



Top 5 Reasons to Move to SQL Server 2022

John Morehouse
Principal Consultant

Lexington Data Technology Group
Thursday, April 27th, 2023



John Morehouse

Principal Consultant
Denny Cherry & Associates

✉ john@dcac.com

LinkedIn /in/johnmorehouse

Twitter @SQLRUS

Website Sqlrus.com

Gender He/Him



Community Speaker

Blogger/Tweeter

Conference Organizer

MVP – Data Platform

Friend of Redgate

VMWare vExpert

Denny Cherry & Associates Consulting



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



<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



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

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	Shrink database		SELECT ... WINDOW clause
	Always encrypted with secure enclaves	Virtual log file growth	Cardinality estimation feedback	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					

Parameter Sensitive Plans



Parameter Sensitive Plan



Helps solve parameter sniffing issues

Only works on equality predicates

Query/Dispatcher Plan/Query Variant

Column statistics histograms used to identify top 3 non-uniform distributions and evaluate the most *at-risk* parameterized predicates

Parameter Sensitive Plan



Predicate Cardinality evaluated at runtime for parameter values.

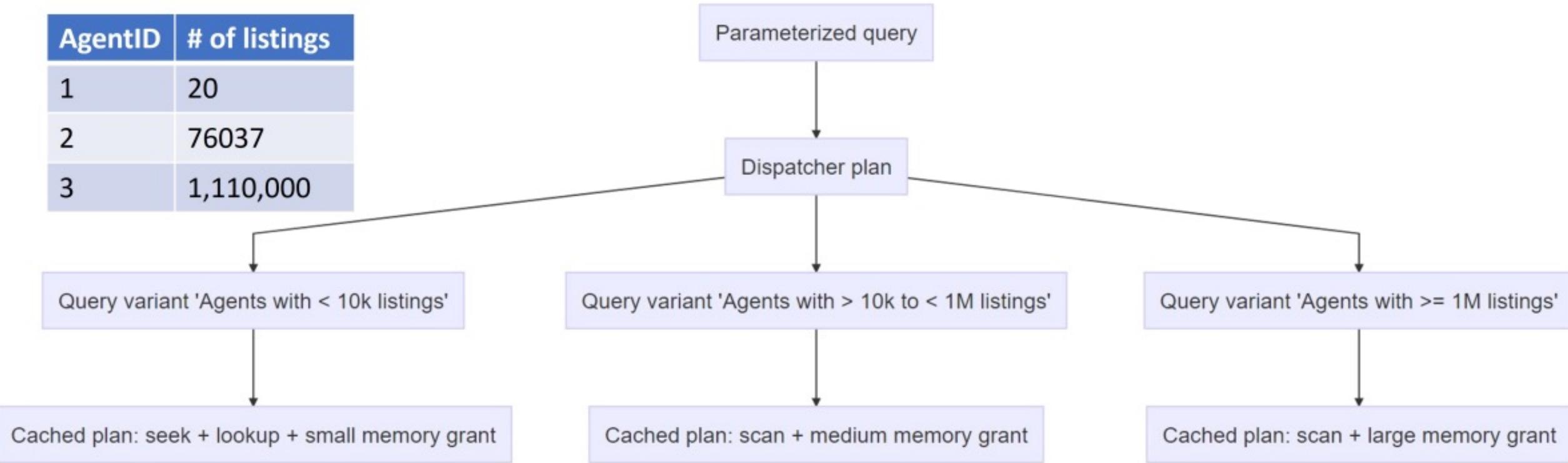
Cardinality values placed into three predicate cardinality “buckets” via Dispatcher.

