Power BI Architecture End-to-End

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Power BI Architecture End-to-End

Agenda

Authoring Tools & Data Storage Modes

Options for Content Delivery

Power BI Service

Power BI Report Server

Embedding

Key Components in the Architecture

Data Gateway

Power BI Premium

Dataflows

Other

Where to Download Materials

Slides:
CoatesDataStrategies.com/Presentations

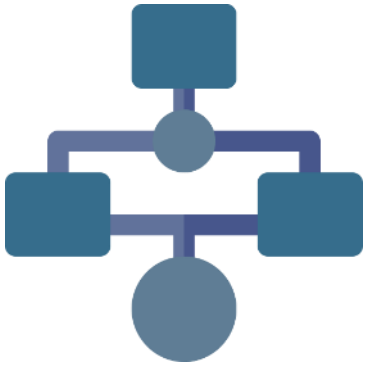
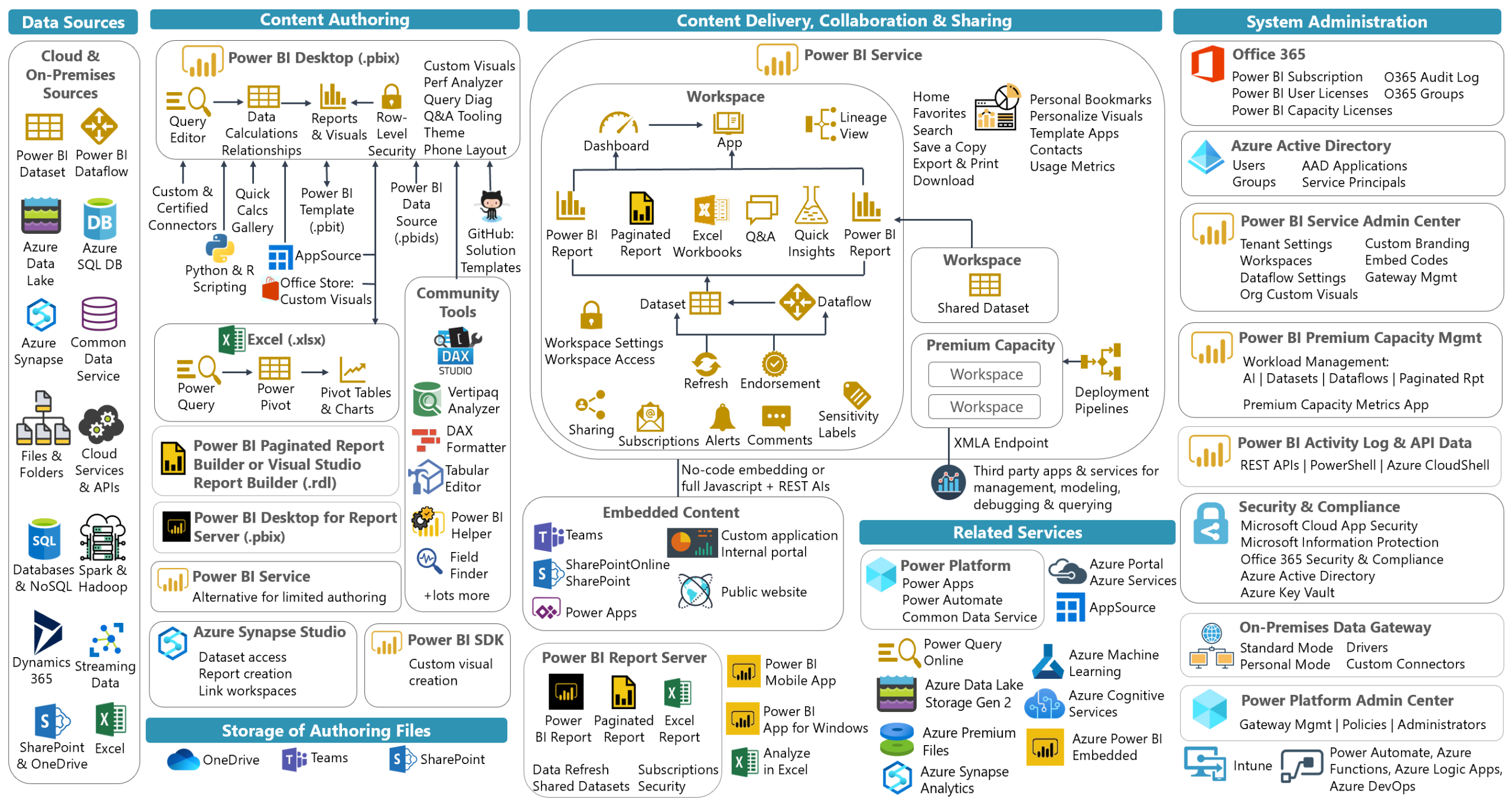


Diagram:
CoatesDataStrategies.com/Diagrams

What is Power BI?

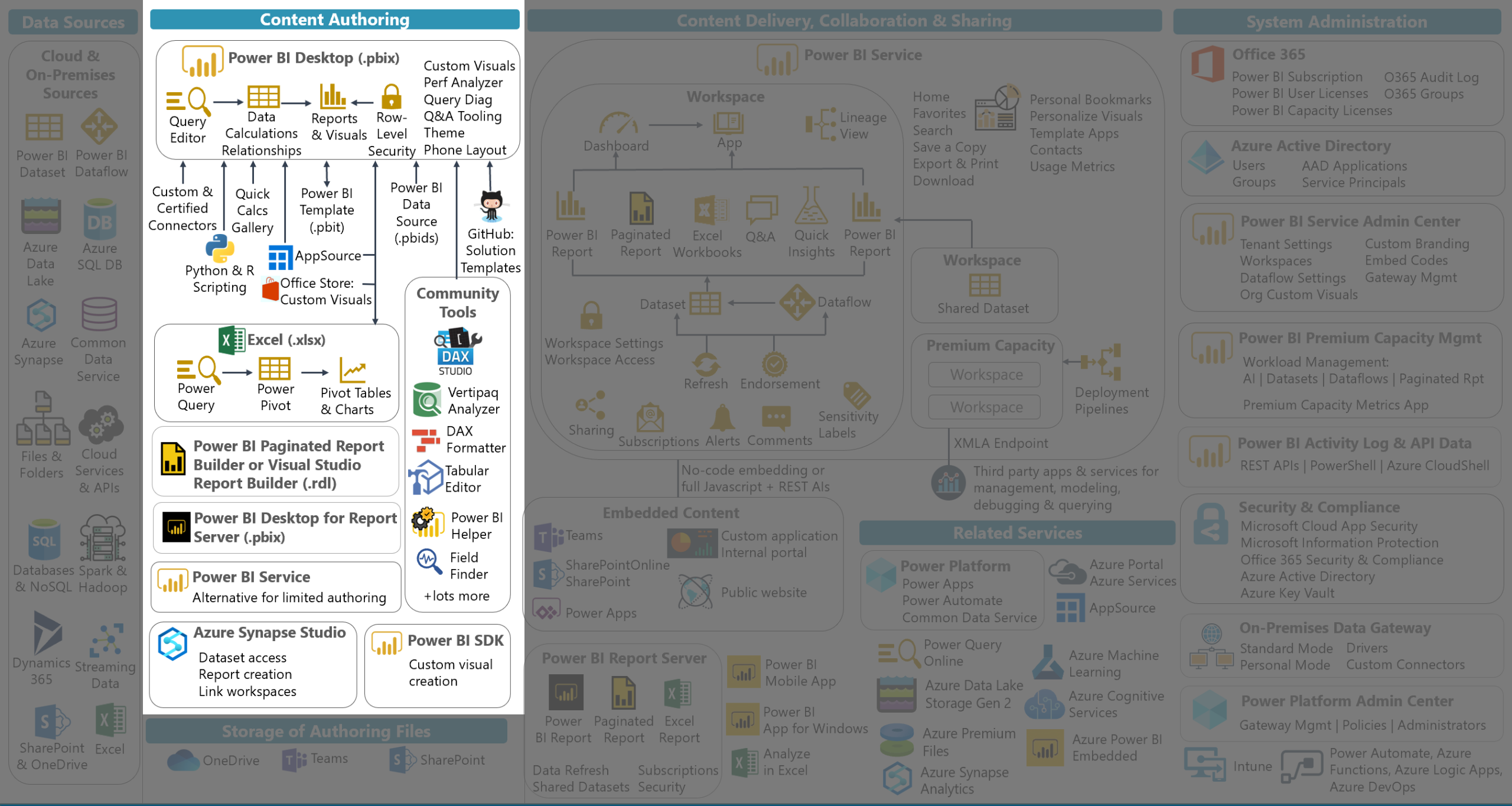
A ***suite of tools*** to support ***both*** self-service BI and corporate BI:

- Data acquisition
- Data preparation and cleansing
- Data modeling
- Calculations
- Reports and visuals
- Content delivery and viewing



Download diagram: CoatesDataStrategies.com/Diagrams

Power BI Authoring Tools & Data Storage Modes



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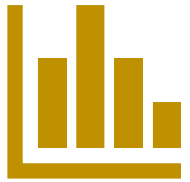
Power BI Authoring

Source Data

Query Editor

Data Calculations Relationships



Reports & Visuals

Skills:	Data preparation	Data modeling	Data visualization
Languages:	Power Query Formula Language (“M”)	Data Analysis eXpressions (“DAX”)	

Authoring Tools

Power BI Desktop (.pbix)	Tool of choice for query editing, data modeling, and report creation
Excel (.xlsx)	Alternative to Power BI Desktop
Power BI Paginated Report Builder (.rdl)	Highly formatted pixel-perfect reports
Power BI Desktop for Report Server (.pbix)	A version of Desktop which aligns with Power BI Report Server update cadence
Power BI Service	Report and dashboard authoring
Azure Synapse Studio	Report and dashboard authoring

Data Storage Modes

		Data stored in Power BI	Data remains in source
Import	Data is imported to Power BI's in-memory columnar data storage		
Direct Query	Queries are passed at execution time to a relational data source		
Live Connection	Queries are passed at execution time to an Analysis Services or Power BI source		
Composite	Combination of Import + DirectQuery defined per table		

Combination of Live Connection + Import is on the release plan

Data Storage Modes

	Local model	Remote model
Data stored in Power BI	**Import Mode** A PBIX file which contains both the schema and the data; may or may not also contain reports	**Live Connection Mode** A PBIX file with reports that obtain data by querying a shared dataset published to the Power BI Service
Data remains in source	**DirectQuery Mode** A PBIX file with reports; model contains schema only; data is obtained by querying the data source when report is executed	**Live Connection Mode** A PBIX file with reports that obtain data by querying an Analysis Services Tabular Model

Data Storage Modes

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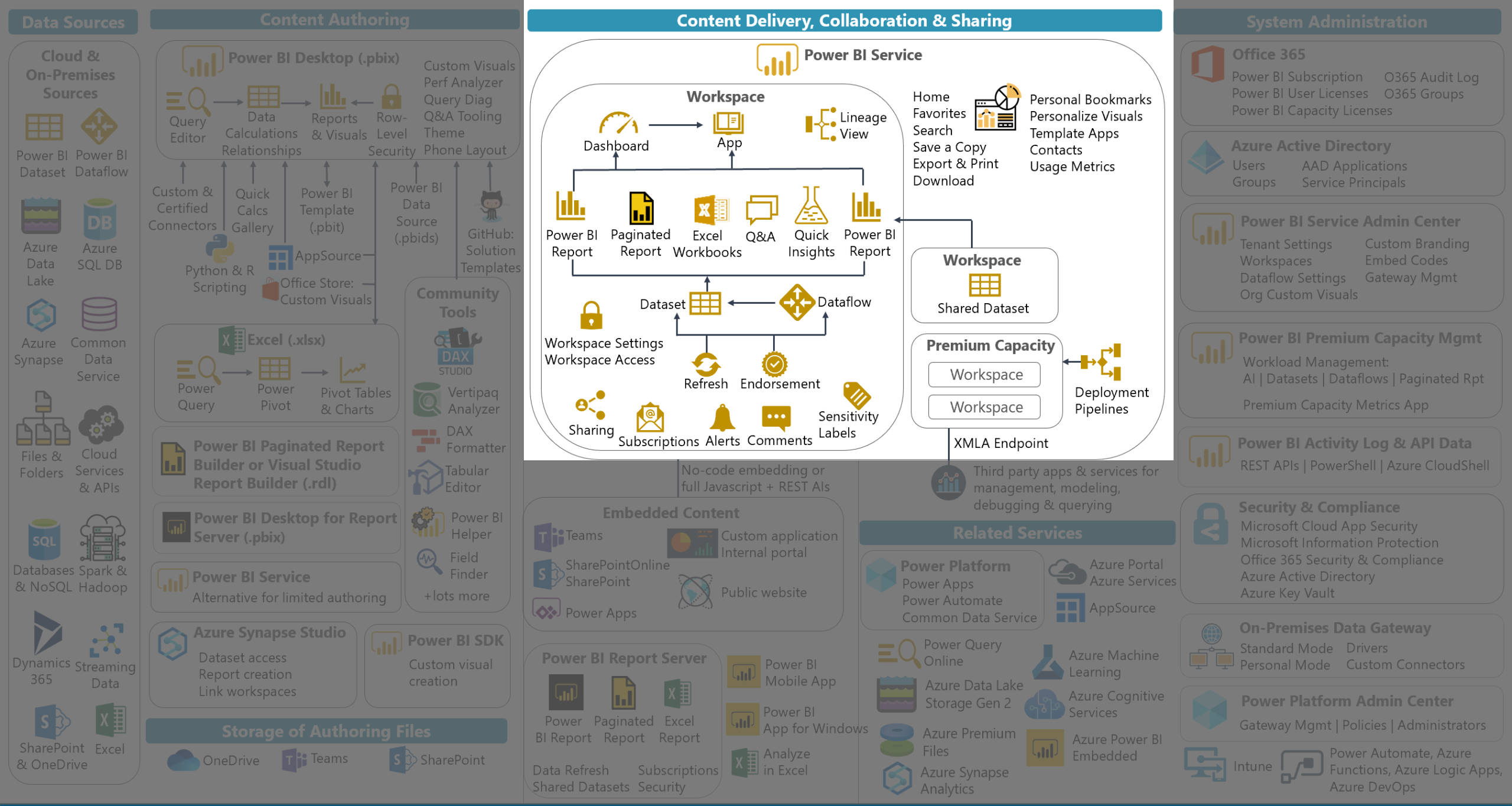
Options for Content Delivery

