



# Top 5 Reasons to Move to SQL Server 2022

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MVP – Data Platform

Friend of Redgate

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# Denny Cherry & Associates Consulting

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Certified IT professionals to help achieve IT goals

Clients ranging from small business to Fortune 10  
corporations

Help save on costs while improving IT reliability and solving  
challenges



# My Slides & Demos

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<https://bit.ly/mypresentationfiles>





How many features were released with  
SQL Server 2022?

Analytics	Availability	Security	Performance	QS & IQP	Management	Platform	Language
Azure Synapse Link for SQL	Link to Azure SQL Managed Instance	Support MS-TDS 8.0 protocol	System page latch concurrency enhancements	Query Store on secondary replicas	Integrated setup experience for the Azure extension for SQL Server	SQL Server Native Client (SNAC) has been removed	Resumable add table constraints
Object storage integration	Contained availability group	Microsoft Defender for Cloud integration	Buffer pool parallel scan	Query Store hints	Manage Azure extension for SQL Server	Hybrid buffer pool with direct write	CREATE INDEX
Data Virtualization	Distributed availability group	Microsoft Purview integration	Ordered clustered columnstore index	Memory grant feedback	Max server memory calculations	Integrated acceleration & offloading	Transactional replication
	Improved backup metadata	Ledger	Improved columnstore segment elimination	Parameter sensitive plan optimization	Accelerated Database Recovery (ADR) improvements	Improved optimization	CREATE STATISTICS
	Azure Active Directory authentication	In-memory OLTP management	Degree of parallelism (DOP) feedback	Improved snapshot backup support			SELECT ... WINDOW clause
	Always encrypted with secure enclaves	Virtual log file growth	Cardinality estimation feedback	Shrink database	WAIT_AT_LOW_PRIORITY		IS [NOT] DISTINCT FROM
	Access Control: Permissions	Thread management	Optimized plan forcing	XML compression			Time series functions
	Access Control: Server-level Roles	Reduced buffer pool I/O promotions		Asynchronous auto update statistics concurrency			JSON functions
	Dynamic data masking	Enhanced spinlock algorithms		Backup and restore to S3-compatible object storage			Aggregate functions
	Support for PFX certificates, and other cryptographic improvements	Improved virtual log file (VLF) algorithms					T-SQL functions
		Instant file initialization for transaction log file growth events					

# Agenda

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Parameter Sensitive Plan

DOP Feedback

ADR Enhancements

Query store on readable secondaries

Parallel redo thread management

S3 Object Store Integration

Azure Synapse Link for SQL

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# Parameter Sensitive Plans



# Parameter Sensitive Plan

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SQL Server 2022

Helps solve parameter sniffing issues

Only works on equality predicates

Query/Dispatcher Plan/Query Variant

# Parameter Sensitive Plan

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Predicate Cardinality evaluated at runtime for parameter values.

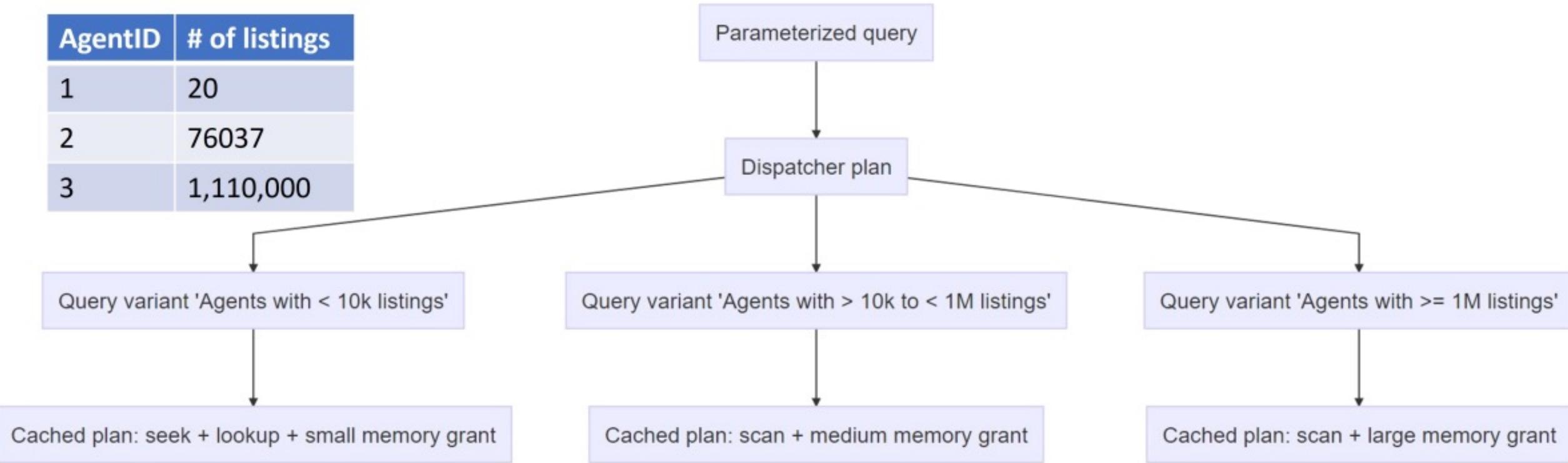
Cardinality values placed into three predicate cardinality “buckets” via Dispatcher.

