

Automate the Pain Away with Adaptive Query Processing and Automatic Tuning



ProcureSQL

# About John Sterrett



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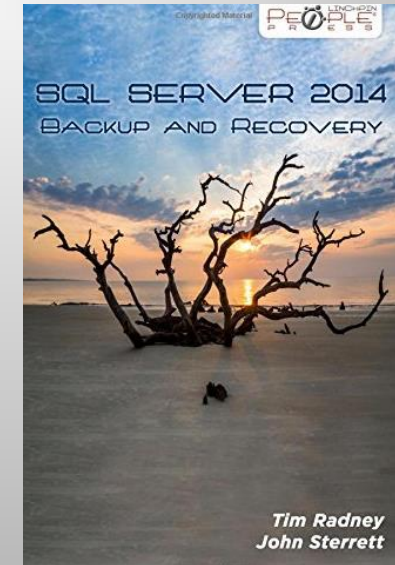
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**ProcureSQL**



# Free Sample Code and Resources

<https://procuresql.com/go/sqlsatdenver2018>

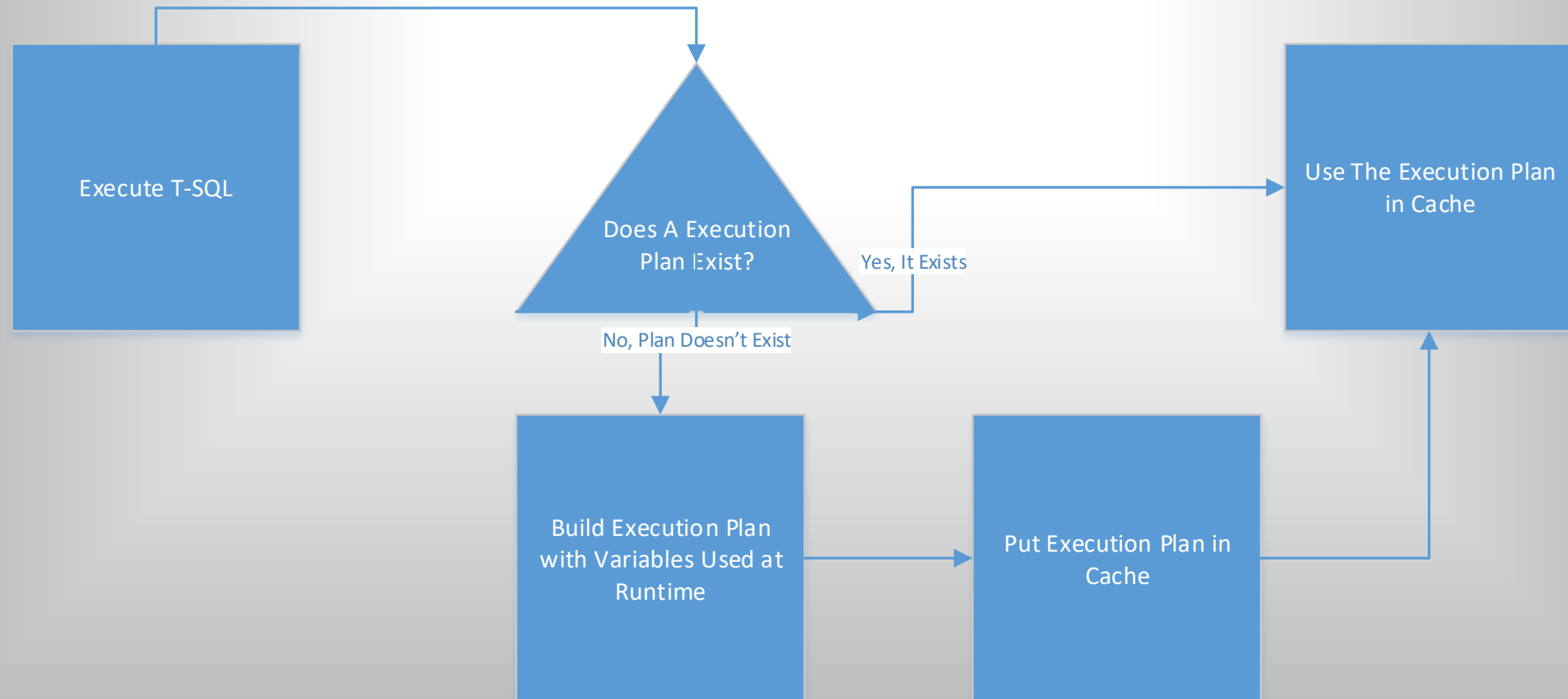


# Agenda...

- Learn how SQL Server 2017 Runs Faster!
  - **Query Store Intro**
    - Automated Tuning
    - Wait Stats in Query Store
  - **Adaptive Query Processing**
    - Adaptive Joins
    - Memory Grant
    - Interleaved Execution
- **Stuff SQL 2017 Doesn't Fix...**
  - Anti-Patterns



# Life of an Execution Plan



# Real-World Automatic Tuning

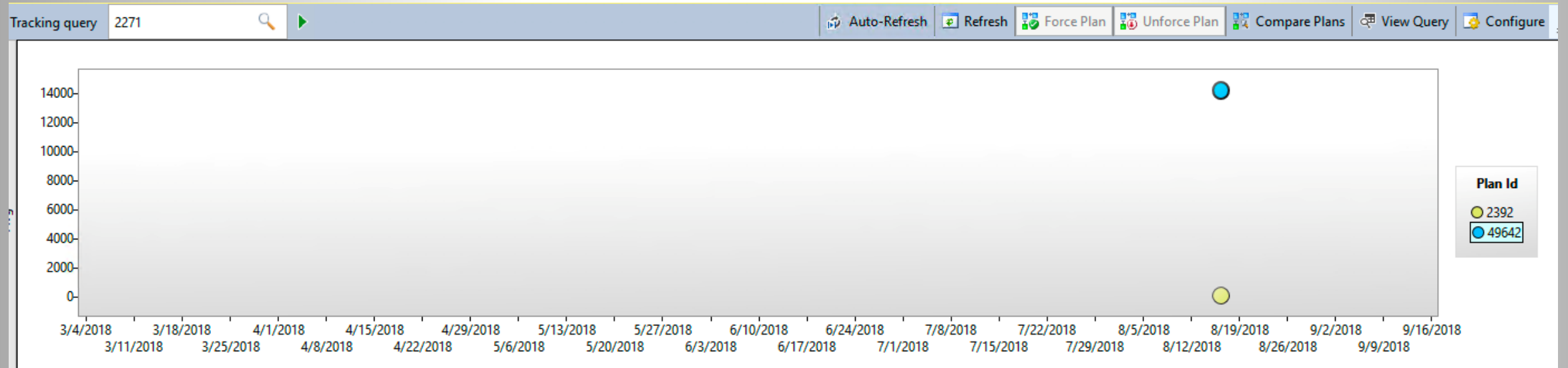
reason	score	script	query_id	current plan_id	recommended plan_id
Average query CPU time changed from 26.6ms to 7235.31ms	92	exec sp_query_store_force_plan @query_id = 2271, @plan_id = 2392	2271	49642	2392
Average query CPU time changed from 0.44ms to 4.91ms	60	exec sp_query_store_force_plan @query_id = 793, @plan_id = 822	793	2972	822
Average query CPU time changed from 10.31ms to 19.53ms	47	exec sp_query_store_force_plan @query_id = 1418, @plan_id = 47651	1418	1502	47651
Average query CPU time changed from 0.24ms to 2ms	42	exec sp_query_store_force_plan @query_id = 833, @plan_id = 15017	833	2845	15017

regressedPlanExecutionCount	regressedPlanCpuTimeAverage	recommendedPlanExecutionCount	recommendedPlanCpuTimeAverage	estimated_gain
16	7235308.625	235	26601.3234042553	1809.38553270053
15	4907.4	94	439.234042553192	0.487030089361702
474	19531.4936708861	62	10306.8225806452	4.94442370436913
15	1999.26666666667	51	242.21568627451	0.115965364705882

<https://www.procuresql.com/blog/2018/09/10/automatic-tuning-sql-server-2017/>



# Query Store



# Automated Plan Change

Showplan Comparison - SQLQuery20.sql - S...A01\ssconsult (51)\* TraceCapture.sql - ...BA01\sscor

