

Microsoft Power BI

Enterprise Deployment Workshop

github.com/tylerchessman/PBIEnterpriseDeploymentWorkshop

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Agenda

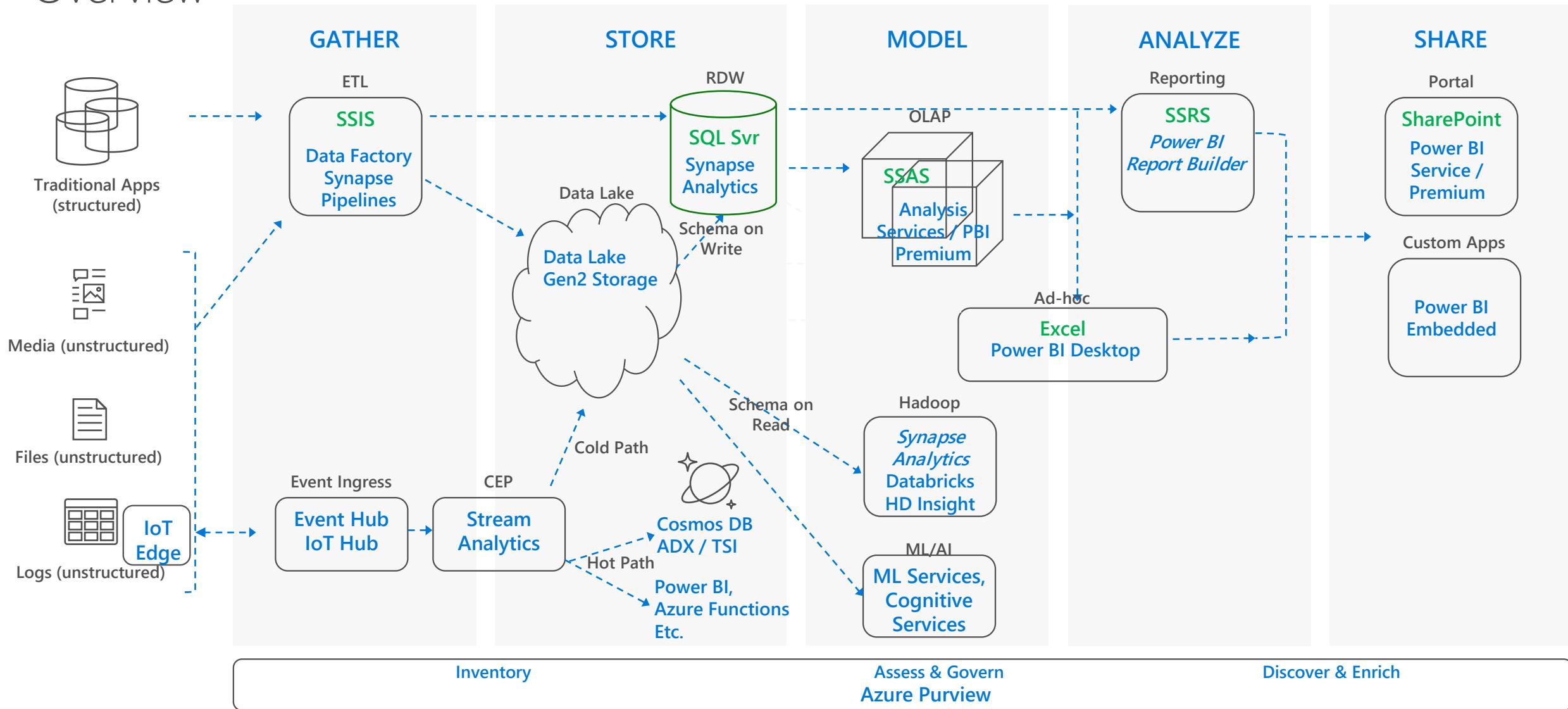
- *Introductions and Expectations for the Day*
- Architectural Overview of Power BI
- Roles/Responsibilities
- Provisioning of Services, Users, & Software
- Training and Evangelism
- Managing/Exposing Data Sources
- Publishing and Sharing Content - Best Practices
- Supporting Data Refresh and Live Connections
- Security Best Practices
- Monitoring and Auditing activity

Notes

- This material was originally developed in 2017
 - It is intended to be delivered as a 1-day workshop (instructor led – with demos, no formal hands-on activities)
 - I periodically maintain/refresh this material – please check the GitHub repository for updates, <https://github.com/tylerchessman/PBIEnterpriseDeploymentWorkshop>
- Additional resources are also available, including
 - Planning a Power BI Enterprise Deployment - [Power BI enterprise deployment whitepaper - Power BI | Microsoft Docs](#)
 - Power BI Premium Planning and Deployment - [Deploying and Managing Power BI Premium Capacities - Power BI | Microsoft Docs](#)
 - Power BI Adoption Framework/guidance
 - Power BI Adoption Framework that includes a series of PowerPoint decks and videos, <https://github.com/pbiaf>
 - Update (June 2021) – Power BI adoption roadmap, [Power BI adoption roadmap - Power BI | Microsoft Docs](#)
 - Please refer to the Power BI Whitepapers web-page for additional resources:
<https://docs.microsoft.com/en-us/power-bi/guidance/whitepapers>

Azure Data Services

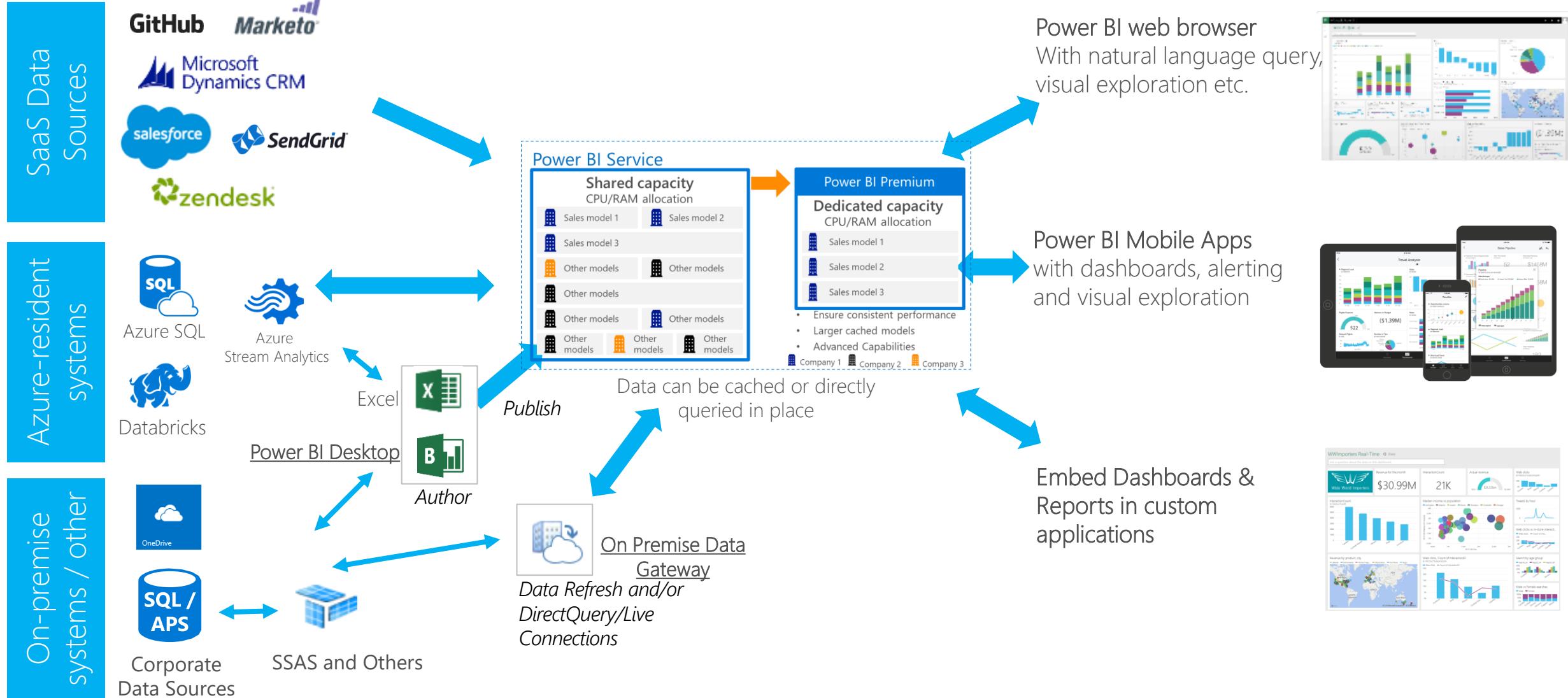
Overview



Power BI Technical Architecture

Bring your data.....

...to life



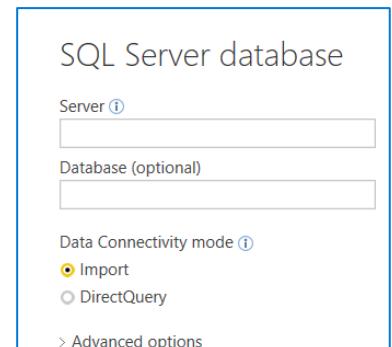
Power BI Authoring

Datasets - cached (*imported*) versus live (*direct query*)

- The building blocks of authoring content in Power BI are a -
 - Dataset (aka Data Model) – detailed data, metadata (e.g., table/column names), and relationships among data tables
 - Report (can be created in the PBI Desktop – and/or in the Power BI Service via a browser)
 - Dashboard (created in the Power BI Service)
- Most Datasets are first built in the Power BI Desktop, with a few notable exceptions -
 - Apps e.g., Salesforce, Google Analytics, etc. are created directly in the Power BI Service
 - They are “imported” datasets (see below) – and may be refreshed on a schedule
 - Streaming Datasets are also created in the Power BI Service
 - an API is used to push (stream) data directly into these datasets; they are typically used for near “real-time” dashboards
 - Authors may choose to first use PBI dataflows to extract/transform/load data – and then load the dataflow into the Desktop
- When creating a dataset, the author in most cases decides to either* -
 - Import data. Data is pulled down, compressed, and saved as part of the Power BI Desktop file (.pbix).
 - Data from 1-to-many disparate data sources can be mashed-up and related together; data is refreshed on-demand
 - Create a Live Connection (*DirectQuery / Connect Live***). A connection to 1 data source*.
 - Only “metadata” (e.g., table names, field names, relationships between tables) is pulled down and stored in the desktop file
 - Note - support for live connections is limited to a smaller set of data sources (e.g., SSAS, SQL Server, Oracle, SAP Hana, Teradata)

*Composite Models can include multiple DirectQuery and Import data connections -
<https://docs.microsoft.com/en-us/power-bi/desktop-composite-models>

**Live Connect is reserved for Analysis Services database (and is
the method used for connections to Power BI datasets)



Power Query

The Basics

- What is it?
 - A "data connectivity and data preparation technology that enables end users to seamlessly import and reshape data from within a wide range of Microsoft products, including Excel, Power BI, Analysis Services, Common Data Service, and more."
- Originally released as a free add-in for Excel 2010/2013, Power Query is now a native feature within Excel 2016+
- Is the native Data Load engine in Power BI (Destkop and Data Flows)
- Supports Multiple Data Sources
- Provides a graphical UI to Connect and Transform Data
- Every "Step" in a Query is part of a script
 - Viewable from the Advanced Editor
 - Informally called "M" (James Bond?)
 - Script can be re-run / scheduled for subsequent data refreshes
- Query Results are stored in a worksheet/data model
 - Load to Data Model for >1 million rows
 - Other tools (e.g., PBI) load to a different destination

The screenshot shows the Microsoft Power Query Editor window. The main area displays a preview of a table named 'WellHeaderKey' with columns 'ProductName', 'Value', and 'DateKey'. The preview shows 24 rows of data. To the right of the preview, the 'APPLIED STEPS' pane is visible, listing the following steps:

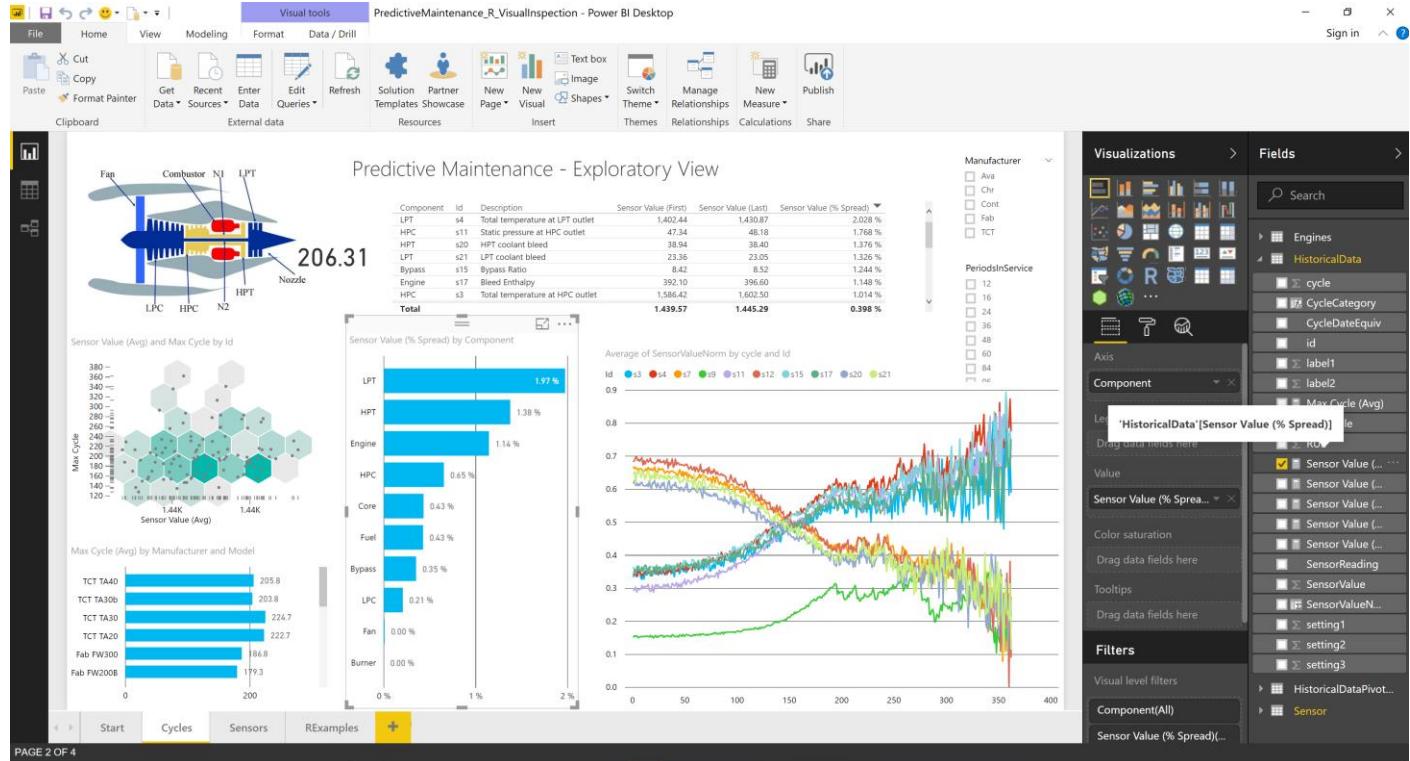
- SourcePath
- Source
- Forecasts_All_Sheet
- Changed Type
- Removed Top Rows
- Promoted Headers
- Unpivoted Columns
- Added Custom
- Removed Columns
- Changed Type1

At the bottom of the editor, a note indicates: "PREVIEW DOWNLOADED ON FRIDAY, JULY 9, 2021".

