Power BI Premium Practical Tips to make the most of it

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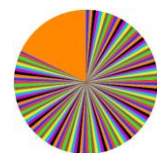
About me

dataMinds.be Co-Leader

@BenniDeJagere

/bennidejagere

/bennidejagere

Data Platform

#SayNoToPieCharts

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 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

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

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

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?

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

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] On

Max Memory (%)

| 20 |

PAGINATED REPORTS - *Active*
Your workload is ready to use.

[On] On

Max Memory (%)

| 15 |

DATASETS - *Active*
Your workload is ready to use.

[On] 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] On

Minimum refresh interval

| 10 | | Minutes ∨ |

Change detection measure

[Off] Off

Minimum execution interval

| 10 | | Minutes ∨ |

XMLA Endpoint

| Read Write ∨ |

DATAFLOWS - *Active*
Your workload is ready to use.

[On] On

Max Memory (%)

| 5 |

Enhanced Dataflows Compute Engine

[Off] Off

Container Size (Mb)

| 700 |

Compute engine memory (%)

| 30 |

Premium Capacity Metrics App

Premium Capacity Metrics App (v2)

Represents collected metrics for different workloads

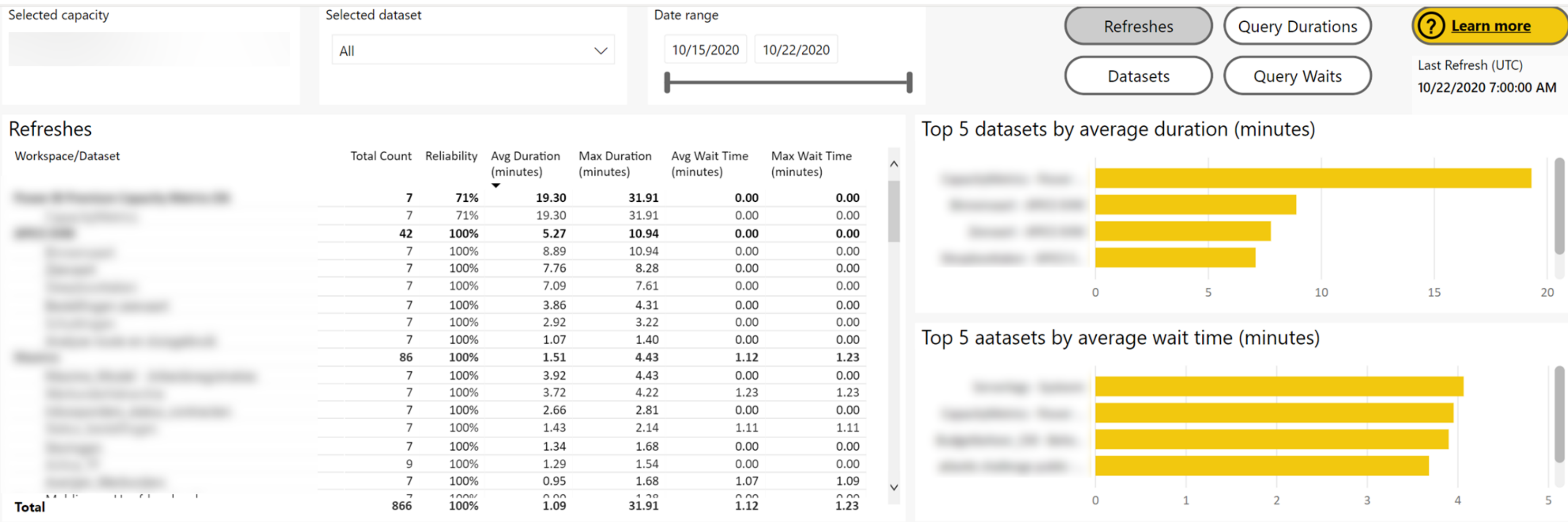Slice 'n Dice with workspaces, datasets, ..

