Power BI Premium
Practical Tips to make the most of it

Benni De Jagere
Enterprise Data Architect, Data Platform MVP
Belgium

About me

dataMinds.be Co-Leader

@BenniDeJagere

/bennidejagere

sessionize /bennidejagere

Microsoft® Most Valuable Professional

Data Platform

#SayNoToPieCharts

inetum realdolmen Positive digital flow

Enterprise Data Architect

Session Objectives

Set the scene on Power BI Premium Gen 1, Gen 2, Per User

Usable set of tips to assist daily tasks

Convince auditing is key (Hopefully ..)

NOT A Roadmap session on Premium Gen 2 or Premium Per User Licensing

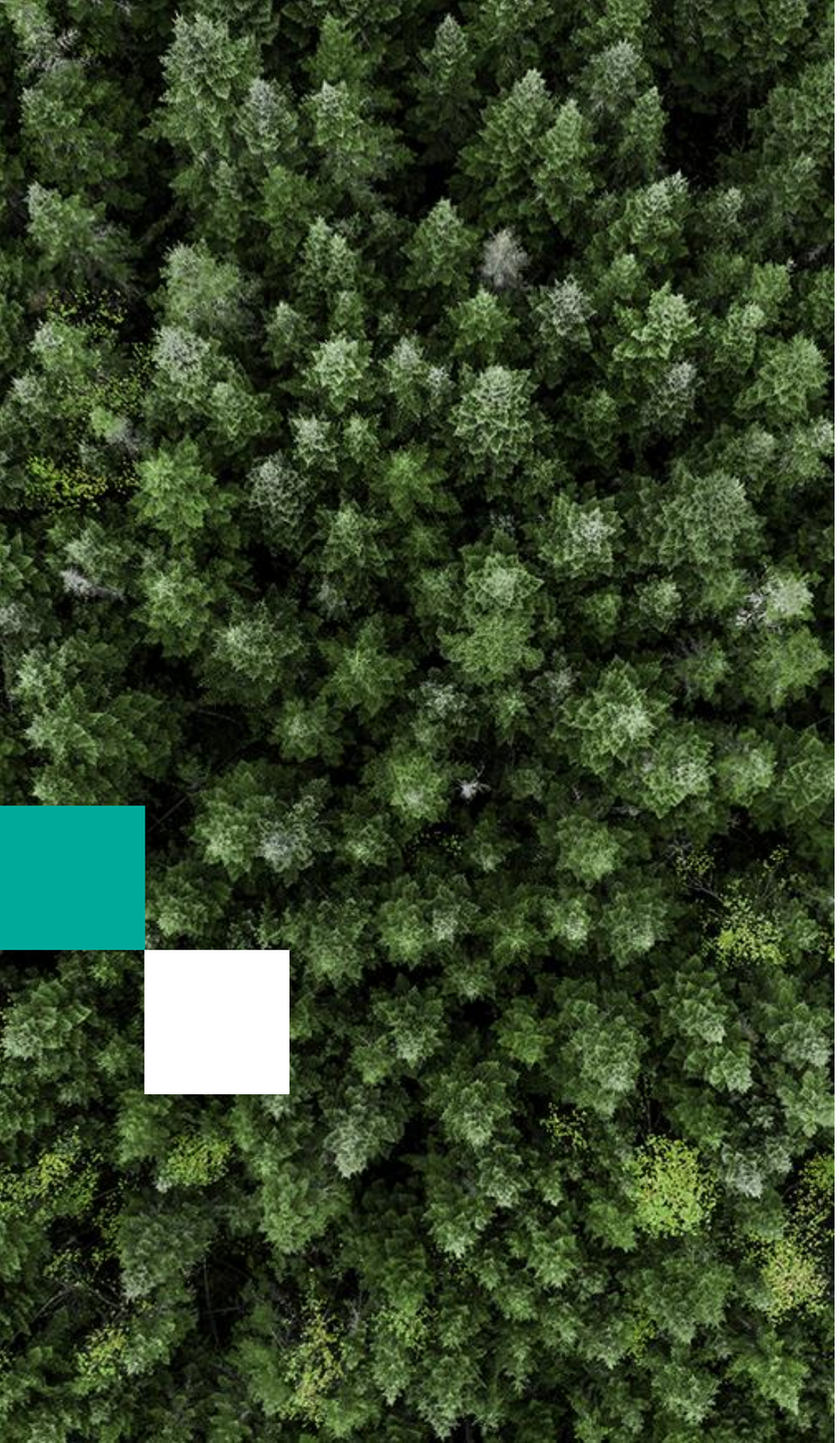
What about Power BI Premium Gen 2?

As of date, no General Availability date has been set

Not every organisation is keen on using features in preview

Full feature parity is currently not there

But yes, Premium Gen 2 is the clear future!



Let’s start!

Power BI Premium?

Dedicated Capacity Nodes, containing v-cores and Memory

Capacity Nodes	Total v-cores	Backend v-cores	Frontend v-cores	RAM (GB)	DirectQuery/Live Connection (per sec)	Model Refresh Parallelism
P1	8	4	4	25	30	6
P2	16	8	8	50	60	12
P3	32	16	16	100	120	24
P4	64	32	32	200	240	48
P5	128	64	64	400	480	96

https://docs.microsoft.com/en-us/power-bi/developer/embedded/embedded-capacity#sku-memory-and-computing-power

Power BI Premium?

Dedicated Capacity for your organisation

Provides a richer feature set

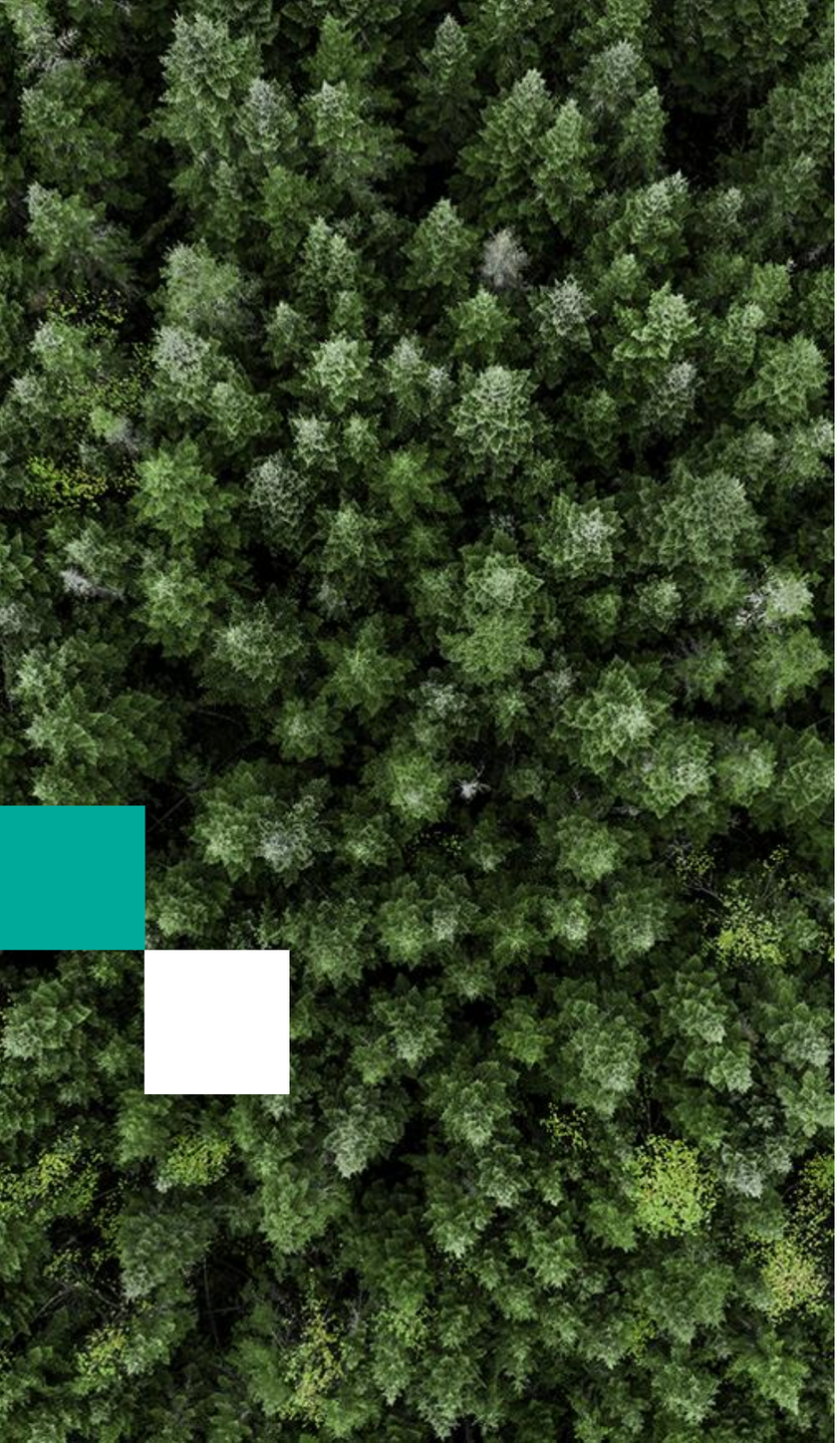
- Some features even released Premium First, Pro later (or not ..)

Support for:

- Data residency by region (Multi-Geo)
- Customer-managed encryption keys for data at rest (BYOK)

Allows for users to access artefacts without a Power BI Subscription

NOT Easy-mode for performance



Hold on ..

Power BI – Feature Comparison

Feature [3]	Power BI Pro	Power BI Premium Per user	Power BI Premium Per capacity
Collaboration and analytics			
Mobile app access	●	●	●
Publish reports to share and collaborate	●	●	
Paginated (RDL) reports		●	●
Consume content without a per-user license			●
On-premises reporting with Power BI Report Server			●

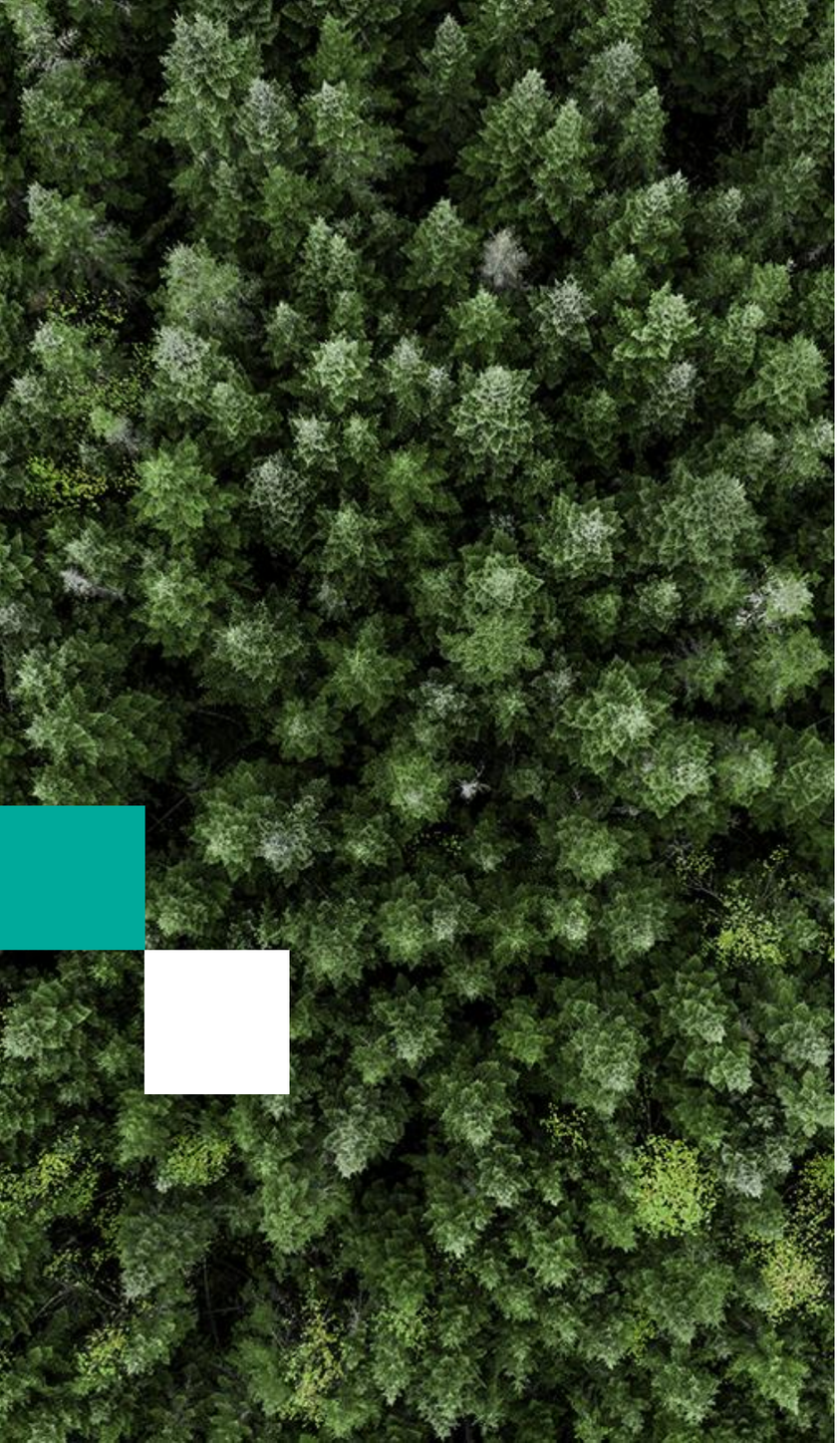
https://powerbi.microsoft.com/en-us/pricing/