Power BI Authoring

Building a Report

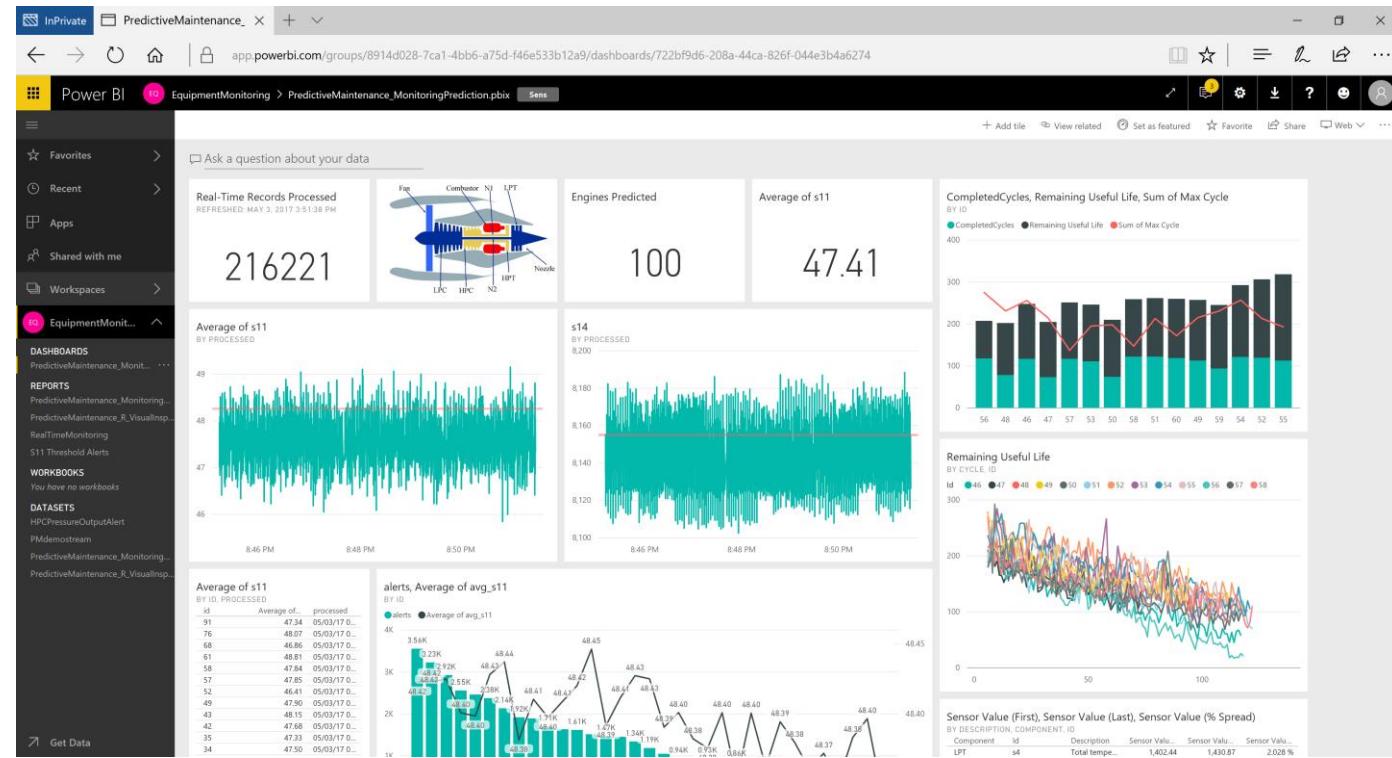
- In the Desktop, the author chooses columns from the dataset to create tables and charts
- A Report is similar to an Excel workbook - it can contain multiple “pages” (worksheets)
- Building a report against a live or imported connection is essentially the same experience
- The author can save the dataset/report as needed
 - Everything is saved in a .pbix file
- The author can email the .pbix file to someone else, place it on a file share, etc.
 - Anyone else with the Power BI Desktop can then open/edit it.
- Most enterprise organizations will want to “publish” the file for easy consumption..



Power BI Authoring

Publishing to the Power BI Service

- The author publishes the Power BI Desktop file to the Power BI Service
 - Remember – the .pbix file contains a data set (live or imported) along with a report
 - These two components (dataset and report) are split out and stored in a workspace
 - Note – we also support publishing Excel workbooks to the Power BI Service
- After the file is published, the author can
 - Edit and/or create new reports directly in the browser
 - Schedule data refresh (may require a [gateway](#))
 - Build a dashboard (a collection of visuals from one or more reports/datasets)
 - Share the dashboard/report/dataset with others



- A note about Workspaces
 - Every user has a personal "My Workspace"
 - A user may be a member of other group Workspaces
 - A Workspace contains Datasets, Reports, and Dashboards
 - We will cover this in more detail during the publishing topic

Power BI Service

Shared Service, Premium, On-Premise Report Server

As of June, 2017....

- The Power BI Service is available in both Shared and the new "Premium" mode

- Shared Mode

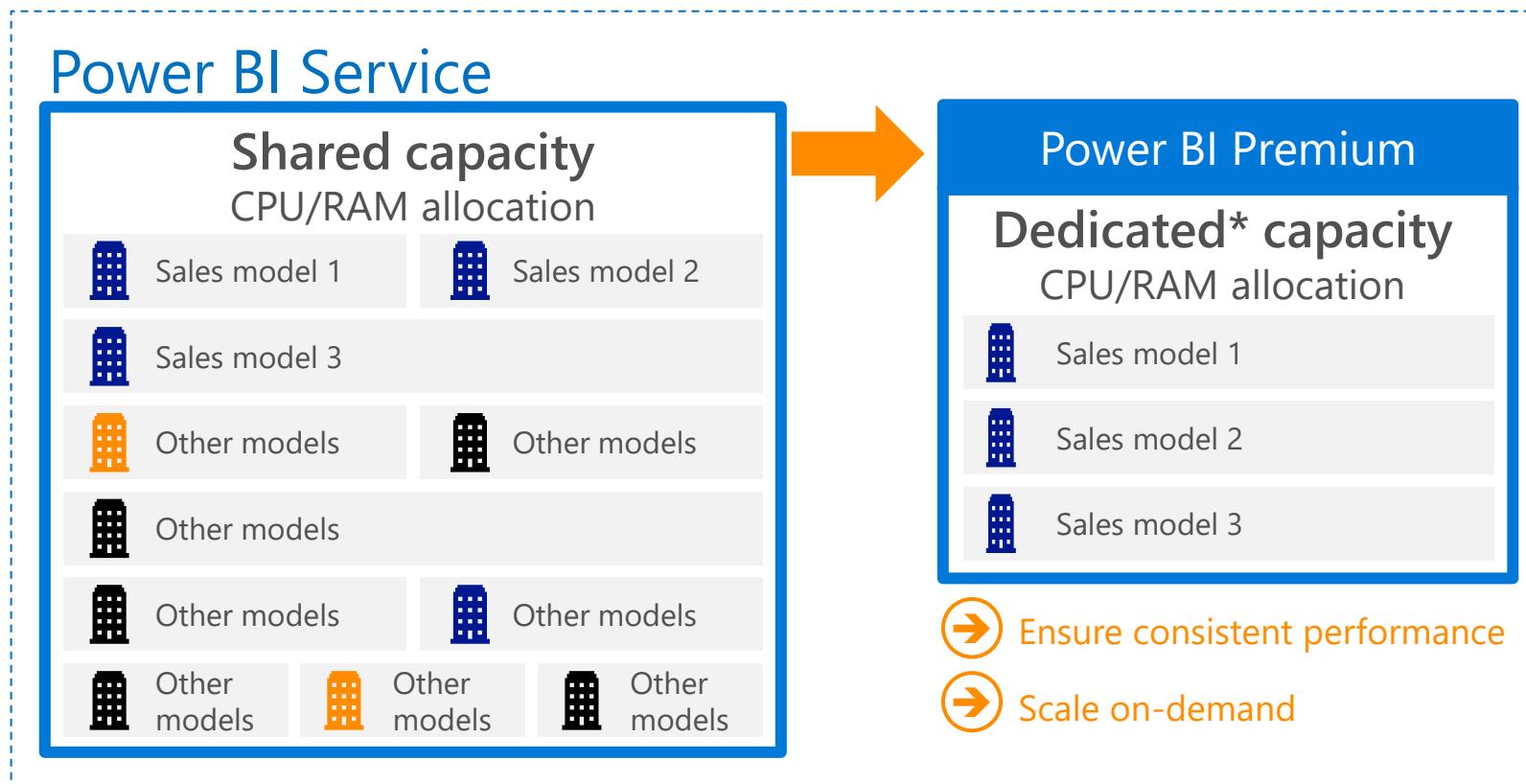
- Licensed by user (Pro licenses)
- Multiple tenants on shared hardware

- Premium Mode

- Licensed by user (Pro licenses for authors) and v-cores
 - Consumers don't need a Pro license
 - Update – [Per-User license mode](#)
- Dedicated hardware

- The Power BI Report Server is available for on-premise deployments

- Power BI Desktop files can be published alongside traditional SSRS reports



Models run on distributed hardware servicing multiple tenants



Company 1



Company 2



Company 3

*Premium [Gen2](#) leverages a regional cluster of physical nodes, shared by tenants using Premium

Power BI Premium

Additional Capabilities vs Shared Service

Current (as of Jan 2022)....

- Larger Imported Models (100 GB+)
 - <https://docs.microsoft.com/en-us/power-bi/service-premium-large-datasets>
- Higher dataset refresh rate (48 per day), unlimited via XML/A
- Larger Storage Capacity (100 TB)
- Incremental refresh (for imported models)
 - <https://docs.microsoft.com/en-us/power-bi/service-premium-incremental-refresh>
- Geo-specific deployment of Premium capacity
 - <https://docs.microsoft.com/en-us/power-bi/service-admin-premium-multi-geo>
- Paginated (rdl) reports
- Automated Machine Learning
- Advanced Dataflows capabilities
- Note – New (2021) Premium Per User licensing offers a new way to acquire/use Premium features

- Generation 2 architecture, including greater scalability, performance, auto-scale, and reduced management overhead -
<https://powerbi.microsoft.com/en-us/blog/announcing-the-upcoming-evolution-of-power-bi-premium-to-enterprise-markets-and-beyond/>

Datasets

Decision Criteria, Capabilities, and Examples

- Model Size

- < 1 GB
- 1 GB - 10 GB
- 10 GB – 400 GB
- 400 GB +

- Refresh Requirements

- Daily to 8x a day
- Up to 48x daily
- Every few minutes
- Real-time

- PBI Service – 1 GB, 8x daily refresh (full)
- PBI Premium – 100 GB*, 48x daily refresh (full / incremental), unlimited refresh via XML/A
- Azure Analysis Services – 400 GB, unlimited refresh (full / incremental), Scale-out replicas (built-in)
 - Alternatively supports a limited set of DirectQuery sources
- SQL Server Analysis Services – ~4 TB, unlimited refresh, scale-out replicas (custom)
 - Alternatively supports a limited set of DirectQuery sources

Example Scenarios

- I have a 400 MB data set; it needs to be refreshed nightly. Recommendation – PBI Service/Premium
- I have a 2 GB data set; it need to be refreshed nightly. Recommendation – PBI Premium
- I have a 2 GB data set that needs to be refreshed every 10 minutes. Recommendation – PBI Premium / Azure Analysis Services
- I have a 25 GB data set; it needs to be refreshed on the hour. Recommendation – PBI Premium / Azure Analysis Services
- I've developed a report against my relational DW (which is 20 TB). The data is refreshed is throughout the day. Recommendation – DirectQuery, or consider a composite model with aggregations

* Power BI Premium Large Model Support - <https://docs.microsoft.com/en-us/power-bi/admin/service-premium-large-models>

DEMO

Build/Publish Report

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- Monitoring and Auditing activity

Roles and Responsibilities

Common Areas/Tasks and role mappings

- Provisioning → • Business Sponsor
 - dependent services, software, licenses
- Training and Education → • Azure AD administrator
 - Office 365 Global Admin
- Data Access and Usage → Power BI Champion
 - Basic on-boarding, how-to's, company standards, tips/tricks, knowledge sharing
- Data Steward
 - Approved sources, master data, sharing and publishing policies
- Authoring
 - Creating/connecting to datasets, creating reports
- Publishing → • Power User/Analyst
 - BI Practitioner/IT Developer
- Sharing → • BI Architect
 - Individual versus teams vs corporate wide
- Securing → Security Architect
 - Data (at-rest & in-transit; on-premise & cloud), authentication/authorization
- Monitoring and Auditing → Power BI Administrator
 - Publishing, Creating, Sharing, Exporting, and Deleting of content

Provisioning Dependent Services

- Azure AD administrator
- Office 365 Global Admin

• Azure Active Directory (Azure AD, AAD)

- Required for user authentication – used by a variety of 3rd party & Microsoft services – Office 365, Exchange Online, SharePoint Online, Power BI, etc.
- In Power BI, AD security groups can also be used to help securing/distributing content to end-users.
- Large enterprises will synchronize their on-premise Active Directory with Azure AD to provide a single sign-on experience
 - AAD Connect - <https://docs.microsoft.com/en-us/azure/active-directory/connect/active-directory-aadconnect>
- **Action Item** - Check with your internal Domain Administrators/Security Team to determine the current state of AAD integration

