governance, security & compliance

4 Support & user education

# Adoption



Activity & System Usage ***Only***

# Defining User Adoption



Using the technology...



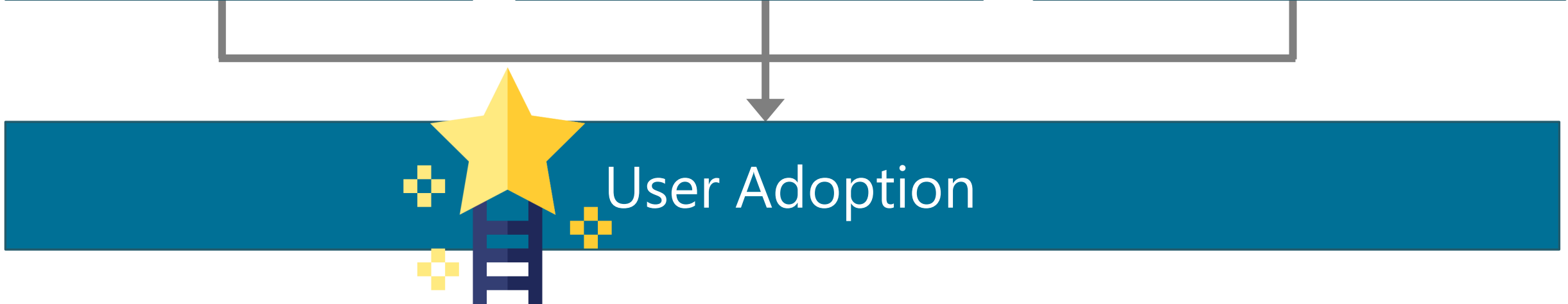
Routinely  
as part of  
job role



As it was  
intended  
to be used



In an optimal  
way to its  
fullest extent





# 1 Adoption & Usage Patterns

## Subcategories of adoption monitoring & measurement:

- 1a Usage & consumption
- 1b Data trustworthiness
- 1c User experience & usability
- 1d Learning & continual improvement
- 1e Organizational awareness & engagement

This data originates outside of Power BI so we won't focus on it in this session



# 1 Adoption & Usage Patterns

## 1a Usage & consumption

### **Content views (reports, dashboards, apps, workspaces) –or– users**

Top n Popular content

#/% of content with active usage

#/% of content with frequent usage

#/% of underutilized content

#/% of usage increasing MoM/QoQ

### **User activity & license usage**

#/% of users who actively publish content

#/% of users with underutilized license



### **Create common definitions to apply to all metrics:**

Active = every month

Frequent = every week

Inactive or Underutilized = not in 3 months



# 1 Adoption & Usage Patterns

## 1b Data trustworthiness

### Certified content

Ratio of datasets to reports

#/% of certified datasets

#/% of certified dataflows

#/% of certified reports

#/% of certified apps

## 1c User experience & usability

### Ensuring optimal experience

% of refresh success for certified datasets & dataflows

#/% unused objects in workspace

% uptime for gateway cluster



## 2 Architecture Overview & Inventory

- # of workspaces, by type
- # of reports, by type
- # of dashboards
- # of datasets
- # of dataflows
- # of users, by active/inactive
  
- Gateways in use
- Data sources in use
- Premium capacities in use



Consider storing this type of data as snapshots over time, so you can do trending.

Combining point-in-time snapshots along with the activity log events provides a full picture.