Collects 7 days worth of data

Storing the data for own usage isn't straight forward

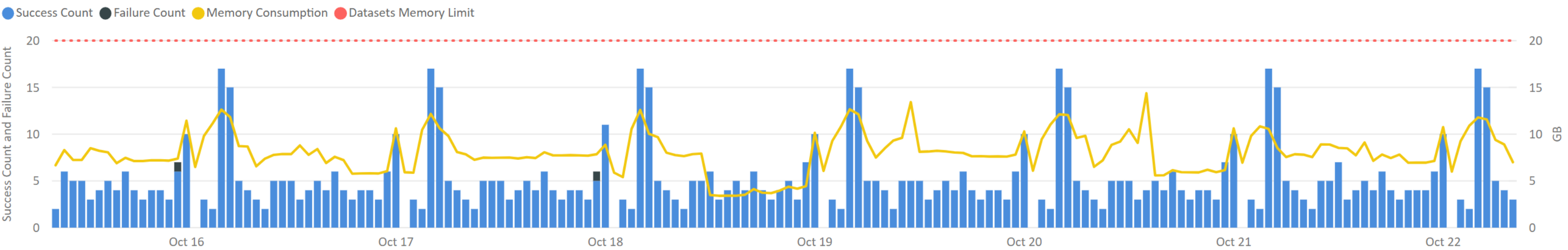All hope rests on Azure Monitor integration for historical data
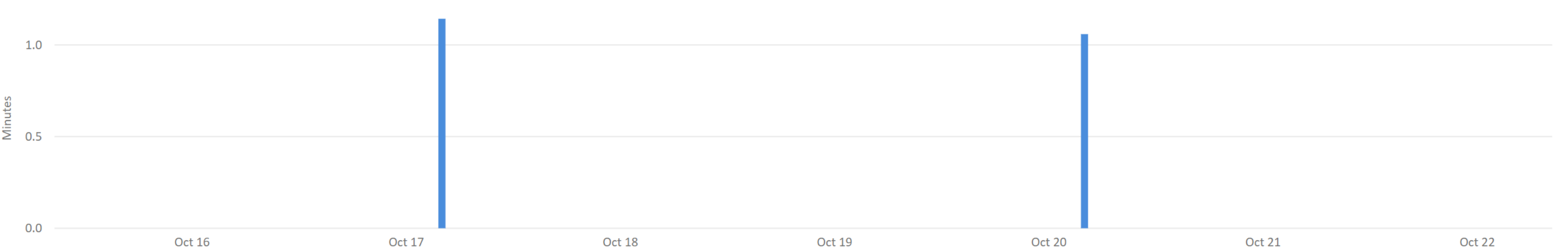
Premium Capacity Metrics App (v2)

Premium Capacity Metrics App (v2)

Hourly refresh count and memory consumption (GB)

● Success Count ● Failure Count ● Memory Consumption ● Datasets Memory Limit

Hourly average refresh wait times (minutes)

22

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)
	2,267.36
	226.89
	355.57
	2,267.36
	1,056.60
	702.14
	1,493.14
	57.19
	57.19
	728.24
	55.24
	73.57
	116.89
	142.71
	32.62
	64.27
	4.12
	3.16
	29.13
	160.09
	36.47
	231.61
	16.91
	55.52
Total	**2,267.36**

Dataset eviction counts

Capacity Name	Total
	612
Total	**612**

High active memory count (over 80%)

Capacity Name	SKU	Count
	P1	0
Total		**0**

Hourly loaded dataset counts

● Models ● Memory Consumption ● Datasets Memory Limit
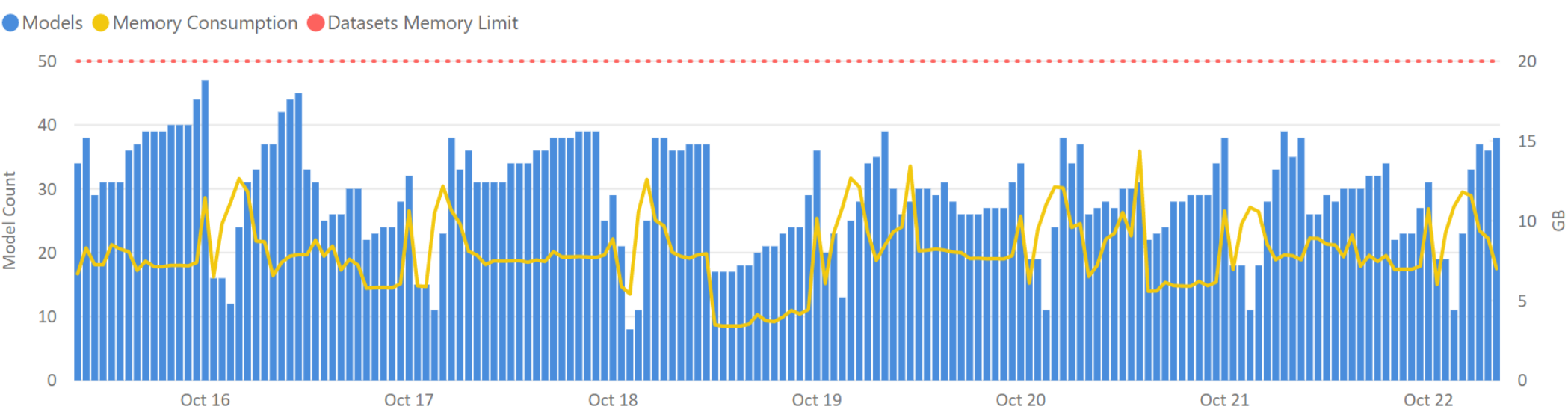
Hourly dataset evictions and memory consumption