• Office 365

- Technically, Power BI doesn't require Office 365 licensing. But, it does use Office 365 artifacts/management capabilities
- The Office 365 Admin portal is also used for license management (you can use Power Shell scripting as well)
- Many organizations already have some Office 365 licensing in place
- **Action Item** – Find out if your organization is using Office 365, and contact the Office 365 Global Admin
- The Office 365 Global Admin has administrative rights over Power BI, but he can delegate a "Power BI Service Administrator" role
 - "Your account needs to be marked as a Global Admin, within Office 365 or Azure Active Directory, or have been assigned the Power BI service administrator role, to get access to the Power BI admin portal!"
- <https://powerbi.microsoft.com/en-us/documentation/powerbi-admin-administering-power-bi-in-your-organization/>
- <https://powerbi.microsoft.com/en-us/documentation/powerbi-admin-role/> . Note, this role does not provide....
 - Ability to modify users and licenses within the Office 365 Admin Center
 - Access to the audit logs (though Power BI now offers its own view of PBI Specific logs! More on this topic later)

Provisioning Users and Software

- Power BI Desktop - <https://powerbi.microsoft.com/en-us/desktop/>
 - The authoring tool for Power Users/IT Developers (and anyone else who is going to author and publish content)
 - A free application, it has no dependency on the Power BI Service; requires local administrative rights to install on a machine
 - Updated monthly – though you don't have to install every update; some organizations are choosing to perform controlled quarterly rollouts
 - E.g., <https://blogs.msdn.microsoft.com/samlester/2016/09/30/installing-power-bi-desktop-through-sccm/>
 - **Action Item** – Develop Power BI Desktop rollout and update strategy
- Power BI Gateway – covered later
- Power BI Service – data center location*
 - <https://www.microsoft.com/en-us/trustcenter/privacy/powerbi-location>
- Power BI Service – User Licenses
 - By Default, users can self-sign up for a Power BI Free license
 - The free license is now severely limited – no sharing capabilities. Free license users can automatically bump themselves up to a 60-day Pro trial
 - **Action Item** – Consider blocking individual sign up - <https://powerbi.microsoft.com/en-us/documentation/powerbi-admin-powerbi-free-in-your-organization/>. Instead, assign licenses in mass or as part of an employee on-boarding process
 - Power BI Pro (or PPU) licenses are required for any users who want to publish/share/modify content.
 - To view shared content, a user will also need a Pro license – unless that content is published to a workspace hosted in a Premium capacity
 - **Action Item** – Identify end-user community of authors and consumers. Look at licensing/pricing, and evaluate against performance requirements
 - <https://powerbi.microsoft.com/en-us/pricing/>

Training and Evangelism

Role out strategy

- Power BI Champion
- BI Architect

- Identify Training Needs

- Power Users – Gather/Store Data, Build Data Models, Build Initial Reports, Publish Content, Share Content
- Consumers – Find Content, Explore Dashboards/Reports (extend dashboards/reports?)
- Administrators – Today!

- Build Internal Awareness for the masses

- Present and record internal presentations/webinars (~1.5 hours) – conduct multiple times and make available for on-demand viewing

- Consider Hands-On Training for Power Users

- Dashboard in a Day Sessions often held at local Microsoft Offices e.g.,
<https://www.microsoftevents.com/profile/form/index.cfm?PKformID=0x188356617d4>
- See Next Slide for Online, Classroom, Books, and Self-Paced training options

- Conduct “Launch” Event(s)

- A repeat of internal awareness content along with Testimonials/internal case studies
- Call to actions (any training materials/follow up sessions)

- Update (April 2021) – See my COE document for additional ideas - [tylerchessman/PBICOE: Guidance for establishing a Power BI Center of Excellence \(github.com\)](https://github.com/tylerchessman/PBICOE)

Business App Summit, Schlumberger PBI Rollout - <https://www.youtube.com/watch?v=yKRdZW5WUVY>
~starts at 26 minutes into video, deployment approach at ~34

Training Links and Resources

- Microsoft provides several free training resources and virtual labs (train yourself):
 - Getting Started with Power BI - <https://powerbi.microsoft.com/en-us/learning/>
 - YouTube Video Library - <https://www.youtube.com/channel/UCy--PYvwBwAeuYaR8JLmrfg>.
 - Power BI Documentation - <https://powerbi.microsoft.com/en-us/documentation/powerbi-landing-page/>
 - July, 2021 – free 60-minute virtual training sessions - [Announcing availability of virtual workshops and training to get started with Power BI | Microsoft Power BI Blog | Microsoft Power BI](#)
 - Contact your local Microsoft sales team to learn more about customized training options – for Admins, Power Users, and End-users
- Training/learning from 3rd party sources
 - www.sqlbi.com. Deep expertise on Tabular, Multidimensional, PowerPivot, and DAX. Provide both books and online training. Recommend signing up for their newsletters
 - Bluegranite. <http://msbiacademy.com/>
 - www.powerpivotpro.com. <https://p3adaptive.com/>.
 - Artis Consulting. Great boutique MSFT BI consulting shop that also offers training www.artisconsulting.com
 - Pragmatic Works. Free and paid training, along with workshops, (<http://pragmaticworks.com>)

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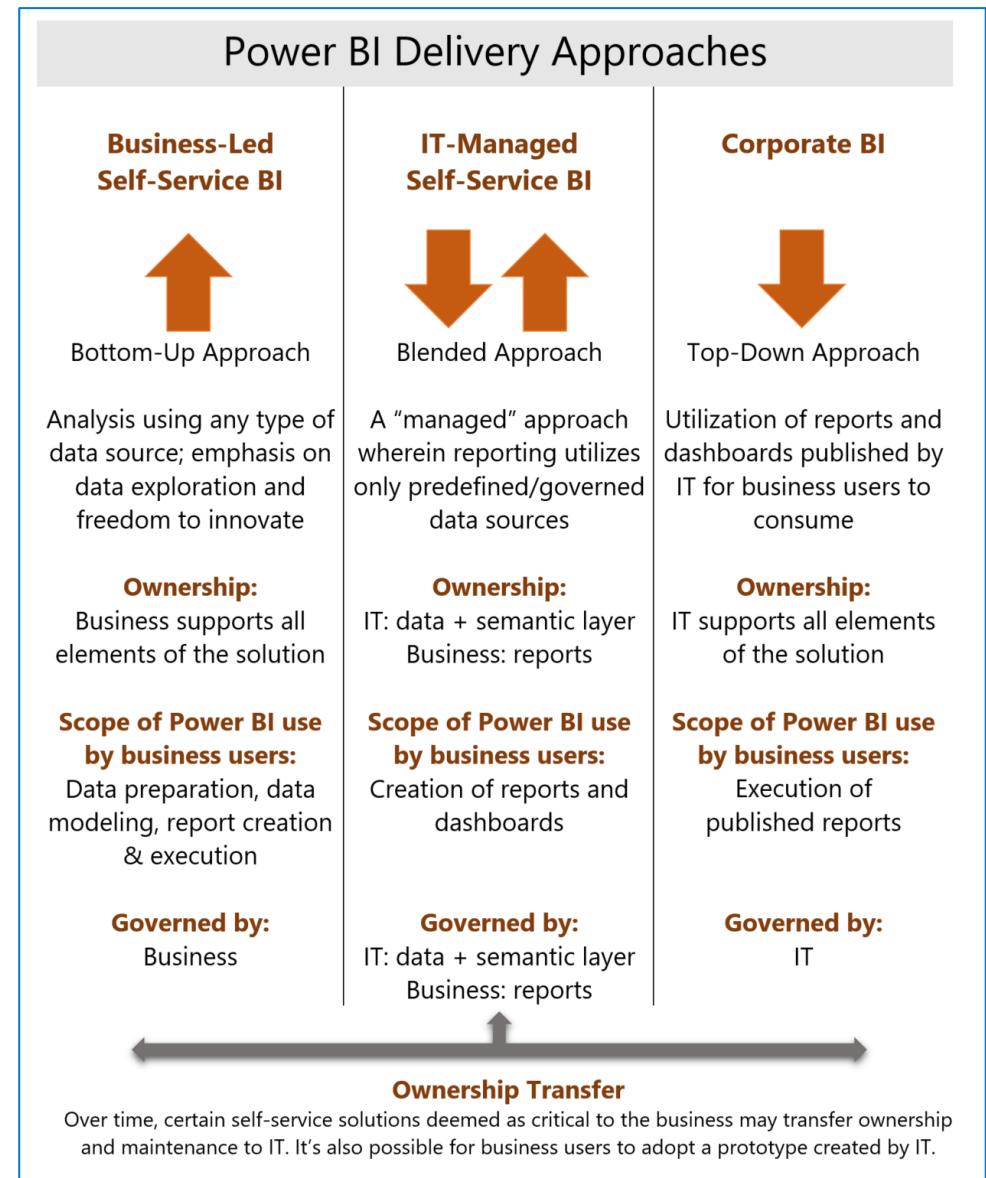
Governance Overview

- Definition

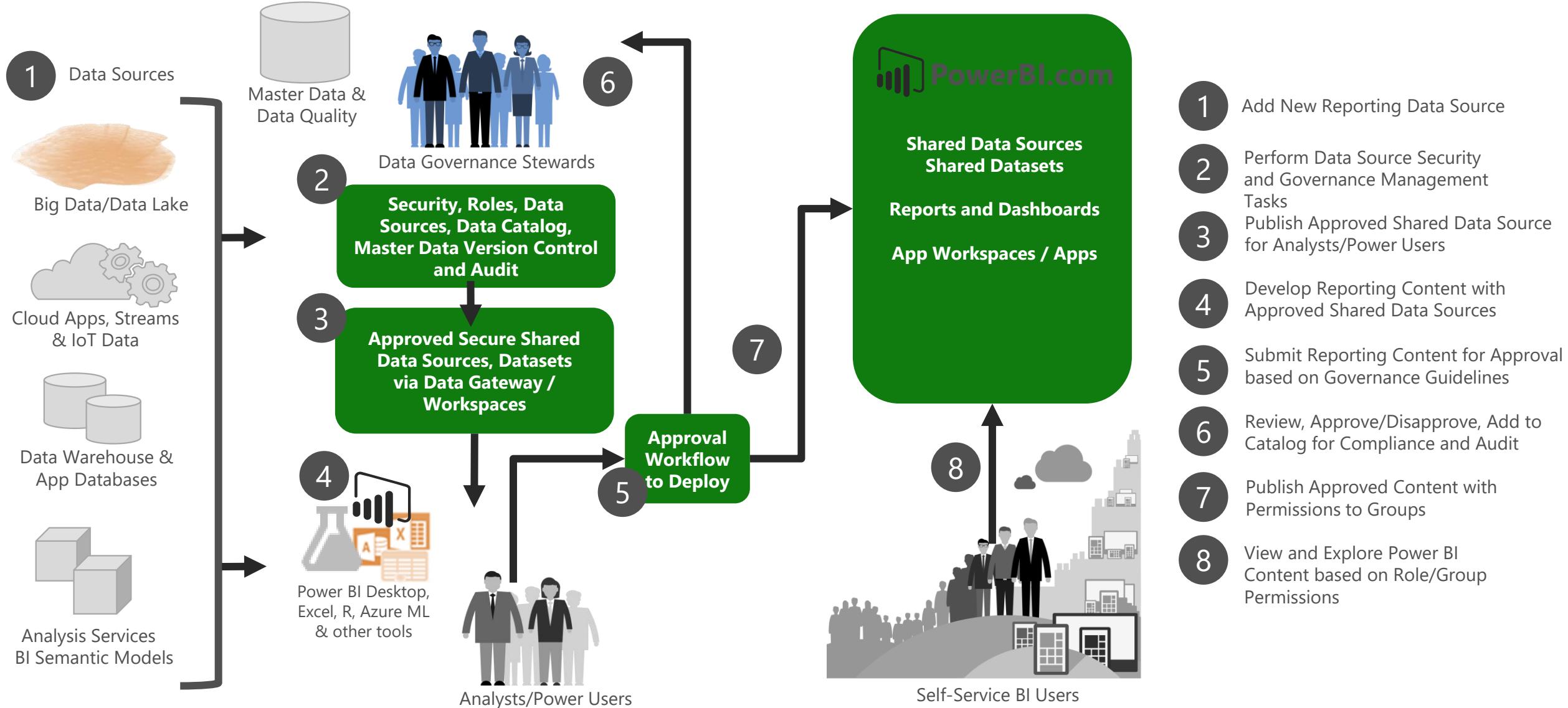
- "Establishment of policies, and continuous monitoring of their proper implementation, by the members of the governing body of an organization. It includes the mechanisms required to balance the powers of the members (with the associated accountability), and their primary duty of enhancing the prosperity and viability of the organization." - www.businessdictionary.com/definition/governance.html

- It is useful to think about governance in the context of three delivery approaches and corresponding levels of control.