**Plan 2392**  
SELECT [Extent1].[...] AS [...], [Extent1].[...] AS [...]  
Missing Index (Impact 98.9347): CREATE NONCLUSTERED INDEX [<Name of Miss

**Plan 49642**  
SELECT [Extent1].[...] AS [...], [Extent1].[...] AS [...]  
Missing Index (Impact 99.9557): CREATE NONCLUSTERED INDEX [<Name of Miss

**Properties**

**Top Plan**

Actual Number of Rows	0
Cached plan size	96 KB
CardinalityEstimationModelVersion	120
CompileCPU	43
CompileMemory	688
CompileTime	73
DatabaseContextSettingsId	1
Estimated Number of Rows	12967.8
Estimated Operator Cost	0.0127 (0%)
Estimated Subtree Cost	42.8476
MemoryGrantInfo	
MissingIndexes	
Optimization Level	FULL
OptimizerHardwareDependentPr	
OptimizerStatsUsage	
Parameter List	@p_inq_1, @p_inq_0
ParentObjectId	0
QueryHash	0xAC522D58EF6D07DC
QueryPlanHash	0x515A3D7FA7432A25
RetrievedFromCache	false
SecurityPolicyApplied	False
Set Options	ANSI_NULLS: True, ANSI_PADDING: True, A
Statement	SELECT [Extent1].[
StatementParameterizationType	1
StatementSqlHandle	0x09007D0733FBF64D94BA7BDABE61373A

**Bottom Plan**

Actual Number of Rows	0
Cached plan size	56 KB
CardinalityEstimationModelVersion	120
CompileCPU	4
CompileMemory	560
CompileTime	4
DatabaseContextSettingsId	1
Estimated Number of Rows	773909
Estimated Operator Cost	2.644 (0%)
Estimated Subtree Cost	972.253
MemoryGrantInfo	
MissingIndexes	
Optimization Level	FULL
OptimizerHardwareDependentPr	
OptimizerStatsUsage	
Parameter List	@p_inq_1, @p_inq_0
ParentObjectId	0
QueryHash	0xAC522D58EF6D07DC
QueryPlanHash	0xB0D49EA115B95597
RetrievedFromCache	false
SecurityPolicyApplied	False
Set Options	ANSI_NULLS: True, ANSI_PADDING: True, A
Statement	SELECT [Extent1].[F
StatementParameterizationType	1
StatementSqlHandle	0x09007D0733FBF64D94BA7BDABE61373A