● Total evictions ● Memory Consumption ● Datasets Memory Limit
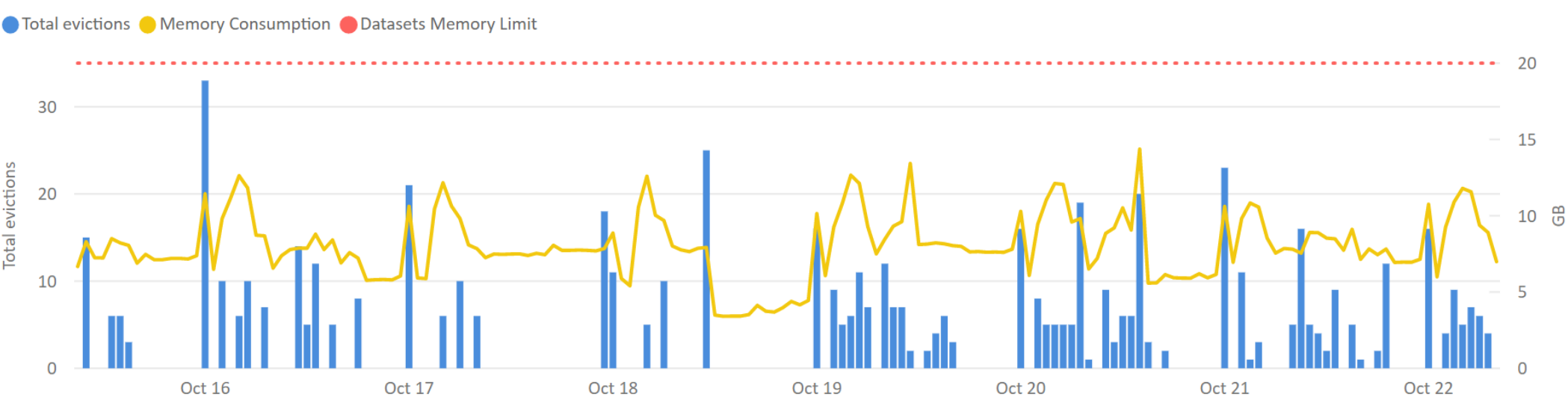
Consumed memory percentages