Feature [3]	Power BI Pro	Power BI Premium Per user	Power BI Premium Per capacity
Data prep, modeling, and visualization			
Model size limit	1 GB	100 GB	400 GB
Refresh rate	8/day	48/day	48/day
Connect to 100+ data sources	●	●	●
Create reports and visualizations with Power BI Desktop[4]	●	●	●
Embed APIs and controls	●	●	●
AI visuals	●	●	●
Advanced AI (text analytics, image detection, automated machine learning)		●	●
XMLA endpoint read/write connectivity		●	●
Dataflows (direct query, linked and computed entities, enhanced compute engine)		●	●
Analyze data stored in Azure Data Lake Storage		●	●

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

Feature [3]	Power BI Pro	Power BI Premium Per user	Power BI Premium Per capacity
Governance and administration			
Data security and encryption	●	●	●
Metrics for content creation, consumption, and publishing	●	●	●
Application lifecycle management		●	●
Multi-geo deployment management			●
Bring your own key (BYOK)			●
Autoscale add-on availability (preview)			●
Maximum storage	10 GB/user	100 TB	100 TB

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



Capacity Settings

Capacity Workload Settings

- 4 main workloads
  - Can be enabled at any time
  - Can only be disabled if there’s no existing workloads
- Granular settings for relevant parameters
  - Max Memory %
  - Specific settings for datasets, dataflows

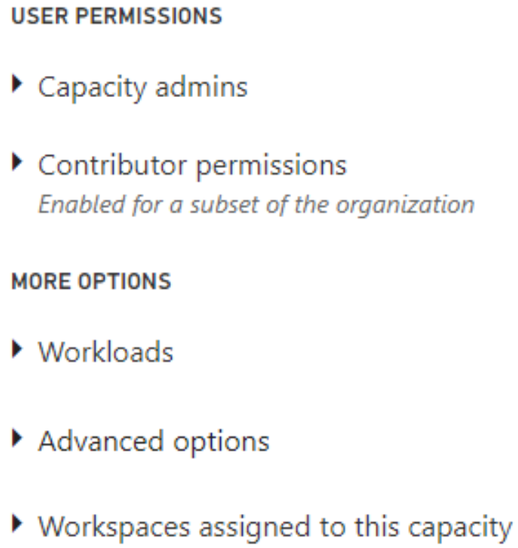
Capacity Workload Settings

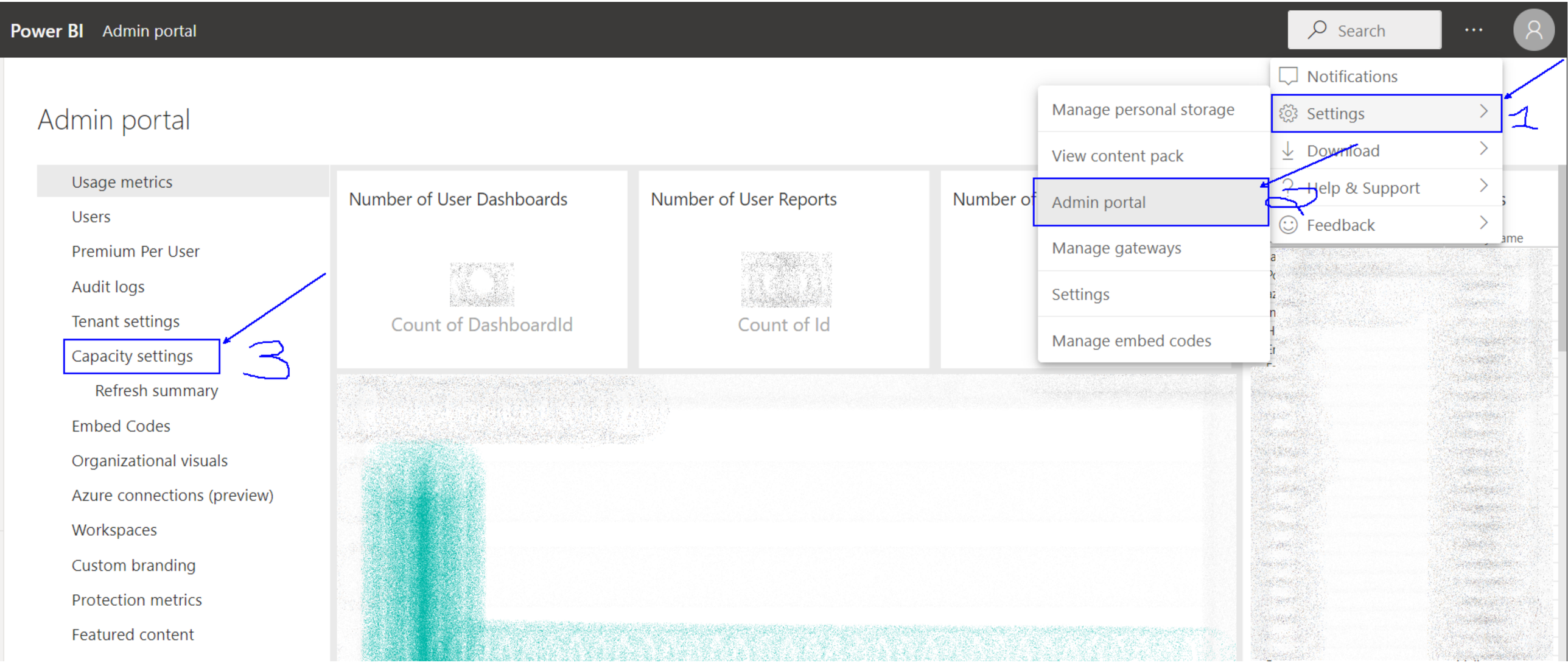
Check the default capacity workload settings

- TIP: Don’t overcommit the allocated resources

Are all the workloads needed/used?

Can we offload some workloads to other capacities?




Power BI
Admin portal
Search
Admin portal
Usage metrics
Users
Premium Per User
Audit logs
Tenant settings
Capacity settings
Refresh summary
Embed Codes
Organizational visuals
Azure connections (preview)
Workspaces
Custom branding
Protection metrics
Featured content
Number of User Dashboards
Count of DashboardId
Number of User Reports
Count of Id
Number of
Manage personal storage
View content pack
Admin portal
Manage gateways
Settings
Manage embed codes
Notifications
Settings
Download
Help & Support
Feedback
1
2
3

Capacity Workload Settings

USER PERMISSIONS

- Capacity admins
- Contributor permissions
  Enabled for a subset of the organization

MORE OPTIONS

- Workloads
- Advanced options
- Workspaces assigned to this capacity

Workloads

Unapplied changes

AI

On

Max Memory (%)

20

PAGINATED REPORTS - *Active*

Your workload is ready to use.

On

Max Memory (%)

15

DATASETS - *Active*

Your workload is ready to use.

On

Max Memory (%)

80

Query Memory Limit (%)

0

Query Timeout (seconds)

3600

Max Intermediate Row Count

1000000

Max Result Row Count

2147483(

Max Offline Dataset Size (GB)

0

Automatic page refresh

On

Minimum refresh interval

10 Minutes

Change detection measure

Off

Minimum execution interval

10 Minutes

XMLA Endpoint

Read Write

DATAFLOWS - *Active*

Your workload is ready to use.

On

Max Memory (%)

5

Enhanced Dataflows Compute Engine

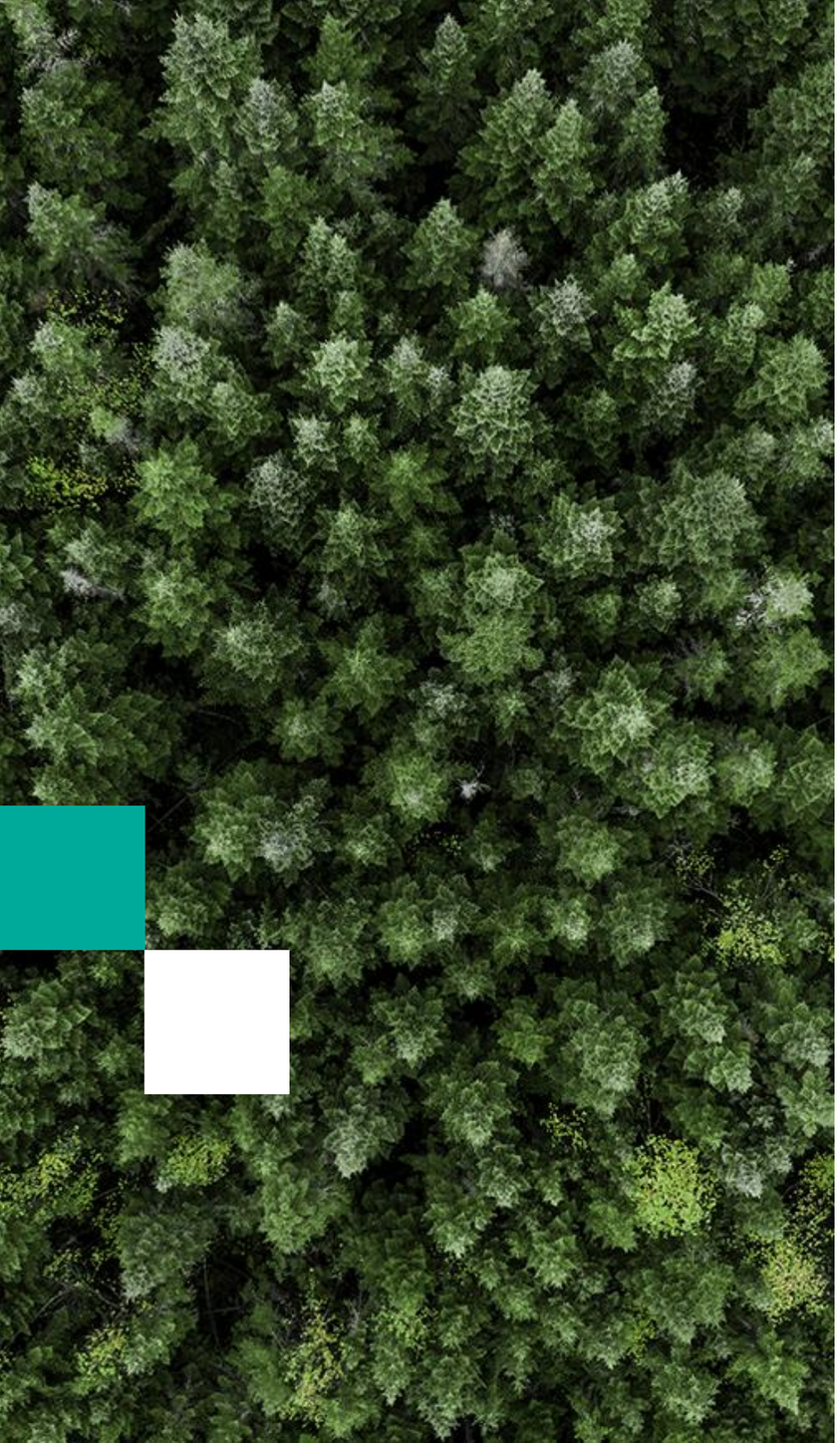
Off

Container Size (Mb)

700

Compute engine memory (%)

30



Premium Capacity Metrics App

Premium Capacity Metrics App (v2)

Represents collected metrics for different workloads

Slice ‘n Dice with workspaces, datasets, ..