Child queries are then compiled and executed generating query variants. They have their own execution plan in Query Store.

# Parameter Sensitive Plan



AgentID	# of listings
1	20
2	76037
3	1,110,000



Sys.query\_store\_plan

Sys.query\_store\_query\_variant



# Degree of Parallelism Feedback

# DOP Feedback

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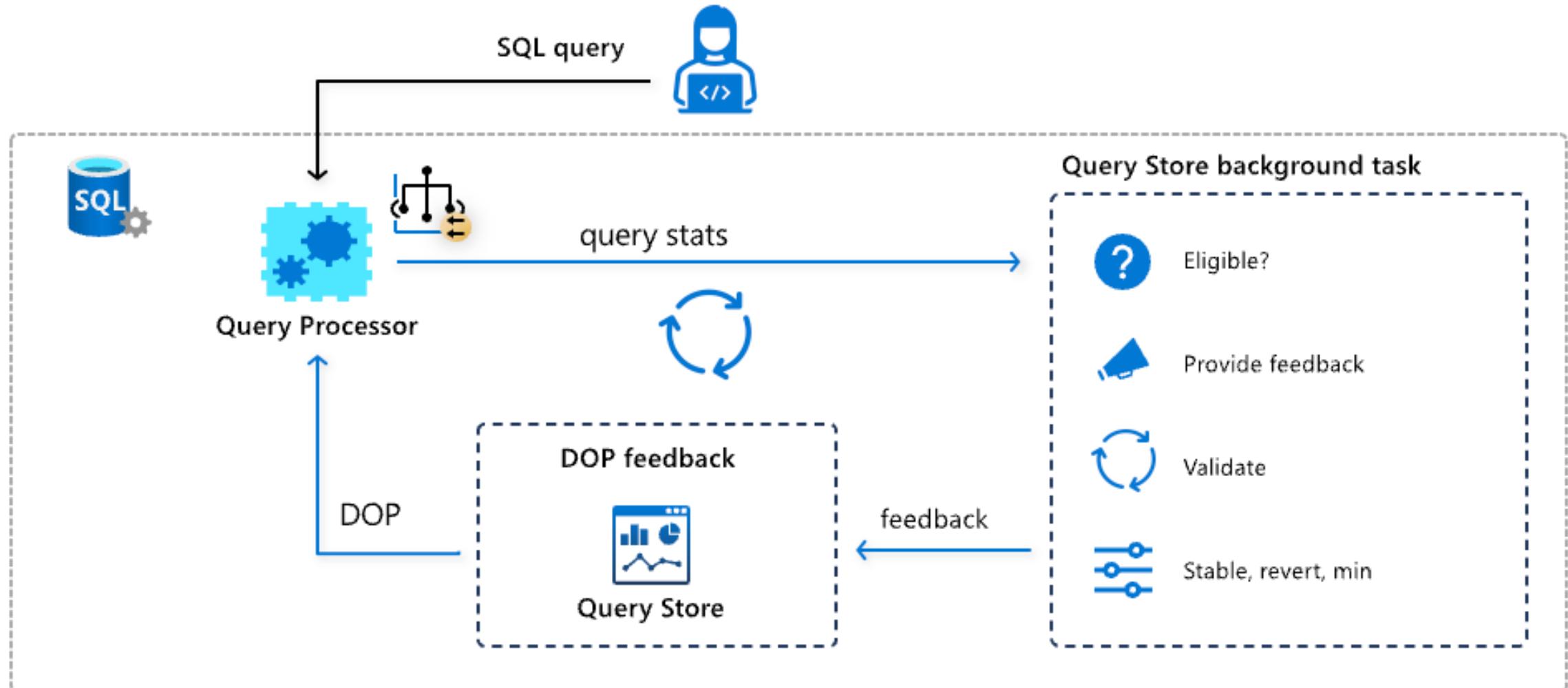
Uses elapsed time and waits to identify inefficient parallelism for repeating queries