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



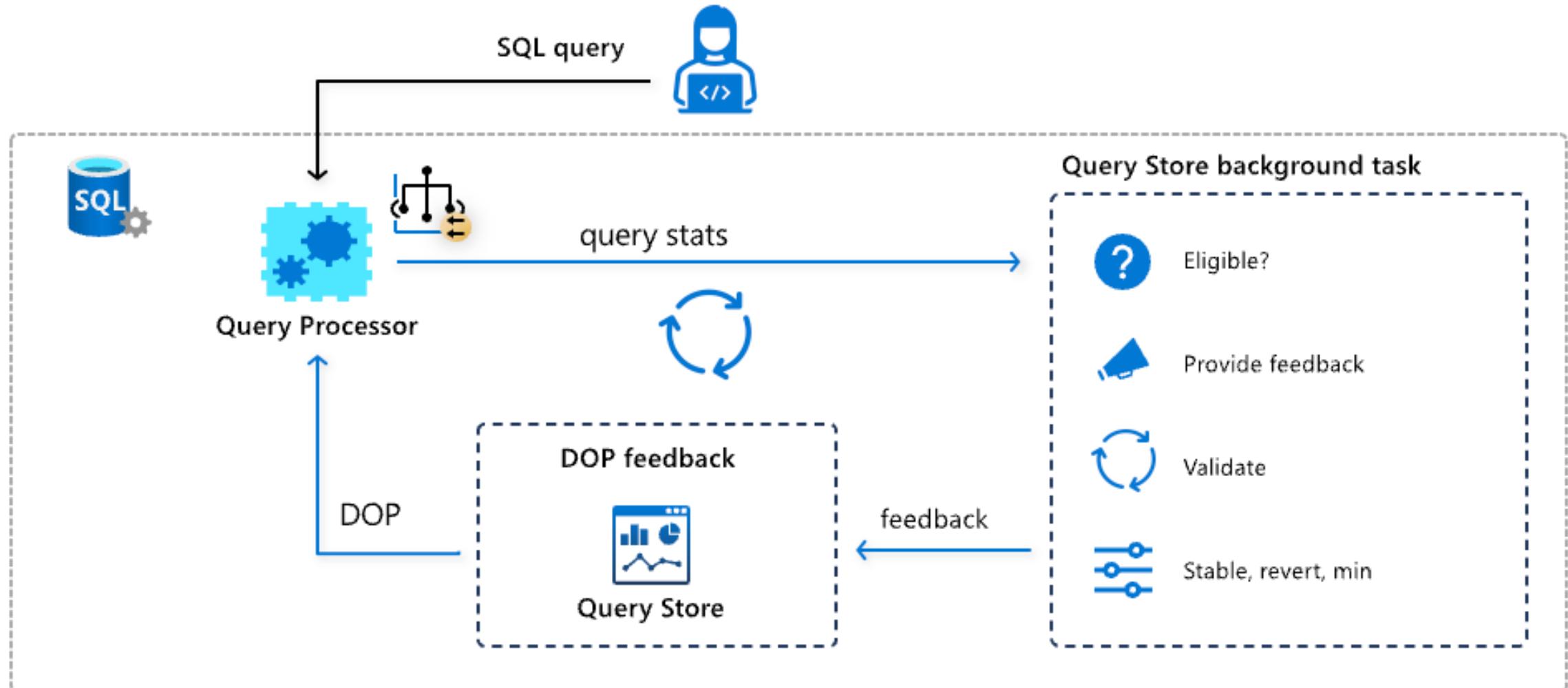
Uses elapsed time and waits to identify inefficient parallelism for repeating queries