Collects 7 days worth of data

Storing the data for own usage isn’t straight forward

All hope rests on Azure Monitor integration for historical data

Premium Capacity Metrics App (v2)

Selected capacity

Selected dataset

All

Date range

10/15/2020 10/22/2020

Refreshes | Query Durations | Datasets | Query Waits

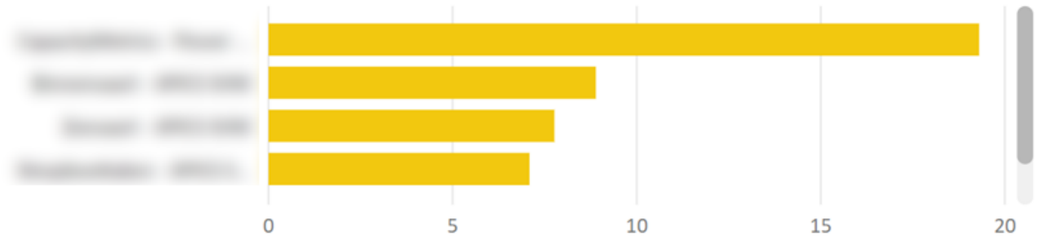
Learn more

Last Refresh (UTC)
10/22/2020 7:00:00 AM

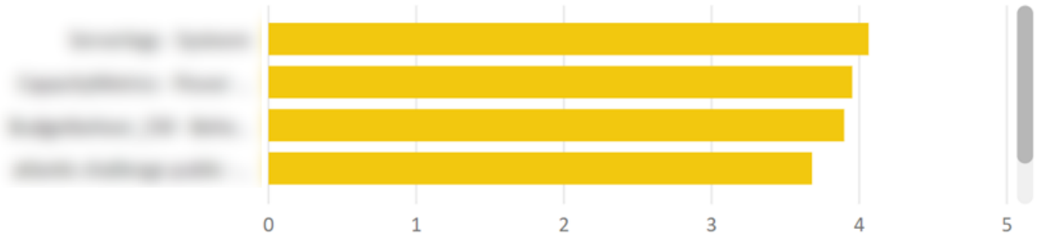
Refreshes

Workspace/Dataset	Total Count	Reliability	Avg Duration (minutes)	Max Duration (minutes)	Avg Wait Time (minutes)	Max Wait Time (minutes)
[redacted]	**7**	**71%**	**19.30**	**31.91**	**0.00**	**0.00**
[redacted]	7	71%	19.30	31.91	0.00	0.00
[redacted]	**42**	**100%**	**5.27**	**10.94**	**0.00**	**0.00**
[redacted]	7	100%	8.89	10.94	0.00	0.00
[redacted]	7	100%	7.76	8.28	0.00	0.00
[redacted]	7	100%	7.09	7.61	0.00	0.00
[redacted]	7	100%	3.86	4.31	0.00	0.00
[redacted]	7	100%	2.92	3.22	0.00	0.00
[redacted]	7	100%	1.07	1.40	0.00	0.00
[redacted]	**86**	**100%**	**1.51**	**4.43**	**1.12**	**1.23**
[redacted]	7	100%	3.92	4.43	0.00	0.00
[redacted]	7	100%	3.72	4.22	1.23	1.23
[redacted]	7	100%	2.66	2.81	0.00	0.00
[redacted]	7	100%	1.43	2.14	1.11	1.11
[redacted]	7	100%	1.34	1.68	0.00	0.00
[redacted]	9	100%	1.29	1.54	0.00	0.00
[redacted]	7	100%	0.95	1.68	1.07	1.09
[redacted]	7	100%	0.00	1.28	0.00	0.00
Total	**866**	**100%**	**1.09**	**31.91**	**1.12**	**1.23**

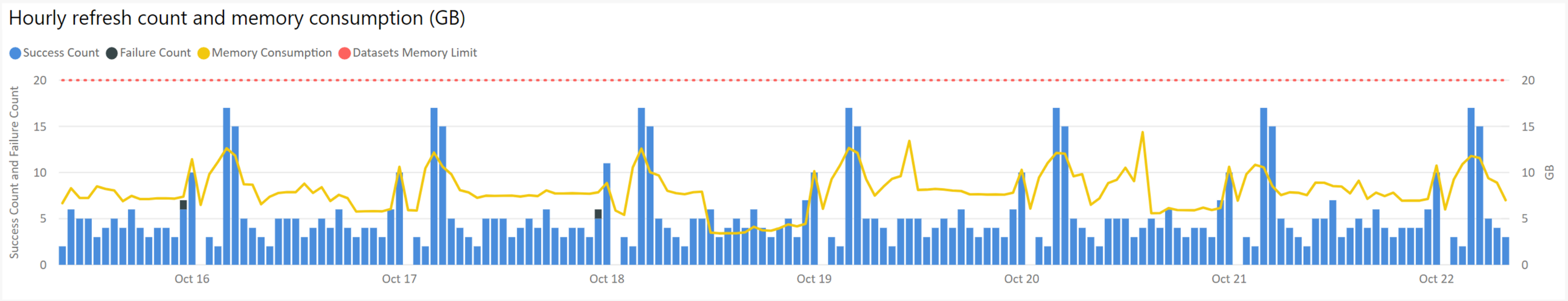
Top 5 datasets by average duration (minutes)

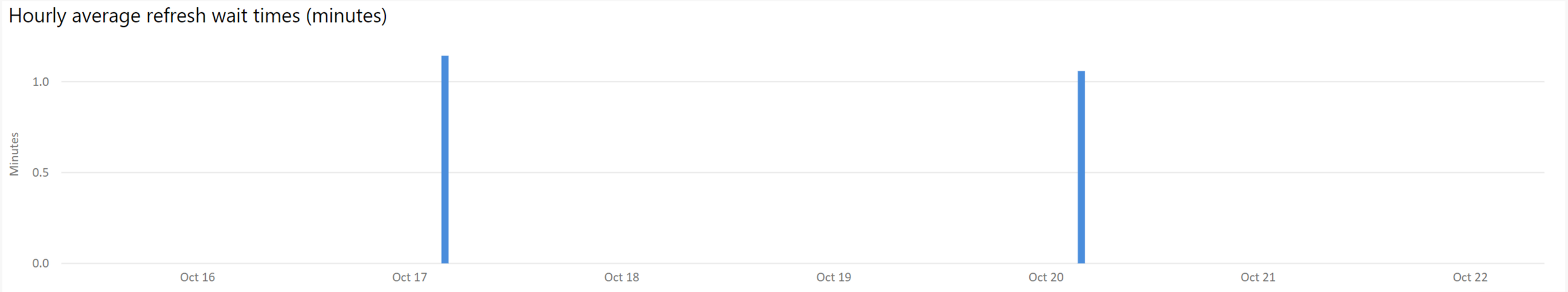


Top 5 aatasets by average wait time (minutes)



Premium Capacity Metrics App (v2)





Dataset Refreshes

- Dataset refreshes are Memory intensive
  - Use ±2x RAM
- Scheduled dataset refresh will be queued if
  - Insufficient memory
  - All models are active (no evictions possible)
- On-demand refreshes (by user request or API call) will retry three times
  - Fail if there are still not enough resources

Dataset sizes

Workspace/Dataset	Max Size (MB)
[redacted]	**2,267.36**
[redacted]	226.89
[redacted]	355.57
[redacted]	2,267.36
[redacted]	1,056.60
[redacted]	702.14
[redacted]	1,493.14
[redacted]	**57.19**
[redacted]	57.19
[redacted]	**728.24**
[redacted]	55.24
[redacted]	73.57
[redacted]	116.89
[redacted]	142.71
[redacted]	32.62
[redacted]	64.27
[redacted]	4.12
[redacted]	3.16
[redacted]	29.13
[redacted]	160.09
[redacted]	36.47
[redacted]	231.61
[redacted]	16.91
[redacted]	55.52
Total	**2,267.36**

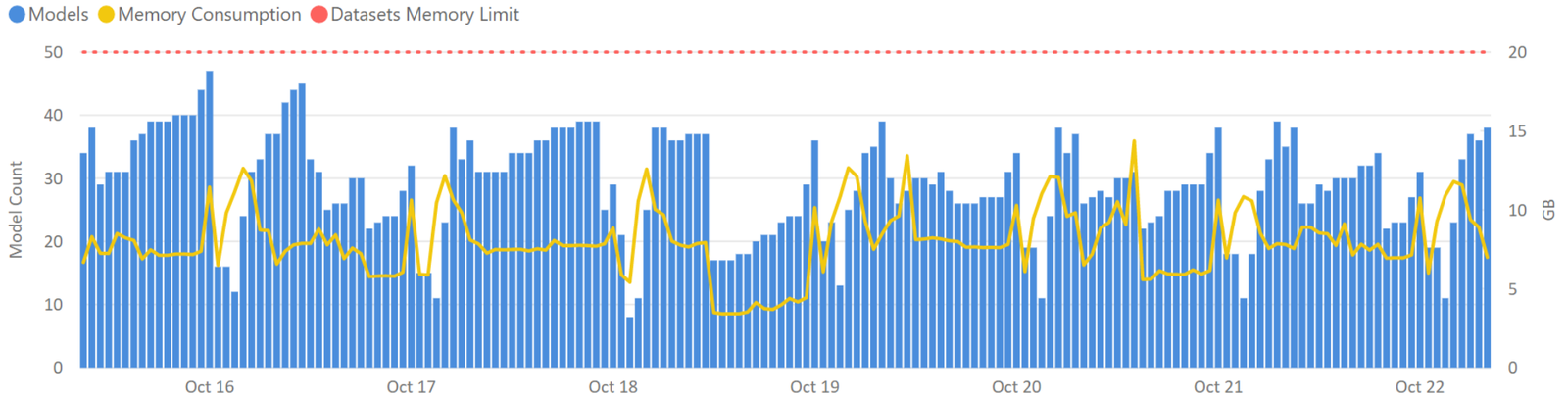
Dataset eviction counts

Capacity Name	Total
[redacted]	612
Total	**612**

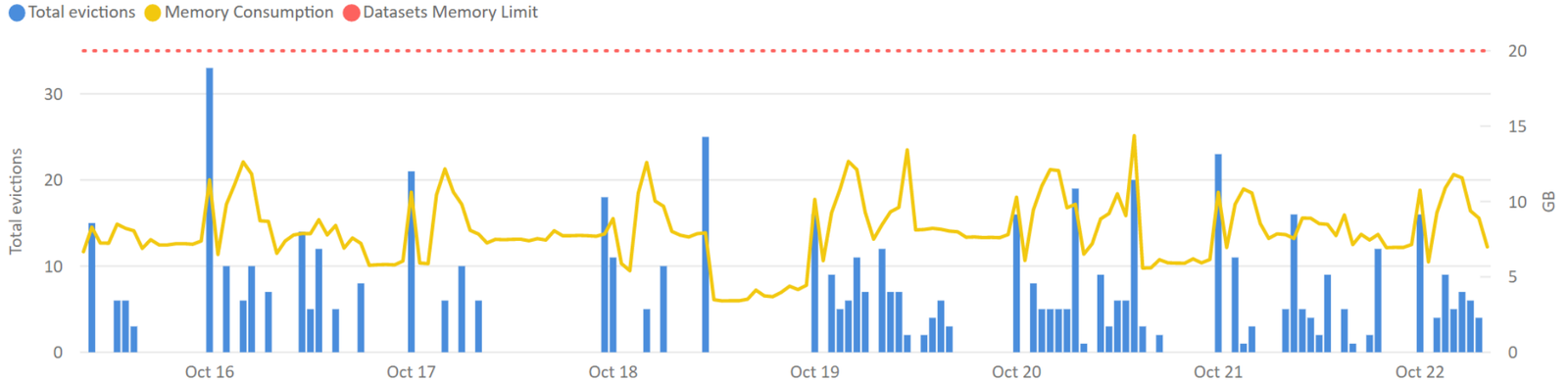
High active memory count (over 80%)