● Active ● All

24
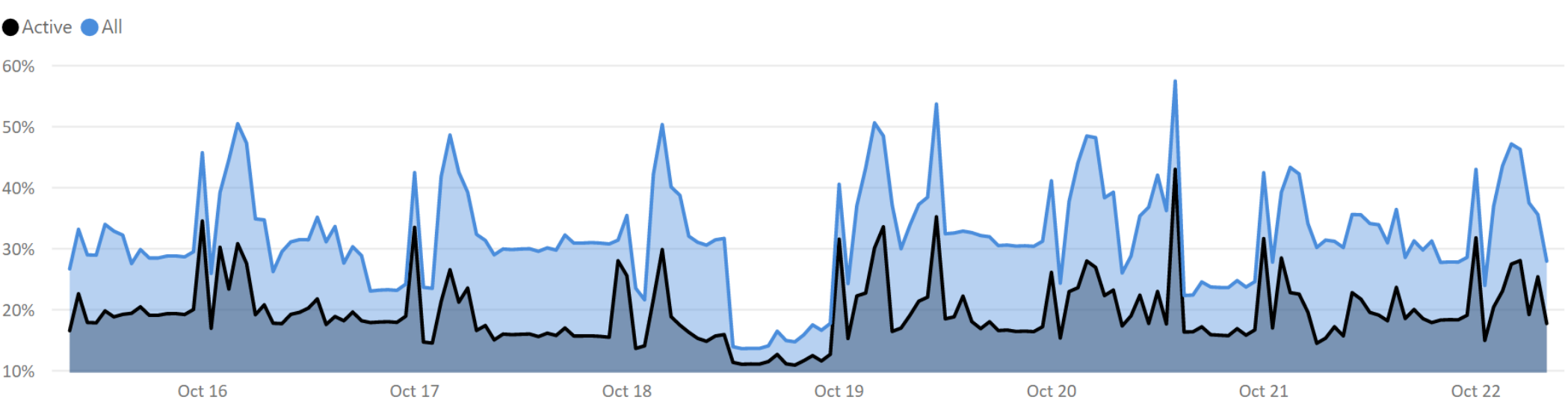
Memory Evictions

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

Query duration distribution

● <= 30ms ● (30ms, 100ms] ● (100ms, 300ms] ● (300ms, 1s] ● (1s, 3s] ● (3s, 10s] ● (10s, 30s] ● > 30s

84.44%   9.45%

Top 5 datasets by average duration (ms)

Hourly query duration distributions

● <= 30ms ● (30ms, 100ms] ● (100ms, 300ms] ● (300ms, 1s] ● (1s, 3s] ● (3s, 10s] ● (10s, 30s] ● > 30s ● Memory Consumption ● Datasets Memory Limit

DirectQuery/live connections - times exceeded 80% utilization

27

Query wait times

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

● <= 50ms ● (50ms, 100ms] ● (100ms, 200ms] ● (200ms, 400ms] ● (400ms, 1s] ● (1s, 5s] ● > 5s

98.81%
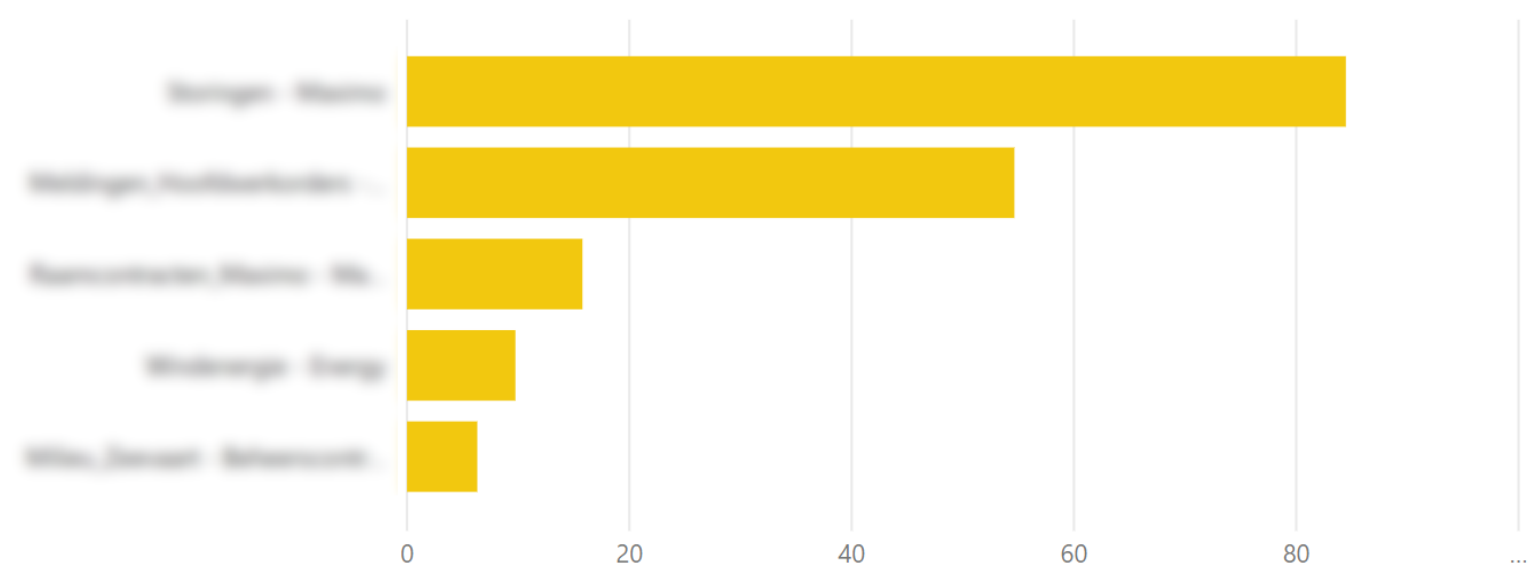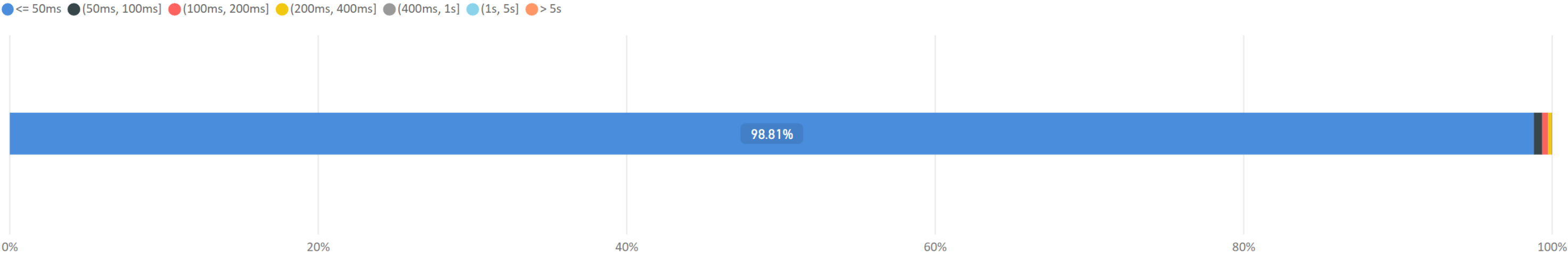
Hourly query wait time distributions