3

# Governance, Security, Auditing, Compliance



Workspace security by role

Security snapshots for users & groups

Security activity/changes

Security after user role or dept changes

Licensing snapshots at point in time

License usage / non-usage

External user activities

Power BI administrator activities

Datasets/dataflows owned by a user who is no longer active or has transferred

Contacts for a user who is no longer active or has transferred



Activity data should be accumulated for at least a year or two



4

# Support & User Education

## Situations we want to minimize

Significant sharing from My Workspace

Significant report views from My Workspace

Many datasets published by the same author

Build permissions exists for a lot of users on a dataset which is not certified

High report views based on content which is not certified

Frequent data refresh failures

Significant use of unsanctioned data sources

Significant & recurring exports to Excel

Significant & recurring printing

Unexpected use of subscriptions



Consider contacting users when you see certain activities happening & directing them to helpful information

# What Can We Do With Power BI Metadata?



- 1 Adoption & usage patterns
- 2 Architecture overview & inventory
- 3 Governance, security, auditing & compliance
- 4 Support & user education

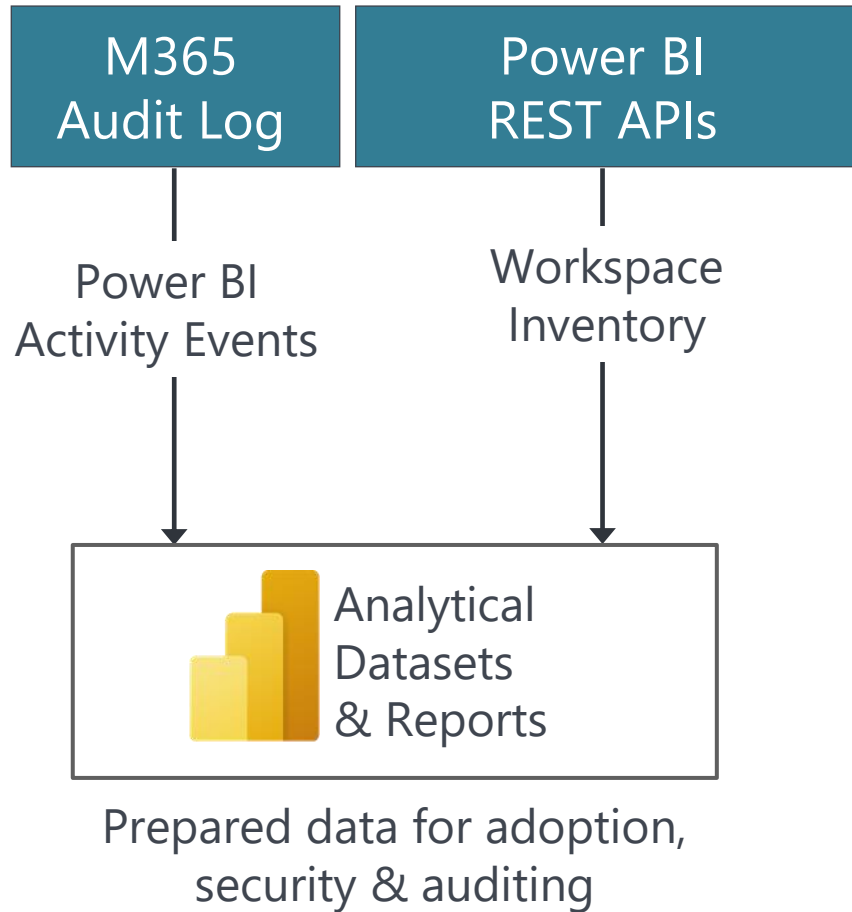
# How

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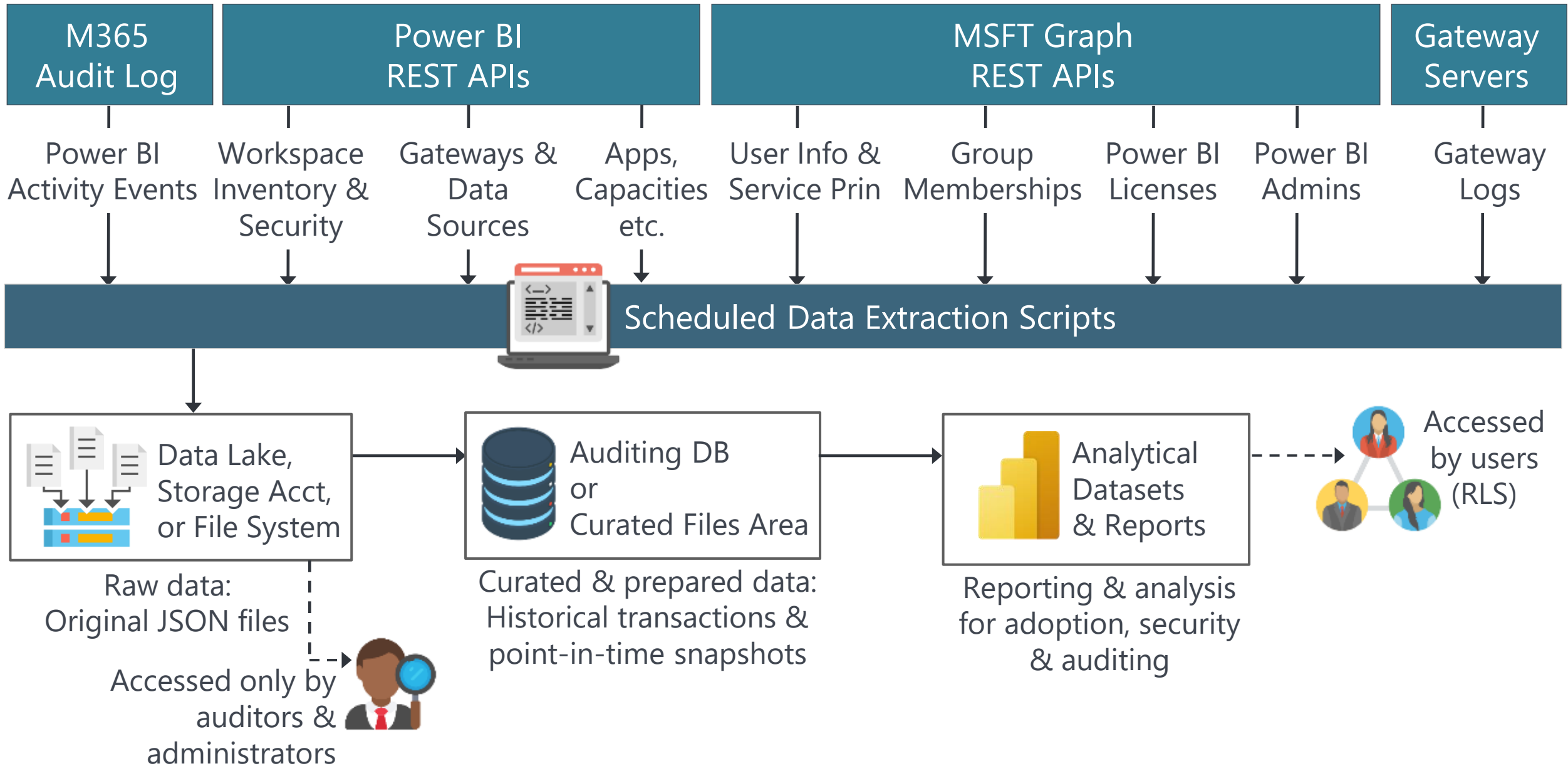
Technical overview  
& demos