1. Business-Led Self-Service BI. Business (typically Power) Users -
 - Have direct access to data (Gather/Store)
 - The ability to create custom data models (Model) and reports (Analyze)
 - Publish data model and reports (Share)
2. IT-Managed Self-Service BI.
 - IT gathers/stores/models and publishes a data model
 - Business users build reports and share with others
3. Corporate BI
 - Typically a "turn-key" solution. IT delivers a ready-to-consume dashboard
 - Additional reports/authored tightly controlled



Governance Example Process



Governance

Introducing into an existing environment

- Review the new Governance documentation, specifically, Method 1
 - Be sure to review the Considerations and [key actions](#)
- Low hanging fruit – Tenant Settings [Tenant settings guidance - Power BI | Microsoft Docs](#) e.g.,
 - Share content with external users
 - Publish to web
 - Export data
- Monitoring – Audit Logs
 - Capture key events (e.g., Export data, data source/gateway usage, etc.)
- Monitoring – Inactive Usage e.g.,
 - [Power BI Unused Artifacts API \(preview\) | Microsoft Power BI Blog | Microsoft Power BI](#)
 - Custom Scripts/Jobs
- Introduce Sensitivity Labels [\(Microsoft Information Protection sensitivity labels in Power BI - Power BI | Microsoft Docs\)](#)
 - Uses Azure Information Protection Premium P1/P2
 - Allows users to classify content (Desktop and Service)
 - Can be applied to datasets, reports, dashboards, and dataflows
 - Labels apply to exported data/.pbix files

Data Sources

Managing & Exposing

- Data Steward
- Power BI Champion

- Self-Service BI may require access to original source systems, data warehouses, big-data stores, and/or 3rd party data sources
 - The Data Steward, along with source systems owners and data administrators, is responsible for providing access to the system(s) they control
- Common concerns and issues WRT data sources & Power BI
 - This tool makes data proliferation easier (Your giving my users a bigger gun)
 - For imported data models, Power BI is similar to an Excel spreadsheet; it is a local copy of a data source that has been extracted and potentially transformed/blended with other data sources. However, the Power BI Service helps reduce data proliferation (emailing spreadsheets and copying charts/graphs into PowerPoint deck).
 - Power BI provides a level of auditing/monitoring that isn't available with local spreadsheets (covered later) – which makes it possible to "upgrade" popular data models to an IT-Managed/Enterprise approach in the future
 - The data is stored in the cloud – I have security, safety, compliance concerns
 - Who has access to this data – how do we secure it
- To address concerns, consider a set of PBI Desktop "templates" to
 - Standardize data access patterns/practices
 - Encourage direct access to authoritative data
- Consider the use of a "Data Catalog" to make it easier for
 - Data Stewards to publish and describe authoritative data sources
 - End-Users to find/consume these data sources

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Publishing and Sharing Content

Overview

- Power BI Champion
- Power User
- BI Practitioner

- How data & reports get into the Power BI Service

- Discover Content ("Apps")
 - My Organization
 - Services
- Create new content (Power BI Desktop / Excel)
 - Files - upload .pbix file (alternative to publishing from Desktop)
 - Databases – don't use!
 - Dataflows – (Power Query data prep in the Service)
 - Build on existing (published) datasets

- Where to Publish

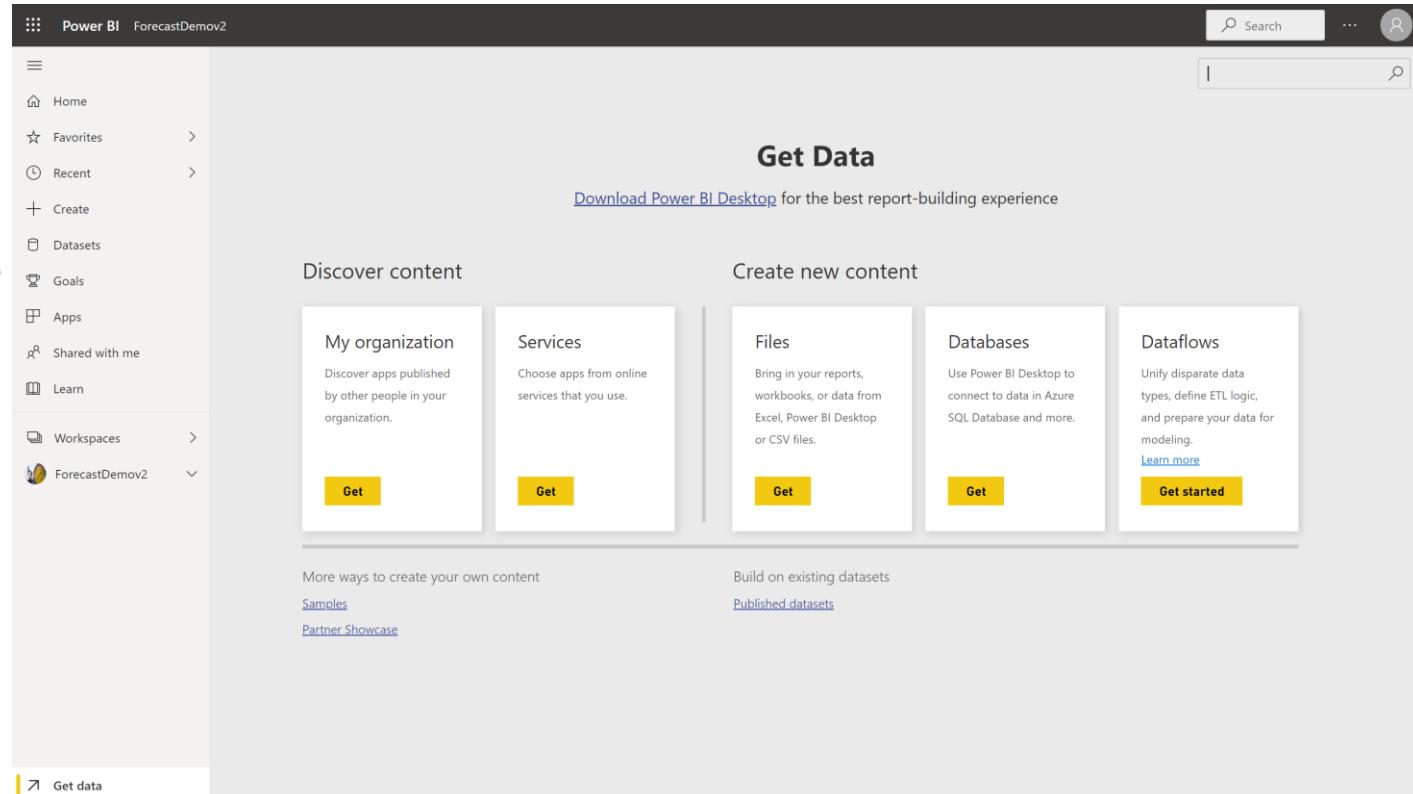
- My Workspace
- App Workspace

- What gets Published

- Dataset (Imported or Live Connection)
- Report

- What you can create (after publishing initial content)

- Additional Reports / Dashboards
- Apps and/or "published" datasets



Publishing and Sharing Content

Different Sharing Options

- Power BI Champion
- Power User
- BI Practitioner

• Share a Dashboard / (Share a Report)

- Share via a list of email addresses (new – security groups)
- Recommendation – Use Sparingly. Monitor for usage and choose different approach for larger audiences

• Use an App Workspace

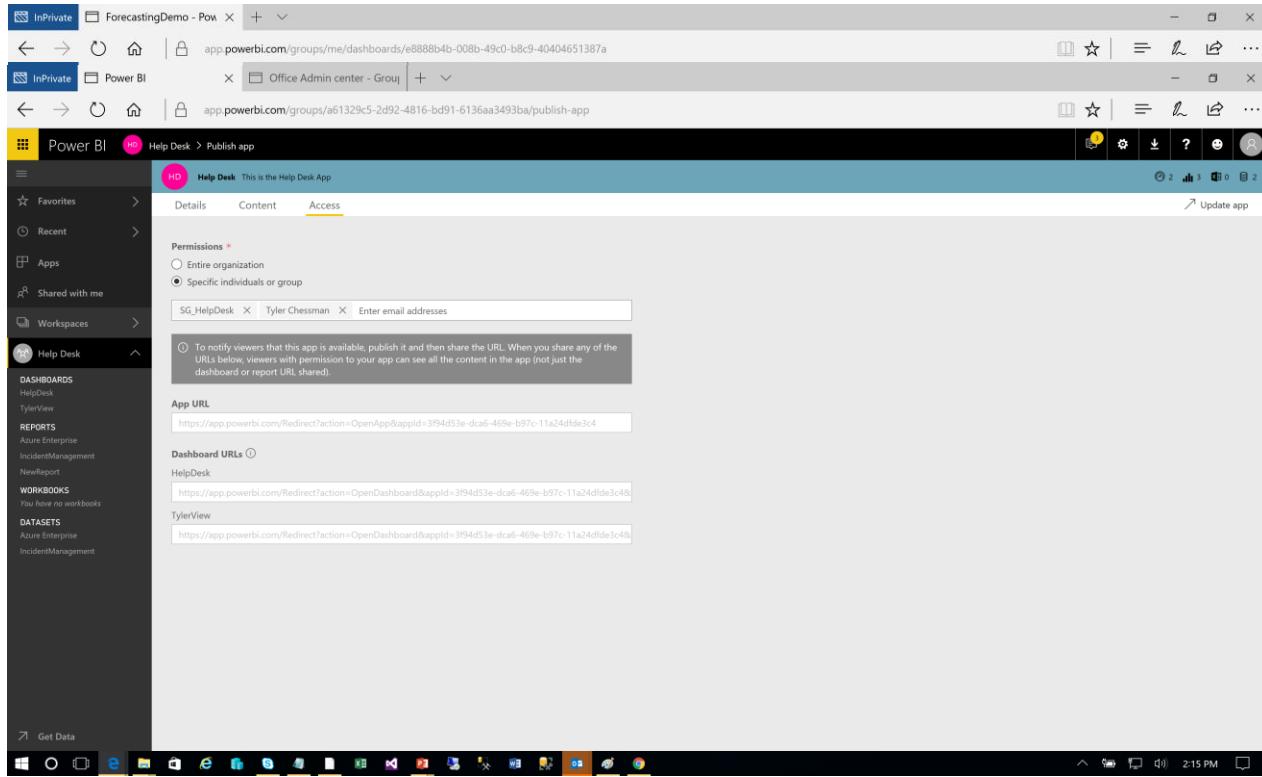
- Add admins and members/contributors/viewer to a workspace; deploy content directly to the workspace – no “publishing” or explicit sharing necessary
- Note – members can have read-only or edit rights

• Publish an App

- You can select what workspace content is included in an App (but currently only 1 App per workspace)
- User can customize with report filters or by saving a report copy to their workspace

• Share a Dataset

- Let users create their own reports in PBI Desktop and other workspaces
- Users can extend dataset with additional measures, composite models



*Users can get your apps in a few different ways:

- They can find and install your app from Microsoft AppSource
- You can send them a direct link.
- You can install it automatically in your coworkers' Power BI accounts if your Power BI administrator gives you permission.

Publishing and Sharing Content

Use Case Recommendations

- Power BI Champion
- Power User
- BI Practitioner

Use Case	Dashboard/Report Share	Workspace Membership	Shared Dataset	App
Share a "read-only" view with small team	Use Sparingly	Yes (first create an App workspace*)		Yes (first create an App workspace)
Share a "read-only" view with a large audience e.g., everyone, a particular security group		Perhaps, with Viewer Role		Yes
Developer/Project "shared space"		Yes - but remember permissions allow overwrite of content		
Share a report / data model that can be customized/extended		Yes – but with overwrite caveat	Yes	Yes, combine with Shared Dataset

*New App Workspaces generally available as of Apr 2019

** Shared datasets - <https://docs.microsoft.com/en-us/business-applications-release-notes/october18/intelligence-platform/power-bi-service/shared-certified-datasets>, <https://docs.microsoft.com/en-us/power-bi/service-datasets-share>

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Data Refresh & Live/DQ Connections

Overview

- Power User
- Power BI Admin
- Data Steward

- Recall – Power BI Desktop supports three operating modes (along with composite mode)

- Import. Data is pulled down, compressed, and saved as part of the Power BI Desktop file (.pbix).
 - Note – Excel PowerPivot workbooks and Service Packs are also imported models
- Create a Live Connection (DirectQuery / Connect Live) . A live connection to 1 data source (composite mode allows for multiple)

- After the .pbix file is published into the Power BI Service....

Mode	View in the Service	Schedule Refresh in the Service
Import	No further configuration needed	Personal or On-Premise Data Gateway may be required
Live Connection	On-Premise Data Gateway may be required	N/A

- Basic workflow for supporting Data refresh and Live Connections

- Power BI Administrator installs an on-premise data gateway on a server/virtual machine within the corporate datacenter; he “registers” the gateway with the Power BI Service using a Power BI Pro account
 - Note - multiple gateways can be installed; each gateway can support 1-to-many back-end data sources
- The Power BI Administrator (from the Power BI console) adds 1 or more data sources to the gateway; he adds users/groups who will be allowed to use this gateway for refresh or live connections
- The Power User publishes .pbix file to the Power BI Service; he specifies (for the dataset) a gateway to use for refresh/live connections

Data Sources

Gateway / Use for cloud data sources (Azure SQL), when, and why

- By default, the Gateway is not required to connect to cloud data sources, like SQL Azure
 - Azure SQL DB allows Firewall rules to restrict client IP access
 - The “allow access to Azure Services” option (On/Off) allows access from Azure Resources, including VMs
- To further restrict Azure SQL DB access, Vnet service endpoints can be employed
 - Architecture discussion to include clustering, high availability, disaster recovery and operational excellence
- By deselecting “allow access to Azure Services”, the Power BI Service can no longer connect to the database
 - The workaround is to use the on-premise data gateway on a VM residing within the Subnet
- Note the restrictions on this approach
 - Must use the SQL Connector, and only basic authentication is supported
- **UPDATE – 2021 – Power BI Now Supports Virtual Network data gateways**
 - Only available in Power BI Premium workspaces
 - Allows import or direct query datasets to connect to data services within an Azure VNet without the need of an on-premises data gateway.

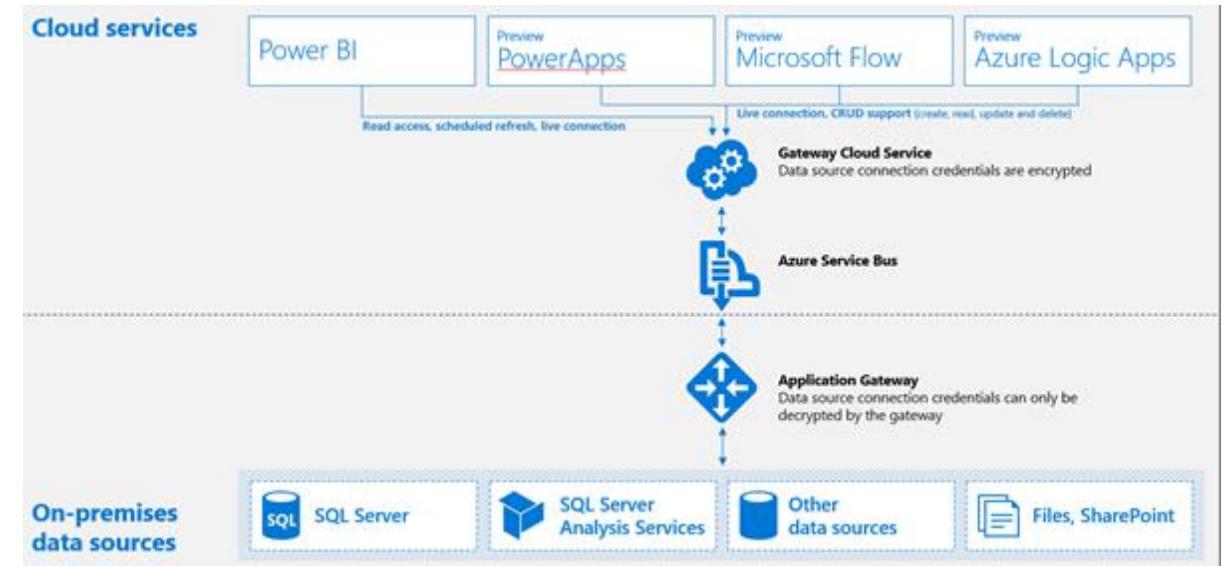
The On-Premises Data Gateway

Overview

The on-premises data gateway acts as a bridge, providing quick and secure data transfer between on-premises data (data that is not in the cloud) and the Power BI, Microsoft Flow, Logic Apps, and PowerApps services.