Capacity Name	SKU	Count
[redacted]	P1	0
Total		**0**

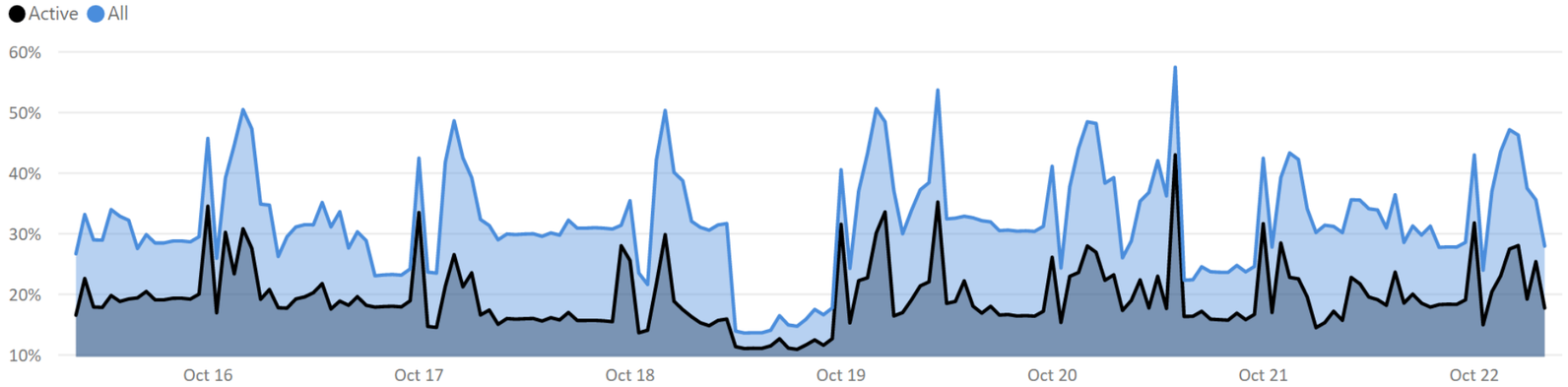
Hourly loaded dataset counts



Hourly dataset evictions and memory consumption



Consumed memory percentages



Memory Evictions

Without memory pressure, models are loaded with ease

With insufficient memory availability

- Memory needs to be freed
- Removing a model from memory is known as an **eviction**

Evictions are a natural element of Power BI Premium

Memory Evictions

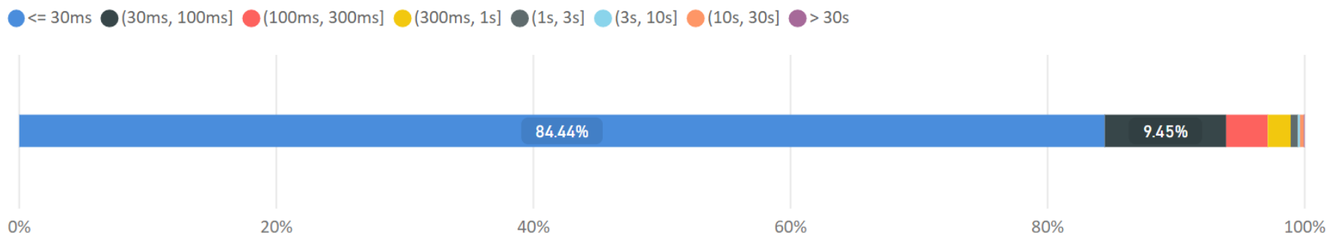
Power BI will

- Detect inactive models (not used in last 3 minutes)
- Evict models for background operations
- After 30 seconds of failed attempts, fail interactive operations of the current user

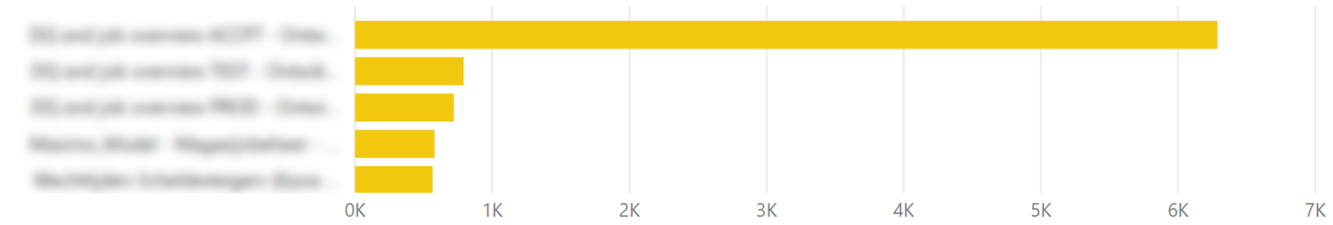
Query durations

Workspace/Dataset	Total Count	Average Duration (ms)	Max Duration (ms)
[redacted]	**475**	**80.15**	**1,418.00**
[redacted]	103	137.70	1,418.00
[redacted]	372	63.22	1,045.00
[redacted]	**218**	**43.24**	**90.00**
[redacted]	218	43.24	90.00
[redacted]	**9,051**	**31.25**	**20,536.00**
[redacted]	182	38.58	1,029.00
[redacted]	81	30.47	355.00
[redacted]	112	16.30	345.00
[redacted]	24	14.09	20.00
[redacted]	875	32.67	173.00
[redacted]is	76	7.26	20.00
[redacted]	3	10.00	20.00
[redacted]	230	14.41	40.00
[redacted]	188	17.20	45.00
[redacted]	25	130.56	432.00
[redacted]	34	22.35	40.00
[redacted]	197	19.76	79.00
[redacted]	6,921	42.76	20,536.00
Total	**133,750**	**978.44**	**1,686,632.00**

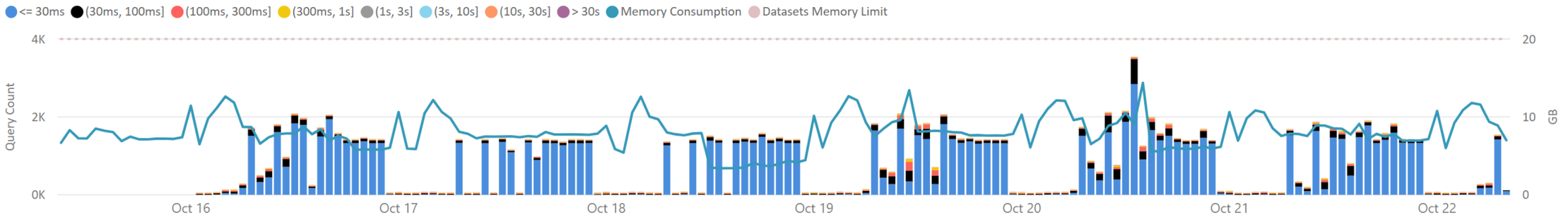
Query duration distribution



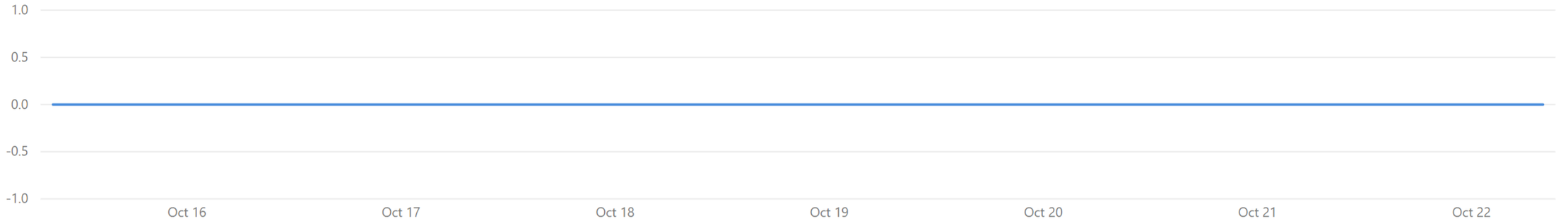
Top 5 datasets by average duration (ms)



Hourly query duration distributions



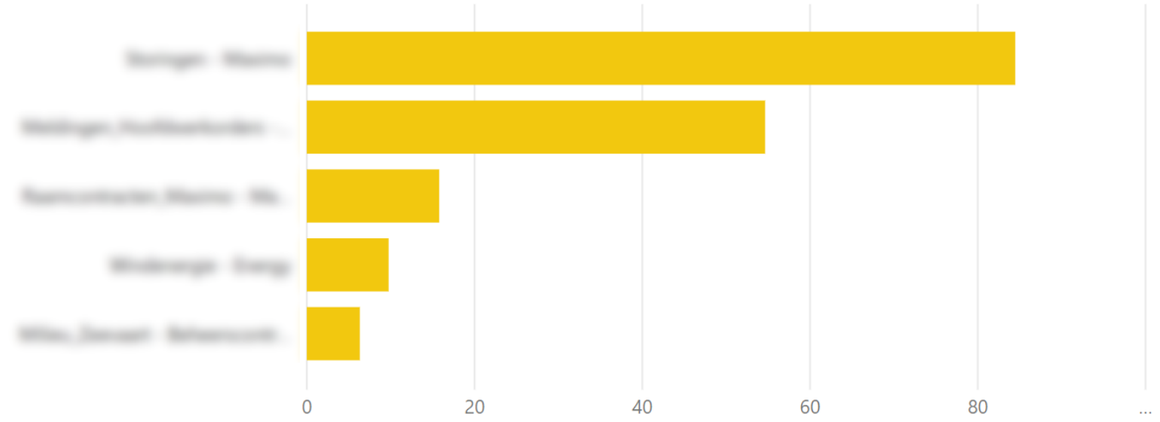
DirectQuery/live connections - times exceeded 80% utilization



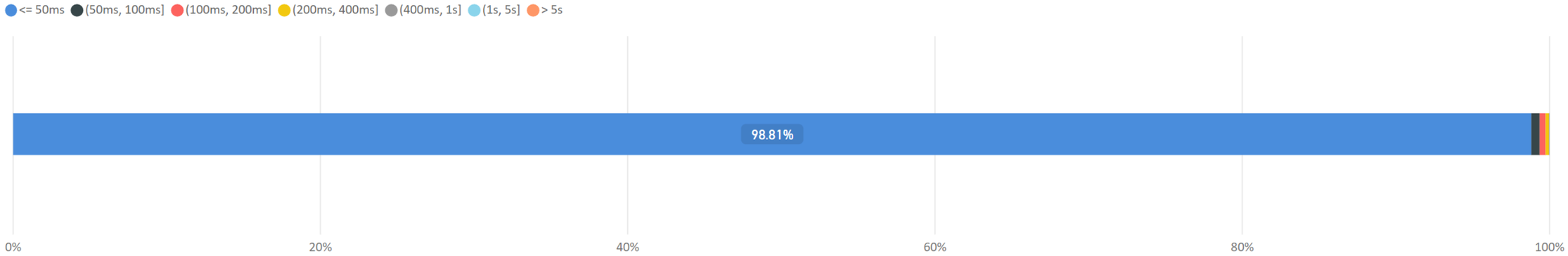
Query wait times

Workspace/Dataset	Total Count	Wait Count	Wait %	Average (ms)	Max (ms)	Duration
[redacted]	**475**	**11**	**2.32%**	**0.20**	**28.00**	**80.15**
[redacted]	103	1	0.97%	0.03	2.00	137.70
[redacted]	372	10	2.69%	0.25	28.00	63.22
[redacted]	**218**	**41**	**18.81%**	**1.37**	**15.00**	**43.24**
[redacted]	218	41	18.81%	1.37	15.00	43.24
[redacted]	**9,051**	**951**	**10.51%**	**0.57**	**242.00**	**31.25**
[redacted]	182	23	12.64%	0.35	4.00	38.58
[redacted]	81	25	30.86%	2.48	13.00	30.47
[redacted]	112	12	10.71%	0.40	24.00	16.30
[redacted]	24	0	0.00%	0.00	0.00	14.09
[redacted]	875	135	15.43%	0.38	21.00	32.67
[redacted]	76	6	7.89%	0.39	7.00	7.26
[redacted]	3	0	0.00%	0.00	0.00	10.00
[redacted]	230	26	11.30%	0.38	8.00	14.41
Total	**133,750**	**10,377**	**7.76%**	**1.78**	**631.00**	**978.44**

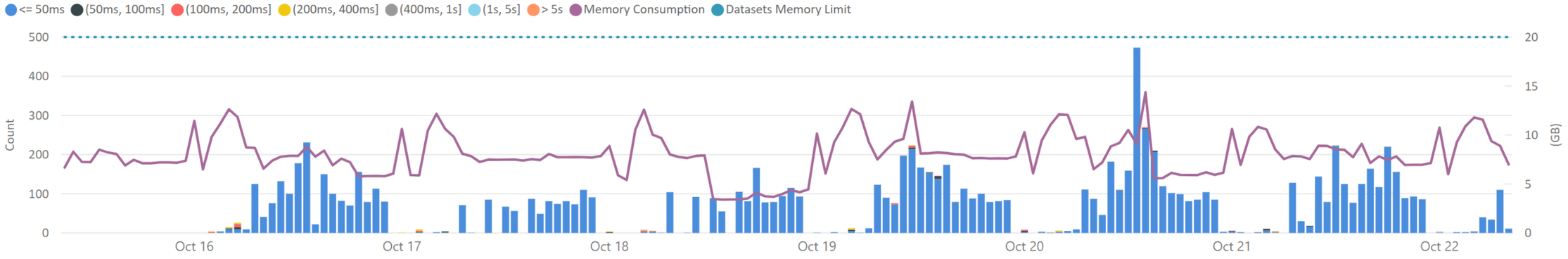
Top 5 datasets by average wait time (ms)