# Basic Power BI Auditing Solution



# End-To-End Power BI Auditing Solution



This data is used for both:  
User adoption  
--plus--  
Auditing & monitoring



# Obtaining Auditing Data Through User Interface

- Microsoft 365 Unified Audit Log



DEMO



# Two Common Ways to Get Data Programmatically



## PowerShell Modules

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Power BI Management Module

Data Gateway Module



## REST APIs

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Power BI Admin REST APIs

Power BI User APIs

Power BI Embedding APIs

# Power BI Management Module



Description	Module Name	Common Cmdlets
Rollup module	MicrosoftPowerBIMgmt	N/A (just a manifest)
Profile module	MicrosoftPowerBIMgmt.Profile	Connect-PowerBIServiceAccount Disconnect-PowerBIServiceAccount Invoke-PowerBIRestMethod
Admin module	MicrosoftPowerBIMgmt.Admin	Get-PowerBIActivityEvent
Capacities module	MicrosoftPowerBIMgmt.Capacities	Get-PowerBICapacity
Data module	MicrosoftPowerBIMgmt.Data	Get-PowerBIDataset Get-PowerBIDataSource Get-PowerBIDataflow
Reports module	MicrosoftPowerBIMgmt.Reports	Get-PowerBIReport Get-PowerBIDashboard
Workspaces module	MicrosoftPowerBIMgmt.Workspaces	Get-PowerBIWorkspace

Supported for:  
Windows  
PowerShell 3.0+

Or

PowerShell Core  
6.0+

PowerShell Gallery: <https://www.powershellgallery.com/packages/MicrosoftPowerBIMgmt>

Cmdlets Reference: <https://docs.microsoft.com/en-us/powershell/power-bi/overview>

GitHub: <https://github.com/microsoft/powerbi-powershell>

# Data Gateway Module



Description	Module Name	Common Cmdlets
Rollup module	DataGateway	Get-DataGatewayCluster Get-DataGatewayClusterStatus Get-DataGatewayClusterDataSource Get-DataGatewayClusterDataSourceStatus Get-DataGatewayClusterDataSourceUser Get-DataGatewayInstaller Get-DataGatewayTenantPolicy
Profile module	DataGateway.Profile	Connect-DataGatewayServiceAccount Disconnect-DataGatewayServiceAccount Resolve-DataGatewayError

Supported for:  
PowerShell Core  
7.0+

PowerShell Gallery: <https://www.powershellgallery.com/packages/DataGateway>

Cmdlets Reference: <https://docs.microsoft.com/en-us/powershell/gateway/overview>



# DEMO

See scripts  
in notebook

## Demo Series #1

### Using the Power BI Management Module

- Authentication
  - Domain account [1-5]
  - Service principal [1-6]
- View workspace info
  - User scope [1-7]
  - Organization (admin) scope [1-8]
- View workspace artifact info [1-9]
- Export workspace inventory [1-10]



# Power BI REST APIs



Operation Groups	
Admin	Embed Token
Apps	Gateways
Available Features	Groups
Capacities	Imports
Dashboards	Push Datasets
Dataflow Storage Accounts	Reports
Dataflows	Template Apps
Datasets	Users

REST API Reference: <https://docs.microsoft.com/en-us/rest/api/power-bi/>

Power BI Activity Log: <https://docs.microsoft.com/en-us/power-bi/admin/service-admin-auditing>