Query store is required

Plan regression = last known good DOP

Honors Plan forcing

# DOP Feedback Architecture



# DOP Feedback

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Won't rotate up unless reverting

DOP of 2 is the minimum value

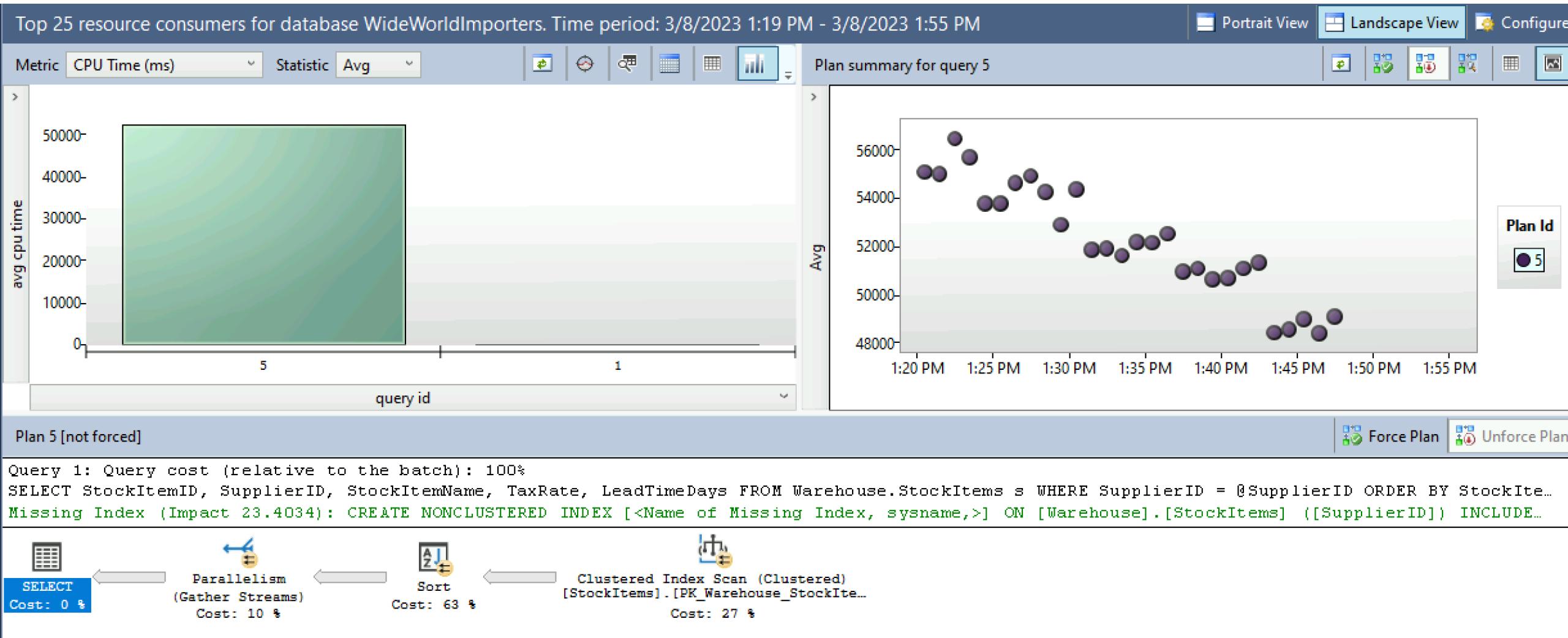
Query Hints will be the new ceiling limit if  $> 2$