Power BI Service



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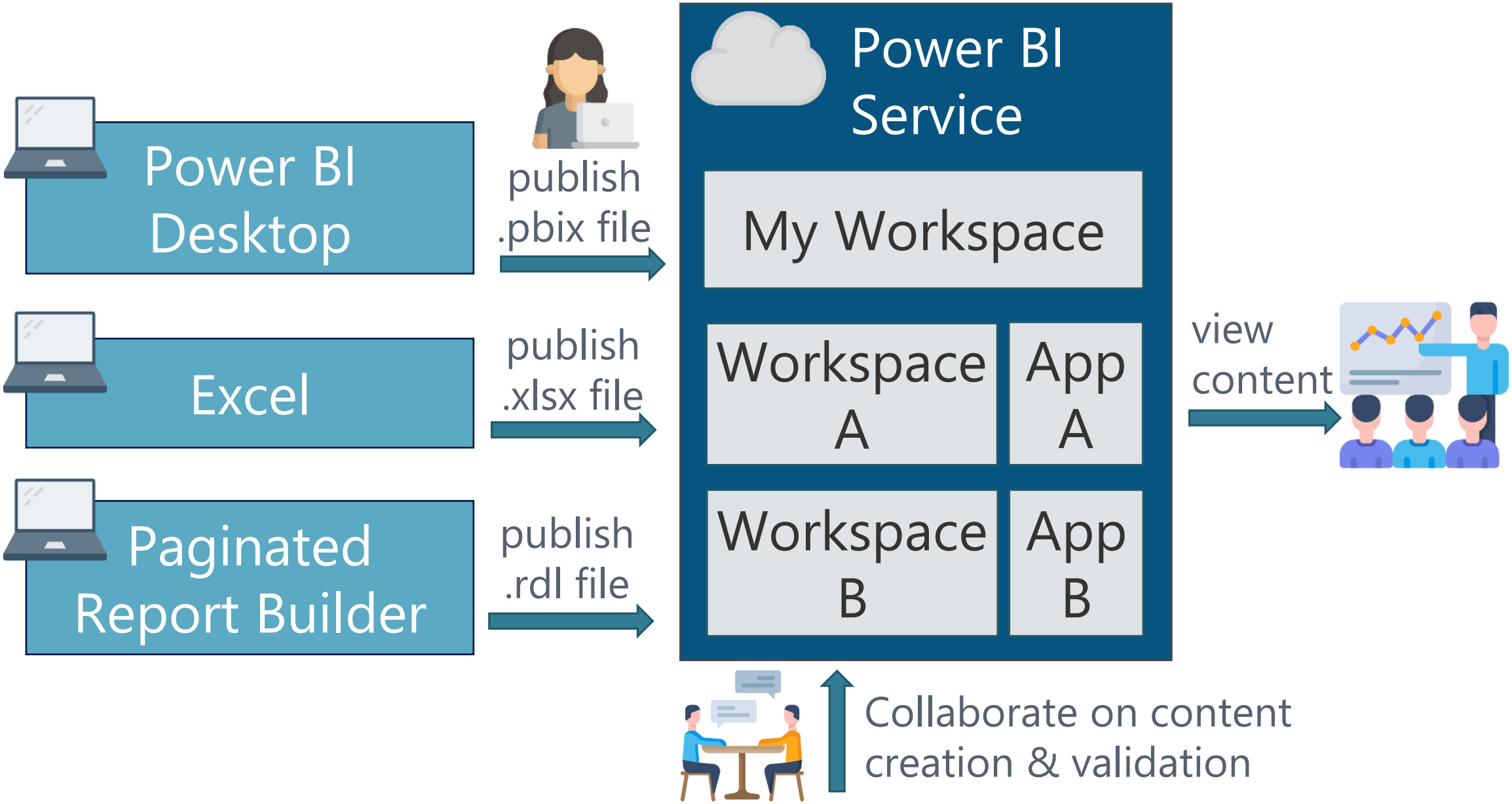
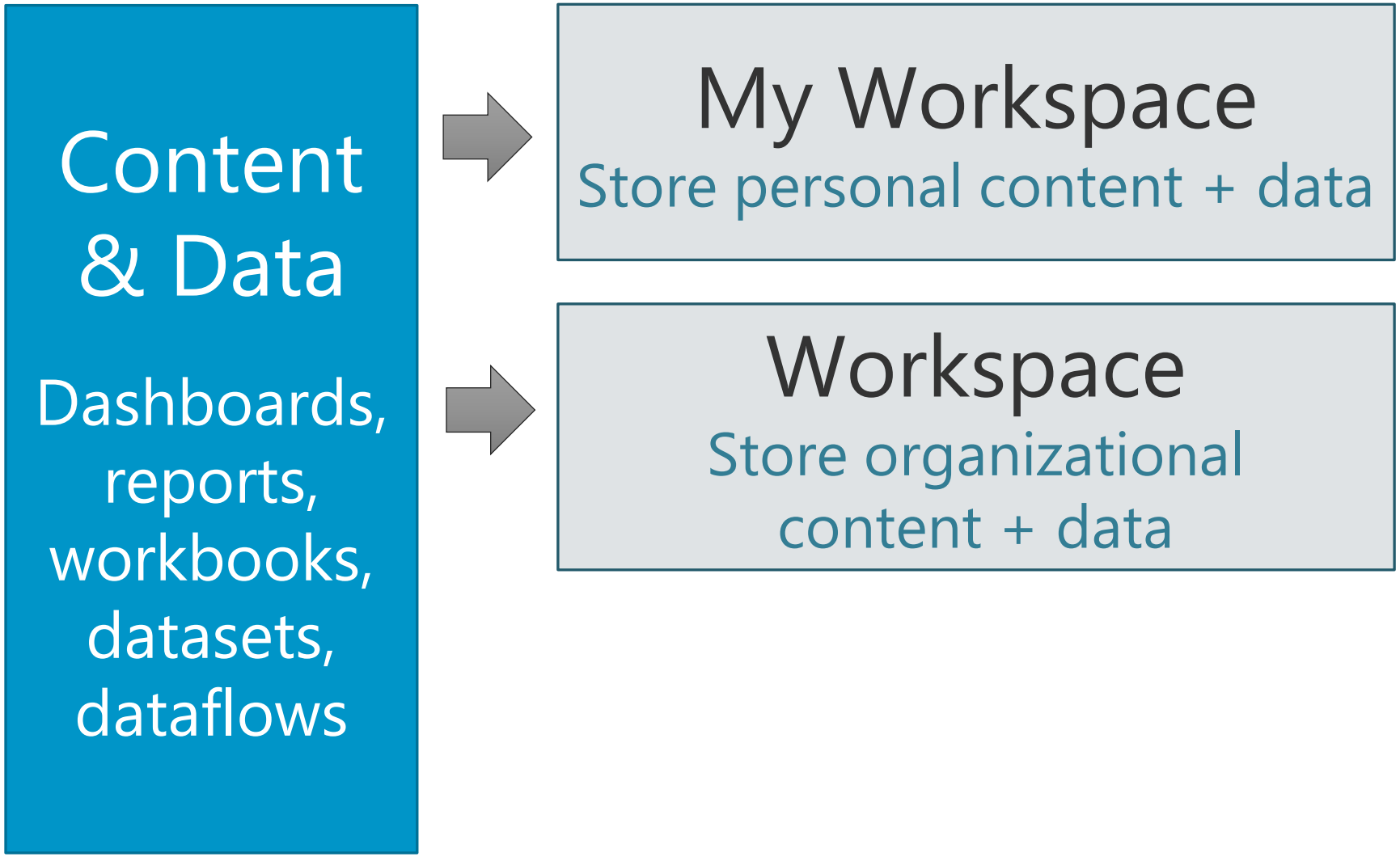
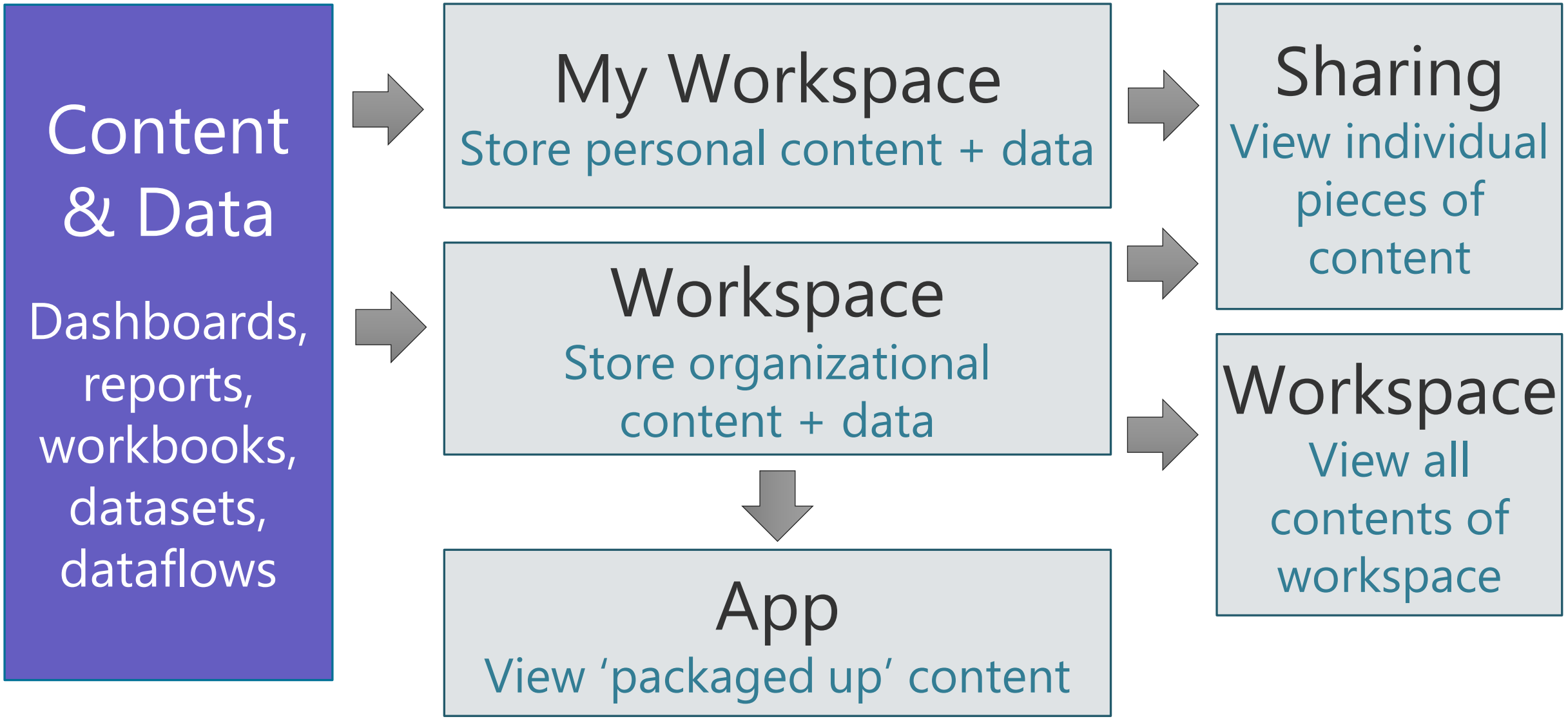
Power BI Service