# How the APIs are Named

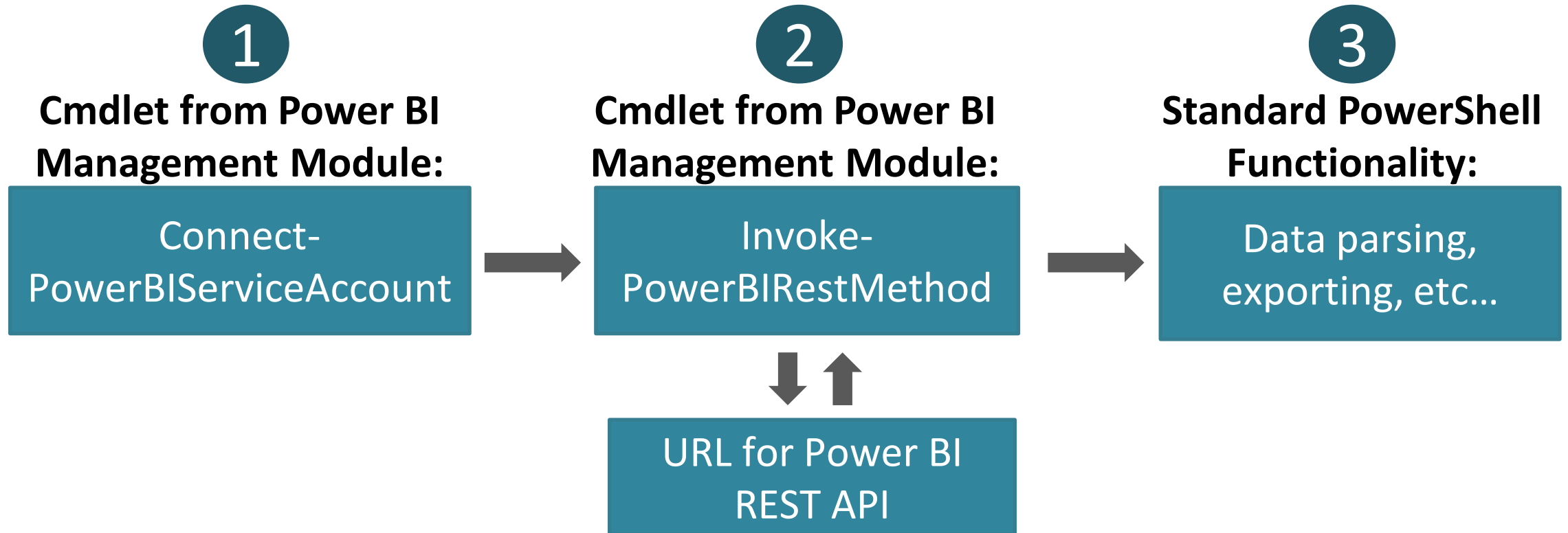
Type of API	Example API	Scope
User	Get Report	My workspace – one report
User	Get Reports	My workspace – all reports
User	Get Report in Group	One workspace – one report
User	Get Reports in Group	One workspace – all reports
Admin	Get Reports as Admin	Organization – all reports
Admin	Get Reports in Group as Admin	One workspace – all reports

User API = based on permissions of the executing user or service principal

Admin API = requires Power BI admin/organization-level permissions

# + Calling the Power BI REST API from Management Module

Simplest way to handle authentication:



```
https://api.powerbi.com/v1.0/myorg/admin/Groups?$top=5000&  
$expand=datasets,dataflows,reports,dashboards,workbooks,users
```

# + PowerShell-Specific Syntax



1

**Cmdlet from Power BI Management Module:**

Connect-  
PowerBIServiceAccount



2

**Cmdlet from Power BI Management Module:**

Invoke-  
PowerBIRestMethod



3

**Standard PowerShell Functionality:**

Data parsing,  
exporting, etc...



URL for Power BI  
REST API

[https://api.powerbi.com/v1.0/myorg/admin/Groups?%24top=5000 & %24expand=datasets,dataflows,reports,dashboards,workbooks,users](https://api.powerbi.com/v1.0/myorg/admin/Groups?%24top=5000&%24expand=datasets,dataflows,reports,dashboards,workbooks,users)





# DEMO

See scripts  
in notebook



## Demo Series #2

# Using the Power BI Management Module & the REST APIs Together

- View workspace artifact info for one workspace [2-1]
- Export workspace inventory [2-2]

# Summary of Ways We Can Get Data



Method of Authentication	 PowerShell Cmdlets	 API Requests
Power BI Management Module	Various cmdlets (ex: Get-PowerBIWorkspace)	Invoke- <b>PowerBI</b> RestMethod
OAuth2	N/A	Invoke-RestMethod



## Advantages of PowerShell Cmdlets:

- ✓ Easier to get started
- ✓ Handles things like pagination automatically
- ✓ Output more human readable by default



## Advantages of API Requests:

- ✓ A lot more data is available
- ✓ Displays newer data faster
- ✓ One less layer of obfuscation if language/tool flexibility is desirable