● <= 50ms ● (50ms, 100ms] ● (100ms, 200ms] ● (200ms, 400ms] ● (400ms, 1s] ● (1s, 5s] ● > 5s ● Memory Consumption ● Datasets Memory Limit

28
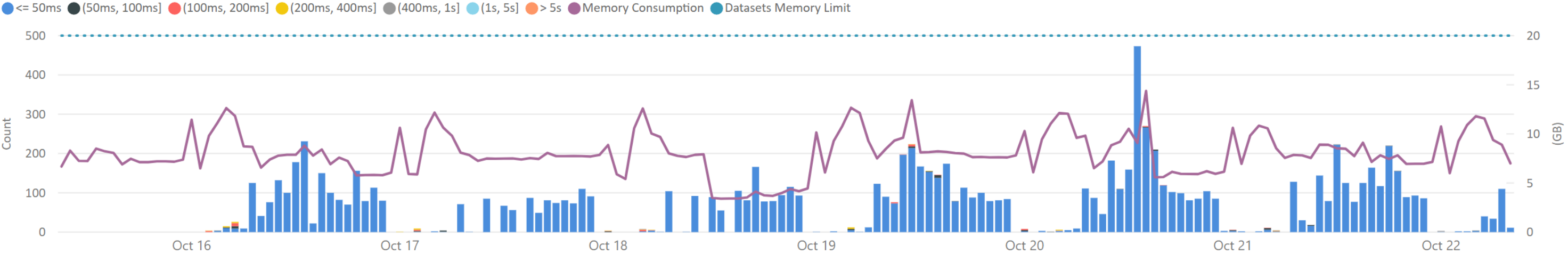
What's going on?