Storing Content in the Power BI Service

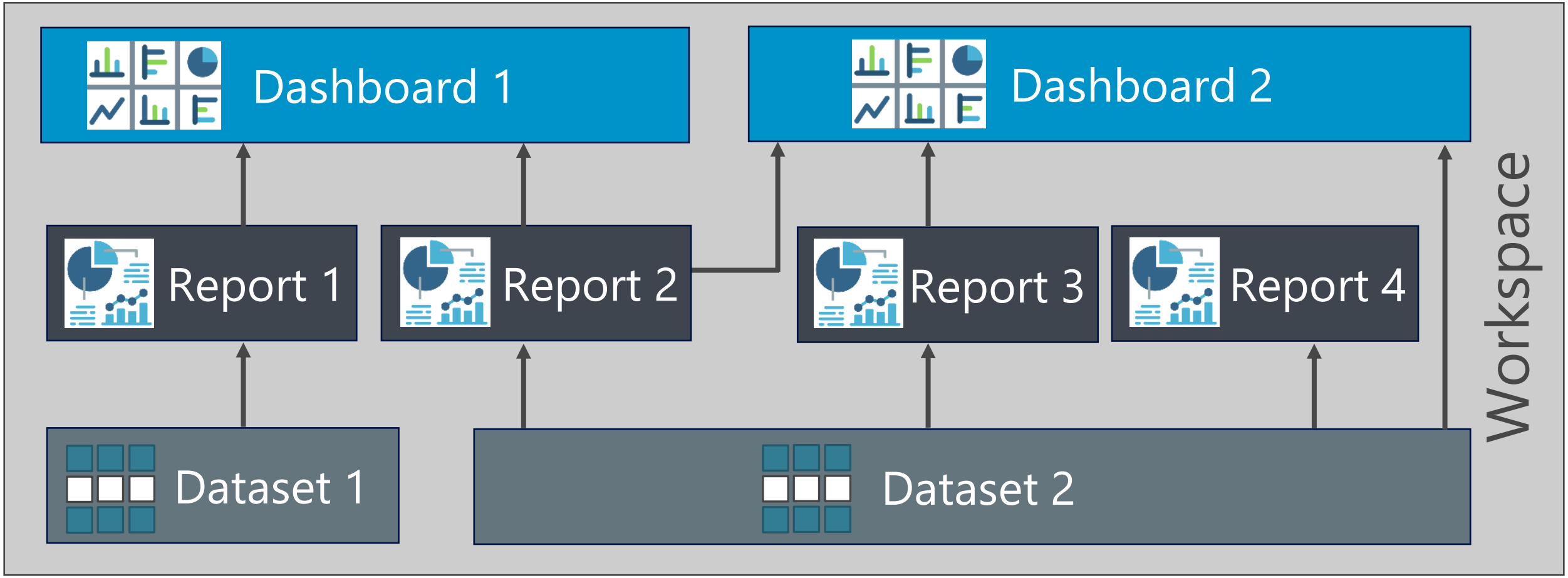


Viewing Content in the Power BI Service



Objects in the Power BI Service

Excluding workbooks & dataflows for now



Licenses Required for Power BI Service

User Licenses:

Free — Personal analytics (my workspace)

Pro — Team collaboration and content distribution (workspaces, apps, sharing)

User identity from Azure Active Directory

Capacity Licenses (*optional*):

Premium — Broad content distribution scenarios + extra functionality

Authors who publish content always need a Pro license

Top Reasons for Using the Power BI Service

Collaboration, Sharing & Content Distribution

Delivering reports using Power BI Desktop on a file system is difficult to do well

Multiple methods & security options to collaborate with both internal and external users

Friendler experience for report consumers with apps + easier to discover content

Top Reasons for Using the Power BI Service

Collaboration, Sharing & Content Distribution

Row-level security works

Use of the Power BI mobile app & the Windows application

Report & dashboard comments

Top Reasons for Using the Power BI Service

Automation

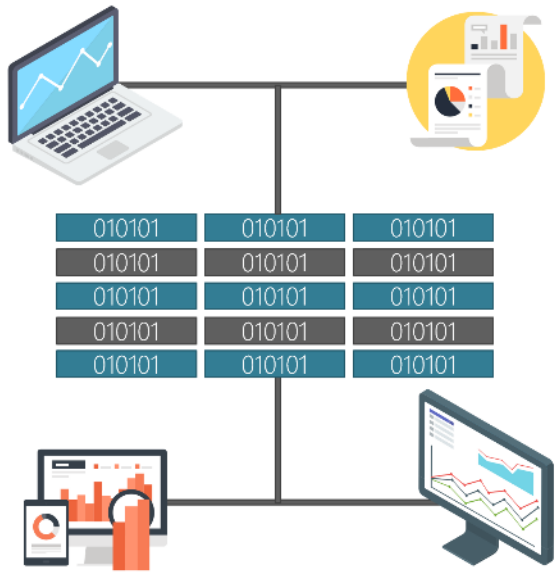
Subscriptions

Scheduled data refresh

Alerts & integration with Power Automate

Top Reasons for Using the Power BI Service

Centralization & Reusability



Centralized dataset reusability across numerous reports with shared datasets & live connections

Certified & promoted (endorsements) for datasets & dataflows

Centralized data cleansing with Power BI dataflows

Top Reasons for Using the Power BI Service

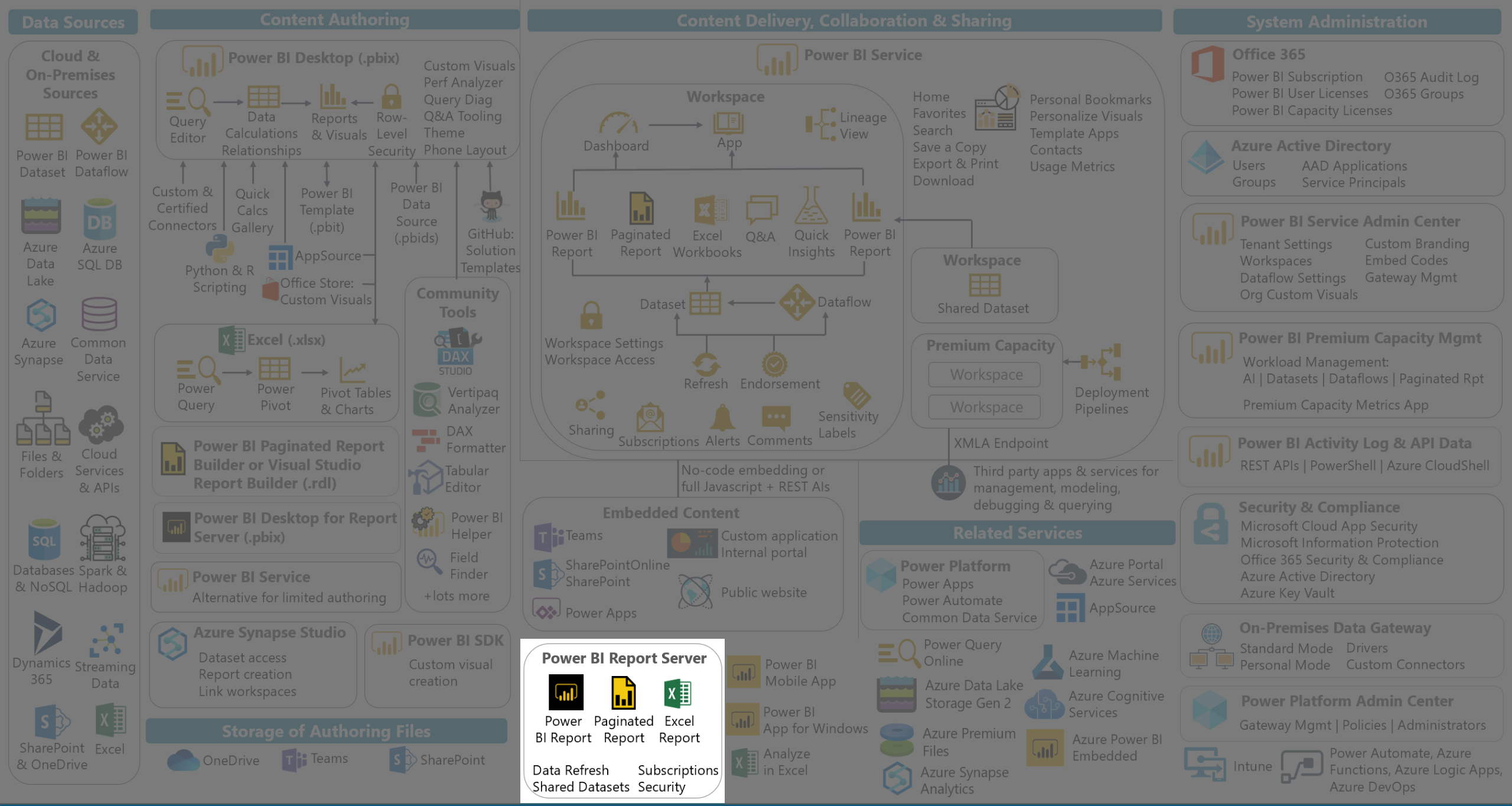
Governance, Compliance & Administration

Tenant settings to manage features & user experience

Integration with Azure Active Directory & Microsoft 365

Administrator visibility into usage & activity logging plus administrator access when necessary

Power BI Report Server



Download diagram: CoatesDataStrategies.com/Diagrams

Power BI Report Server

Power BI Desktop for Report Server

Excel

Paginated Report Builder

publish .pbix file

publish .xlsx file

publish .rdl file

Power BI Report Server

Web Server
Report Server
Report Server TempDB

collaborate on content creation & validation

view content

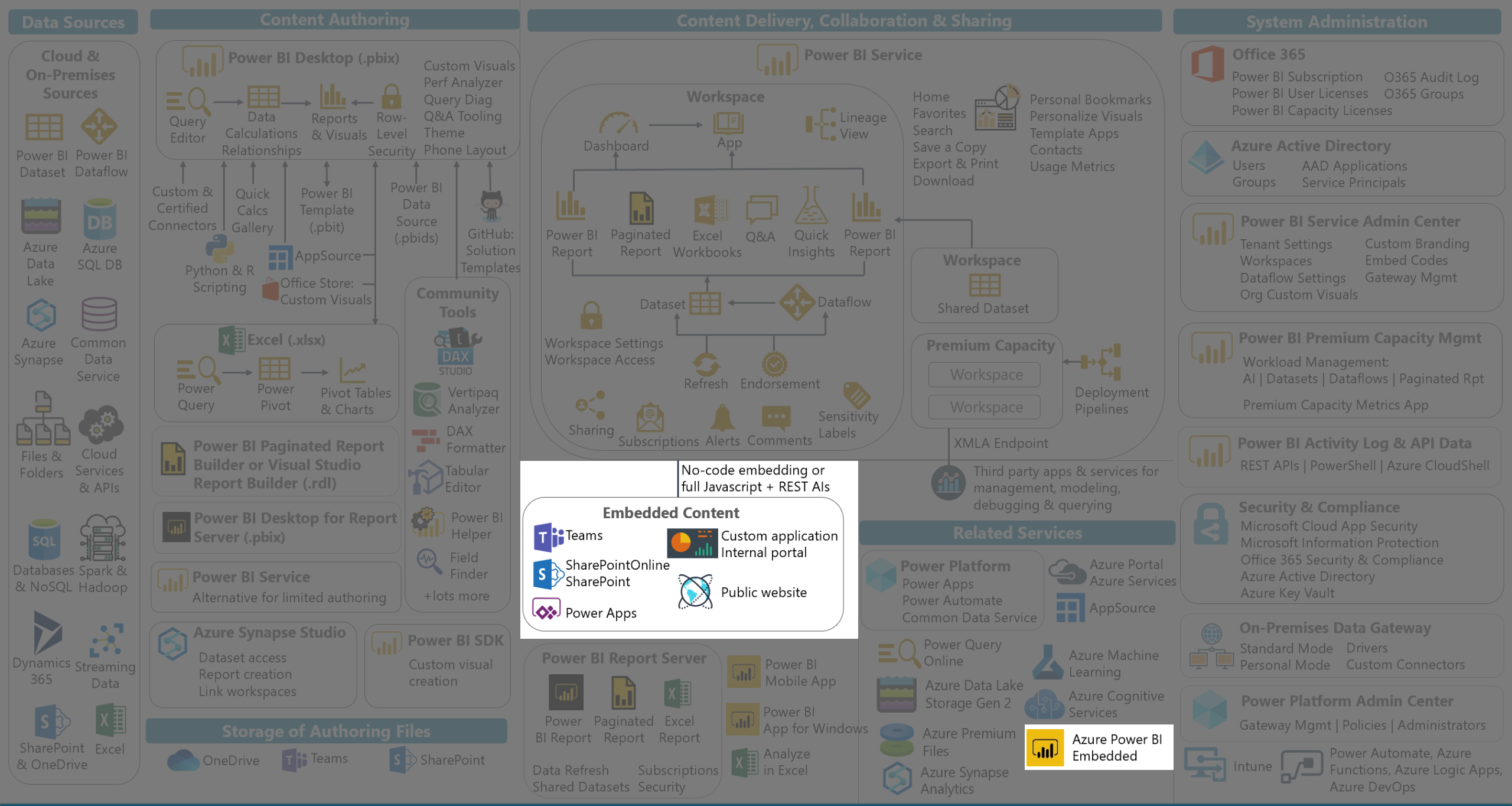
Top Reasons for Using Power BI Report Server