# Power BI Activity Events



## Common Examples of Activity Events

### Add Content:

Create App  
Create Folder (workspace)  
Create Report

### Delete Content:

Unpublish App  
Delete Folder (workspace)  
Delete Report

### Edit Content:

Edit Dataset  
Update Dataflow  
Rename Dashboard

### View Content:

View Report  
Analyze In Excel  
Analyzed by External Application

### Export Content:

Download Report  
Export Report  
Export Artifact

### Refresh Content:

Refresh Dataset  
Set Scheduled Refresh  
Request Dataflow Refresh

### Security:

Create Group (workspace)  
Generate Embed Token  
Create Email Subscription

### Manage Content:

Edit Certification Permission  
Sensitivity Label Applied  
Assign Workspace to Pipeline

### Administration:

Migrate Workspace Into Capacity  
Update Gateway  
Upgrade Workspace



Activity Log Reference: <https://docs.microsoft.com/en-us/power-bi/admin/service-admin-auditing>

Activity Log Examples: <https://docs.microsoft.com/en-us/power-bi/guidance/admin-activity-log>



# Power BI Activity Events

Several ways to get the detailed activity events:

- PowerShell cmdlet: Get-PowerBIActivityEvent  **First choice: easiest**
- Power BI REST API: Get Activity Events API  **Second choice**
- Microsoft 365 Compliance Center: unified audit log search
- Microsoft 365 Management API
- Microsoft Cloud App Security *(if MCAS is integrated with Power BI Service)*
- PowerShell cmdlet: Search-UnifiedAuditLog *(shouldn't be used anymore)*
- A 3<sup>rd</sup> party solution such as Power BI Sentinel

Activity Log Reference: <https://docs.microsoft.com/en-us/power-bi/admin/service-admin-auditing>

Activity Log Examples: <https://docs.microsoft.com/en-us/power-bi/guidance/admin-activity-log>

Activity Events API: <https://docs.microsoft.com/en-us/rest/api/power-bi/admin/getactivityevents>



# DEMO

See scripts  
in notebook

## Demo Series #3

### Activity Events Data

- View one type of activity events for one day [3-1]
- Export activity events for a range of days [3-2]
- Review different types of events

# Getting Started

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Tips for  
getting started



## Getting Started Tips

Decide what is most important to measure.  
Considerations:

- What does **success** mean?
- What behavior do you want to **encourage**?
- What do you want people to **start** doing?
- What do you want people to **stop** doing?



# Getting Started Tips

Decide **how you want to handle authentication:**

- A domain account (could be a service account) who is granted Power BI administrator rights.  
And/or
- Service principal (aka Azure AD app). This is considered a better security practice, but not all admin APIs are supported yet.





## Getting Started Tips

Start storing the activity log data right away if you aren't already.

Plan to accumulate history of at least 2 years to measure adoption, trends, changes, as well as for auditing purposes.



# Getting Started Tips

Consider accumulating [workspace snapshots](#) on a regular basis (ex: weekly). For large tenants, this needs to be done efficiently to minimize # of API calls. Options:

- [Get-PowerBIWorkspace](#) cmdlet from the Power BI Management Module with the `-Include All` parameter
- The [admin groups API](#) with the `$expand` parameter
- New [GetModifiedWorkspaces API](#)



## Getting Started Tips

Extract the **original raw data** without any filters or formatting.

Since new events arrive regularly, use JSON format to allow for a flexible schema since new auditing attributes are introduced regularly.



## Getting Started Tips

Retain the **original raw data** files in a **secure location**. Preferably an **immutable** location which allows no modifications or deletions.

This allows you to:

- Accommodate new attributes with a flexible schema
- Re-parse the data when you become aware of new auditing data, or if you want to reload
- Rely on this data for formal auditing if required



## Getting Started Tips

Use the data regularly enough to **know what your “normal” is**. This allows you to recognize fairly quickly when something unusual begins to occur so you can **take action**.