Power BI Auditing

Extract information about

Artefacts

Usage

User information

Licensing

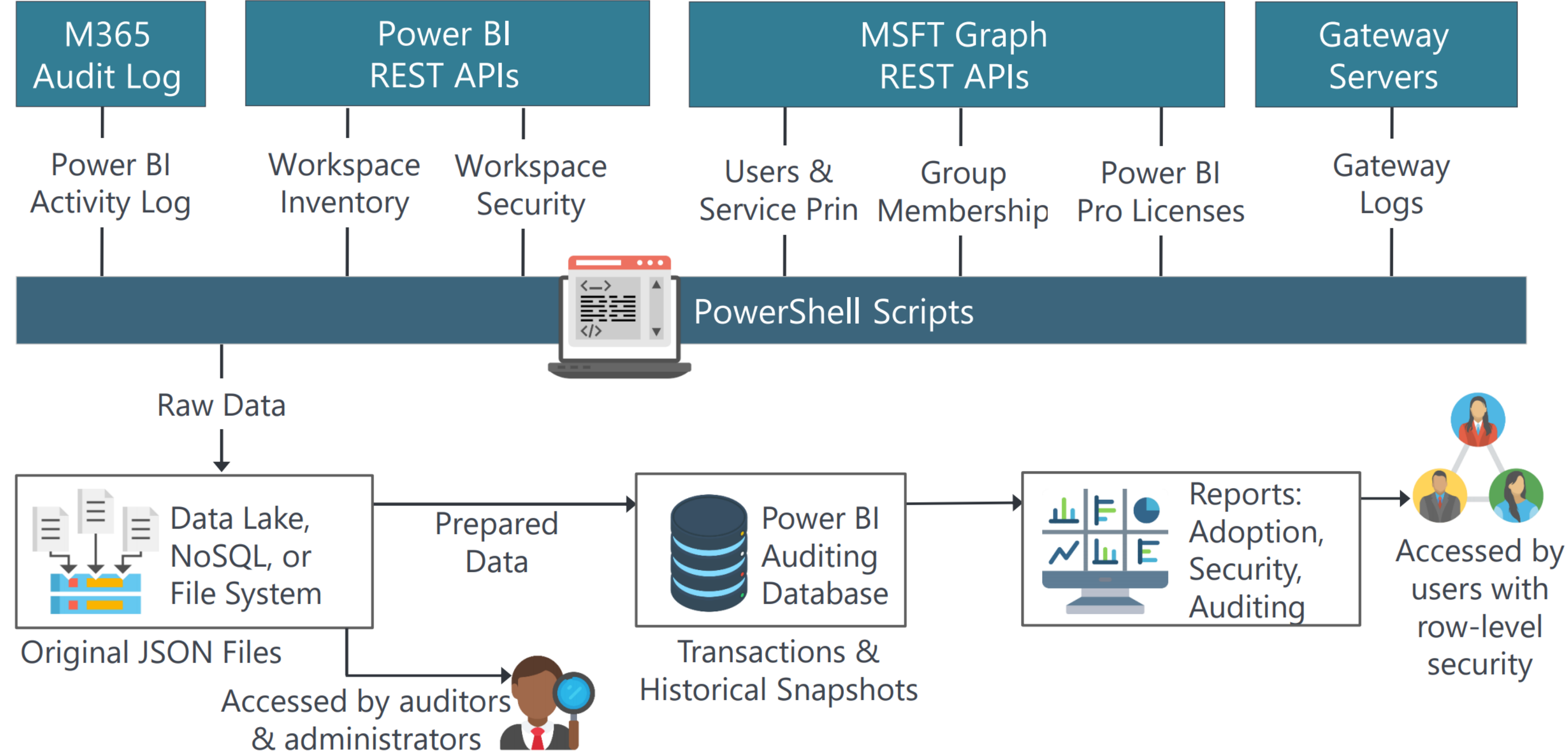Correlate these for insights into your capacity usage

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

M365 Audit Log	Power BI REST APIs		MSFT Graph REST APIs			Gateway Servers
Power BI Activity Log	Workspace Inventory	Workspace Security	Users & Service Prin	Group Membership	Power BI Pro Licenses	Gateway Logs

PowerShell Scripts

Raw Data

Data Lake, NoSQL, or File System

Original JSON Files

Accessed by auditors & administrators

Prepared Data

Power BI Auditing Database

Transactions & Historical Snapshots

Reports: Adoption, Security, Auditing

Accessed by users with row-level security

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

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

Refresh summary

Schedule   History

Choose a capacity:

Use UTC timezone:

↻ Refresh   ↓ Export

Day of the week	Time	Refresh time booked (minutes)	Refresh time available (minutes)
Sunday	12:00 AM		180
Sunday	12:30 AM		180
Sunday	01:00 AM		180
Sunday	01:30 AM	16	164

Capacity Refresh History

Refresh summary

Schedule   **History**

↻ Refresh   ↓ Export

Name	Type	Workspace	Capacity	Start time	Duration	Average duration	Refreshes per day	Outcome	Owner
	Dataset			Today, 09:01 AM	00:00:21	00:00:31	5	Completed	
	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

<u>An A Sku can not be used for organisational production usage</u>

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 (H2 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)

⚙ Settings

Data Insights – The Playground

About   Premium   Azure connections (preview)

Premium capacity ⓘ

🟡 On

Choose an available Premium capacity for this workspace

Premium Per User - Reserved - North Europe ⌄

Default storage format

Small dataset storage format ⌄

Learn more about dataset storage formats

Workspace Connection

powerbi://api.powerbi.com/v1.0/myorg/Data Insights - The Playground

Copy

Power BI Premium Per User (PPU)

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

Premium Per User

◢ Auto Refresh

Automatic page refresh

On

Minimum refresh interval

5   Minutes ▾

Change detection measure

On

Minimum execution interval

30   Seconds ▾

◢ Dataset workload settings

XMLA Endpoint

Read Write ▾

Apply   Discard

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 & cpu usage to only 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