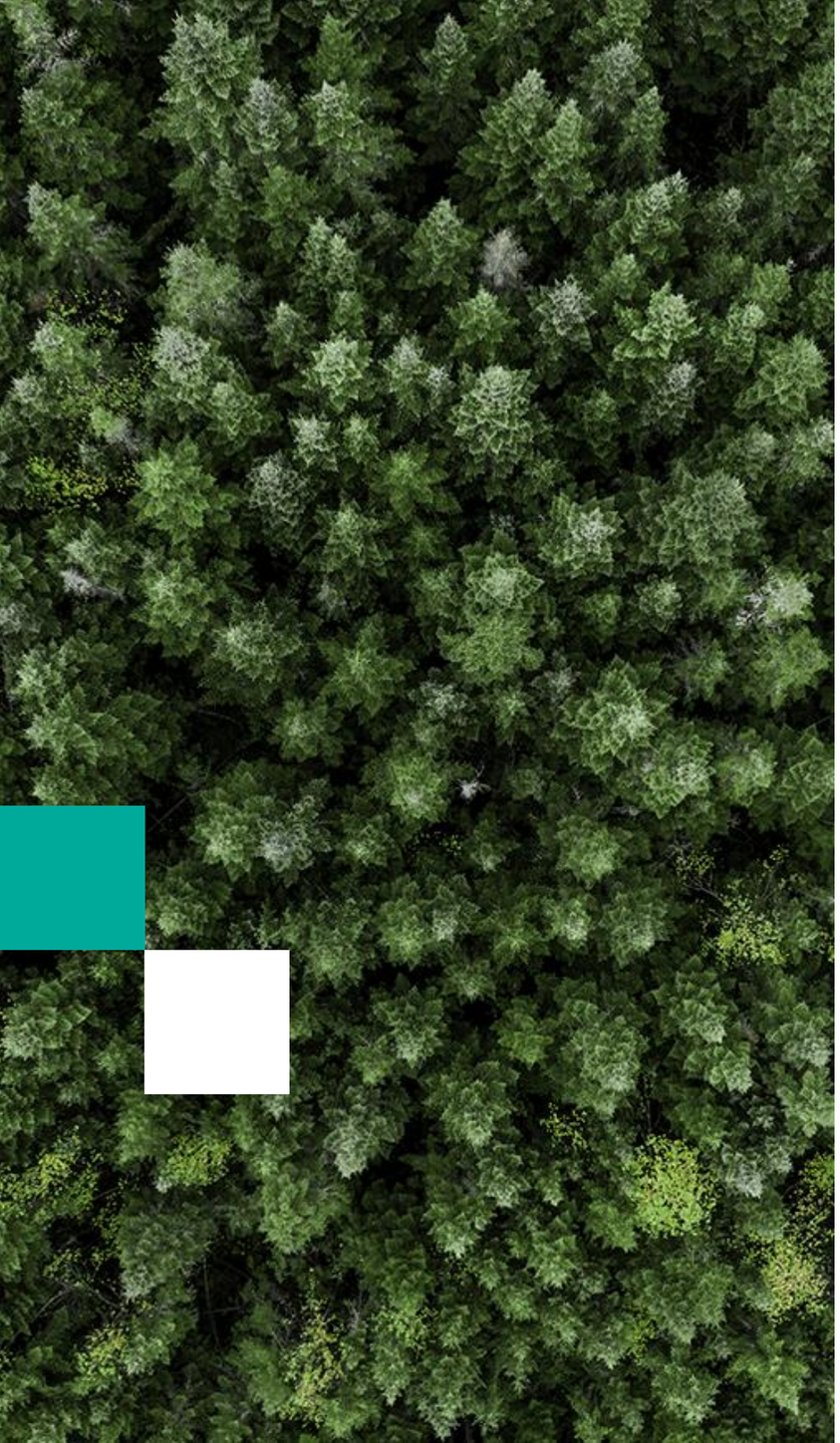


Wait time distributions



Hourly query wait time distributions





What’s going on?

Power BI Auditing

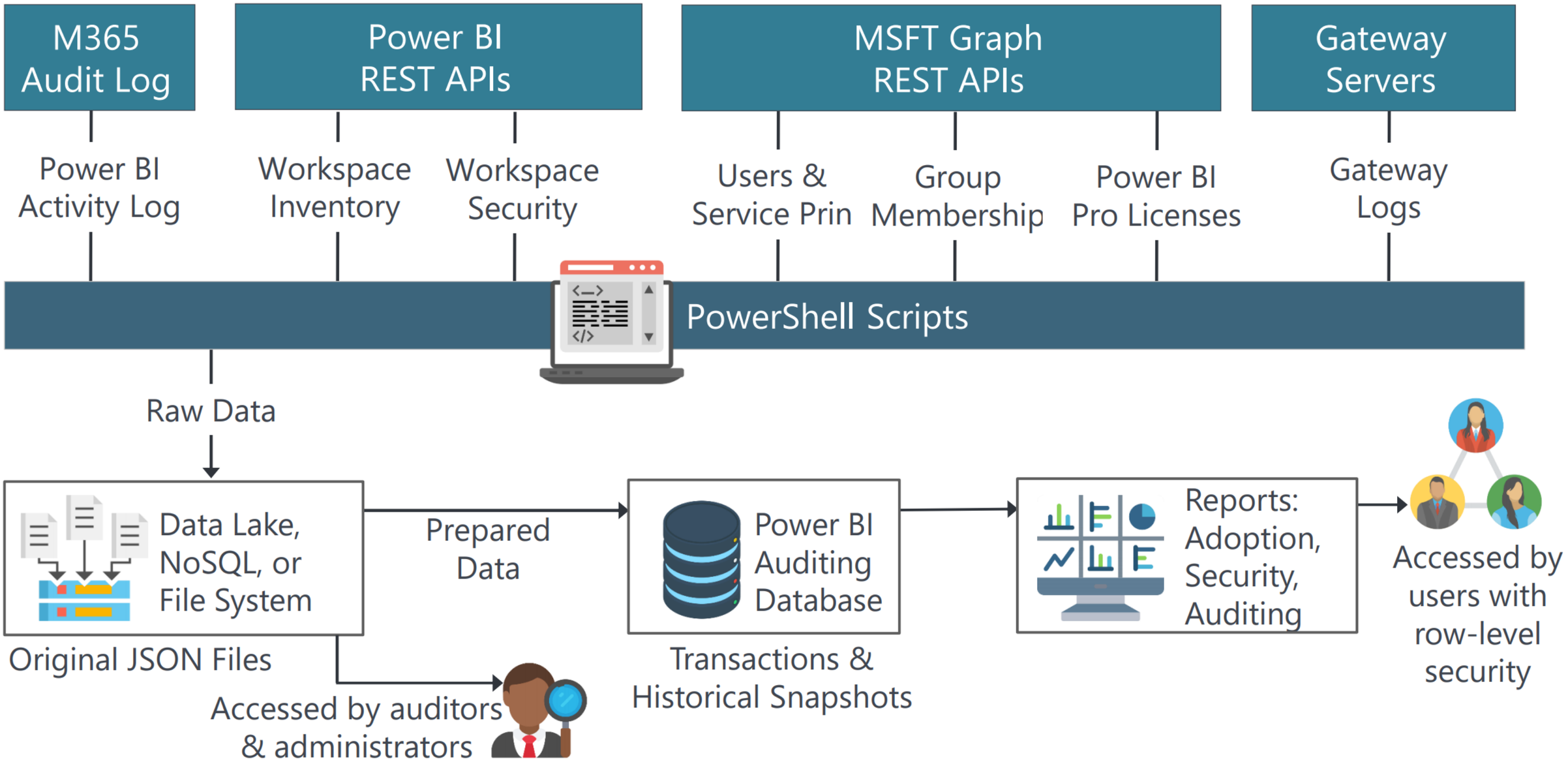
Extract information about

- Artefacts
- Usage
- User information
- Licensing

Correlate these for insights into your capacity usage

- Are users actively using their Pro Subscription?
- Are we having usage spikes at certain (predictable) moments?
- Are we seeing suspicious behaviour that needs to be looked into?