This works best when:

- The Power BI administrator has a thorough understanding of how the system is used, and
- Time is allocated for & understanding the data



## Getting Started Tips

Release reports based on the **curated/prepared data** for users in the business units to help them understand the impact of their solutions. Incorporate **row-level security** if necessary.

The built-in usage metrics reports are helpful, but the dataset we create can be far more powerful.

Wrap-Up



# The Importance of Power BI Metadata

The Power BI metadata from the Activity Log and the REST APIs are critical for:

- ✓ Monitoring adoption efforts
- ✓ Understanding usage patterns of content
- ✓ User support, education, and identifying training opportunities
- ✓ Identifying suspicious usage patterns
- ✓ Change tracking
- ✓ Documenting the architecture & objects deployed to Power BI
- ✓ Internal & external auditing support
- ✓ Monitoring data trustworthiness levels
- ✓ Tracking effectiveness of license usage
- ✓ Governance, auditing & oversight activities





Q&A

# Finding More Info from Melissa

 **Slides:** [CoatesDS.com/Presentations](https://CoatesDS.com/Presentations)

 **Diagrams:** [CoatesDS.com/Diagrams](https://CoatesDS.com/Diagrams)


 **Blog:** [CoatesDS.com/Blog-Posts](https://CoatesDS.com/Blog-Posts)


 **Videos:** [YouTube.com/c/CoatesDataStrategies](https://YouTube.com/c/CoatesDataStrategies)


 **Twitter:** [@CoatesDS](https://twitter.com/CoatesDS) | [@SQLChick](https://twitter.com/SQLChick)

 **Governance Training:** [CoatesDS.com/Workshop](https://CoatesDS.com/Workshop)



 Attribute to me as original author if you share these materials

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# Release Plan Items to Watch

## **Azure Monitor Integration**

<https://docs.microsoft.com/en-us/power-platform-release-plan/2020wave2/power-bi/azure-monitor-integration>

Connect to a Log Analytics workspace for long-term storage. First priority for the public preview: queries & processing operations from query engine.

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## **Custom visual monitoring**

<https://docs.microsoft.com/en-us/power-platform-release-plan/2020wave2/power-bi/power-bi-custom-visual-monitoring-administrators>

Monitor which users, reports or dashboards are using a custom visual.



# Release Plan Items to Watch

## **Data lineage, impact, and API enhancements**

<https://docs.microsoft.com/en-us/power-platform-release-plan/2021wave1/power-bi/data-lineage-impact-api-enhancements>

Asynchronous admin APIs to efficiently scan Power BI artifacts & lineage.  
Incremental admin API to only scan workspaces changed since last API call.

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## **Embedding Power BI into a Jupyter notebook**

<https://docs.microsoft.com/en-us/power-platform-release-plan/2020wave2/power-bi/embed-power-bi-jupyter-notebook>



# Learning Resources

## **Just Thorning Blindbæk**

<https://justb.dk/blog/2021/02/extracting-the-power-bi-activity-log-with-data-factory/>

Extracting the Power BI activity log data using **Azure Data Factory**. Be sure to use the version (at the bottom) to send raw data to a storage account, rather than parsing directly to a DB table (goal is to avoid losing any data).

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## **Tom Martens**

<https://www.minceddata.info/2021/01/03/the-power-bi-service-admin-mapping-the-hive/>

Extracting the Power BI activity log data using **Azure Automation**.



# Learning Resources

**Gilbert Quevauvilliers**

<https://www.fourmoo.com/2020/02/12/how-you-can-store-all-your-power-bi-audit-logs-easily-and-indefinitely-in-azure/>

Extracting the Power BI activity log data using **Azure Functions**.