Query store is required

Plan regression = last known good DOP

Honors Plan forcing

DOP Feedback Architecture



DOP Feedback



Won't rotate up unless reverting

DOP of 2 is the minimum value

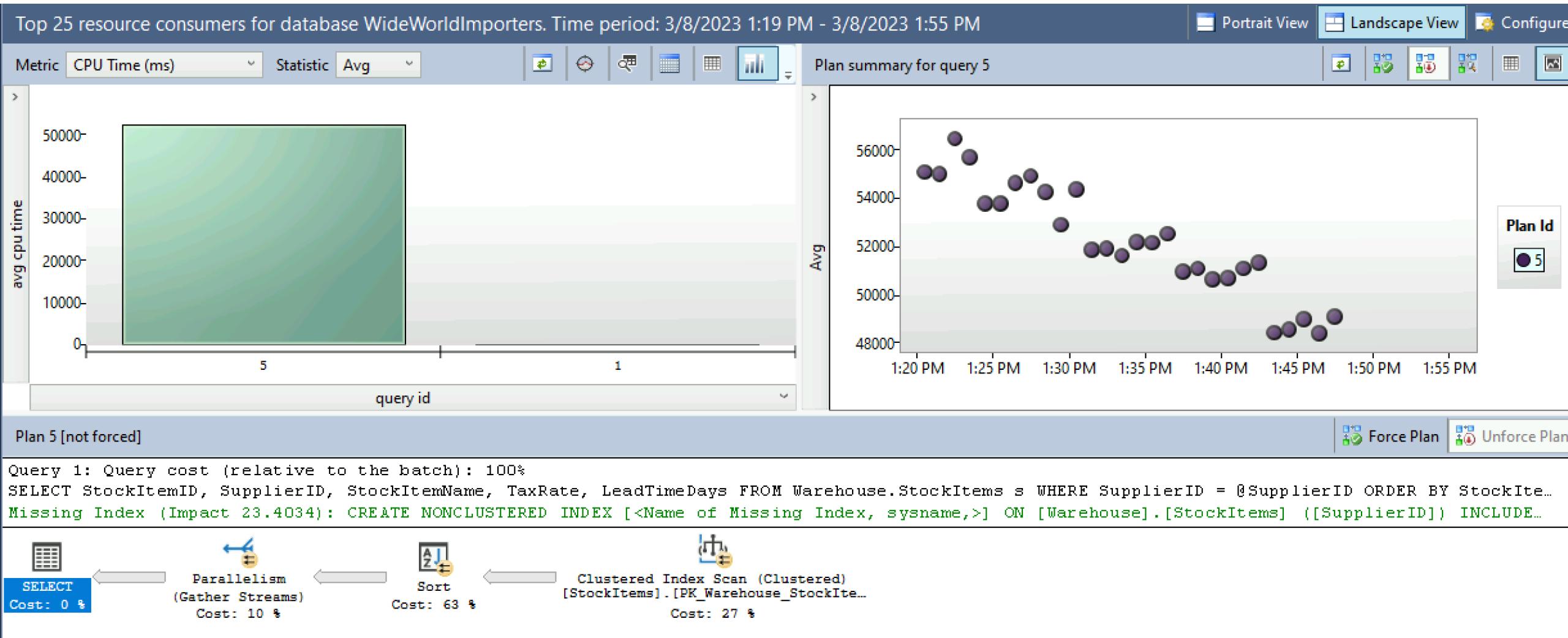
Query Hints will be the new ceiling limit if > 2