Typical Power BI Auditing Solution



Scheduled Refreshes

By default, scheduled refreshes can be configured by anyone

Concurrent refreshes are limited by Capacity SKU

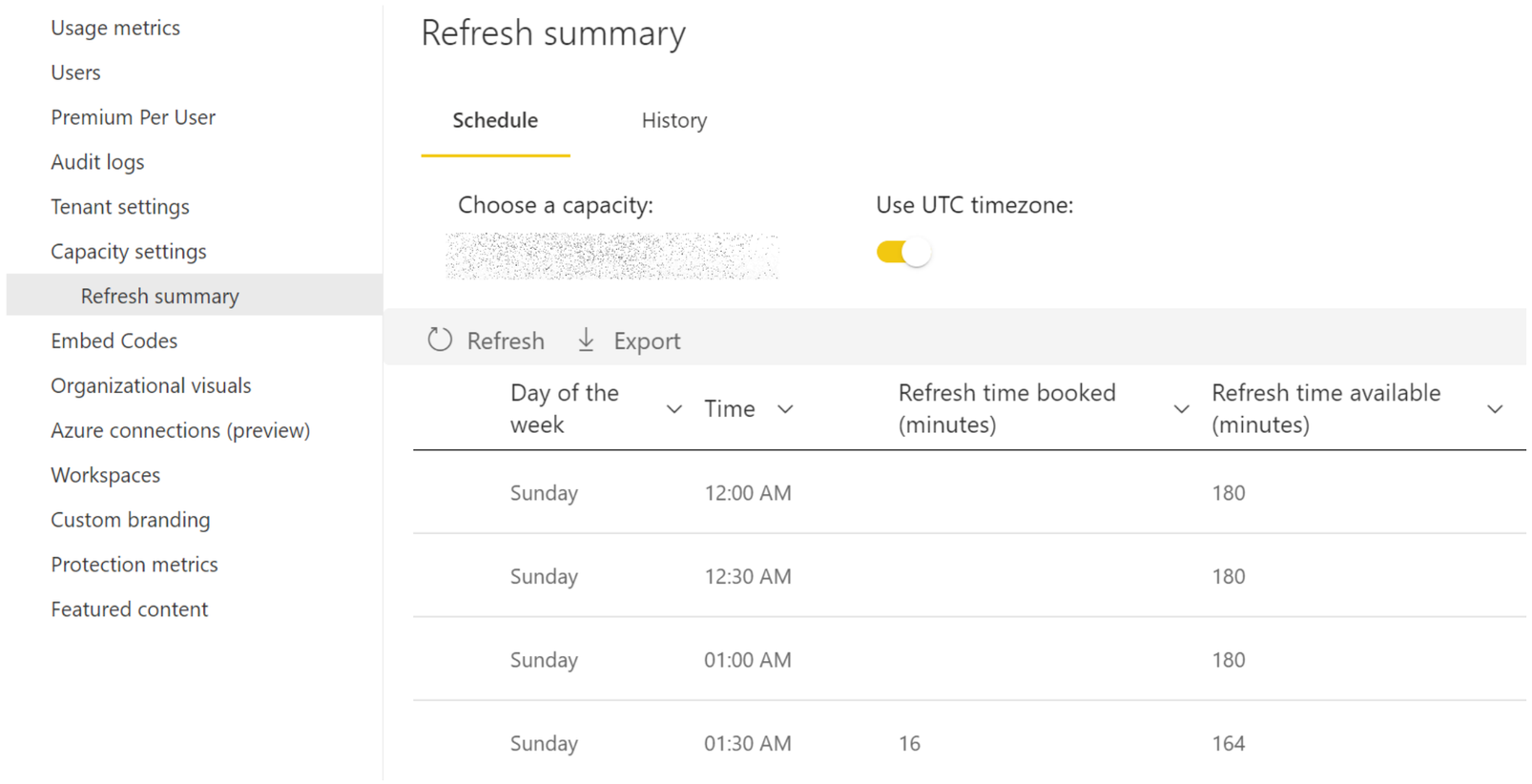
Avoid congestions on specific timezones

Refer to Capacity Refresh Summary

TIP: Extract Refresh Schedules and History, build your own

Capacity Refresh Summary

Admin portal



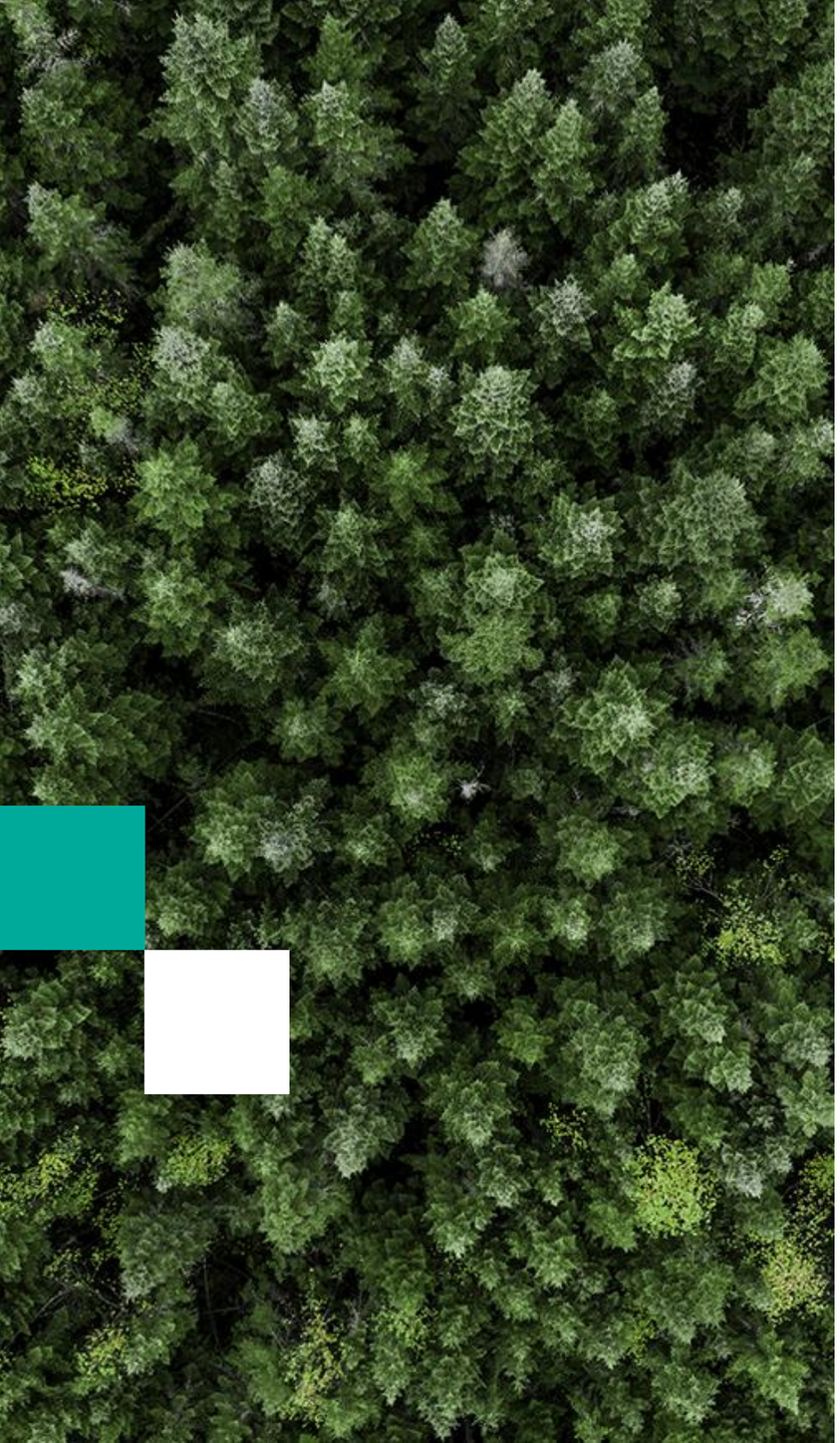
Capacity Refresh History

Refresh summary

Schedule | History

Refresh | Export

Name	Type	Workspace	Capacity	Start time	Duration	Average duration	Refreshes per day	Outcome	Owner
[redacted]	Dataset	[redacted]	[redacted]	Today, 09:01 AM	00:00:21	00:00:31	5	Completed	[redacted]
	Dataset			Today, 01:30 AM	00:03:33	00:03:24	1	Completed	
	Dataset			Today, 01:00 AM	00:00:29	00:00:28	1	Completed	
	Dataset			Today, 01:30 AM	00:00:58	00:00:40	1	Completed	
	Dataset			Today, 11:22 AM	00:00:02	00:00:03	60	Completed	



It’s all about the €€€

Power BI Pro Licenses

TIP: Consuming users don’t need Power BI Pro Subscriptions

Users will not need a Power BI Pro Subscription when :

- They are a viewer in an App Workspace (v2), backed by Premium
- A member of a App Workspace App, backed by Premium

Users will need a Power BI Pro Subscription when :

- They are an Admin, Member, Contributor in any Workspace
- Sharing content with other users in the organisation
- Consuming any content that is not hosted on Power BI Premium

Power BI Embedded (A Sku)

A Sku has close to feature parity

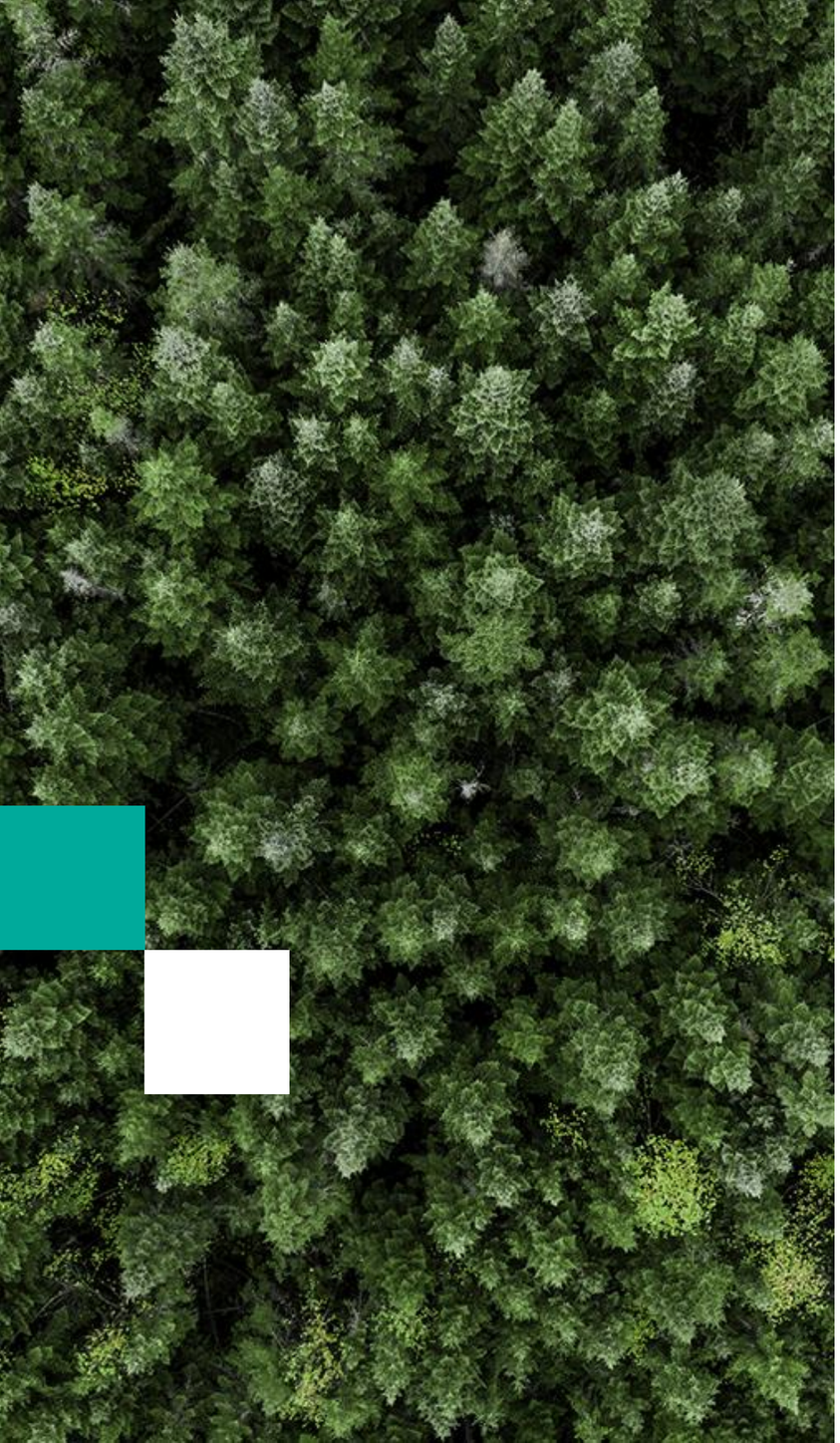
Billed by the minute to Azure Billing

- Don’t forget to set up Billing Alerts, Policies, and Automation ☺

TIP: You can spin up A SKU to host certain ‘Premium Features’ when needed, to reduce usage on the P SKU

- Ie. Use an A SKU for the ‘DEV’ and ‘ACC’ workspace of Deployment Pipelines

An A Sku can not be used for organisational production usage



Power BI Premium Per User

Power BI Premium Per User (PPU)

PPU is a subscription based model, based on Premium Gen 2

Introduced at Ignite (September 2020)

Free usage for entire preview period

General Availability on April 2nd 2021

Pricing:

- 10$ as an add-on to Power BI Pro / Office 365 E5
- 20$ as a standalone subscription

Power BI Premium Per User (PPU)

Access to Premium features on a per user basis

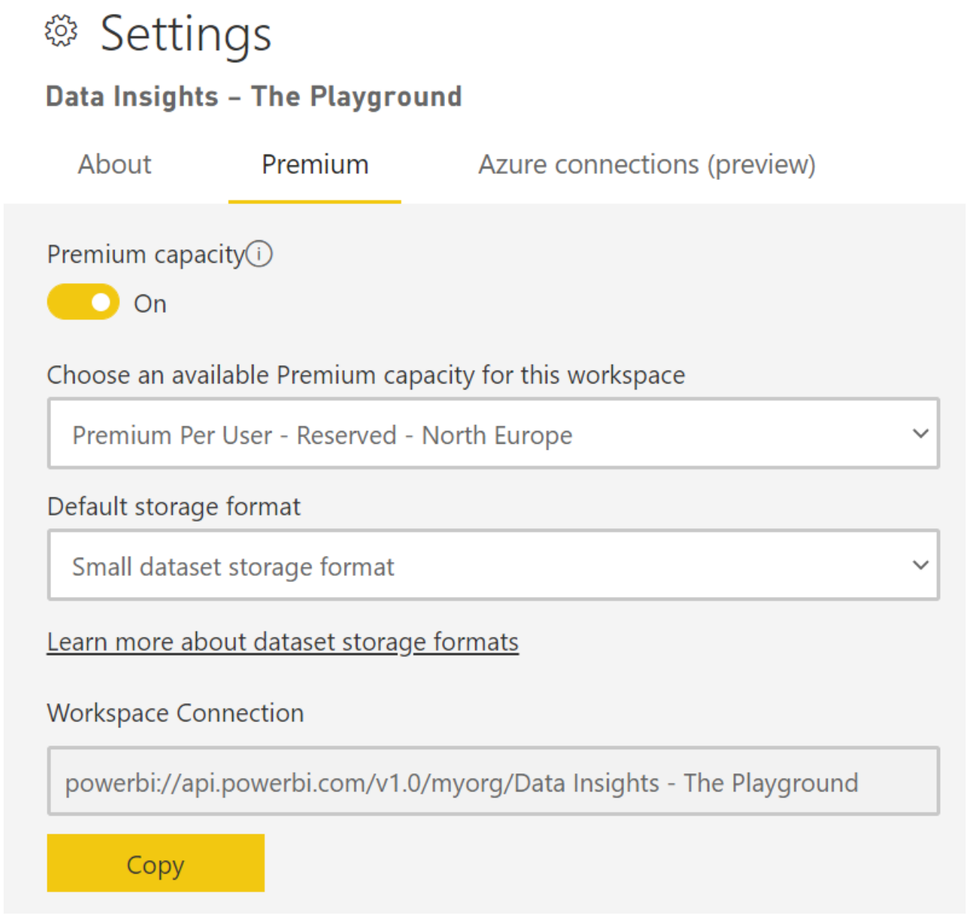
Every tenant has a PPU Capacity (P3 equivalent)