Two different gateway modes

1. On-premises data gateway: multiple users can share and reuse a gateway; can be used by Power BI, PowerApps, Flow or Logic Apps. For Power BI, this includes support for schedule refresh & DirectQuery
2. Personal: for Power BI only and can be used as an individual without any administrator configuration*. This can only be used for on-demand refresh and schedule refresh.



*The on-premise gateway installs as a service. Personal gateway will install as a service or, without admin rights, an application

Keeping data current in Power BI

On-Premises Data Gateway

- IT can install the On-Premises Data Gateway to serve large groups of users to refresh supported on-premises data sources
- IT can:
 - Centrally manage the set of users who have access to the underlying data sources
 - Gain visibility into gateway usage, such as most commonly accessed data sources, and the users accessing them
- Ports. The gateway creates an outbound connection to Azure Service Bus. It communicates on outbound ports: TCP 443 (default), 5671, 5672, 9350 thru 9354. The gateway does not require inbound ports.

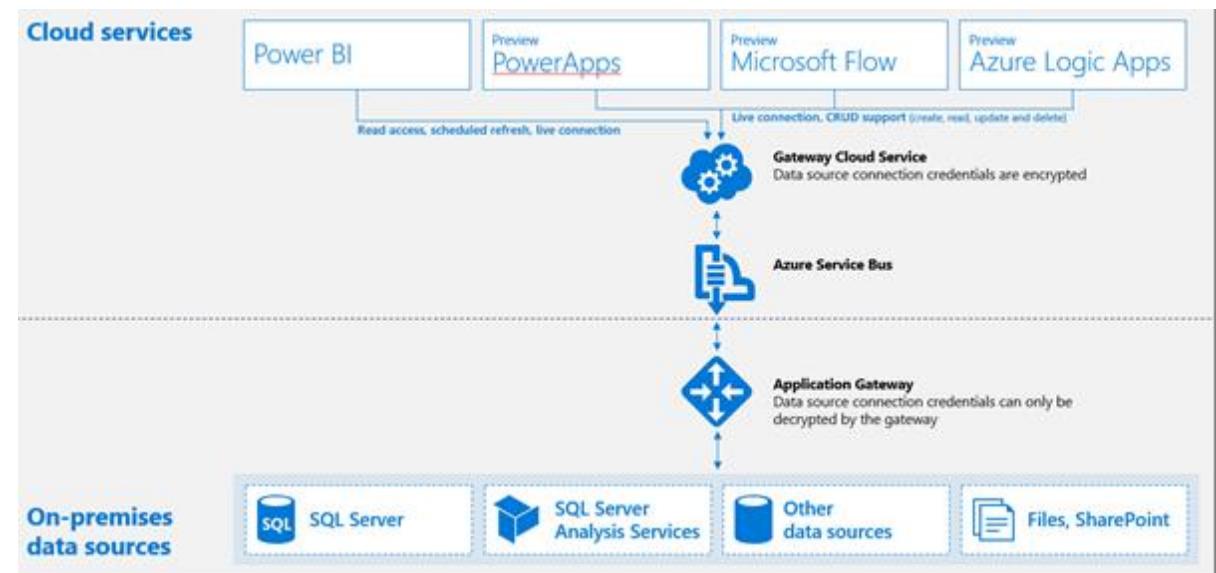
Data sources A-B

Data source	Connect from Desktop	Connect and refresh from service	DirectQuery / Live connection	Gateway (supported)	Gateway (required)	Power BI Dataflows
Access database	Yes	Yes	No	Yes ¹	Yes	Yes
ActiveDirectory	Yes	Yes	No	Yes	Yes	Yes
Adobe Analytics	Yes	Yes	No	No	No	No
Amazon Redshift	Yes	Yes	Yes	Yes	No	Yes
appFigures	Yes	Yes	No	No	No	No
AtScale cubes	Yes	Yes	Yes	Yes	No	No
Azure Analysis Services	Yes	Yes	Yes	No	No	No
Azure Blob Storage	Yes	Yes	No	Yes	No	Yes
Azure Cosmos DB	Yes	Yes	No	No	No	No
Azure Cost Management	Yes	Yes	No	No	No	No
Azure Data Explorer (Kusto)	Yes	Yes	Yes	Yes	No	Yes
Azure Data Lake Storage Gen1	Yes	Yes	No	No	No	No
Azure Data Lake Storage Gen2	Yes	Yes	No	Yes	No	Yes
Azure Databricks	Yes	Yes	Yes	Yes	No	No
Azure DevOps	Yes	Yes	No	No	No	No
Azure DevOps Server	Yes	Yes	No	Yes	Yes	No
Azure HDInsight (HDFS)	Yes	Yes	No	No	No	No
Azure HDInsight Spark	Yes	Yes	Yes	No	No	Yes
Azure SQL Database	Yes	Yes	Yes	Yes	No	Yes
Azure Synapse	Yes	Yes	Yes	Yes	No	Yes
Azure Table Storage	Yes	Yes	No	Yes	No	Yes
BI Connector	Yes	Yes	Yes	Yes	Yes	No
BI360 - Budgeting & Financial Reporting	Yes	Yes	No	No	No	No

How the Gateway works

What happens when a user interacts with an element connected to an on-premises data source -

1. A query will be created by the cloud service, along with the encrypted credentials for the on-premises data source, and sent to the queue for the gateway to process.
2. The gateway cloud service will analyze the query and will push the request to the Azure Service Bus.
3. The on-premises data gateway polls the Azure Service Bus for pending requests.
4. The gateway gets the query, decrypts the credentials and connects to the data source(s) with those credentials.
5. The gateway sends the query to the data source for execution.
6. The results are sent from the data source, back to the gateway, and then onto the cloud service. The service then uses the results.



<https://powerbi.microsoft.com/en-us/documentation/powerbi-gateway-onprem-indepth/>

The On-Premises Data Gateway

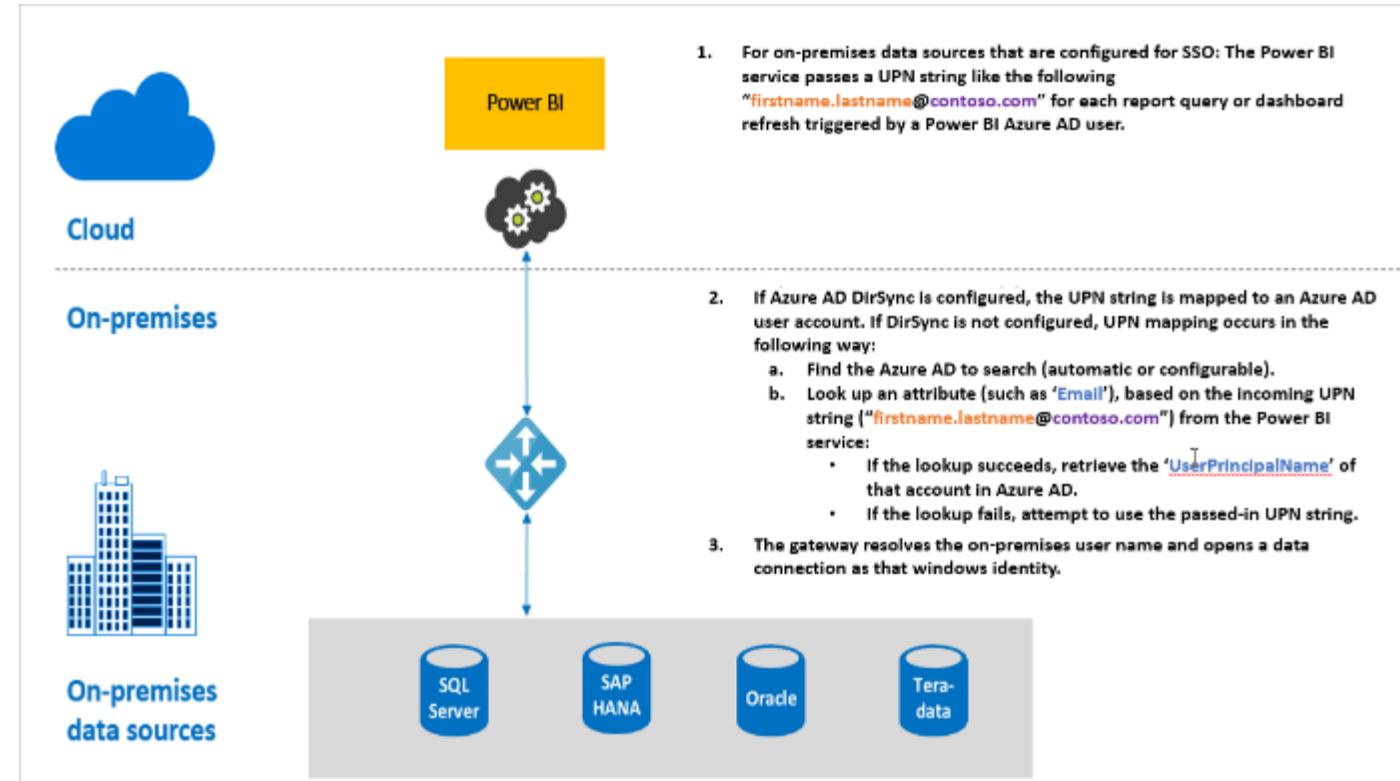
SSO

SSO is currently supported (for DirectQuery*) for the following data sources –

- SQL Server (Kerberos)
- SAP HANA (Kerberos and SAML)
- SAP BW (Kerberos)
- Teradata (Kerberos)
- Spark (Kerberos)
- Impala (Kerberos)

Query Steps when running SSO

1. For each query, the Power BI service includes the user principal name (UPN) when sending a query request to the configured gateway.
2. The gateway needs to map the Azure Active Directory UPN to a local Active Directory identity.
 - If Azure AD DirSync (also known as Azure AD Connect) is configured, then the mapping works automatically in the gateway.
 - Otherwise, the gateway can look up and map the Azure AD UPN to a local user by performing a lookup against the local Active Directory domain.
3. The gateway service process impersonates the mapped local user, opens the connection to the underlying database, and sends the query.



* Live Connections to SSAS use impersonation via EffectiveUserName

Gateway Management/Monitoring

Management

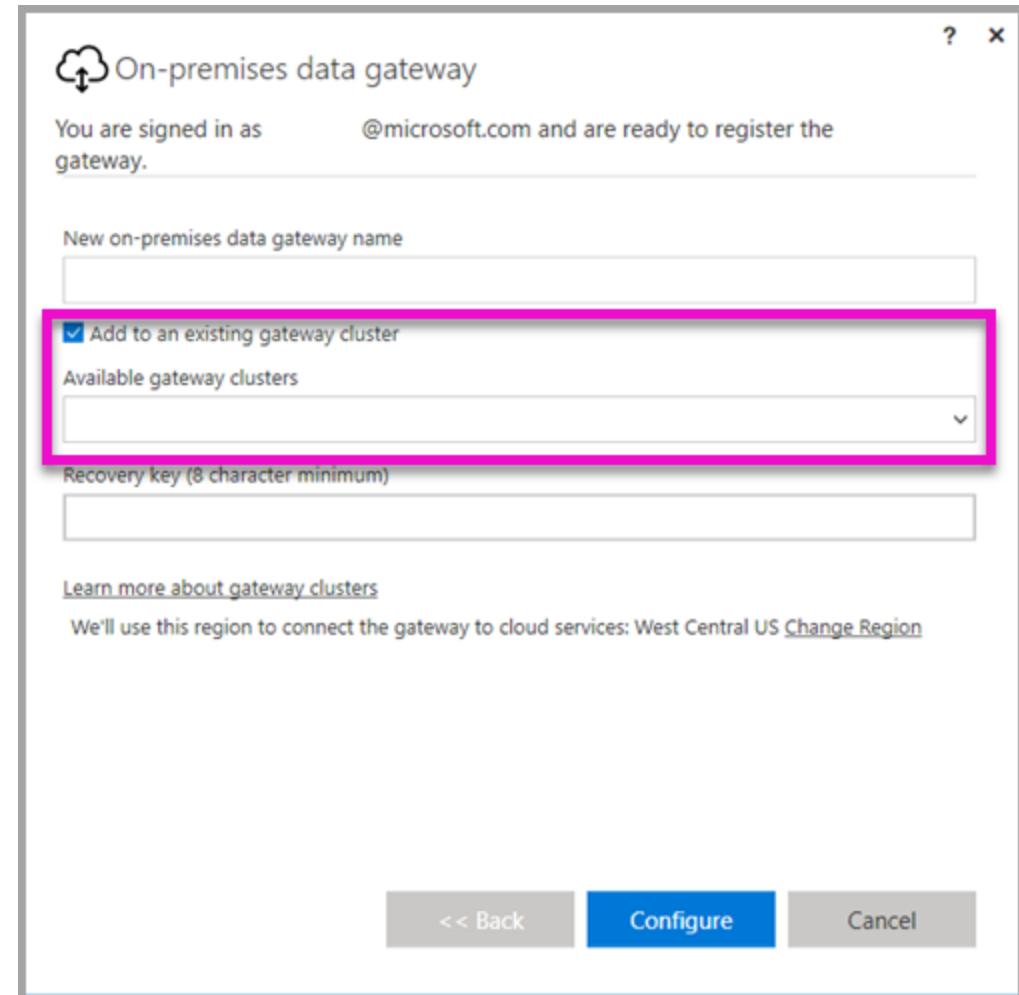
- Today, anyone with a Pro license can install a gateway.
- Consider organization policies to monitor/prevent unwanted installations
- Audit logs can also monitor gateway events
- Consider a “shared” Power BI Pro Account (e.g., “GatewayAdmin”) to configure/register a Gateway (the gateway is tied to a single Pro Account – though multiple admins can be added to the gateway)
- **New** – Power Platform Admin Center to see full list of gateways installed.