DOP Feedback is Replica aware

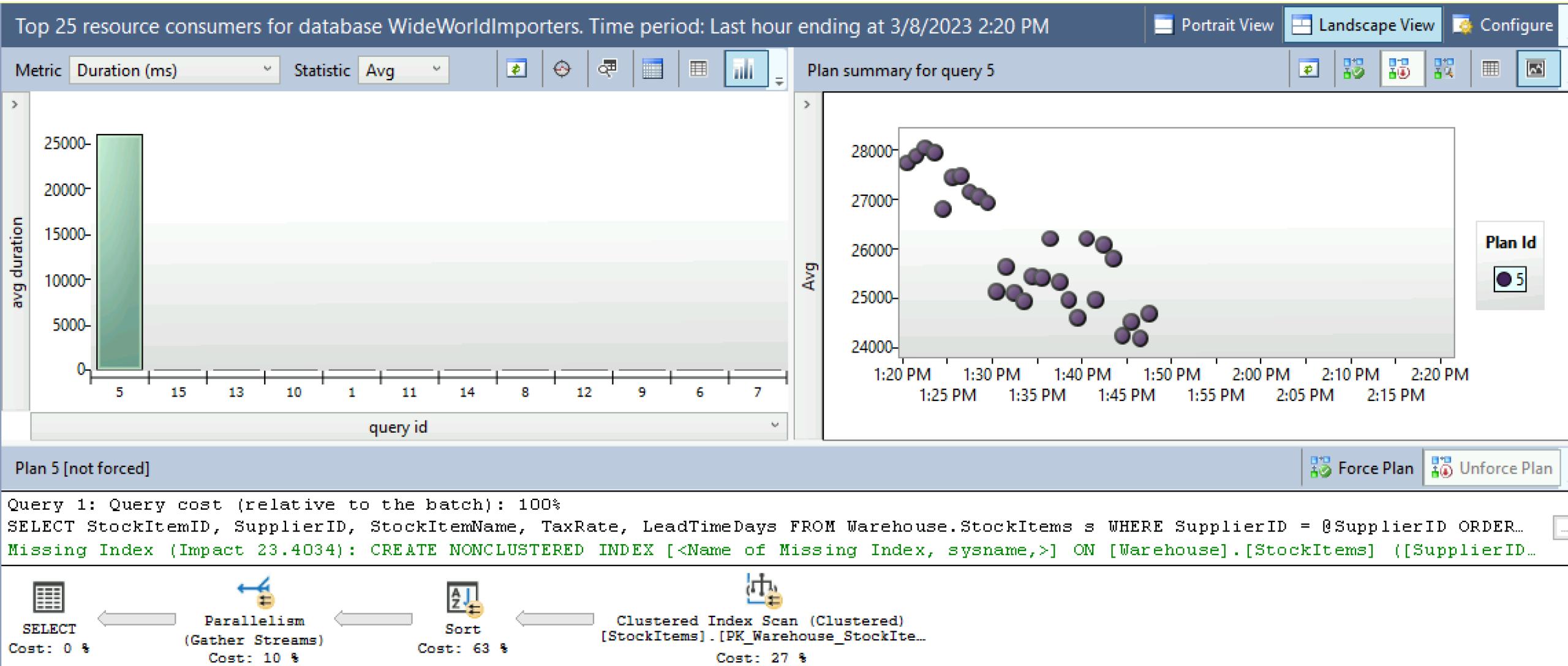
Displaying 16 Events

	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



Feature Availability



Feature	Enterprise	Standard
Parameter Sensitive Plan	Yes	Yes
Degrees of Parallelism Feedback*	Yes	No