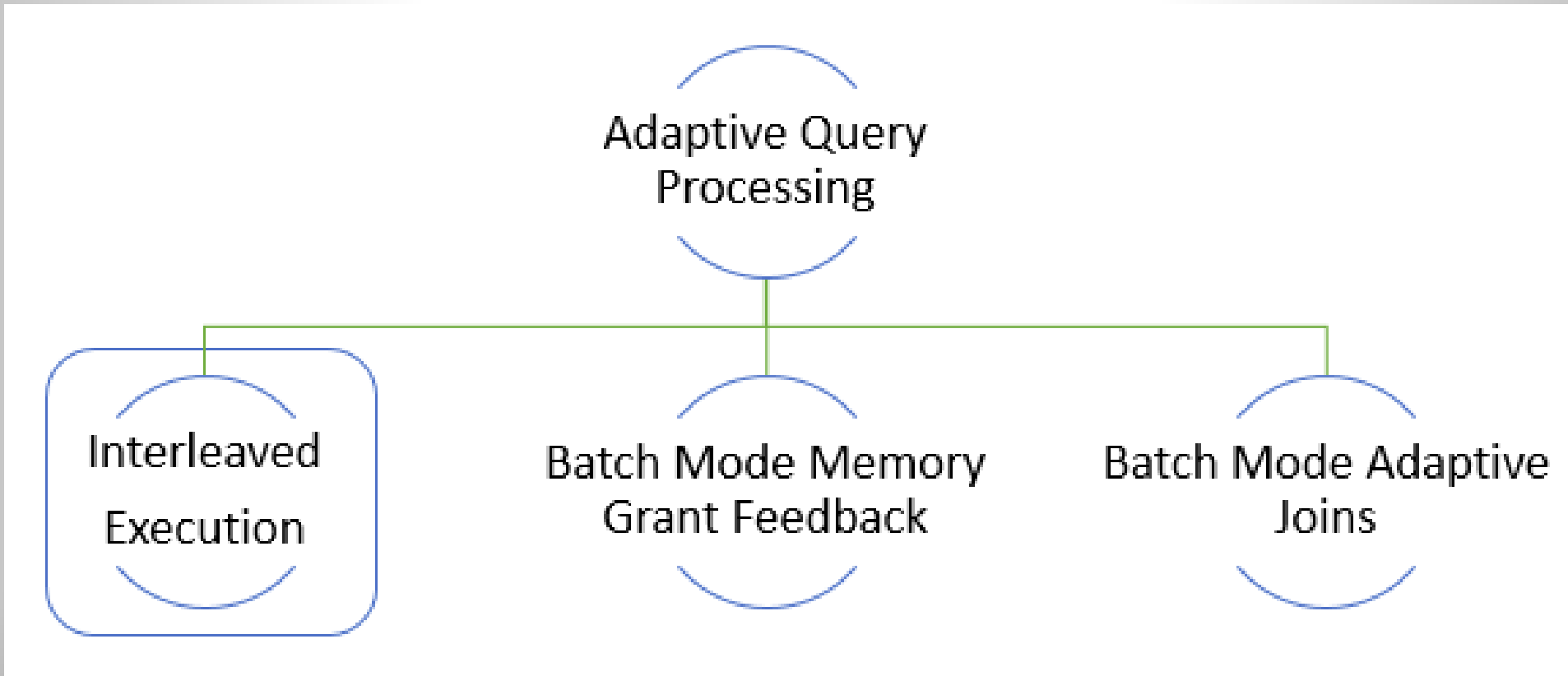
# AUTOMATED TUNING DEMO



# QUERY STORE WAIT STATISTICS DEMO



# Interleaved Executions



# Interleaved executions



# Interleaved execution

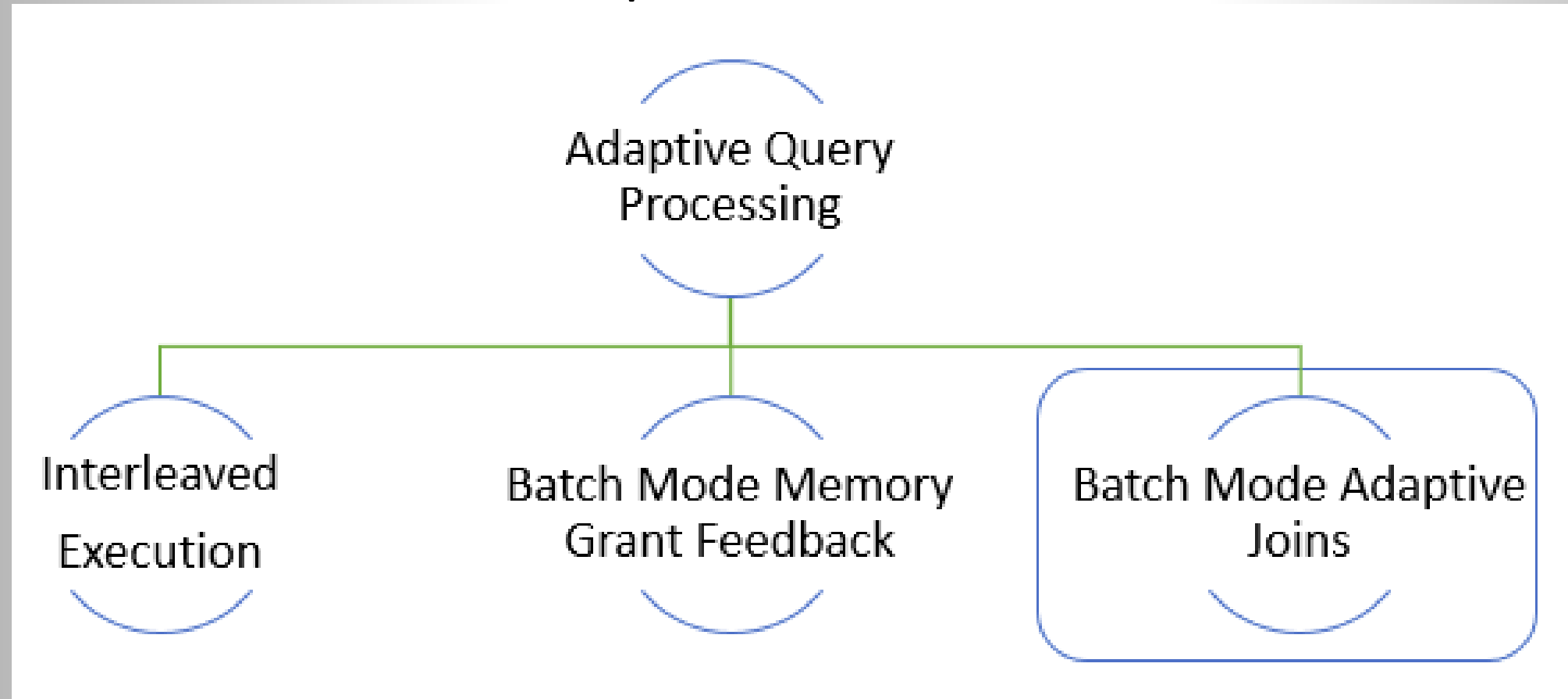
- SQL Server 2017 only uses interleaved execution for multi-statement user defined functions (MSTVFs).
- To get Interleaved execution your MSTVFs must be **read-only and not part of a data modification operation**. Also, the MSTVFs will *not* be eligible for interleaved execution if they are used on the inside of a **CROSS APPLY**.
- <http://procaresql.com/go/aqp>