Monitoring

- The Gateway can be monitored via Service availability/Performance Counters
- The following link details an approach and considerations in monitoring the On-Premises Data Gateway - <https://insightsquest.com/2016/08/08/monitor-on-premises-data-gateways/>
- **New** - <https://docs.microsoft.com/en-us/power-bi/service-gateway-performance-monitoring>

High Availability

- (Dec 2017) - High availability with active/passive configuration now available (load-balancing is now available as well) - <https://docs.microsoft.com/en-us/power-bi/service-gateway-high-availability-clusters>
- (Older) Alternative, use a recovery key for a smooth take-over scenario
 - Install a gateway on the first machine, configure, and note the recovery key
 - Install a gateway on a 2nd machine – but don’t configure
 - Choose “Migrate, restore, or takeover an existing gateway” option



DEMO

On Premise Data Gateway

Lifecycle Management

Moving from Dev to Test to Production

- Power BI Champion
- Power User
- BI Practitioner

- Assumption – You are using an App for “deployment to the masses”

- App is deployed within a workspace with a small set of Admins/Members; Admins are responsible for member management and app publishing.
- Members are the developers and/or power users who participate in creating/maintaining/validating content

- Option 1 – One Workspace

- Use the “Included in App” capability to include/exclude items from App (dashboards/reports)
- Changes to “included” dashboards/reports are not visible to the App until the App is updated (re-published)
- Note that “breaking changes” – e.g., removing/renaming a dataset table field, are reflected immediately (i.e. no dataset versioning)

- Option 2 – Multiple Workspaces

- Note that you can still use the “Included in App” capability to include/exclude items from App (dashboards/reports)
- But now, initial creation of content and changes to existing content (including datasets, reports, and dashboards) is done in a workspace that is independent of the “Production” workspace
- Migration of content from workspaces can be done manually or via scripts (Power BI Rest APIs) e.g., <https://powerbi.microsoft.com/en-us/blog/duplicate-workspaces-using-the-power-bi-rest-apis-a-step-by-step-tutorial/>
- Datasets can also be updated to point to a different data source via script

- Option 3 – Deployment Pipelines

- <https://docs.microsoft.com/en-us/power-bi/create-reports/deployment-pipelines-overview>

Lifecycle Management

Deployment Pipelines

- Power BI Champion
- Power User
- BI Practitioner

- Enables BI creators to manage content lifecycle
 - Available with Premium Capacity.
 - Includes reports, paginated reports, dashboards, and datasets (dataflows not included as of Apr 2021)
- Designed as a pipeline with 3 stages
 - Development
 - Test
 - Production

Agenda

- Introductions and Expectations for the Day
- Architectural Overview of Power BI
- Roles/Responsibilities
- Provisioning of Services, Users, & Software
- Training and Evangelism
- Managing/Exposing Data Sources
- Publishing and Sharing Content - Best Practices
- Supporting Data Refresh and Live Connections
- *Security Best Practices*
- Monitoring and Auditing activity

Power BI Security

Agenda

1. User Identity (Authentication)
2. Data Security
3. Collaboration within your organization
4. Collaboration outside of your organization



Find compliance offerings

Filter by Region Country Industry Power BI Clear all

Title	Description
CCSL (IRAP)	Microsoft is accredited for the Australian Certified Cloud Services List based on an IRAP assessment.
China GB 18030	Azure and Office 365 operated by 21Vianet are certified as compliant with the Chinese character standard.
CJIS	Microsoft government cloud services adhere to the US Criminal Justice Information Services Security Policy.
CSA STAR Attestation	Azure and Intune were awarded Cloud Security Alliance STAR Attestation based on an independent audit.
CSA STAR Certification	Azure, Intune, and Power BI were awarded Cloud Security Alliance STAR Certification at the Gold level.
DoD	Microsoft received Department of Defense (DoD) Provisional Authorizations at Impact Levels 5, 4, and 2.
EU Model Clauses	Microsoft offers EU Standard Contractual Clauses, guarantees for transfers of personal data.
EU-U.S. Privacy Shield	Microsoft complies with this framework for protecting personal data transferred from the EU to the US.
FedRAMP	Microsoft was granted US Federal Risk and Authorization Management Program P-ATOs and ATOs.
FERPA	Microsoft aligns with the requirements of the US Family Educational Rights and Privacy Act.
FIPS 140-2	Microsoft certifies that its cryptographic modules comply with the US Federal Info Processing Standard.
FISC	Microsoft meets the requirements of the Financial Industry Information Systems v8 standard in Japan.
HIPAA/HITECH	Microsoft offers Health Insurance Portability & Accountability Act Business Associate Agreements (BAAs).
HITRUST	Azure is certified to the Health Information Trust Alliance Common Security Framework.
ISO 27001	Microsoft is certified for its implementation of these information security management standards.
ISO 27018	Microsoft was the first cloud provider to adhere to this code of practice for cloud privacy.
MeitY	The Ministry of Electronics and Information Technology in India awarded Microsoft full accreditation.
NZ CC Framework	Microsoft NZ addresses the questions published in the New Zealand cloud computing framework.
PCI DSS	Azure complies with Payment Card Industry Data Security Standards Level 1 version 3.2.
SOC 1	Microsoft cloud services comply with Service Organization Controls standards for operational security.
SOC 2	Microsoft cloud services comply with Service Organization Controls standards for operational security.
SOC 3	Microsoft cloud services comply with Service Organization Controls standards for operational security.
UK G-Cloud	The Crown Commercial Service renewed the Microsoft cloud services classification to Government Cloud v6.

<https://www.microsoft.com/en-us/trustcenter/Compliance/default.aspx>

Power BI Security

User Identity (Authentication)

- Power BI is part of the larger Microsoft cloud
- Like other cloud services, PBI leverages Azure Active Directory (AAD)
 - AAD is the default authentication mechanism for PBI
 - Other authentication approaches can be used for Embedded scenarios
- AAD setup and configuration is a key building block for PBI
 - Most large organizations will synchronize their on-premise Active Directory with AAD
 - Advanced authentication requirements (e.g., multi-factor) are supported in AAD
- AAD is also used, and can be supplemented, for the PBI mobile devices (next slide)

Power BI Security

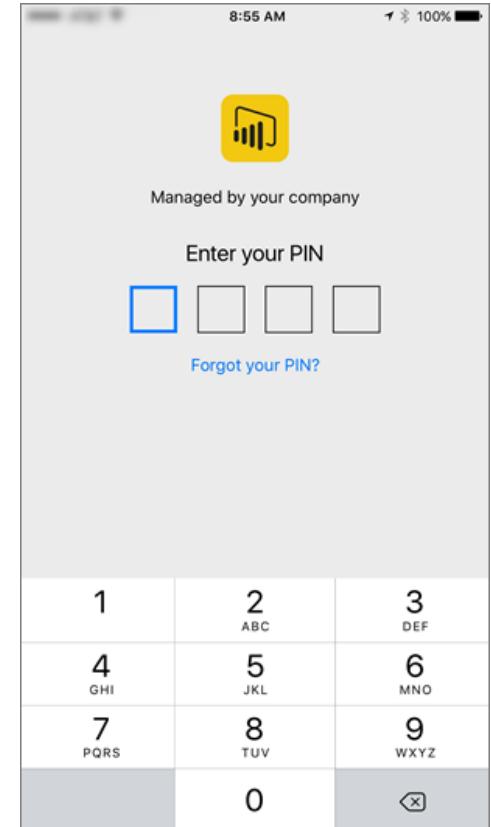
User Identity (Authentication)

Mobile Device/App Management:

- Controlled via Intune for Power BI Mobile apps on iOS (7+) /Android (4+)
- Policies such as:
 - Require PIN
 - Max failed PIN attempts

Configuring InTune:

- Specify the app
- Configure policies (i.e. require PIN)
- Enable for deployment
- End-users install from Company Portal app

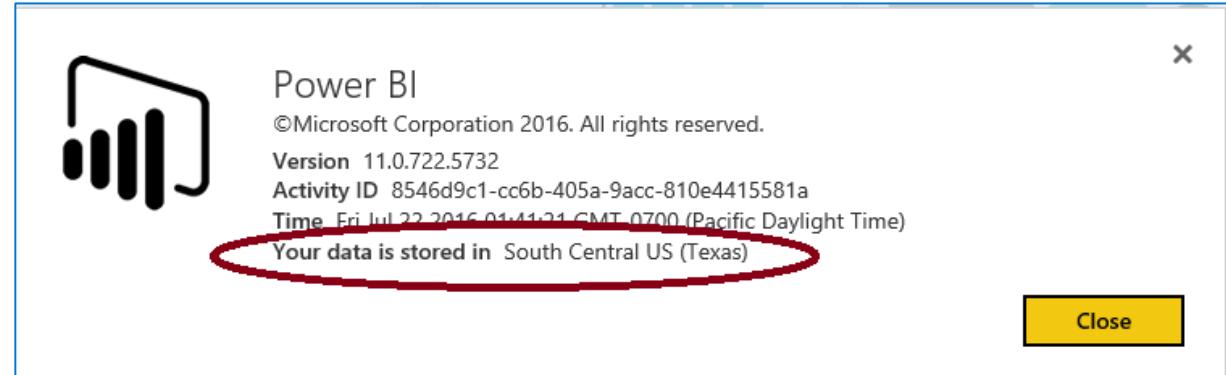
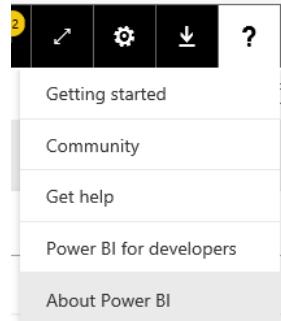


Power BI Security

Date Storage & Encryption Keys

Where is my data stored?

Power BI encrypts data
at-rest & in-process



The encryption keys....

- to Azure Blob keys are stored, encrypted, in a separate location in the Power BI service.
- for Azure SQL Database, TDE technology is managed by Azure SQL itself.
- for Data Movement service and on premises Gateway are stored:
 - On-prem data sources: In the on-premise Gateway on customer's infrastructure
 - Cloud-based data sources: In the Data Movement Role
- Power BI Premium offers additional BYOK encryption options for datasets

Power BI Security

Data Security: User Data Access

- Data Access can be considered a subset of authorization (what you can do)
- Some data access requirements can be handled with item-level sharing e.g.,
 - Share a dashboard or reports for read-only access with a user or group
 - Share a collection of dashboards/reports (via an App) with a user or group
 - Assign membership in a workspace (e.g., viewer, contributor, admin) to allow a user/group to view and/or modify dashboards/reports/datasets
 - Note: knowing whether an item has been shared/viewed/exported is handled via PBI monitoring capabilities (covered in subsequent slides)
- Other use-cases require more granular data access rules e.g.,
 - We both can view a report - you can only see North America sales, & I should see South America; Fred the admin can see everything
 - This is referred to as row-level security (RLS) aka dynamic security

Power BI Security

Data Security: RLS Overview

- **Imported datasets**
 - RLS can be defined as part of the authoring/publishing process (next slide)
- **Direct Query datasets**
 - RLS can be defined as part of the .pbix file (next slide)
 - RLS can alternatively be handled by an “RLS-enabled” data sources, which means...
 - The back-end data source implements some form of RLS
 - Power BI can pass (or impersonate) the user credentials when connecting to the data source (i.e. Single Sign On – SSO)
- **RLS-enabled data sources**
 - Data presented is based on permissions of the user who is accessing the report/dashboard, etc.
 - SSO is available for several on-prem DirectQuery data sources (e.g., SQL Server, SAP Hana/BW, Oracle, Teradata, Spark, Impala) - <https://docs.microsoft.com/en-us/power-bi/service-gateway-sso-overview>
 - SSO is also available for some cloud-based sources (e.g., Azure SQL DB, Azure Synapse Analytics)

Power BI Security

Row Level Security (RLS) for SSAS/PBI Datasets

- SQL/Azure Analysis Services is a RLS-enabled data source
 - Analysis Services allows data to be secured based on a user's Role, and via Row Filters (if configured)
 - Power BI can emit the username used to sign into the PBI service (UserPrincipalName) via Analysis Services' EffectiveUserName option – which is used to impersonate the user and set role mappings/RLS
- Role-Level Security is also available for an imported/direct query dataset
 - You configure Roles and define RLS for the dataset in The PBI Desktop
 - You then map users to roles within PowerBI.com (i.e. after the Desktop file has been published)
 - Note: be aware of performance implications for direct query datasets (additional filter on each query)

Define Roles in the Desktop

The screenshot shows the 'Manage roles' section of the Power BI Desktop interface. It lists two roles: 'BU_View_Gulf_Coast' and 'UserNameSimulation'. Below the roles, there are 'Create' and 'Delete' buttons. To the right, a 'Tables' section lists several tables: DimDate, DimProduct, FactProductionWithFutureEstim..., Forecasts, ProductPrices, and WellHeaders. A 'Table Filter DAX Expression' field contains the formula: [BusinessUnit] = "Gulf Coast".

Map Users in the Service

The screenshot shows the 'Row-Level Security' configuration in the Power BI service. It lists a single member 'UserNameSimulation (1)' under the 'Members (1)' section. Below it, there is a field labeled 'People or groups who belong to this role' with a placeholder 'Enter email addresses' and an 'Add' button. A user named 'Gary Chessman' is listed at the bottom.

Power BI Security

Collaboration outside of your organization

- You can share dashboards/reports with people outside your organization via email with a link to the shared dashboard/report
 - The recipient has to sign-in to Power BI to see the dashboard/reports
 - If they don't have a Power BI account, they can create one after clicking the link
 - External sharing can be turned off by the tenant admin
- Note – you can also expose a report for anonymous access (publish to web)
 - This can also be turned on/off by the tenant admin
- Update (Feb 2018) – Power BI now integrates with Azure AD B2B
 - Allows distribution of Power BI content to guest users outside of the org
 - Three licensing options – Power BI Premium, Assign Pro license to guest user, or guest user brings their own Power BI Pro license
 - <https://docs.microsoft.com/en-us/power-bi/service-admin-azure-ad-b2b>

Power BI Tenant-Level Settings

Help and support settings

- ▶ Publish "Get Help" information
Disabled for the entire organization
- ▶ Receive email notifications for service outages or incidents
Enabled for the entire organization

Workspace settings

- ▶ Create workspaces (new workspace experience)
Enabled for the entire organization
- ▶ Use datasets across workspaces
Enabled for the entire organization

Information protection (preview)

- ▶ Connect Power BI to Microsoft Information Protection sensitivity labels (step 1)
Disabled for the entire organization
- ▶ Allow users to apply sensitivity labels for Power BI content (step 2)
Disabled for the entire organization

Export and sharing settings

- ▶ Share content with external users
Enabled for the entire organization
- ▶ Publish to web ⓘ
Enabled for the entire organization
- ▶ Export data
Enabled for the entire organization
- ▶ Export to Excel
Enabled for the entire organization

- ▶ Export reports as PowerPoint presentations or PDF documents
Enabled for the entire organization

- ▶ Export reports as image files (Preview)
Disabled for the entire organization

- ▶ Print dashboards and reports
Enabled for the entire organization

- ▶ Certification
Enabled for the entire organization

- ▶ Allow external guest users to edit and manage content in the organization
Disabled for the entire organization

- ▶ Email Subscriptions
Enabled for the entire organization

- ▶ Featured content
Disabled for the entire organization

Content pack and app settings

- ▶ Publish content packs and apps to the entire organization
Enabled for the entire organization

- ▶ Create template organizational content packs and apps
Disabled for the entire organization