DOP Feedback is Replica aware

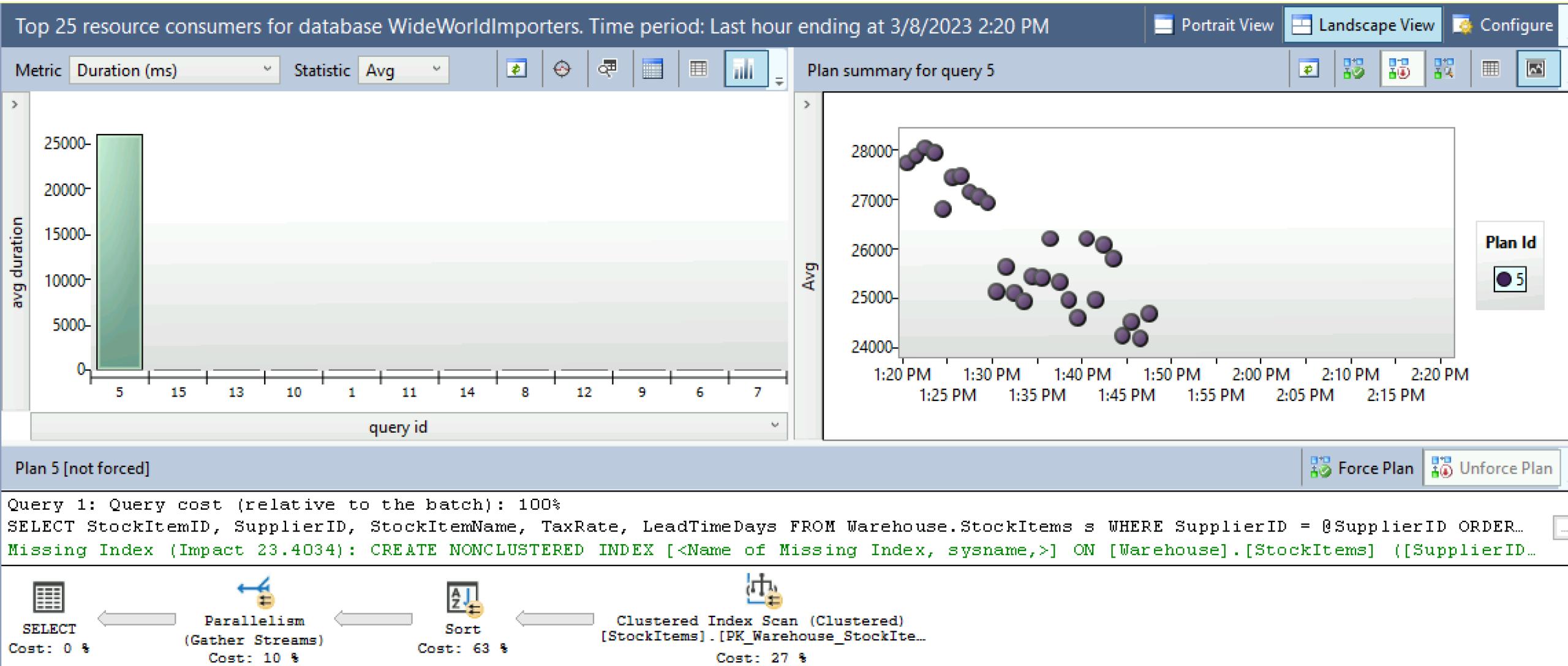
## Displaying 16 Events

	name	timestamp	feedback_dop	query_dop
▶	dop_feedback_eligible_query	2023-03-08 13:16:55.7877502	NULL	16
	dop_feedback_provided	2023-03-08 13:23:30.4246819	12	16
	dop_feedback_validation	2023-03-08 13:23:58.8934144	12	NULL
	dop_feedback_validation	2023-03-08 13:24:26.7528532	12	NULL
	dop_feedback_validation	2023-03-08 13:28:58.6556280	12	NULL
	dop_feedback_provided	2023-03-08 13:29:26.7178994	8	12
	dop_feedback_validation	2023-03-08 13:29:52.5435216	8	NULL
	dop_feedback_validation	2023-03-08 13:31:34.9902149	8	NULL
	dop_feedback_validation	2023-03-08 13:35:47.0307650	8	NULL
	dop_feedback_provided	2023-03-08 13:36:13.8242589	6	8
	dop_feedback_validation	2023-03-08 13:36:39.4556774	6	NULL
	dop_feedback_validation	2023-03-08 13:38:20.4270055	6	NULL
	dop_feedback_validation	2023-03-08 13:42:35.0200419	6	NULL
	dop_feedback_provided	2023-03-08 13:42:59.9480367	4	6
	dop_feedback_validation	2023-03-08 13:43:24.4562714	4	NULL
	dop_feedback_validation	2023-03-08 13:45:04.2911374	4	NULL