Need an alternative to the Power BI Service in the organization's data center

Existing significant investment in Reporting Services

Desire simplicity, slower release cadence, and a subset of feature support

Embedding Solutions



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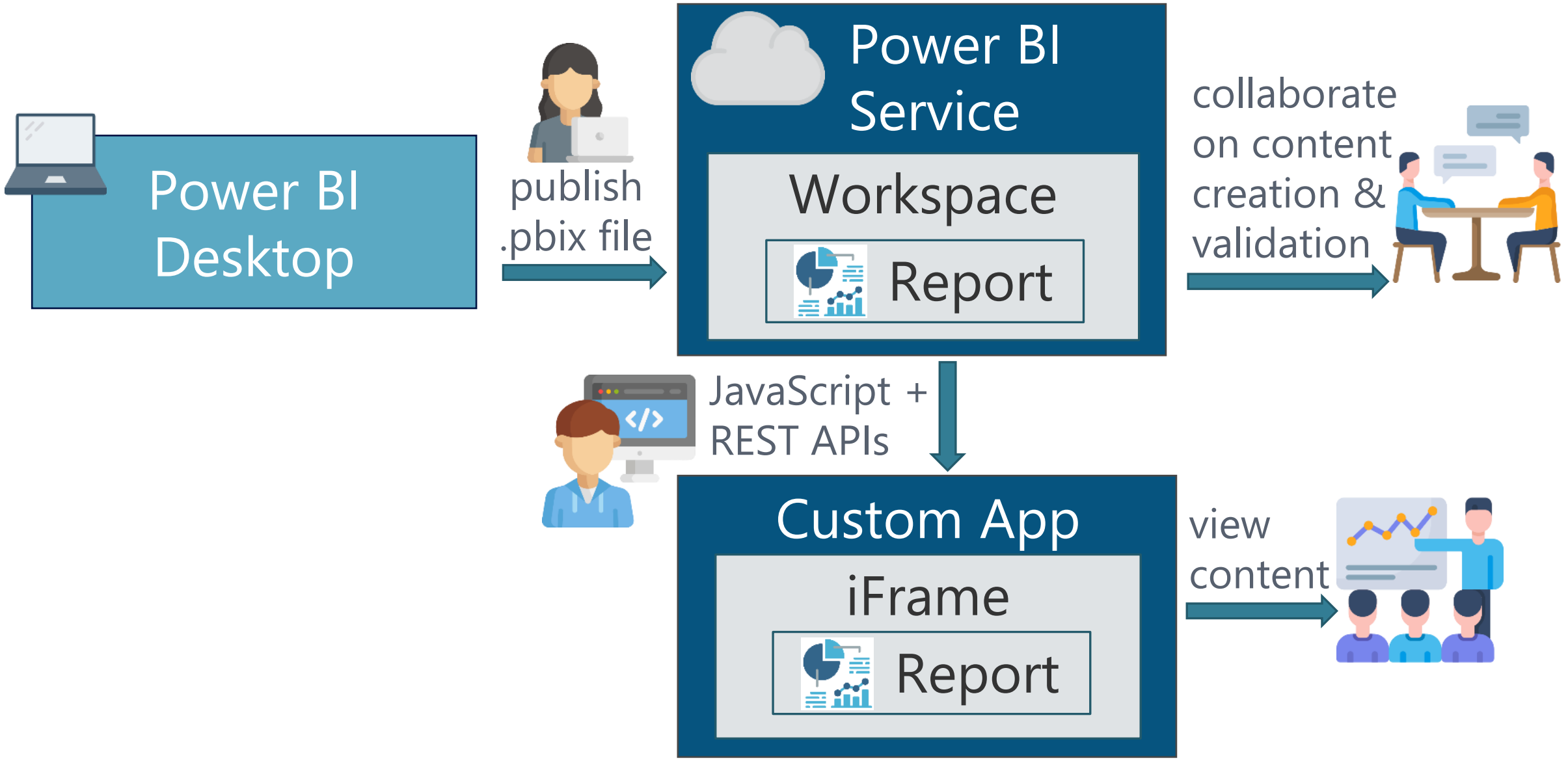
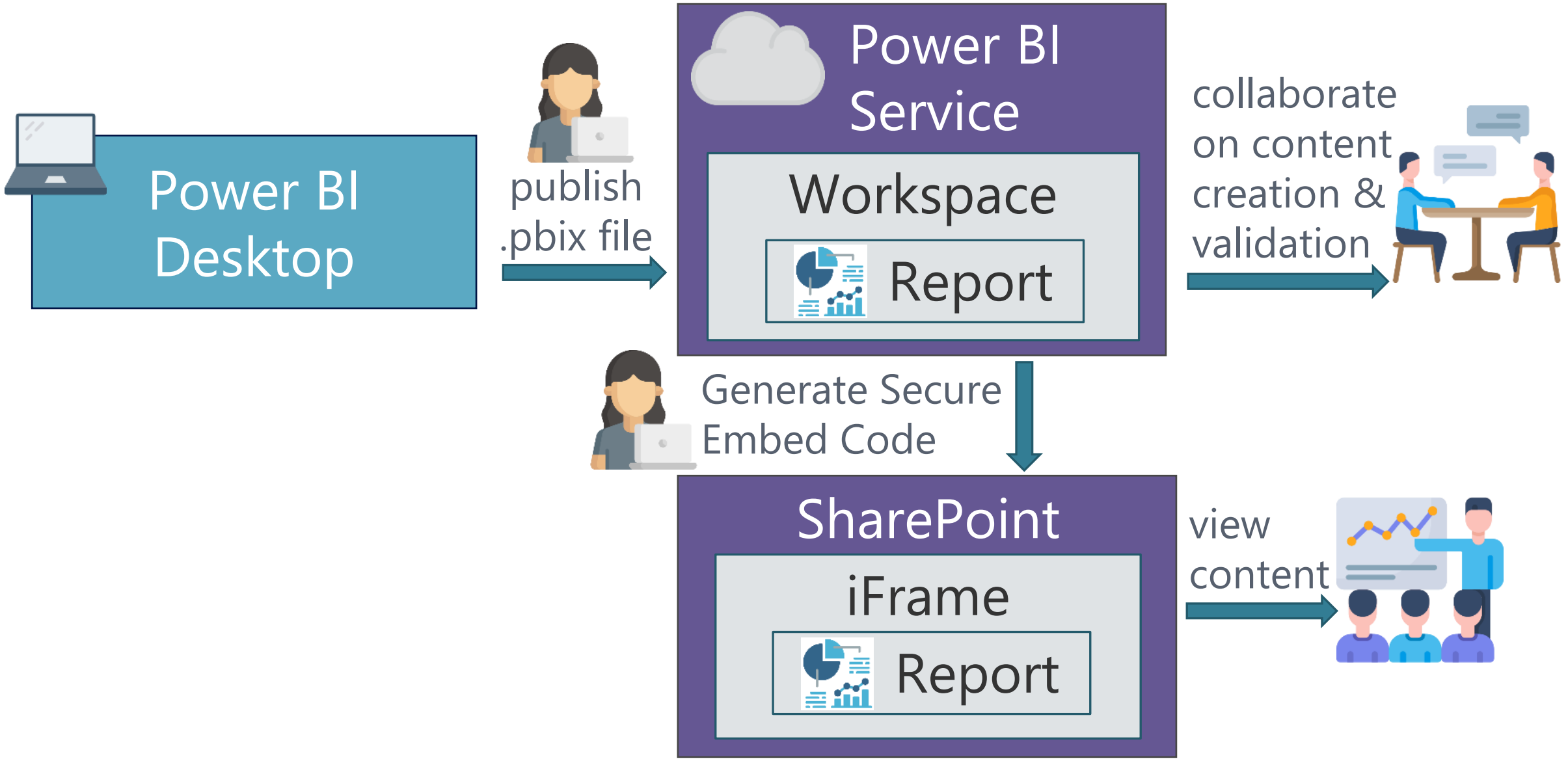
Embedding Content in a Custom Application



No-Code Embedding



Options for Embedding Content

Internal Embedding

Embed for productivity (no-code)

URL Embedding for internal websites and portals

Embedding in Teams

Embedding in SharePoint

Embed for your org (user owns data)

REST APIs: Custom portals and custom apps

Secured by organizational Azure AD

External Embedding

Embed for customers (app owns data)

REST APIs: ISV apps and services

Secured by application authentication

Public

Publish to web: public portals, open data initiatives

No user authentication

Image adapted from: [Planning a Power BI Deployment Whitepaper]

Options for Free Users

Internal Embedding

URL Embedding for internal websites and portals

Embedding in Teams

Embedding in SharePoint

REST APIs: Custom portals and custom apps

External Embedding

REST APIs: ISV apps and services

Publish to web: public portals, open data initiatives

Power BI Premium (P-series SKUs)

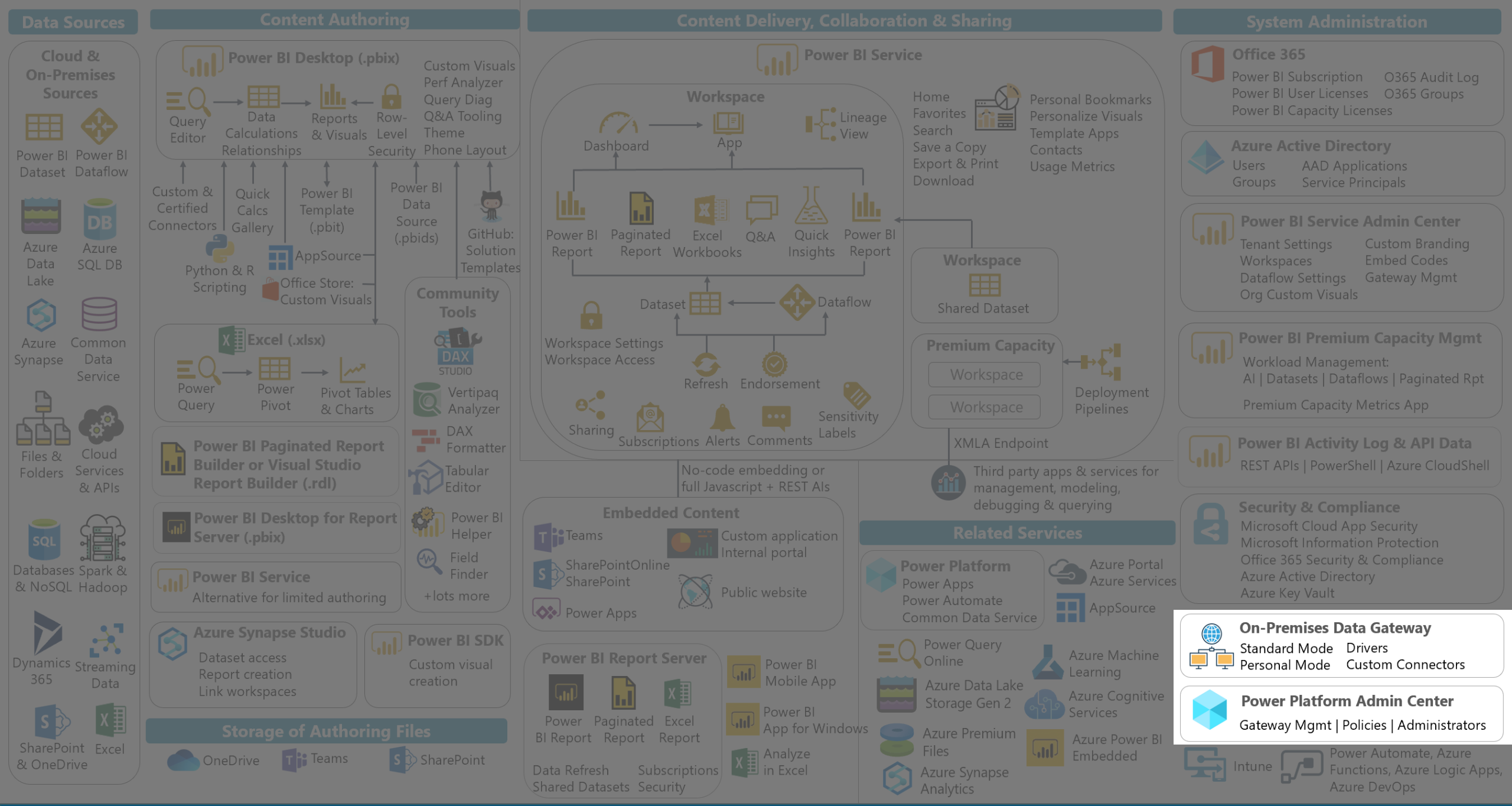
EM-series SKUs

Power BI Embedded (A-series SKUs)

Image adapted from: [Planning a Power BI Deployment Whitepaper]