# AQP – INTERLEAVED EXECUTIONS DEMO



# Batch Mode Adaptive Joins



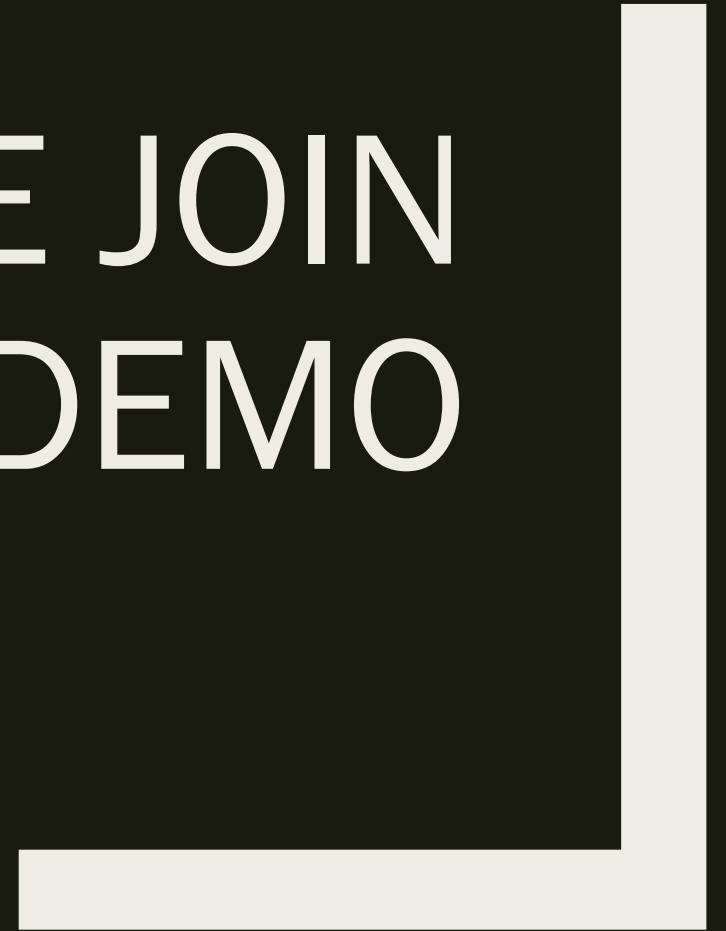
# Adaptive Join Details

Adaptive Join	
Chooses dynamically between hash join and nested loops.	
Physical Operation	Adaptive Join
Logical Operation	Inner Join
Actual Join Type	NestedLoops
Actual Execution Mode	Batch
Estimated Join Type	HashMatch
Is Adaptive	True
Estimated Execution Mode	Batch
Adaptive Threshold Rows	85.0093
Actual Number of Rows	5
Actual Number of Batches	1
Estimated Operator Cost	0 (0%)
Estimated I/O Cost	0
Estimated CPU Cost	0.0000096
Estimated Subtree Cost	0.100854
Estimated Number of Executions	1
Number of Executions	1
Estimated Number of Rows	481.058