Accelerated Database Recovery



STILL WAITING FOR ROLLBACK TO FINISH

ADR Enhancements



Introduced in 2019

Near instantaneous rollback of transactions

Game changer for transaction management

New objects

SLOG

Persisted version store

Logical revert

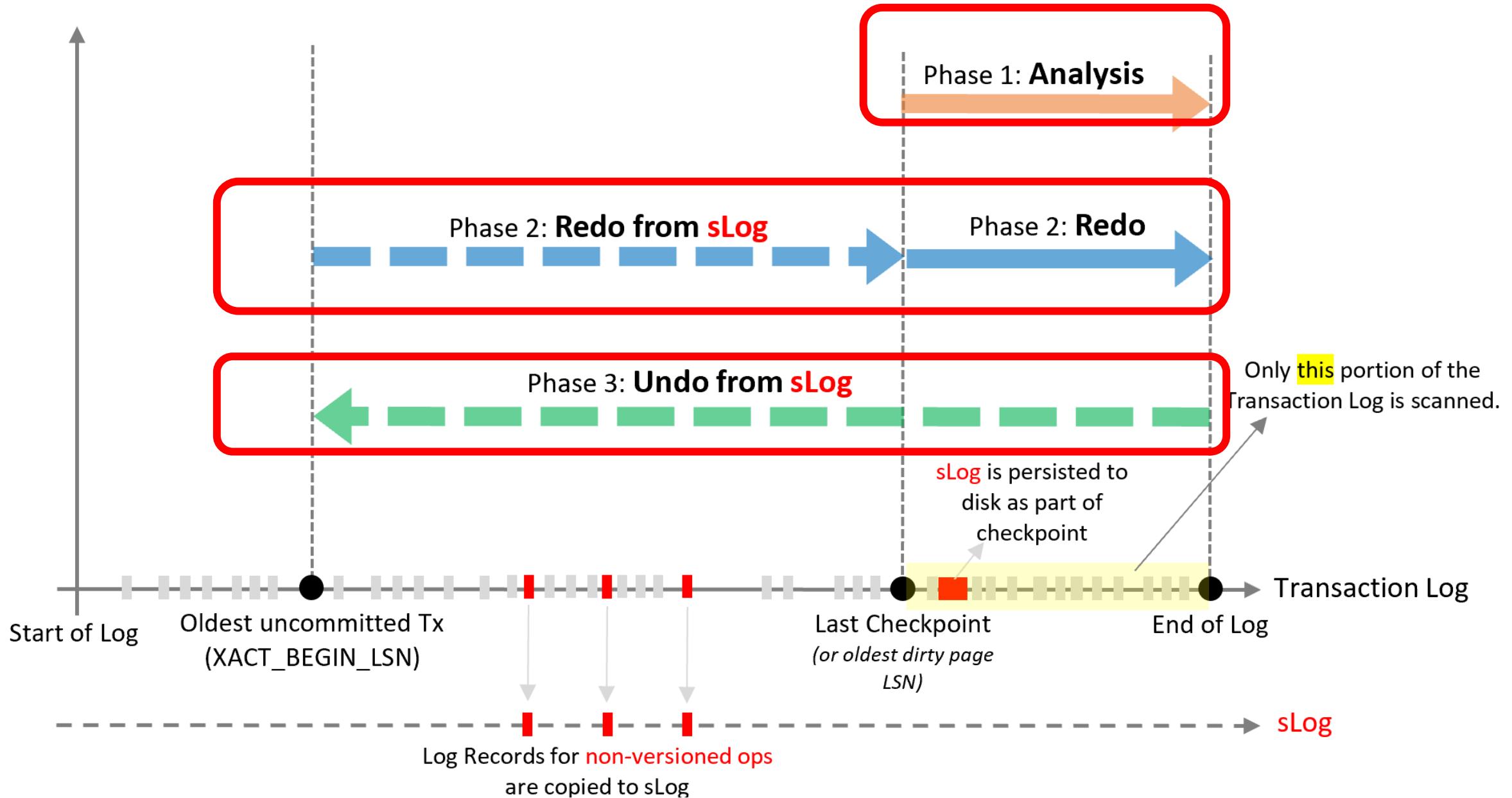
Some Light Reading

Constant Time Recovery in
Azure SQL Database

<http://bit.ly/SQLADREExplained>



Recovery Phase / Transaction Log / sLog (with ADR)