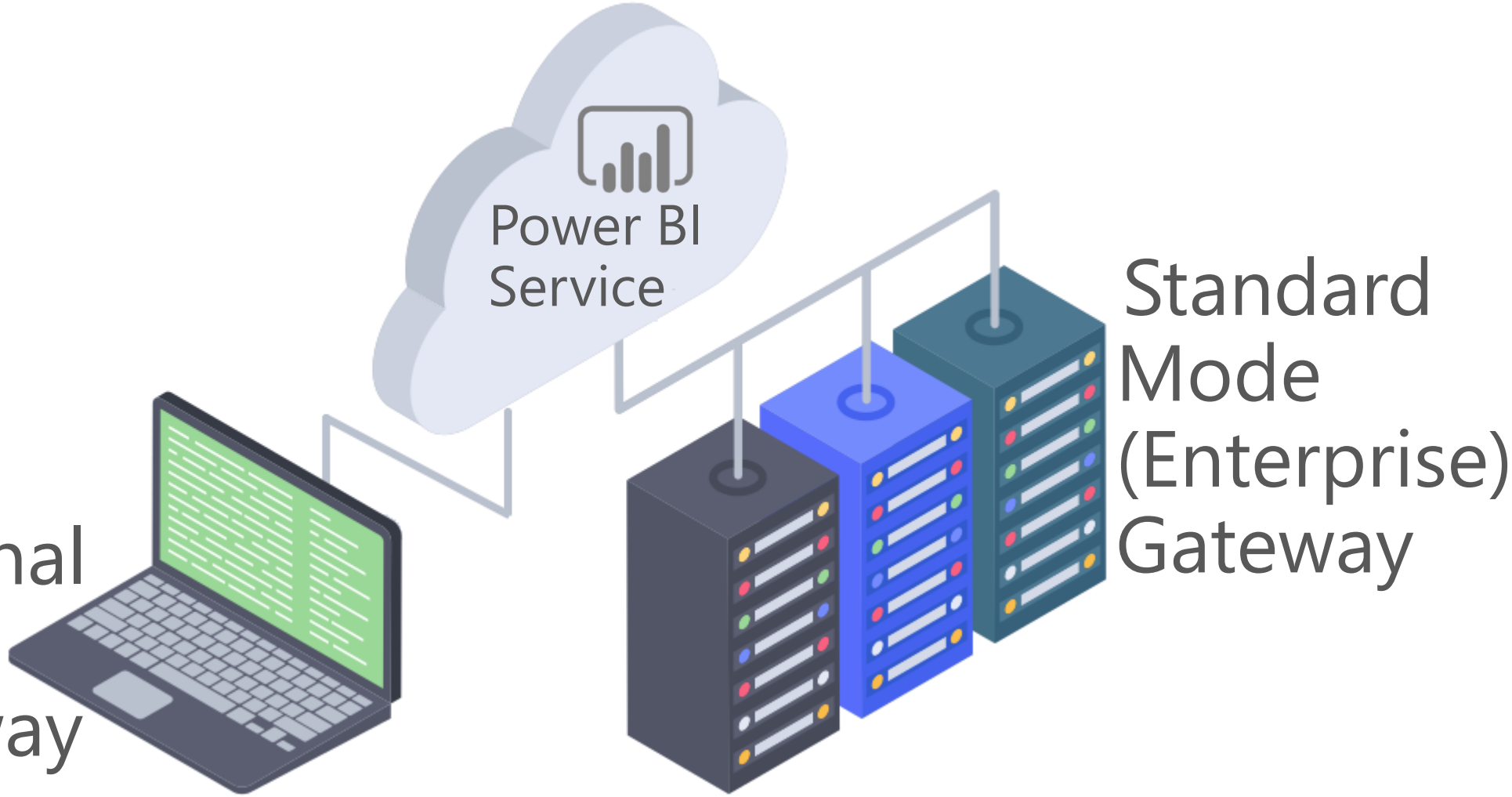
Key Components in a Power BI Architecture

On-Premises Data Gateway



Download diagram: CoatesDataStrategies.com/Diagrams

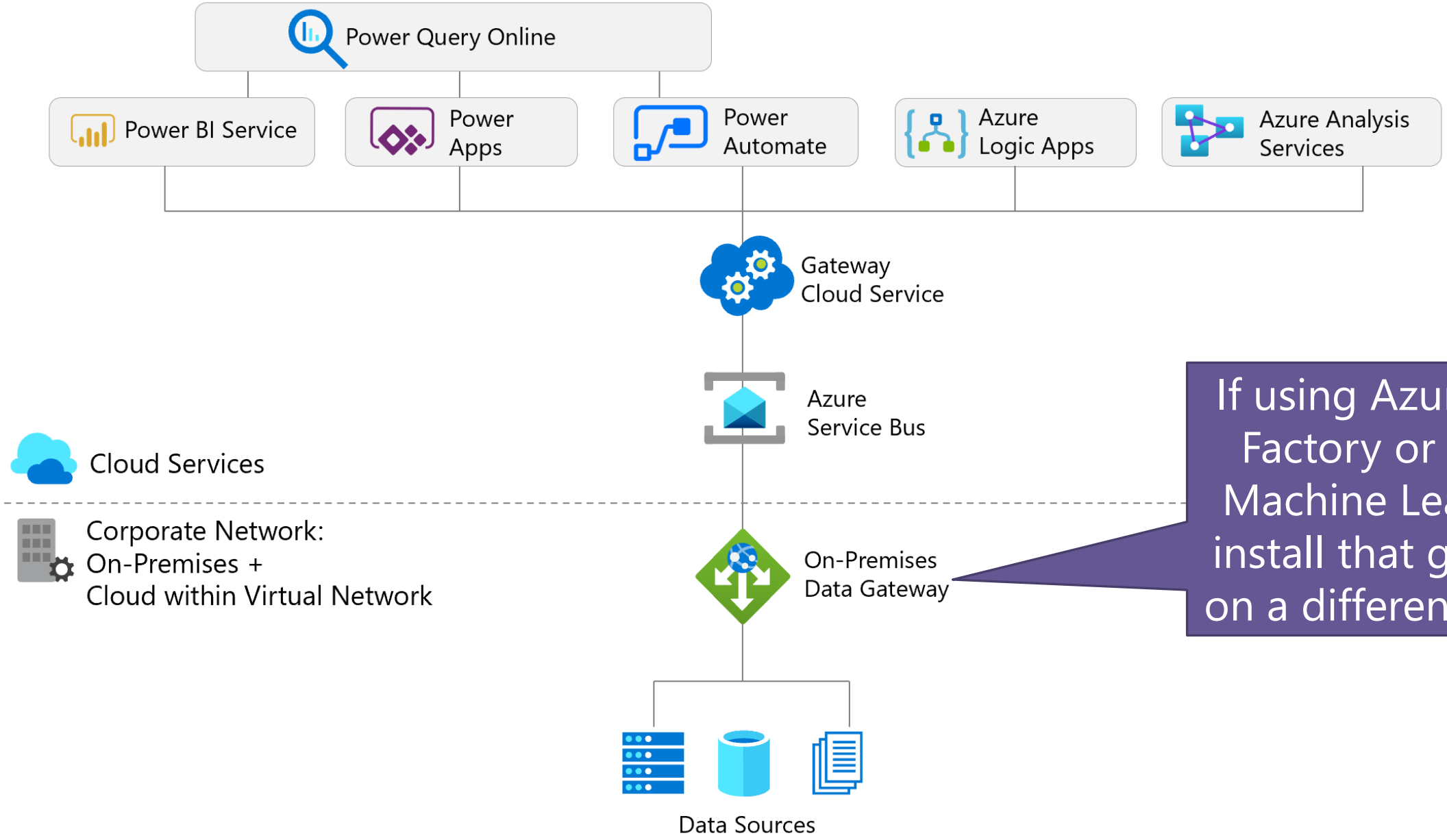
Two Types of Gateways



Personal Mode Gateway

Standard Mode (Enterprise) Gateway

Standard Mode Data Gateway



When is a Gateway Needed?

In the Power BI Service:

- Refreshing imported datasets
- Refreshing dataflows
- Using DirectQuery
- Using Live Connection for Analysis Services

AND

Data Source Is Located:

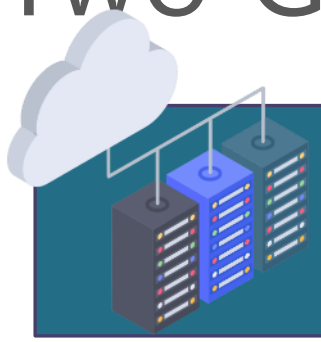
- On-premises data center
- Cloud-based IaaS (infrastructure as a service)
- Cloud-based PaaS (platform as a service) in a VNet (virtual network)

OR

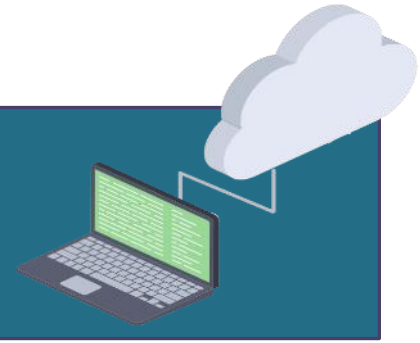
Certain Functionality is Used:

- Web.Page() function
- Single M query combines cloud & on-prem data

Two Gateway Modes



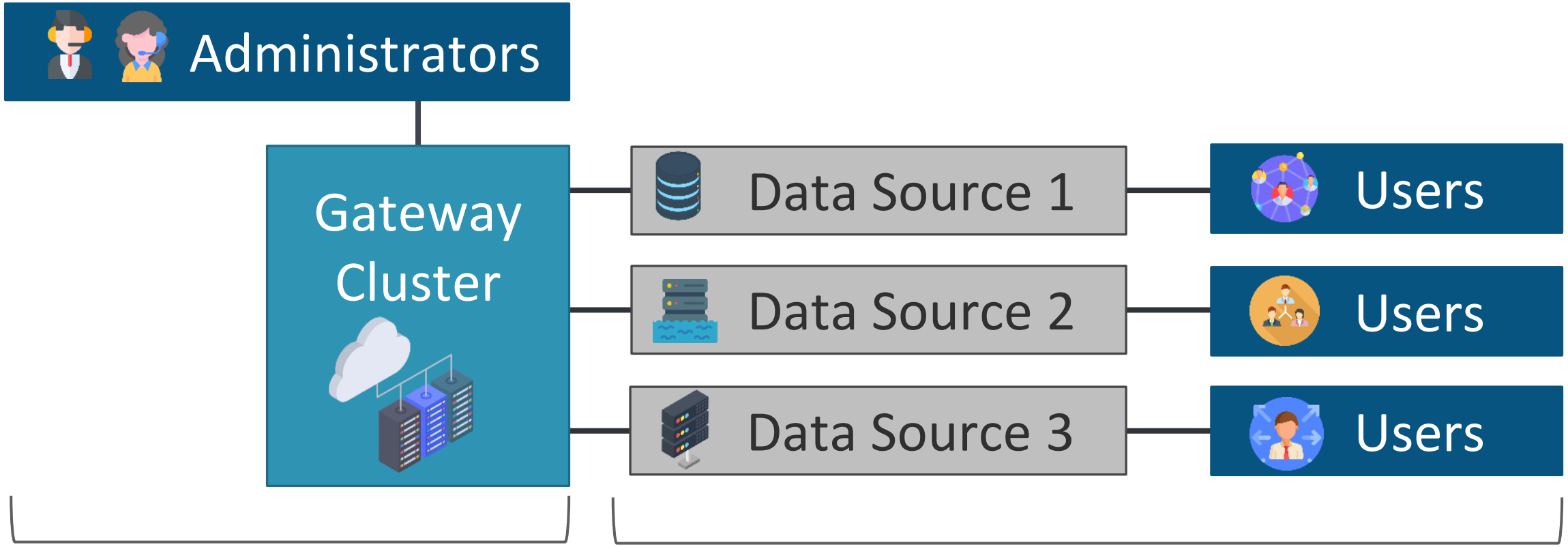
Standard Mode (Enterprise)



Personal Mode

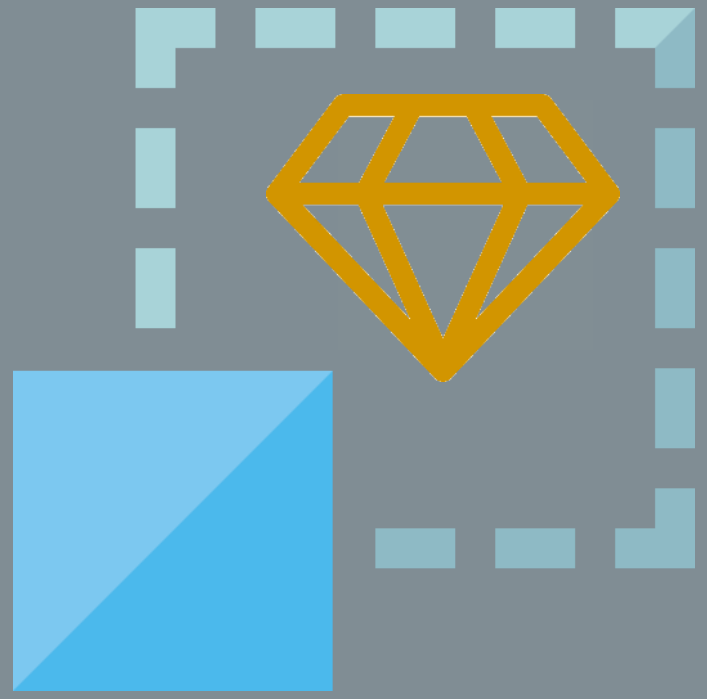
Standard Mode (Enterprise)	Personal Mode
Gateway Admin sets up for use by many users	Individual user sets up for personal use
Supports data refresh, DirectQuery + live conn	Supports data refresh only
Supports a range of tools	Supports Power BI only
Each data source is explicitly configured with permissions	