Workspaces are assigned to the Capacity

PPU Content requires every consumer to have a subscription

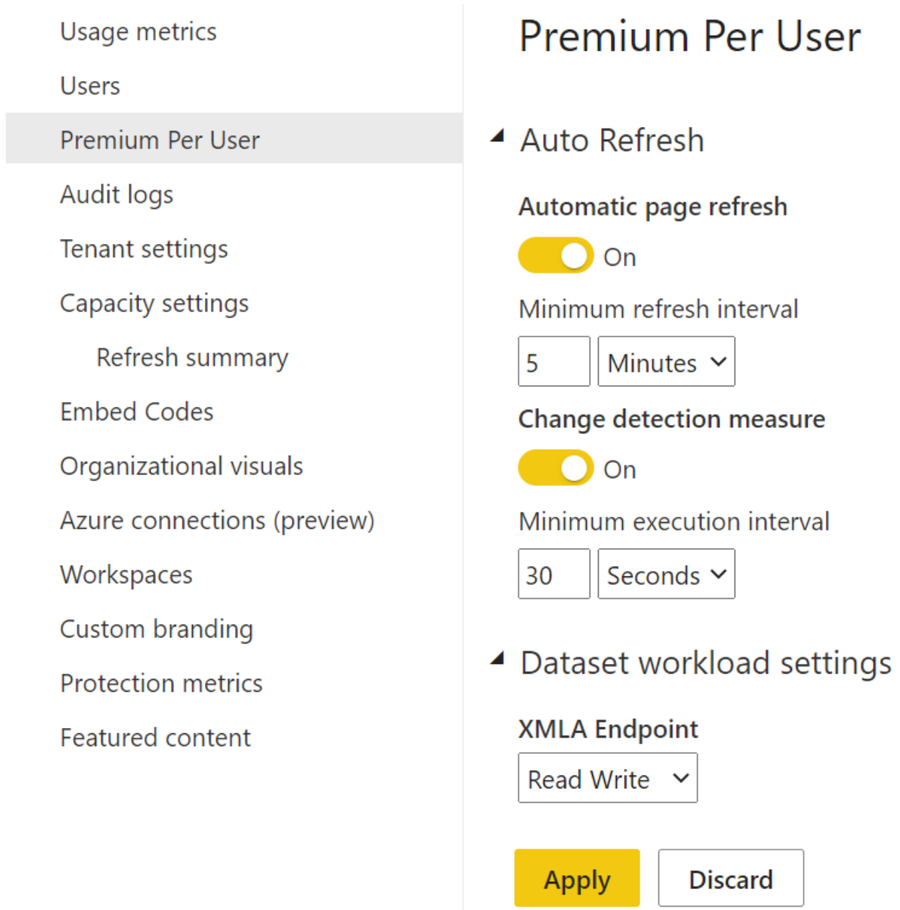
Aimed at smaller organisations, or offloading scenarios

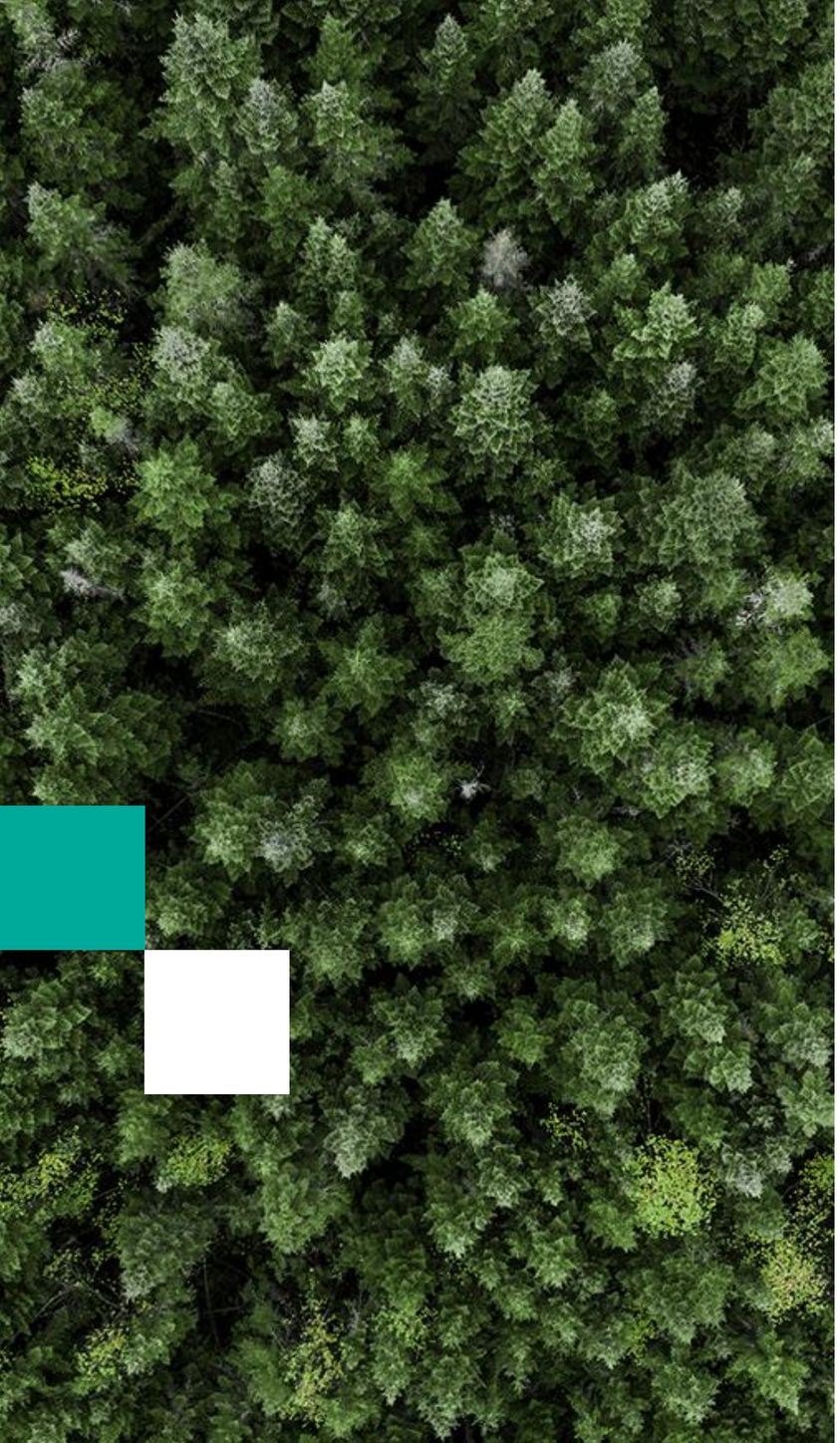
Power BI Premium Per User (PPU)



Power BI Premium Per User (PPU)

Admin portal





What about Premium Gen 2?

Power BI Premium Gen 2

Flexibility to license by capacity **AND** by user

Up to 16X performance boost

Scale capacity when needed with Autoscale

Consistent and reliable cost-management

Power BI Premium Gen 2

Currently still in Public Preview, no official date known

Easily switch over your tenant between Gen 1 & Gen 2

Aimed at more ‘bang for buck’, specifically for performance

Power BI Premium Gen 2

A few key concepts to remember:

- Under the covers, everyone operates on P3 equivalent shared nodes
- Goodbye Dedicated Capacity, hello Reserved Capacity!
- Usage metrics shift from memory usage to cpu usage
- Usage metrics now return 30 – 45 days by default

Power BI Premium Gen 2 - Advantages

Shared nodes are P3 equivalent (increasing concurrency)

Load balancing will block out memory for your process

Organisational Noisy Neighbours are limited

Cross-workload resource contention is eliminated

Resource limitations shift to:

- Total capacity CPU Throughput
- Memory limit per artefact equivalent to your capacity sku limit

Power BI Premium Gen 2 - Backend v-Cores

Backend v-cores are implemented on regional clusters

Shared by all tenants in that region

Clusters have resource groups, allocated to handle workloads

Power BI Premium Gen 2 - Storage

Contents are stored on the organisational storage layer

Limited to 100TB per organisation, across all workloads

Loaded into shared compute nodes by request

Power BI handles load balancing

Power BI Premium Gen 2 – Load Evaluation

Based on your P-sku, you have an ‘allowance’ per cycle

- Ie. P1 has 4 backend v-cores, for 30 seconds each.

Every 30 seconds, Power BI evaluates throughput

- Slow operations (Background) are spread out across 24 hours
- Fast operations (Interactive) are aggregated to a 30 second window

Aggregation of these two determines load per cycle

Power BI Premium Gen 2 – AutoScale

AutoScale can be configured per P Sku

Reaching a load evaluation treshold, AutoScale **can** kick in

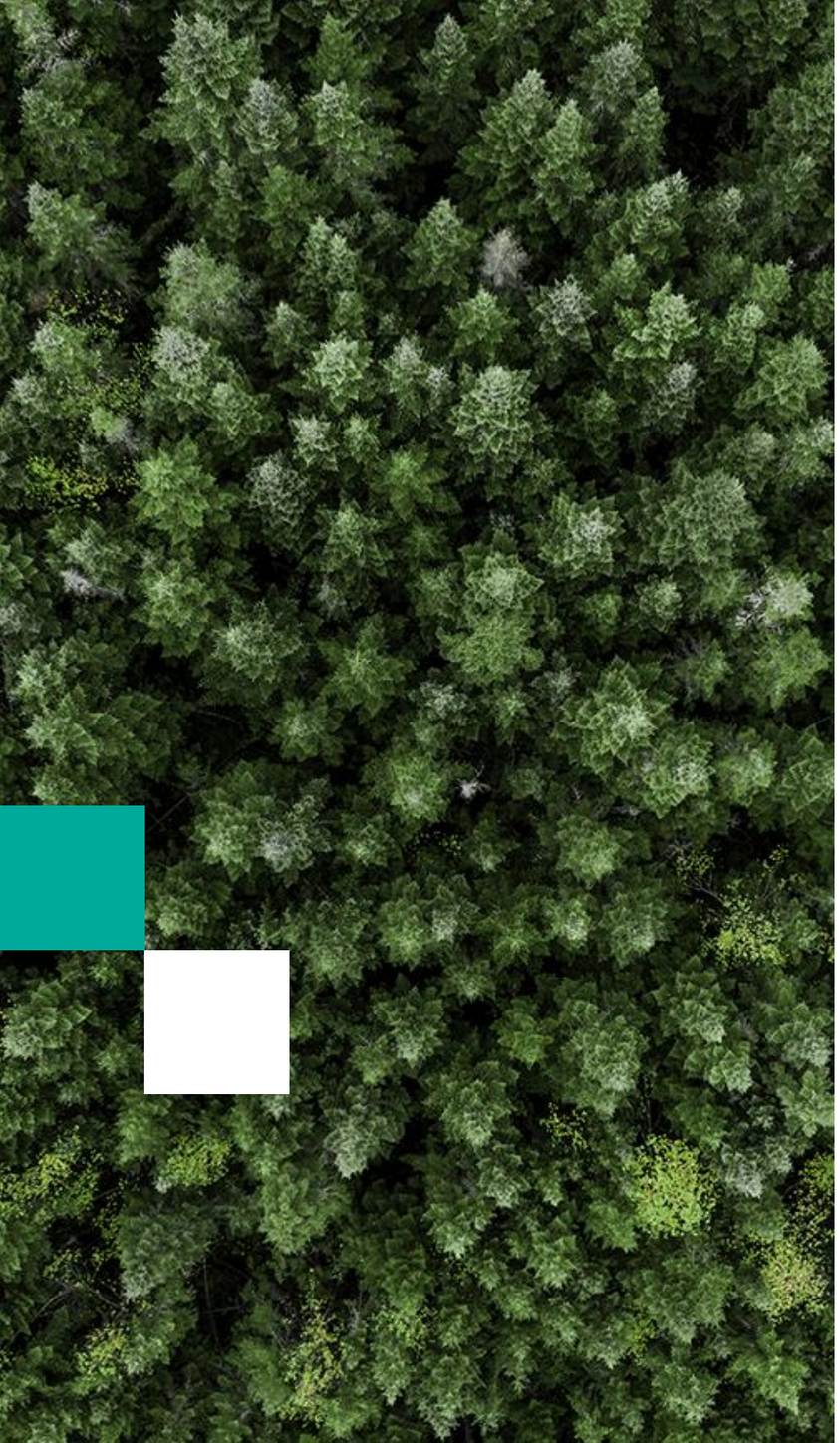
For 24 hours, you'll receive an extra backend v-core