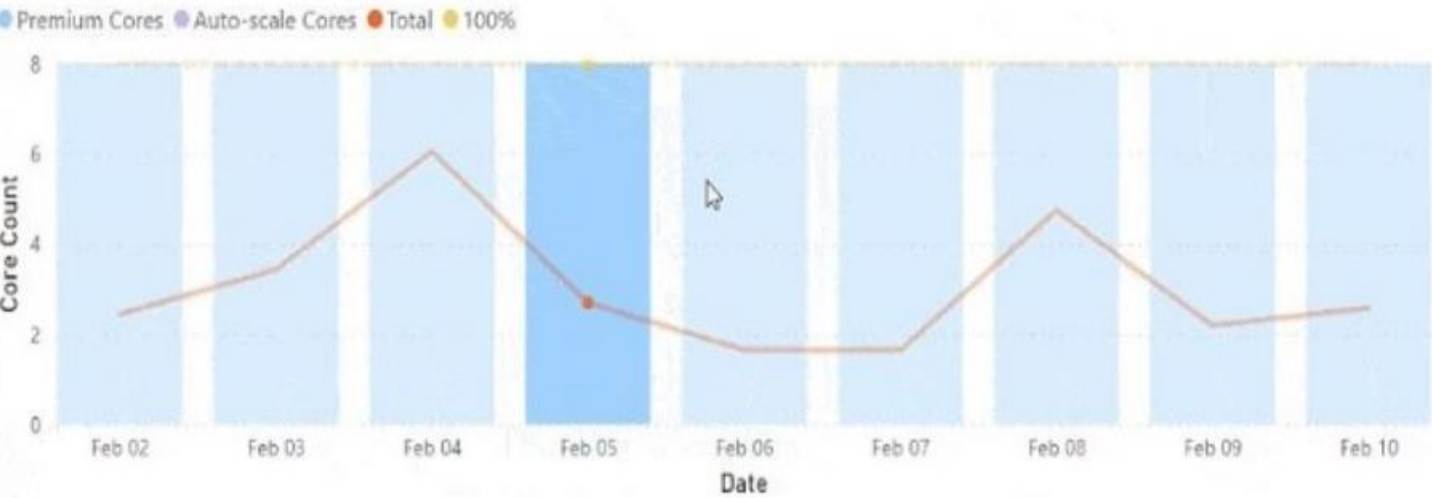**TIP**: Set up reactive / proactive budget control
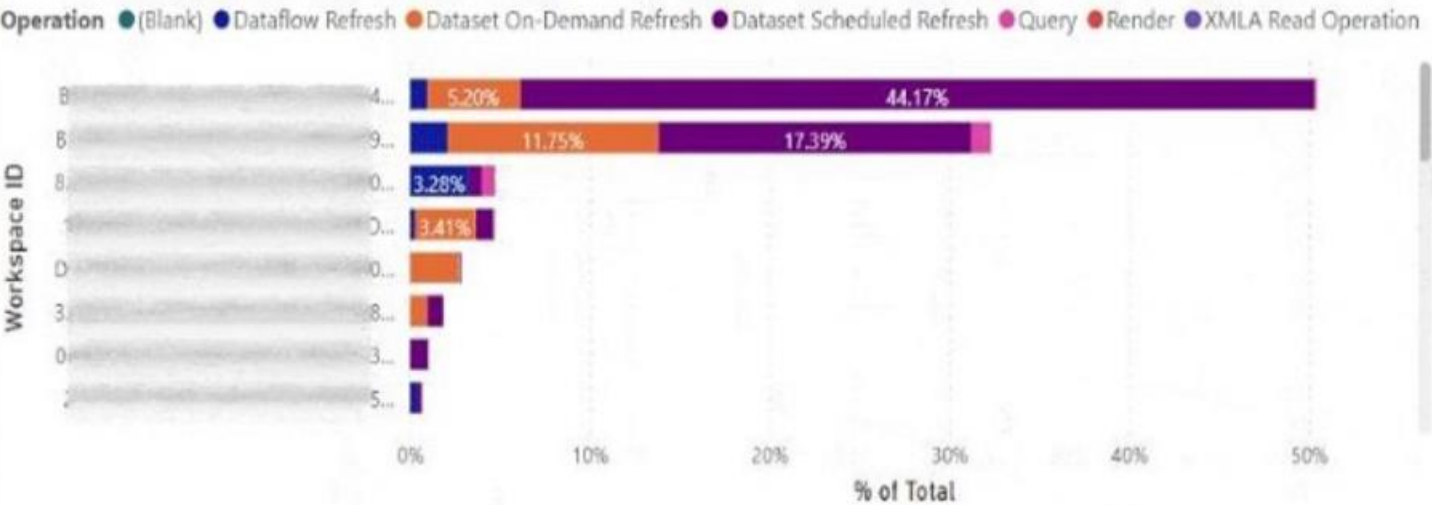
Power BI Premium Gen 2 Metrics App