Standard Data Gateway

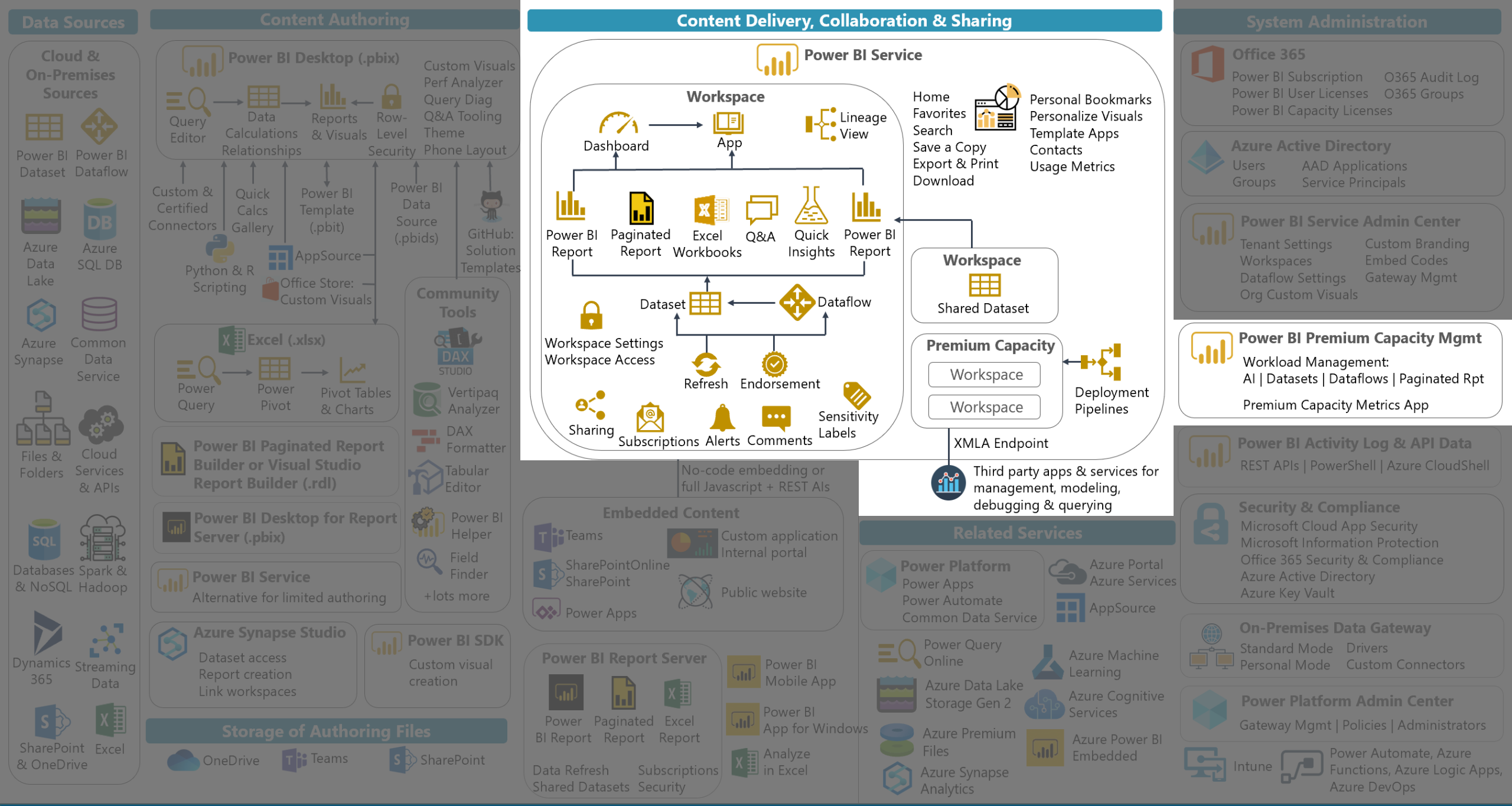


Managed:
Power BI Service or
Power Platform Admin Center
or PowerShell

Managed:
Power BI Service
or PowerShell



Power BI Premium

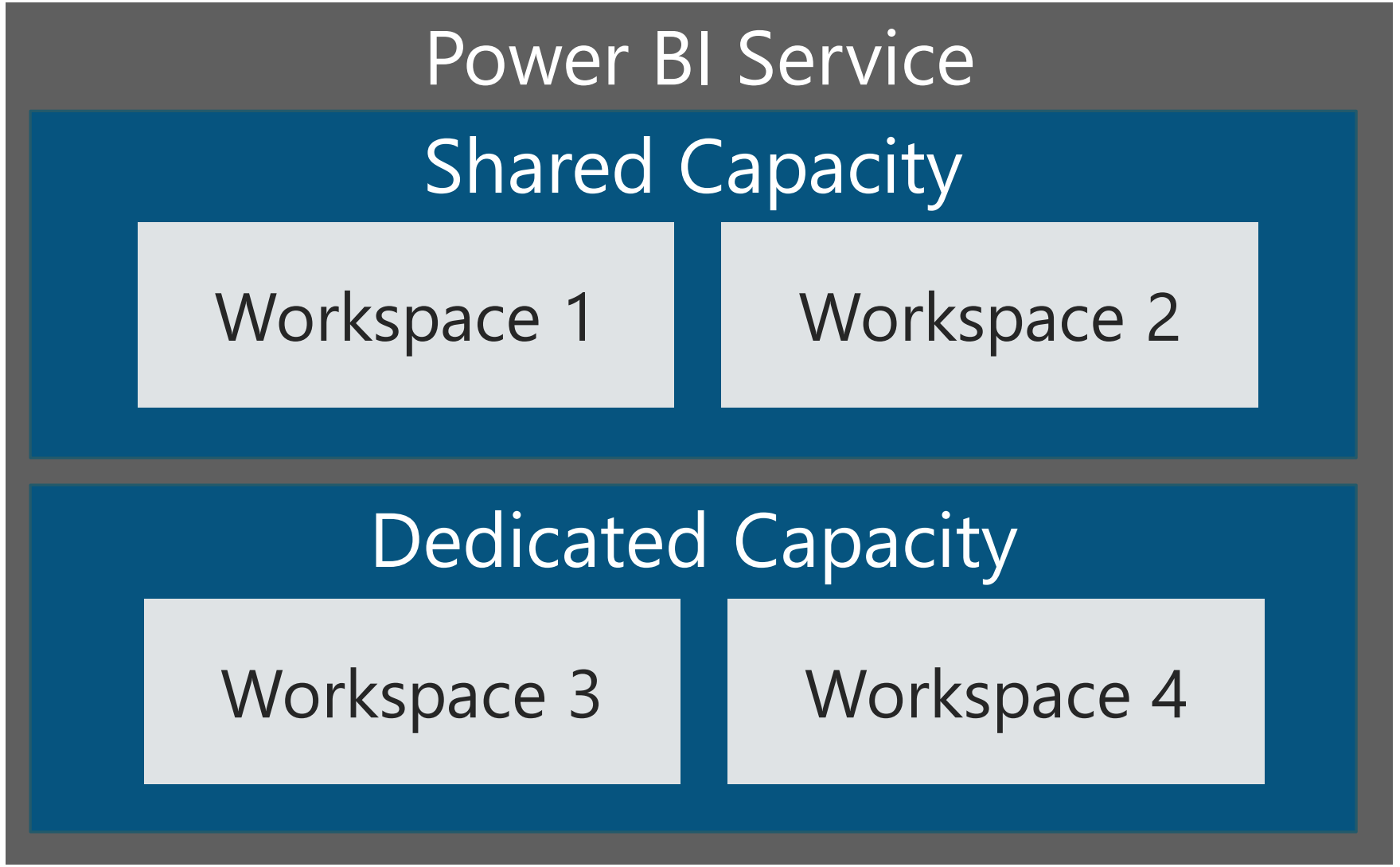


Download diagram: CoatesDataStrategies.com/Diagrams

Power BI Premium

User-based licensing

Capacity-based licensing



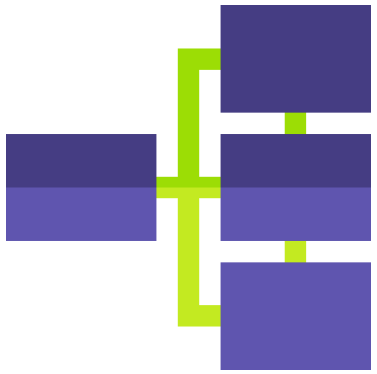
Top Reasons for Using Power BI Premium

Capacity-Based Licensing

Large number of read-only users is more cost-effective than Pro licenses

Top Reasons for Using Power BI Premium

Features to Bring Enterprise BI Capabilities to Self-Service BI



Deployment pipelines

XMLA read/write

Paginated reports in the Power BI Service

Full featureset for dataflows

Near real-time reporting: change detection

Top Reasons for Using Power BI Premium

Integration with Other Apps

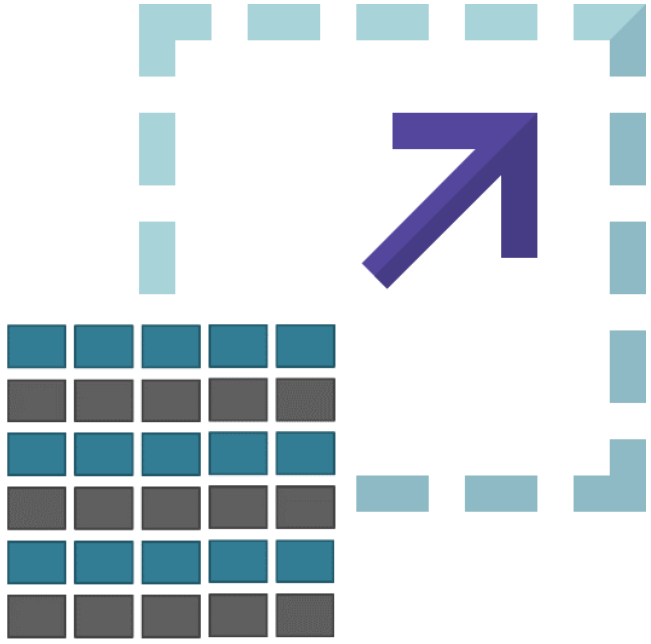
Azure Cognitive Services

Azure Machine Learning

Top Reasons for Using Power BI Premium