# CPU Time



# Duration





# Accelerated Database Recovery

# ADR Enhancements

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Introduced in 2019

Near instantaneous rollback of transactions

Game changer for transaction management

New objects

SLOG

Persisted version store

Logical revert

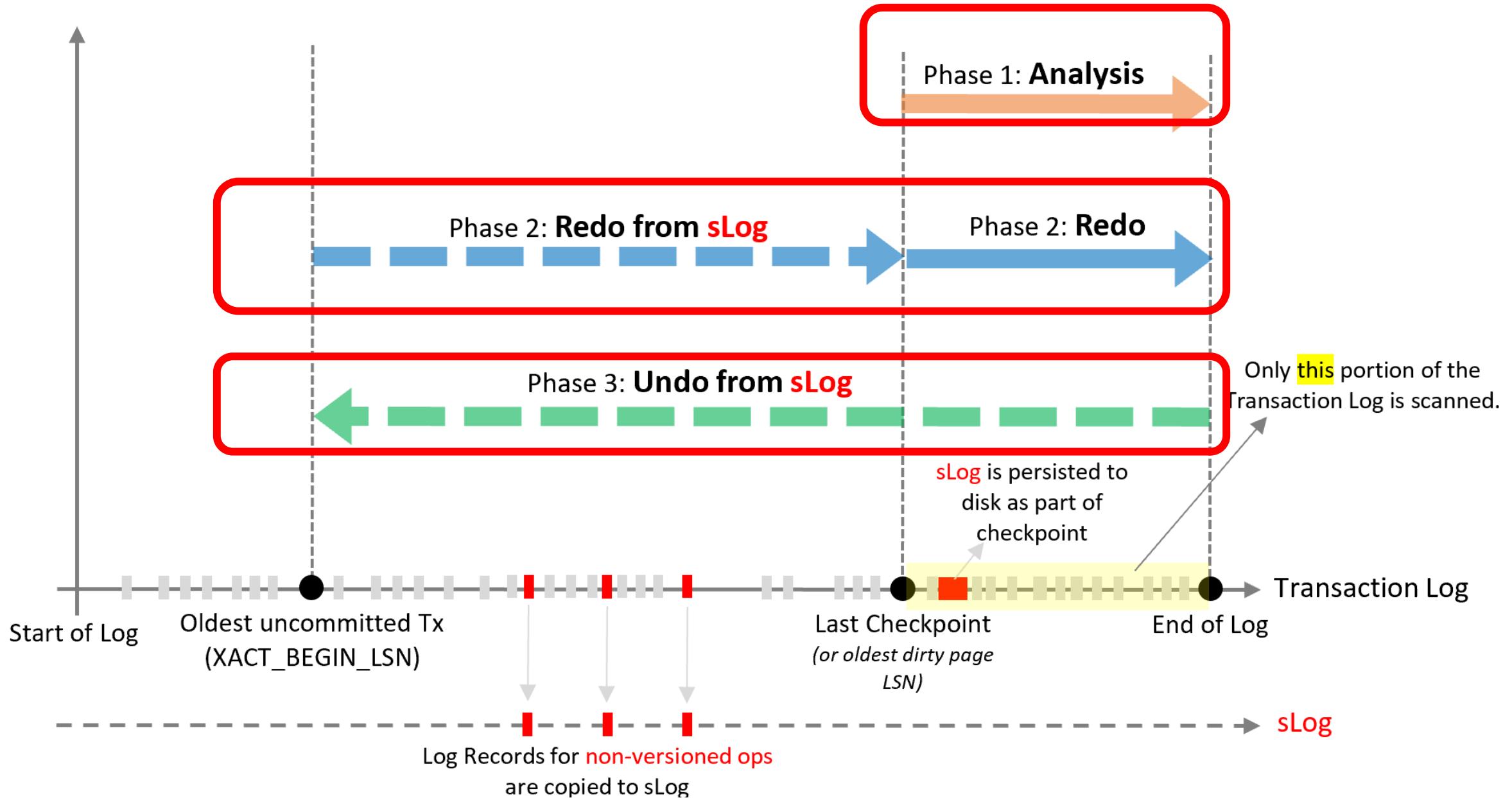
# Some Light Reading

Constant Time Recovery in  
Azure SQL Database

<http://bit.ly/SQLADREExplained>



## Recovery Phase / Transaction Log / sLog (with ADR)



# ADR Enhancements

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Improved user transaction clean up

Reducing memory footprint for PVS page tracker

Accelerated Data Recovery (ADR) Cleaner improvements

Transaction-level persisted version store (PVS)

Multi-threaded version cleanup



**Query  
Store  
Readable  
Secondary**

# Readable Secondary Conundrum



# Query Store on Readable Secondary

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All replicas are enabled when set

Query data is sent back to the primary

All replicas are updated from the primary

Does allow for plan forcing on the secondary

# Query Store on Readable Secondary

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Requires Enterprise Edition

Uses the same channel as the replication traffic

Currently in **preview**, so not production ready

Must enable trace flag 12606



# Parallel Redo

# Parallel Redo

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Used to process AG redo queue on secondaries

Limited to 100 worker threads

16 threads for the first 6 databases then single threaded

Based on database startup



# Parallel Redo Improvements

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Pool of worker threads available