- ▶ Push apps to end users
Enabled for the entire organization

Integration settings

- ▶ Use Analyze in Excel with on-premises datasets
Enabled for the entire organization

- ▶ Use ArcGIS Maps for Power BI
Enabled for the entire organization

- ▶ Use global search for Power BI (Preview)
Enabled for the entire organization

- ▶ Snowflake SSO
Disabled for the entire organization

Custom visual settings

- ▶ Add and use custom visuals
Enabled for the entire organization

- ▶ Allow only certified custom visuals (block uncertified)
Disabled for the entire organization

R visuals settings

- ▶ Interact with and share R visuals
Enabled for the entire organization

Audit and usage settings

- ▶ Create audit logs for internal activity auditing and compliance
Enabled for the entire organization

- ▶ Usage metrics for content creators
Enabled for the entire organization

- ▶ Per-user data in usage metrics for content creators
Enabled for the entire organization

DEMO

RLS / Adjusting Tenant Level Settings

<https://docs.microsoft.com/en-us/power-bi/guidance/admin-tenant-settings>

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- Publishing and Sharing Content - Best Practices
- Supporting Data Refresh and Live Connections
- Security Best Practices
- *Monitoring and Auditing activity*

Monitoring and Auditing

Overview

- Power BI Champion
- Power BI Admin
- Security Architect

- Basic “Usage Metrics” in the admin portal – ignore
- Metrics can be generated at a workspace level
- Optionally, a Tenant Level Setting (“Audit and usage settings”) can be configured
 - Power BI will start logging various activities that your users perform in Power BI. The logs take up to 48 hours to show up in the O365 Security & Compliance Center
 - From the “Audit logs” section, you can then navigate to the Office 365 Admin Center (Audit Log Search) to query the logs
 - Feb 2018 – a Coworker example/template that automates the log extraction and provides base reports - angryanalytics.com/
 - Note – You can assign audit log privileges to non-admin accounts

• Update – Feb 2018

- The Office 365 Admin APIs can now be used in lieu of the Audit logs. Does not require audit and usage setting to be marked in Power BI, but still requires O365 Admin tenant privileges. 7-day retention, so important to extract/load.
- Pre-configured partner solution available - <https://powerbi.microsoft.com/en-us/blog/announcing-the-power-bi-usage-metrics-solution-template/>

• Update – Aug 2018

- New Monitoring capabilities for Power BI Premium Capacities - <https://powerbi.microsoft.com/en-us/blog/new-monitoring-capabilities-for-power-bi-premium-capacities/>

• Update – Dec 2019 – Power BI Audit logs as alternate to the usage logs

Power BI activities	
Viewed Power BI dashboard	Created Power BI dashboard
Deleted Power BI dashboard	Shared Power BI dashboard
Viewed Power BI tile	Exported Power BI tile data
Deleted Power BI report	Printed Power BI report page
Published Power BI report to web	Exported Power BI report visual data
Edited Power BI report	Created Power BI dataset
Created Power BI group	Added Power BI group members
Created organizational Power BI content pack	Created Power BI app
Updated Power BI app	Updated organization's Power BI settings
Started Power BI extended trial	Analyzed Power BI dataset
Deleted Power BI gateway	Added data source to Power BI gateway
Changed Power BI gateway admins	Changed Power BI gateway data source users
Unpublished Power BI app	Deleted organizational Power BI content pack
Edited Power BI dataset	Updated capacity display name
Updated capacity admin	Changed capacity user assignment
Removed workspace from a capacity	Shared Power BI report
Discovered Power BI dataset data sources	Updated Power BI dataset data sources
Binded Power BI dataset to gateway	Changed Power BI dataset connections
Updated Power BI gateway data source credentials	Imported file to Power BI

DEMO

Custom Solution – Power BI Audit Logs

- Power BI Admin

Power BI Premium Management Basics

- After purchasing a Power BI Premium subscription, the tenant receives a corresponding number of v-cores to assign to capacities ("v-core pooling) E.g.,

- A P1 subscription provides 8 v-cores to create a single P1 capacity
- A P3 subscription can be used to create one, or up to four (4 x P1) capacities

- Multi-Geo support is now available

- Cannot be changed after the capacity is created.

- Role of the Capacity Admin

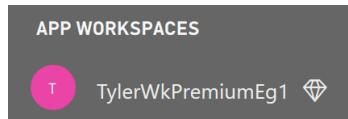
- Assign workspaces to the capacity
- Manage user permissions, to add additional Capacity Admins or users with assignment privileges (i.e. enable them to assign a workspace to the capacity)
- Manage workloads (configure max memory usage) / Restart capacity

- Capacity Workloads

- The services made available to user (see [here](#))
- Memory and other settings can be used to bound performance

- Assigning a Workspace to a Capacity

- This is done during/after the setup of a workspace
- Workspace admin needs assignment privilege to set this configuration



Edit workspace

Name: TylerWkPremiumEg1

Privacy: Private - Only approved members can see what's inside
Members can only view Power BI content

Workspace members: tylerc@contoso.onmicrosoft.com (Admin)

Advanced ▲
Dedicated capacity ⓘ
On

Choose an available dedicated capacity for this workspace: BI Champs Premium P1 - East US 2

Learn more about Premium capacity

Workspace Connection: powerbi://api.powerbi.com/v1.0/myorg/TylerWkPremiumEg1

Copy

X Remove all + Assign workspaces

Power BI Premium Monitoring Basics

- Monitoring is available in both the portal, and via the Power BI Premium Capacity Metrics app

- Portal provides a quick view with high-level metrics (currently for the last 7 days)
- The App provides more in-depth info (currently for the last 7 days)

Using the Capacity Metrics app

- Can be installed from the Apps (Get Apps – Apps – Power BI)
- Refreshed automatically, with rolling 7-day history (may want to consider use of a subscription to review older data)
- High-level dashboard provides summary statistics, with ability to drill down into detailed report
- Tip – Keep a close watch on Memory usage, specifically overall memory consumption

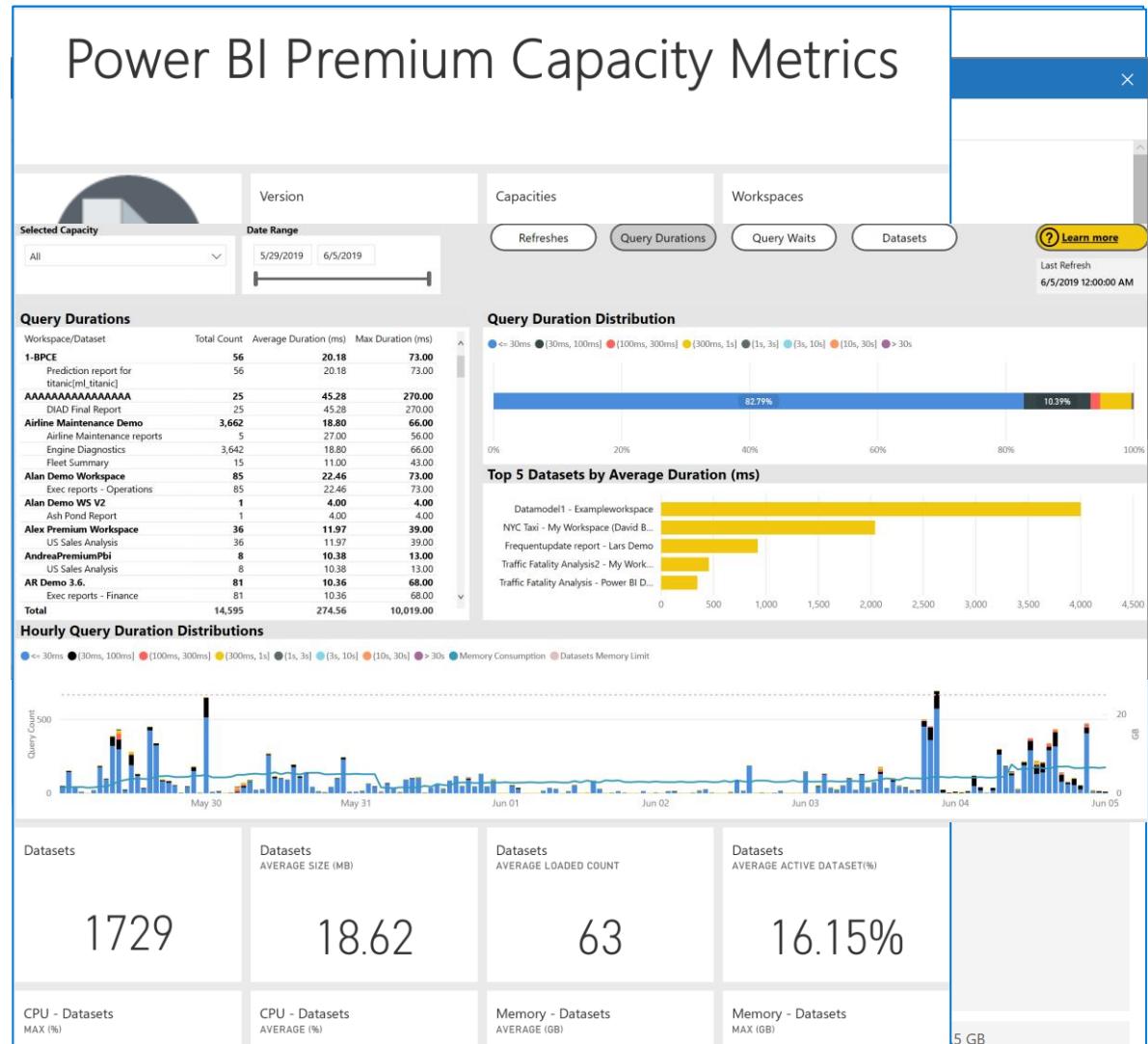
May 2020

- New Alerts for Premium Capacity Overload events -
<https://powerbi.microsoft.com/en-us/blog/announcing-timely-premium-capacity-overload-alerts/>

June 2021 – Public Preview, Log Analytics integration

- Workspaces can now be configured to export usage & performance related information to Log Analytics; supports retention up to 2 years
- [Announcing long-term usage and performance insights \(Public Preview\) | Microsoft Power BI Blog | Microsoft Power BI](https://powerbi.microsoft.com/en-us/blog/announcing-long-term-usage-and-performance-insights-public-preview-microsoft-power-bi-blog-microsoft-power-bi/)

- Power BI Admin



- Power BI Admin

Power BI Premium

Capacity Metrics Highlights

- Resource Consumption

- All up View of CPU and Memory Consumption for a given Capacity

- Refreshes

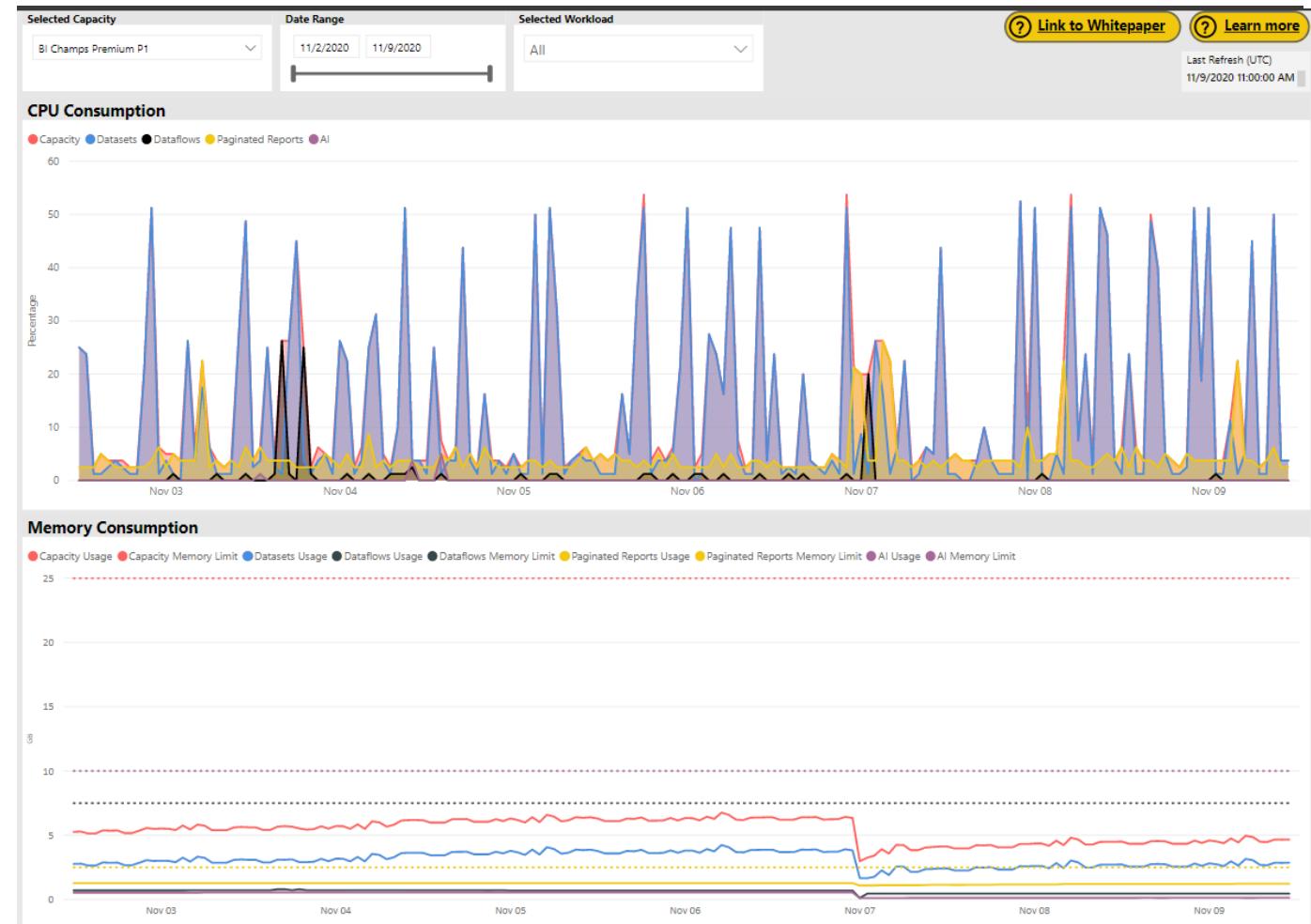
- Note: Datasets Memory Limit is configurable (as %)
- Note – In G1 Premium, “recall” that the supported number of maximum concurrent refreshes is set to 1.5 times the backend v-cores, rounded up
 - Backend v-cores (P1-4, P2-8, P3-16)

- Datasets

- Evictions – Total # of datasets evicted due to memory pressure
- The App provides more in-depth info (currently for the last 7 days)