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

● Premium Cores ● Auto-scale Cores ● Total ● 100%

Peak usage - 15m intervals

● Background ● Interactive ● Total ● 100%

Total by Workspace ID and Operation

Operation ● (Blank) ● Dataflow Refresh ● Dataset On-Demand Refresh ● Dataset Scheduled Refresh ● Query ● Render ● XMLA Read Operation
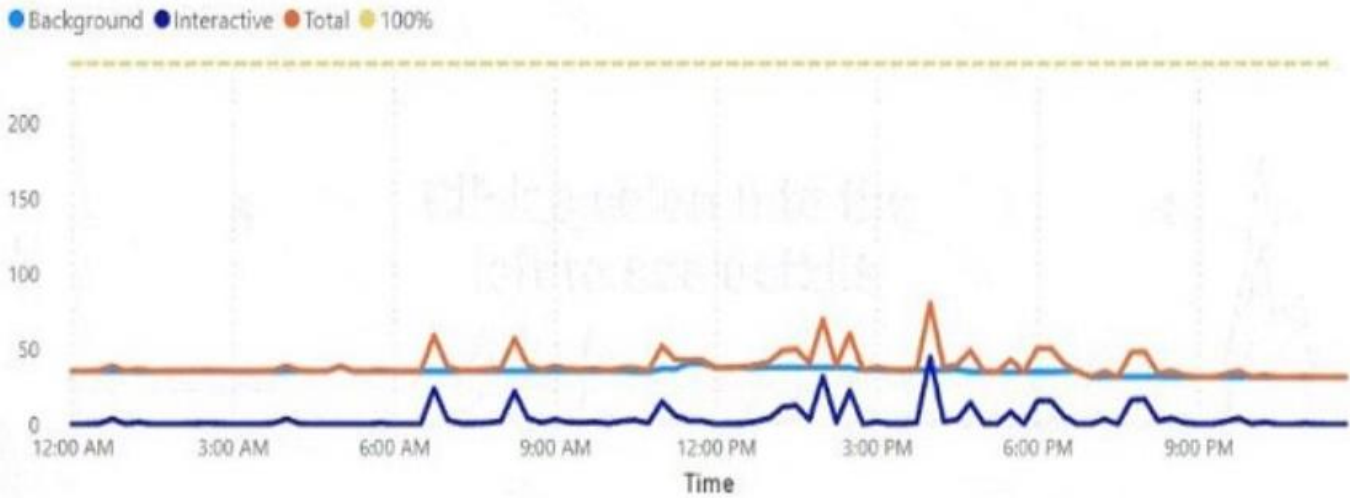
WorkspaceId	ArtifactId	Artifact kind	Identity	Interactive usage (s)	Background usage (s)	Total usage (s)
		Dataset	(PII:H1...	263.93		263.929
		Dataset	(PII:H1...	240.79		240.789
		Dataset	(PII:H1...	221.20		221.195
		Dataset	(PII:H1...	186.84		186.835
		Dataset	(PII:H1...	184.60		184.598
		Dataset	(PII:H1...	119.21		119.207
		Dataset	(PII:H1...	94.83		94.833
		Dataset	(PII:H1...	74.01		74.009
		Dataset	(PII:H1...	73.52	20,499.357	20,572.876
		Dataset	(PII:H1...	72.97		72.970
		Dataset	(PII:H1...	72.08		72.081
		PaginatedR...	(PII:H1...	44.62		44.624
		Dataset	(PII:H1	20.74		20.739

Workspace ID
All ⌄

Operation
All ⌄

34%	**4:11 PM**	**19%**	**15%**
Total	Time	Interactive	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/
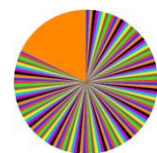
About me

dataMinds.be Co-Leader

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Data Platform

#SayNoToPieCharts