ADR Enhancements



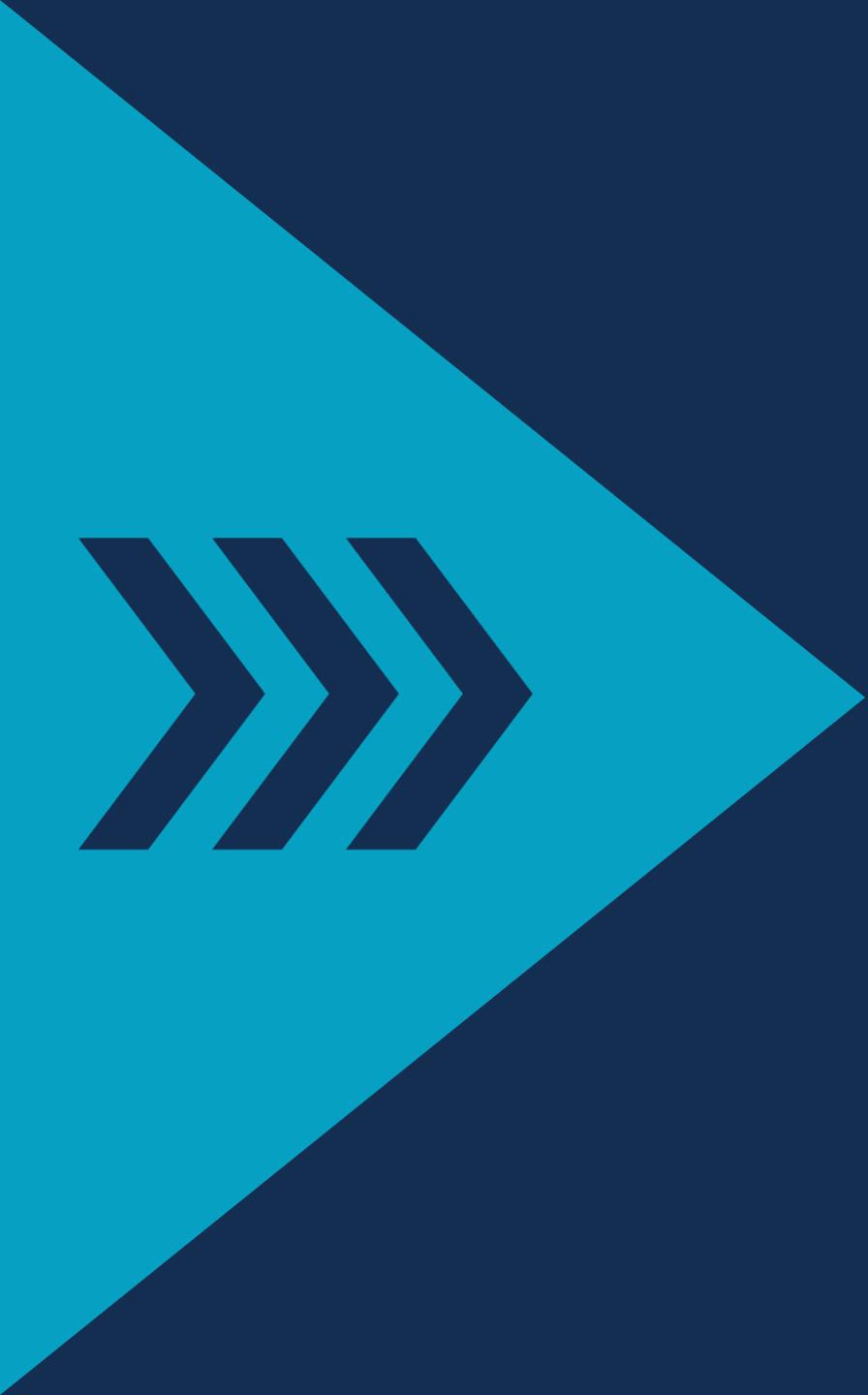
Improved user transaction clean up

Reducing memory footprint for PVS page tracker

Accelerated Data Recovery (ADR) Cleaner improvements

Transaction-level persisted version store (PVS)