- Note – The Gen2 Capacity Metrics approach (and accompanying app) is very different

- Currently in Preview, detailed info not yet available
- Focused on CPU utilization, not memory usage
- Consider combining with (Workspace) Log Analytics for comprehensive performance monitoring



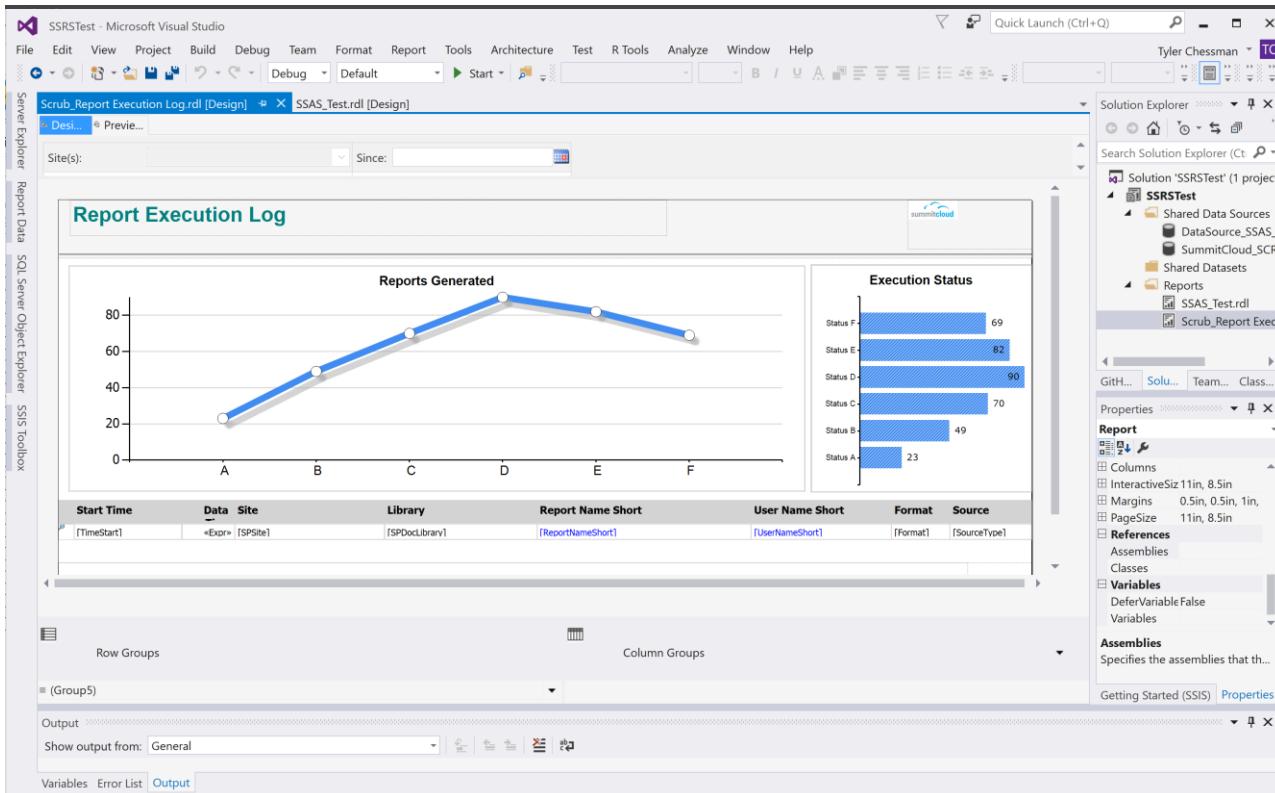
DEMO

Monitoring Power BI Premium

Power BI Paginated Reports

Getting Started

- Reports are authored in the Power BI Report Builder*
 - Visual Studio can also be used to author reports – be aware of feature support differences (next slide)
- Basics of building a report....
 - Create one or more data sources (e.g., SQL Server, Oracle)
 - Create one or more datasets (queries against a data source)
 - Optional – define parameter(s)
 - Design Report Layout
 - Preview Report
 - Publish
 - Monitor
- Note - Reports are saved in the SSRS .rdl format



*Free download - <https://www.microsoft.com/en-us/download/details.aspx?id=58158>

Power BI Paginated Reports

Data Source & Feature Support

Supported Data Sources

- Power BI Datasets (via single sign-on (SSO))
- Azure Analysis Services (via single sign on (SSO) and oAuth)
- Azure SQL Data Warehouse
- Azure SQL Database (username/password, SSO and oAuth)
- Azure SQL Managed Instance via Public Endpoint (username/password)
- SQL Server*
- SQL Server Analysis Services (SSAS) tabular (DAX) and multidimensional (MDX) models*
- Oracle*
- Teradata*

*requires the on-premises Gateway.

SSRS features not yet available

- Shared data sources (workaround – inline data sources)
- Shared datasets
- Subreports
- Drillthrough and click-through to other reports
- Linked reports
- Data-driven subscriptions

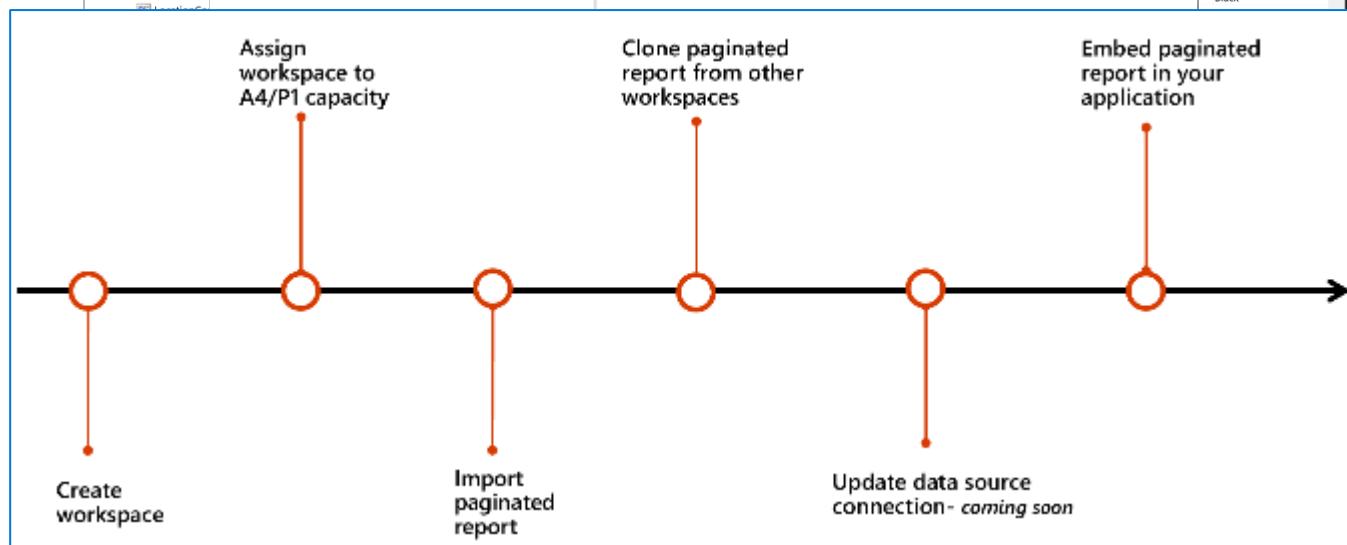
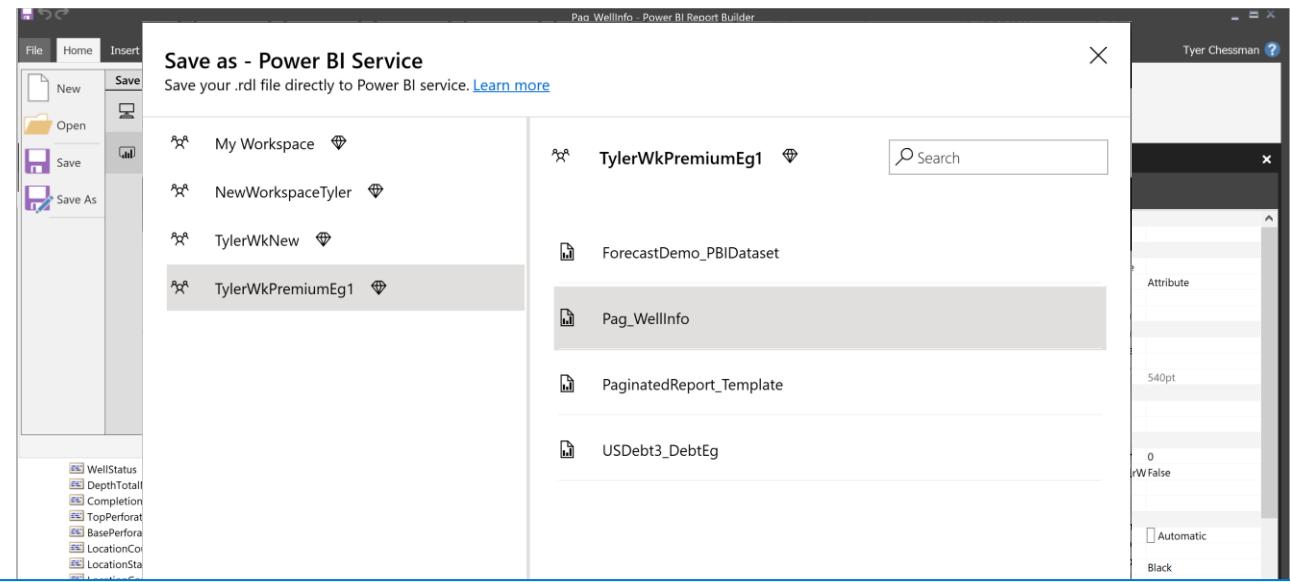
DEMO

Design Paginated Reports

Power BI Paginated Reports

Publishing

- From Report Builder, reports can be directly published to the Service
- Alternatively, a user can upload an .rdl file to the workspace via the browser
- Developers may want to leverage REST APIs for deployment automation* e.g.,
 - Create workspace
 - Assign workspace to capacity
 - Import paginated report
 - Clone paginated report from another workspace
 - Update datasource connection (API coming soon – workaround via the RDL data source property change)
 - Embed paginated report in your application

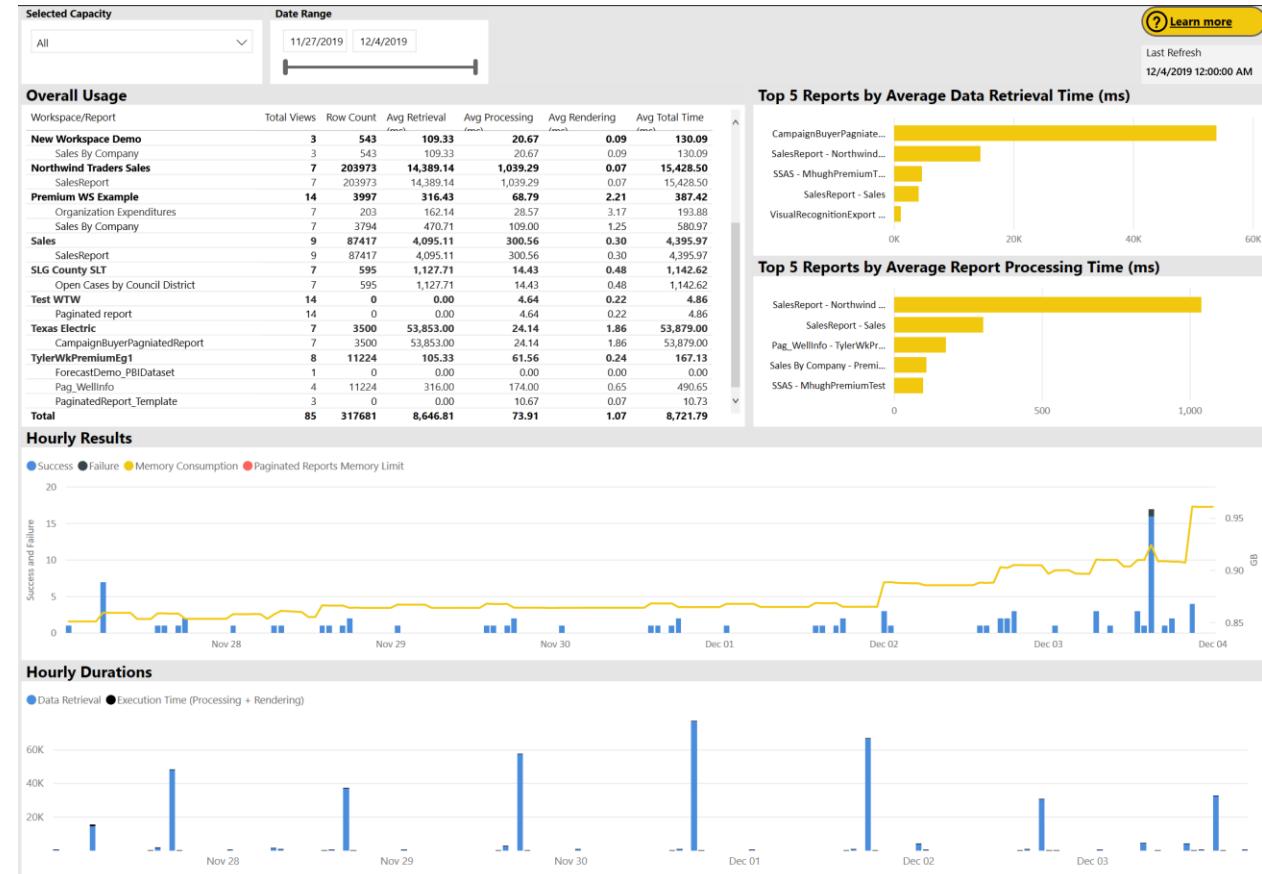


*<https://powerbi.microsoft.com/en-us/blog/embed-paginated-reports-in-your-own-application-for-your-customers-preview/>

Power BI Paginated Reports

Monitoring

- Note – Paginated Reports can be enabled and configured to consume a max amount of capacity resources.
- Monitoring of paginated reports is available in both the portal, and via the Power BI Premium Capacity Metrics app
 - Portal provides a quick view with high-level metrics (currently for the last 7 days)
 - The App provides more in-depth info (currently for the last 7 days)
- Using the Capacity Metrics app
 - Can be installed from the Apps (Get Apps – Apps – Power BI)
 - Refreshed automatically, with rolling 7 day history (may want to consider use of a subscription to review older data)
 - High-level dashboard provides summary statistics, with ability to drill down into detailed report
- Note – auditing Power BI usage (e.g. who viewed a particular report) is available via the Audit logs (covered later)



DEMO

Publish/Manage Paginated Reports



Microsoft