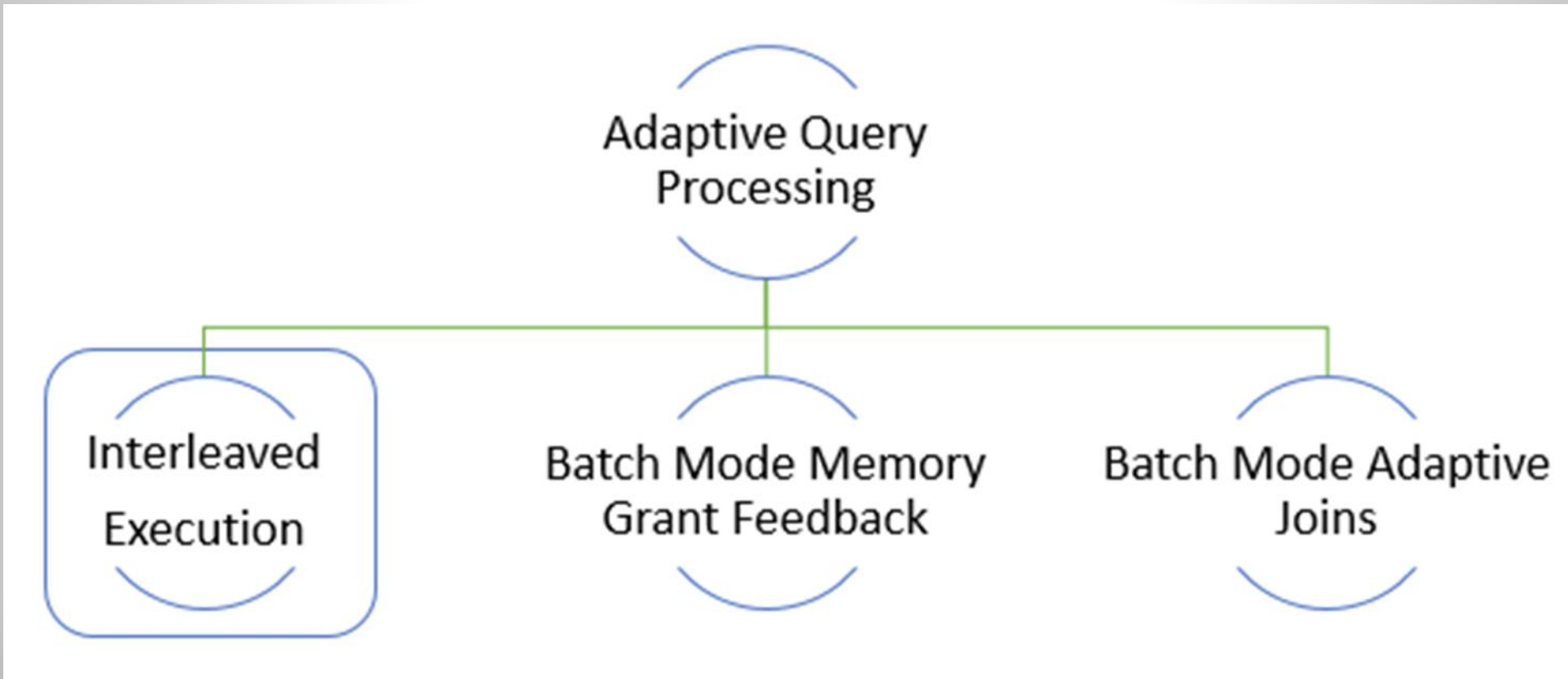




# AQP – ADAPTIVE JOIN DEMO



# Memory Grant Feedback



# AQP – BATCH MEMORY GRANT DEMO



# SQL 2017 Anit-Patterns DEMOS!

- Bookmark Lookup
- Inline Scalar Functions
- Sargabilty
- Table Variable vs Temp Table
- CTE vs Temp Table
- Accounting Query (Running Totals)
- EXISTS vs COUNT
- Implicit Conversions



# Links...

<https://procurysql.com/go/sqlsatdenver2018>



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