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**Nassim Kasdali** (Microsoft Power BI team)

<https://github.com/kasdali/pbila>

Power BI Log Analytics Starter Kit



# Learning Resources

**Dev Camp Labs** (Ted Pattison from Power BI Customer Advisory Team)

<https://www.powerbidevcamp.net/>

<https://github.com/PowerBiDevCamp/PowerBI-PowerShell-Tutorial>

See Ted's Sept. 24, 2020 session on Writing PowerShell Scripts for Power BI. It uses Windows PowerShell still, but shares lots of good tips nonetheless.

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**Brett Powell** (Insight Quest)

<https://insightsquest.com/>

<https://github.com/BrettP76/Insight-Quest-Examples>

Brett has lots of examples to learn from in his GitHub repositories.



# Learning Resources

## **Parker Stevens 4-Part Series**

Part 1: <https://www.youtube.com/watch?v=cTqFNgy9lw>

Part 2: <https://www.youtube.com/watch?v=2RZkcqrV1g>

Part 3: <https://www.youtube.com/watch?v=Z4E2jSZ4r6A>

Part 4: <https://www.youtube.com/watch?v=BxKIJL5baAU>

A few considerations:

- Some flaws from part 1 are fixed in part 2, so watch the first two parts before you build too much out.
- The technique used has some serious security concerns so if you use this approach, strenuously protect the PBIX file.
- Only 30 days of history can be accumulated using this technique.





# Learning Resources

**Aaron Nelson** (Microsoft)

<https://github.com/SQLvariant/Demos/tree/master/Presentations/PowerShell-for-PowerBI>

Aaron uses notebooks to illustrate various techniques.

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**Guy In a Cube** (Microsoft)

Power BI REST API No-Code Options

<https://www.youtube.com/watch?v=fXbJeIY2CgE>

Power BI Service Principals 101

<https://www.youtube.com/watch?v=1SO19uik1rw&t=310s>



# References

## **Operations available in the Power BI activity log**

<https://docs.microsoft.com/en-us/power-bi/admin/service-admin-auditing#operations-available-in-the-audit-and-activity-logs>

## **PowerShell cmdlets, REST APIs, & .NET SDK for Power BI admin**

<https://docs.microsoft.com/en-us/power-bi/admin/service-admin-reference>

## **Working with PowerShell in Power BI**

<https://powerbi.microsoft.com/en-us/blog/working-with-powershell-in-power-bi/>

## **Announcing APIs and PowerShell Cmdlets for Power BI Administrators**

<https://powerbi.microsoft.com/en-us/blog/announcing-apis-and-powershell-cmdlets-for-power-bi-administrators/>



# References



## **Power BI Management Module: Download Module from PowerShell Gallery**

<https://www.powershellgallery.com/packages/MicrosoftPowerBIMgmt>

## **Power BI Management Module: Documentation**

<https://github.com/Microsoft/powerbi-powershell>

## **Power BI Management Module: Cmdlet Reference**

<https://docs.microsoft.com/en-us/powershell/power-bi/overview?view=powerbi-ps>



# References

## **Data Gateway Module: Download Module from PowerShell Gallery**

<https://www.powershellgallery.com/packages/DataGateway>

## **Data Gateway Module: Cmdlet Reference**

<https://docs.microsoft.com/en-us/powershell/module/datagateway/?view=datagateway-ps>

## **On-Premises Data Gateway Management**

<https://powerbi.microsoft.com/en-us/blog/on-premises-data-gateway-management-via-powershell-public-preview/>



# References

## **Power BI REST API Reference**

<https://docs.microsoft.com/en-us/rest/api/power-bi/>

## **Power BI REST API with 'Try It' Tool**

<https://azure.microsoft.com/en-us/updates/power-bi-rest-api-tryit-tool/>

## **Announcing New Admin APIs and Service Principal Authentication to Make for Better Tenant Metadata Scanning**

<https://powerbi.microsoft.com/en-us/blog/announcing-new-admin-apis-and-service-principal-authentication-to-make-for-better-tenant-metadata-scanning/>