Scalability

More frequent data refreshes



Large datasets

Top Reasons for Using Power BI Premium

Compliance

Isolated, dedicated hardware

Bring-your-own encryption key

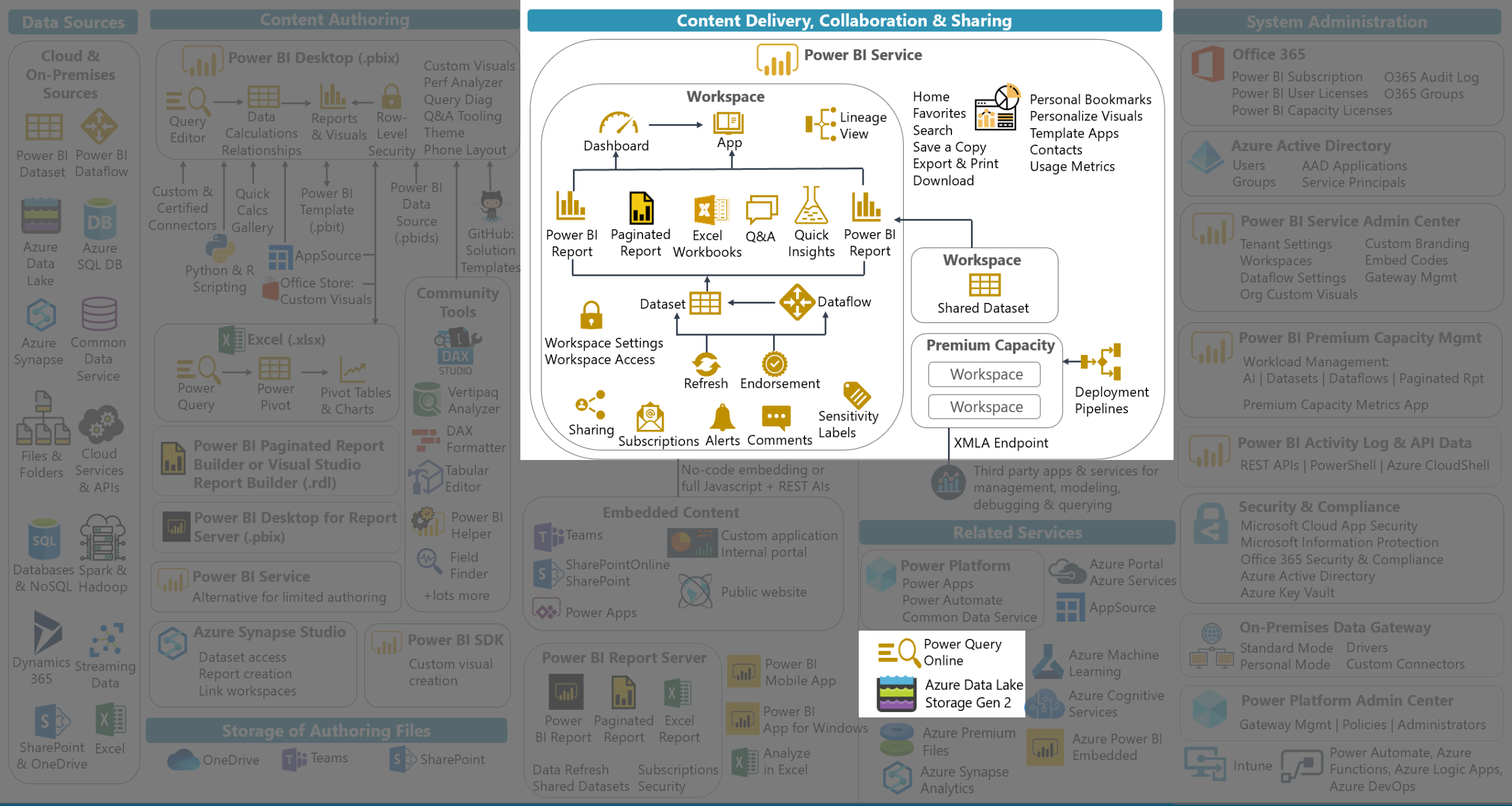
Specific geography for data storage

Top Reasons for Using Power BI Premium

Hybrid Cloud

Use of Power BI Report Server as an alternative report portal

Power BI Dataflows



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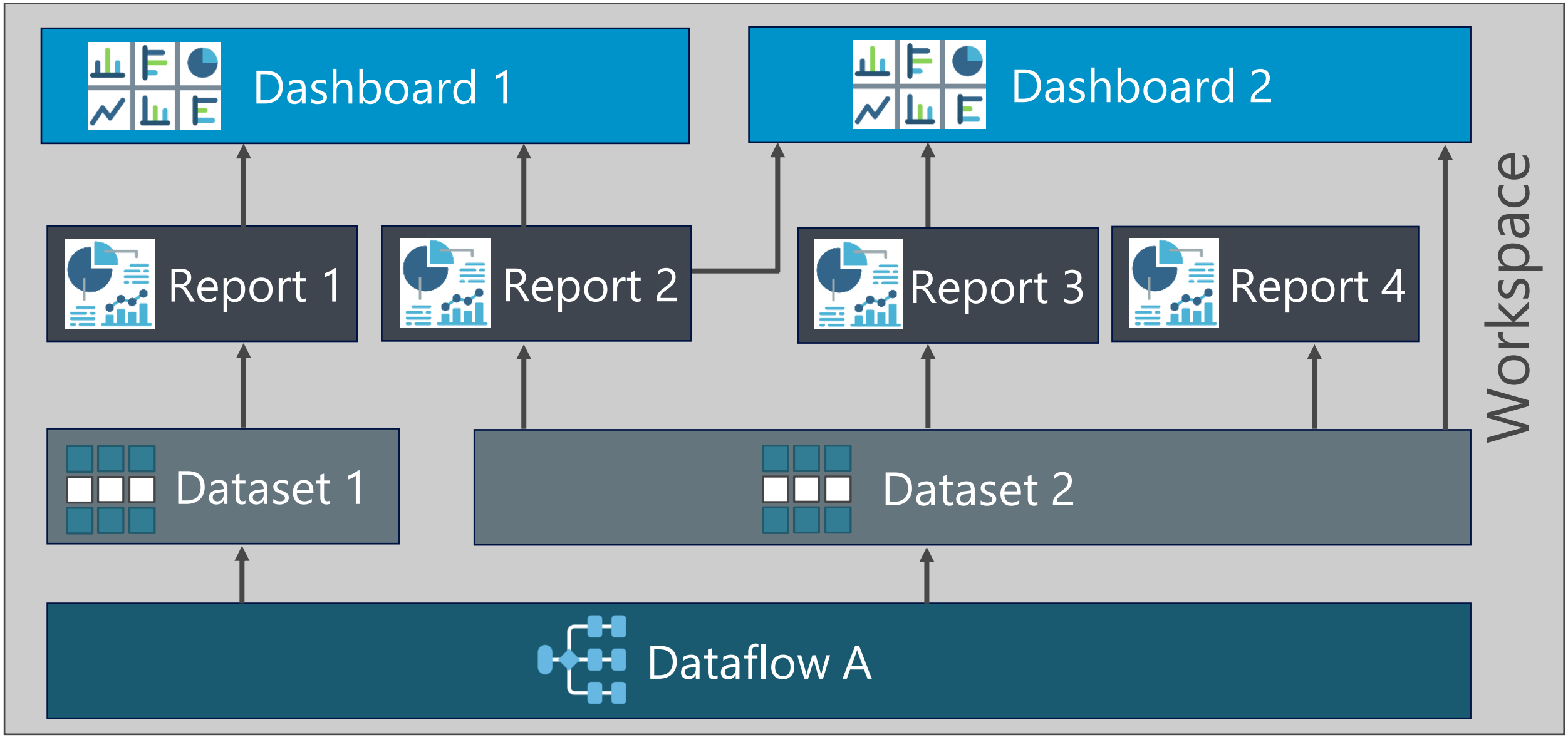
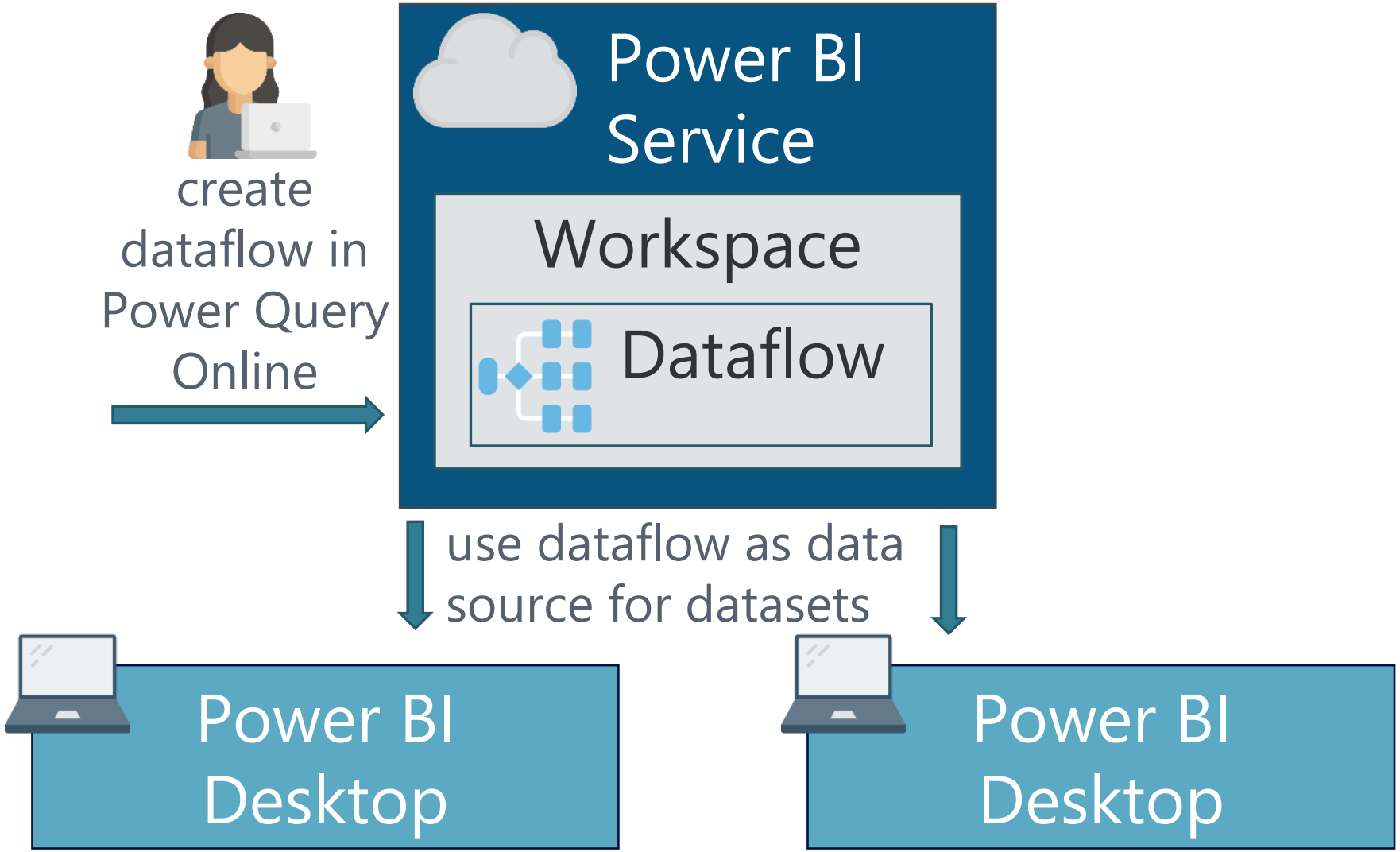
Dataflows

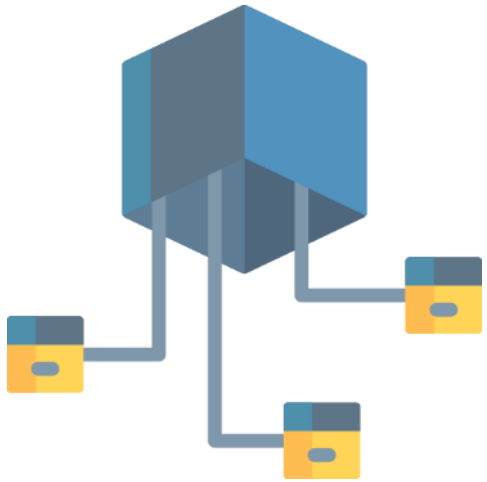

Dashboard 1
Dashboard 2
Report 1
Report 2
Report 3
Report 4
Dataset 1
Dataset 2
Dataflow A
Workspace

Dataflows


create dataflow in Power Query Online
Power BI Service
Workspace
Dataflow
use dataflow as data source for datasets
Power BI Desktop
Power BI Desktop

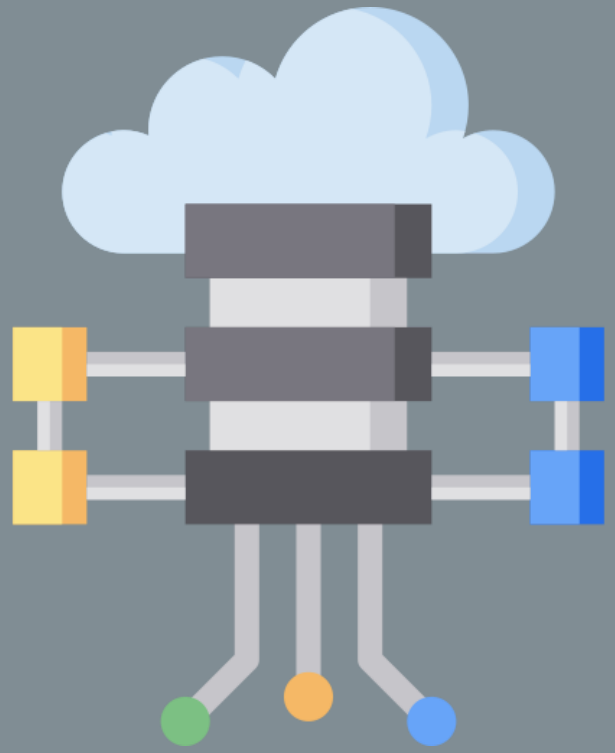
Top Reasons for Using Power BI Dataflows

Reusable self-service data cleansing & preparation reduces repetitive work by data modelers