Adjustable Multi-threaded version cleanup



**Query
Store
Readable
Secondary**

Readable Secondary Conundrum



Query Store on Readable Secondary



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



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



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



Pool of worker threads available

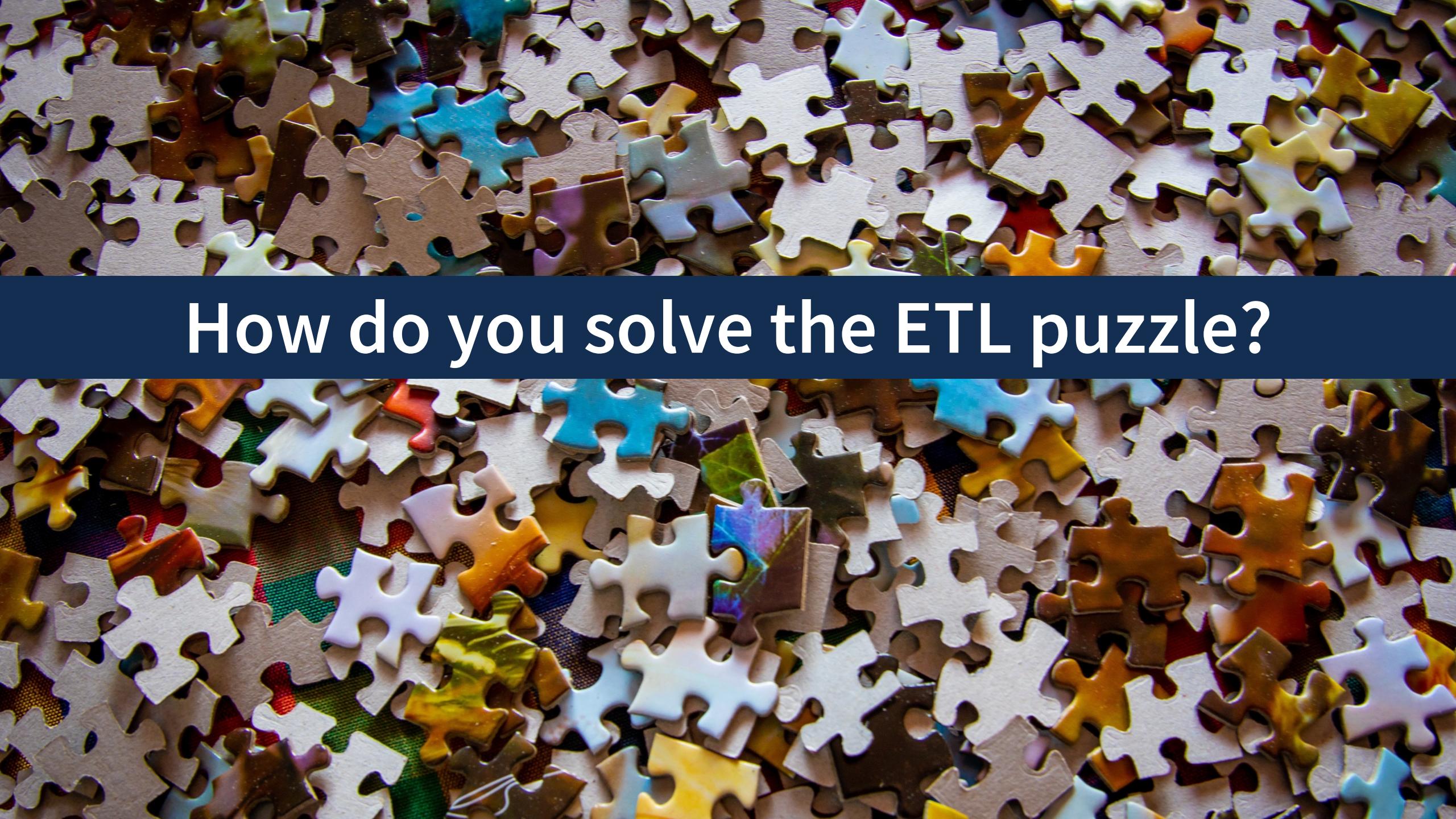
All databases can take advantage of the pool

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 all interlocked, forming a complex, non-uniform shape. The lighting is somewhat dim, highlighting the edges of the individual puzzle pieces.

How do you solve the ETL puzzle?

Azure Synapse Link for SQL



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



Reduces ETL job complexity

Requires SIHR agent for on-premises to Synapse



Known Issues



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



Synapse can be pricey

ADR is disabled automatically

Behaves like CDC

<https://bit.ly/SynapseLinkIssues>





S3 Bucket Integration

S3 Bucket Integration



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



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?

Follow Me
on Twitter!

Check out
my blog!

Denny Cherry & Associates Consulting

DCAC*



john@dcac.com



Sqlrus.com



@SQLRUS



[/in/johnmorehouse](https://www.linkedin.com/in/johnmorehouse)