Up to maximum amount of v-cores you have for your capacity

Priced at 85$, per v-core, per 24 hours

Billed through your Azure Subscription

TIP: Set up reactive / proactive budget control

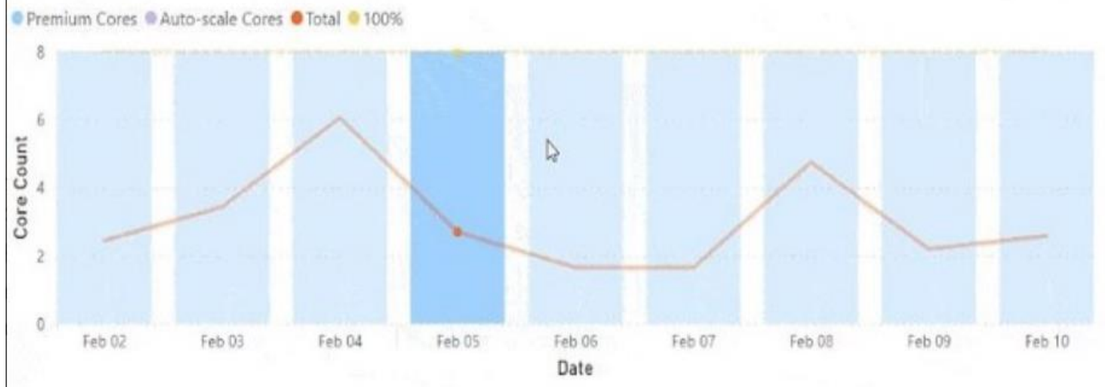


Power BI Premium Gen 2 Metrics App

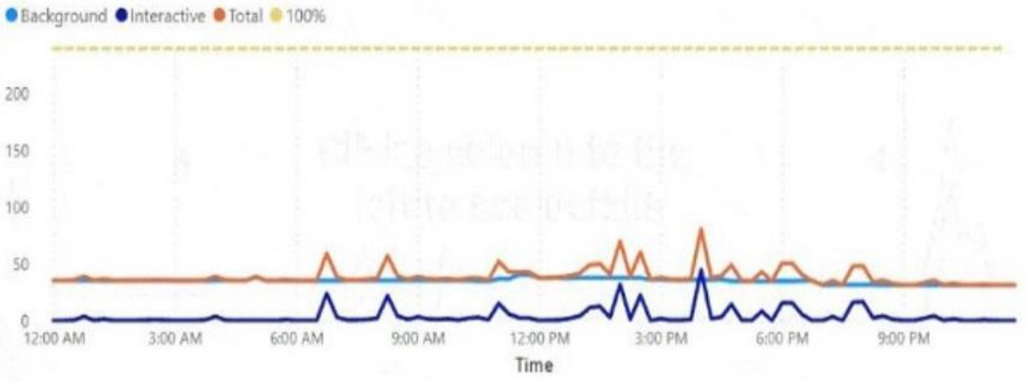
The visualizations below show the daily peak usage of your Premium capacity as a percentage of the capacity's cores, as well as the workspaces and operations that contributed to the usage. Click on a day to see how the usage was spread across the day.

Ctrl + click on any data point to see which workspaces and artifacts were in use during that time.

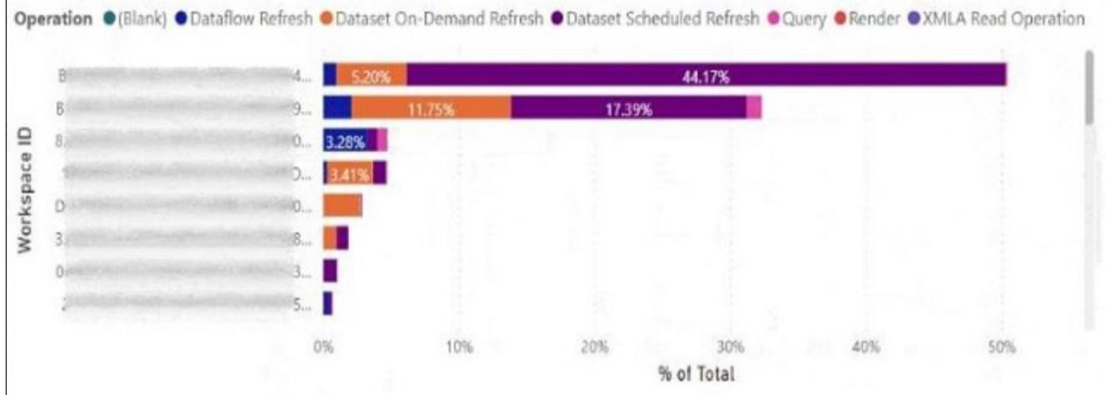
Daily peak usage



Peak usage - 15m intervals



Total by Workspace ID and Operation



WorkspaceId	ArtifactId	Artifact kind	Identity	Interactive usage (s)	Background usage (s)	Total usage (s)
[redacted]	[redacted]	Dataset	(PII:H1...	263.93		263.929
[redacted]	[redacted]	Dataset	(PII:H1...	240.79		240.789
[redacted]	[redacted]	Dataset	(PII:H1...	221.20		221.195
[redacted]	[redacted]	Dataset	(PII:H1...	186.84		186.835
[redacted]	[redacted]	Dataset	(PII:H1...	184.60		184.598
[redacted]	[redacted]	Dataset	(PII:H1...	119.21		119.207
[redacted]	[redacted]	Dataset	(PII:H1...	94.83		94.833
[redacted]	[redacted]	Dataset	(PII:H1...	74.01		74.009
[redacted]	[redacted]	Dataset	(PII:H1...	73.52	20,499.357	20,572.876
[redacted]	[redacted]	Dataset	(PII:H1...	72.97		72.970
[redacted]	[redacted]	Dataset	(PII:H1...	72.08		72.081
[redacted]	[redacted]	PaginatedR...	(PII:H1...	44.62		44.624
[redacted]	[redacted]	Dataset	(PII:H1...	39.74		39.739

Workspace ID: All

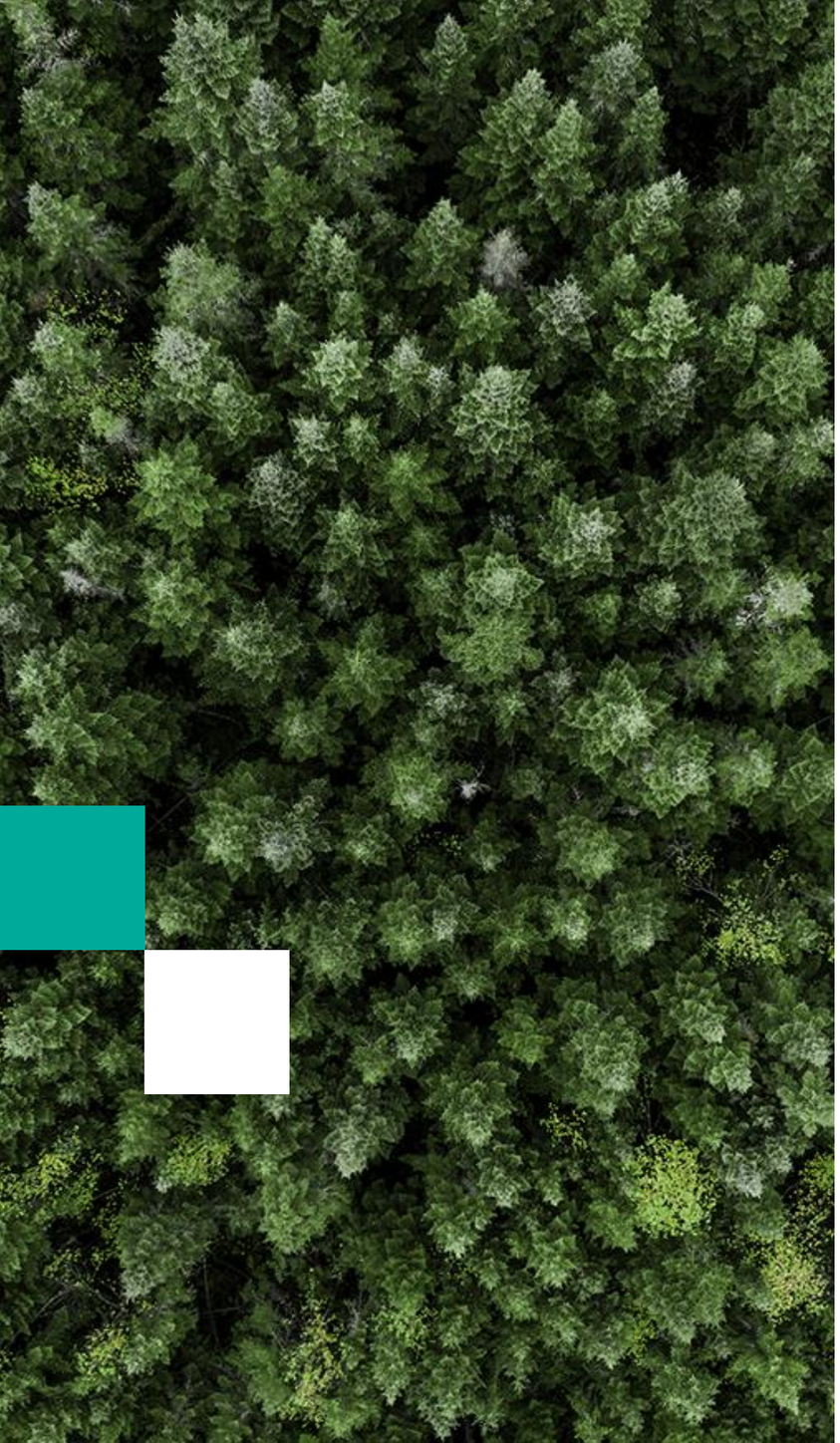
Operation: All

34% Total

4:11 PM Time

19% Interactive

15% Background



Takeaways

Takeaways

Check (and adjust) the Capacity Workload Settings

Premium Capacity Metrics App v2 is your Ops Base

Evictions are perfectly normal, don’t stress

Set up auditing to have a complete overview of what’s happening

Activate large model support for models > 1GB

Offload non-production workloads to A Sku / PPU

Takeaways (Power BI Premium Gen 2)

Premium Gen2 and PPU will be yuuuuge

Understand the shift in usage metrics (Memory -> CPU)

When using Gen 2 AutoScale, set up consumption limits

Usage Patterns are still key, even though the need is less pressing

Fingers crossed for Azure Monitor integration ☺

Resources

https://docs.microsoft.com/en-us/power-bi/admin/service-premium-what-is

https://docs.microsoft.com/en-us/power-bi/admin/service-premium-faq

https://docs.microsoft.com/en-us/power-bi/admin/service-premium-large-models

Resources

https://powerbi.microsoft.com/en-us/blog/answering-your-questions-around-the-new-power-bi-premium-per-user-license/

https://powerbi.microsoft.com/en-us/blog/driving-a-data-culture-in-a-world-of-remote-everything/

https://powerbi.microsoft.com/en-us/blog/announcing-the-upcoming-evolution-of-power-bi-premium-to-enterprise-markets-and-beyond/

Resources

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

https://docs.microsoft.com/en-us/power-bi/transform-model/desktop-ai-insights

https://ssbipolar.com/2019/06/29/power-bi-dataflows-enhanced-compute-engine/

Resources

https://docs.microsoft.com/en-us/power-bi/paginated-reports/paginated-reports-report-builder-power-bi

https://docs.microsoft.com/en-us/power-bi/admin/service-premium-connect-tools

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

Resources

https://docs.microsoft.com/en-us/power-bi/admin/service-premium-concepts

https://docs.microsoft.com/en-us/power-bi/admin/service-premium-gen2-metrics-app

https://appsource.microsoft.com/en-us/product/power-bi/pbi_pcmm.microsoftpremiumpen2ptilizationmetrics?tab=Overview

Resources

https://docs.microsoft.com/en-us/power-bi/admin/service-premium-auto-scale

https://docs.microsoft.com/en-us/power-bi/admin/service-premium-faq

https://docs.microsoft.com/en-us/power-bi/developer/embedded/embedded-capacity

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

Resources

https://powerbi.microsoft.com/en-us/blog/premium-gen2-utilization-analysis-app-now-available/

https://powerbi.microsoft.com/en-us/blog/announcing-power-bi-premium-per-user-general-availability-and-autoscale-preview-for-gen2/

About me

dataMinds.be Co-Leader

@BenniDeJagere

/bennidejagere

sessionize /bennidejagere

Microsoft® Most Valuable Professional

Data Platform

#SayNoToPieCharts