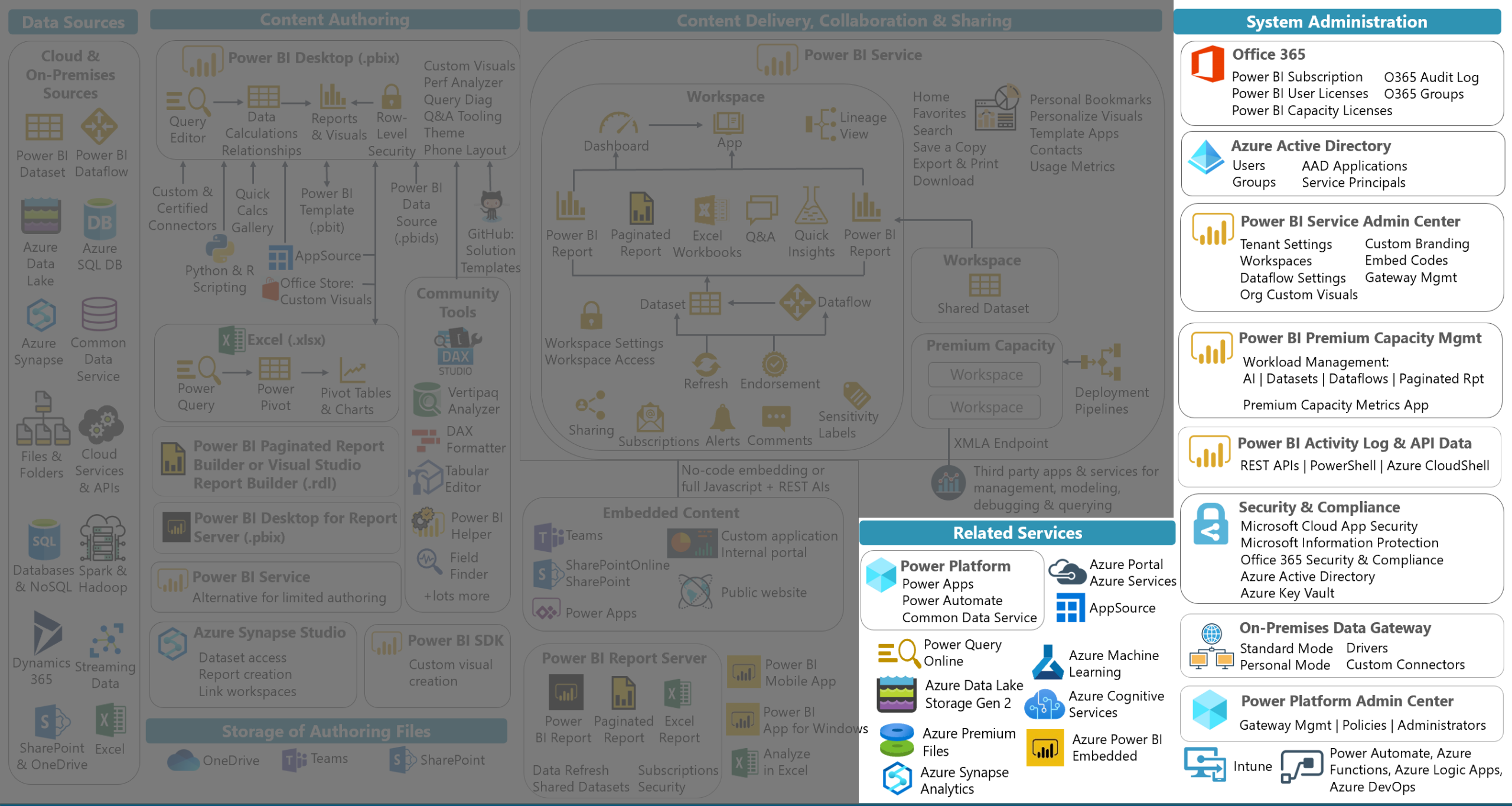


Standardized, consistent data consumed by many different datasets

Reduce load & queries sent to source systems



Other Components



Download diagram: CoatesDataStrategies.com/Diagrams

Integration with Microsoft 365

- M365 Audit Log → Power BI Activity Log
- User licenses & Power BI Premium licenses
- OneDrive for Business and SharePoint
- Teams

Integration with Power Platform

Power Automate (Flow)

Power Apps

Common Data Service

Common Data Model

Power Platform Admin Center

Integration with Azure Services

Azure Active Directory:

Users, Groups, AAD Apps, Service Principals, B2B

Power BI Embedded (A-series SKUs)

Azure Data Lake Storage Gen 2 (dataflows storage)

Azure Premium Files (large dataset storage)

Azure Cognitive Services

Azure Machine Learning

Azure Synapse Analytics

Integration with Azure Security/Governance Services

Microsoft Cloud App Security

Microsoft Information Protection

Azure Key Vault

InTune (mobile app management)

Automation

PowerShell: Power BI Management Module

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

PowerShell: Data Gateway Modules

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

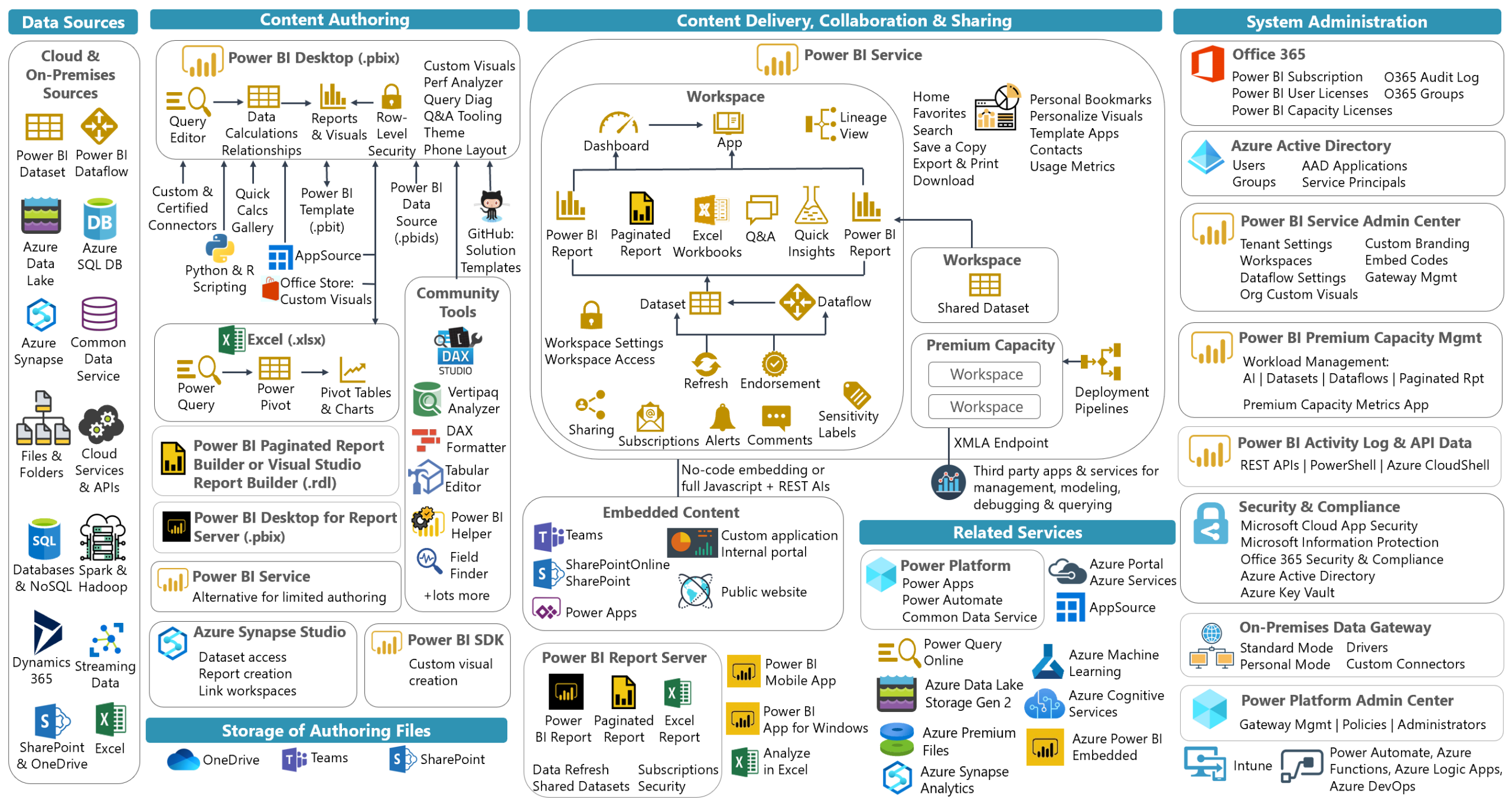
Power BI REST APIs

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

Power BI Embedded REST APIs

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

Wrap-Up, Q&A, Links to More Information



Download diagram: CoatesDataStrategies.com/Diagrams

Q&A

Where to Find More Info

Presentation Slides:
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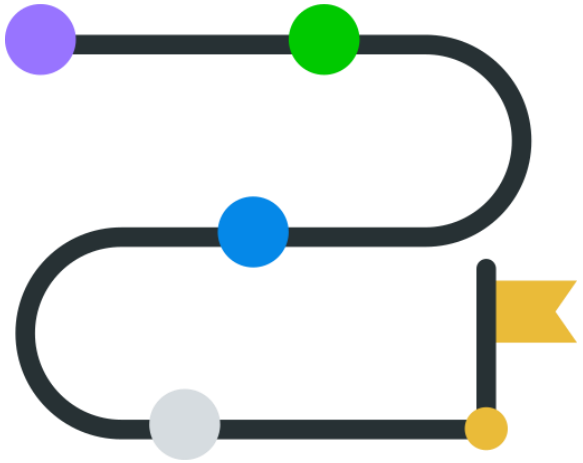
Power BI Whitepapers

Planning a Power BI Enterprise Deployment – published May 2020 by Melissa Coates and Chris Webb

Power BI whitepapers

Power BI Release Plan (Roadmap)



https://powerbi.microsoft.com/en-us/roadmap/

Wave 1 2020: April 2020 through September 2020

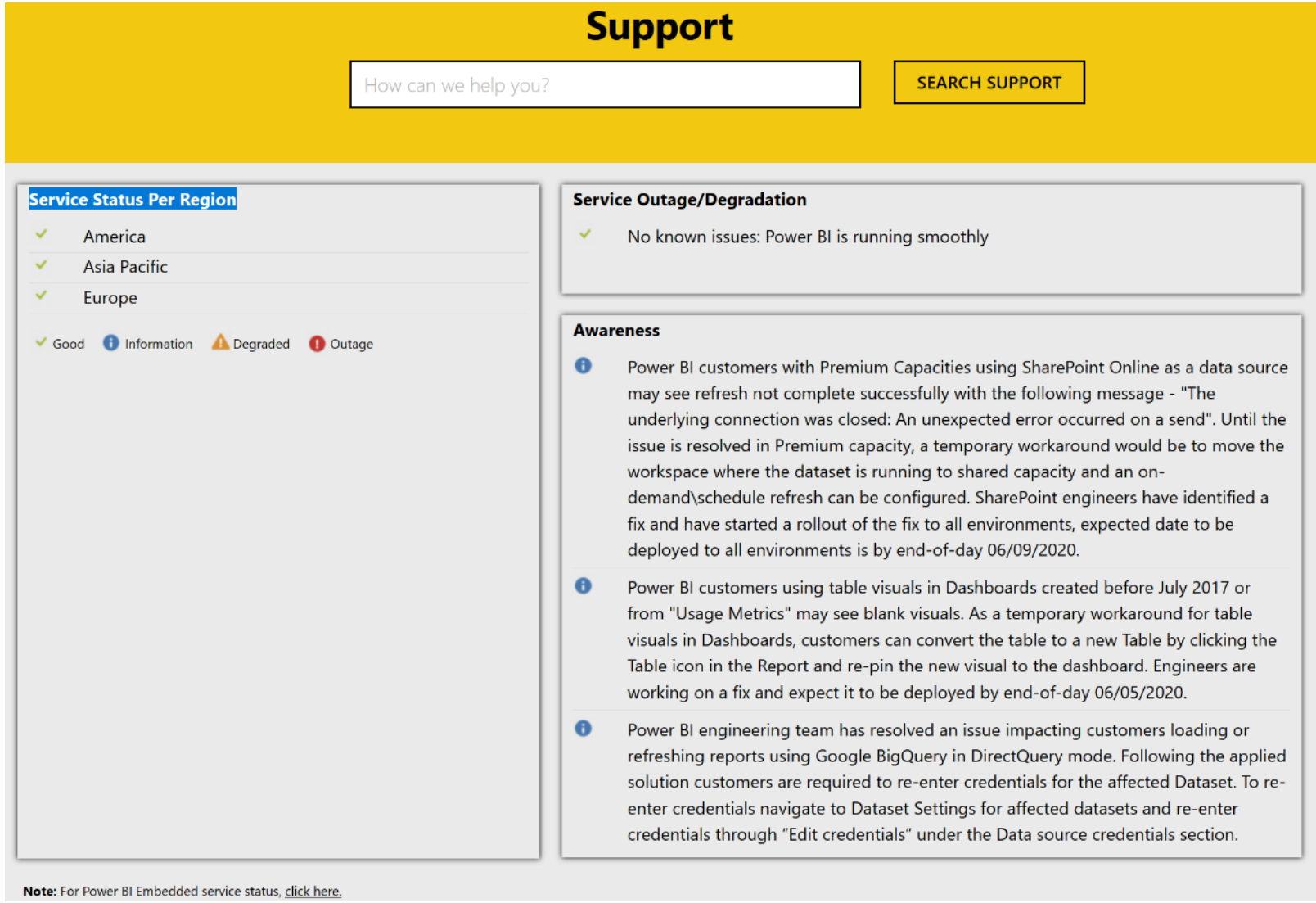
https://docs.microsoft.com/en-us/power-platform-release-plan/2020wave1/business-intelligence/planned-features

Wave 2 2020: October 2020 through March 2021

https://docs.microsoft.com/en-us/power-platform-release-plan/2020wave2/business-intelligence/planned-features

Power BI Service Health

Issues broadly affecting many customers are reported here: https://powerbi.microsoft.com/en-us/support/



Power BI Blog

Follow the blog closely:
https://powerbi.microsoft.com/en-us/blog/

The main Power BI blog has all major announcements about features & functionality.

There is an abundance of information: the Power BI community is very active with blogs, videos, and webinars. Be cautious with info found online - it gets out of date quickly as Power BI evolves and matures.