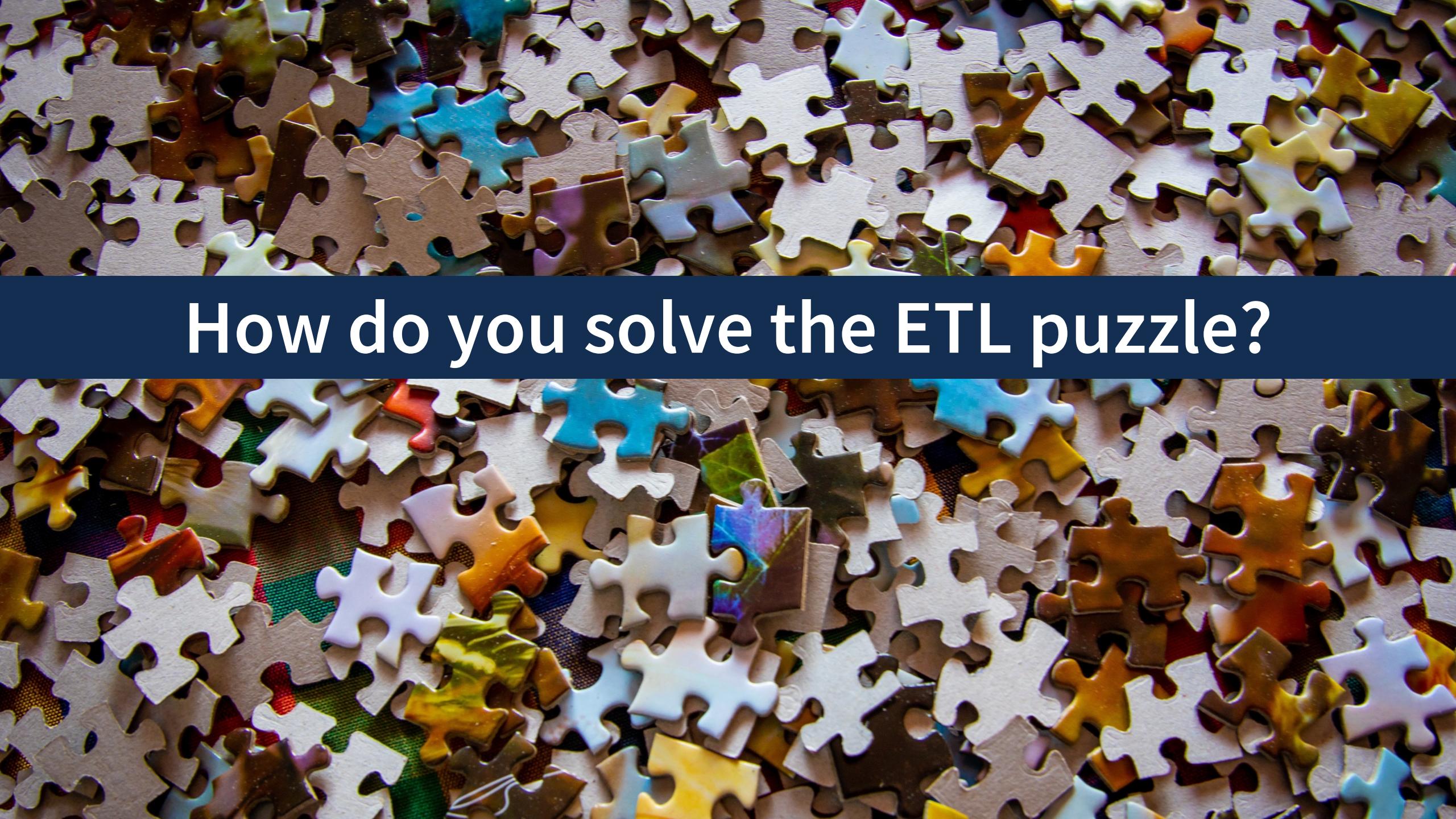
All databases can take advantage of the pool

Batch Redo introduced

Allows for faster and more efficient processing of the redo queue



# Azure Analytic Synapse Link

The background of the slide consists of a large pile of jigsaw puzzle pieces scattered across a surface. The pieces are of various colors, including shades of brown, tan, blue, red, and yellow. They are randomly oriented, creating a complex and somewhat chaotic pattern.

# How do you solve the ETL puzzle?

# Azure Synapse Link for SQL

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Provides near real time analytics from operational data stores (not ODS)

Minimal impact on transactional workloads

Works for SQL Server 2022 or Azure SQL Database

Extract incremental data changes

Utilizes Azure Synapse Analytics Dedicated SQL pools

# Azure Analytics Sn

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Reduces ETL job complexity

Requires SIHR agent for on-premises to Synapse



# Known Issues

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Source tables must have primary keys.

Only a writeable, primary replica is supported as the data source for Azure Synapse Link for SQL.

5000 max tables per single link connection

Can't do things like:

Switch Partition	Alter Primary Key	Rename Table
Add/Drop/Alter Column	Drop/Truncate Table	

# But wait! There's more known Issues

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Synapse can be pricey

ADR is disabled automatically

Behaves similar to CDC

<https://bit.ly/SynapseLinkIssues>





# S3 Bucket Integration

# S3 Bucket Integration

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If < SQL Server 2022, you had to find alternative solution

Syncing local backups to AWS buckets

Extends URL destinations now

Backup to AWS S3 Buckets

Can utilize PolyBase to interrogate S3 object storage data

# Summary

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Many many enhancements with SQL Server 2022

Query store improvements to help achieve better performance quickly and easily on readable secondary

New IQP features to help combat very common performance issues caused by MAXDOP and parameter sniffing

New analytic features to help solve the ETL problem

S3 bucket integration for more backup targets



# Questions? Answers!

# John Morehouse

Got  
Questions?

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