Improving SQL Server Queries

By Reading and Understanding Execution Plans

About Me

- Server Related:
  - Infrastructure & Security Architect

- SQL Server Related:
  - Data Architect
  - Database Administrator
  - SQL Server security columnist / blogger
  - SQL Server and Security speaker & trainer
  - Former Microsoft SQL Server MVP (2009-2016)

MSSQLTips

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Agenda

- The Tools
- How to Read Execution Plans
- Statistics and Indexing
- Anti-Patterns

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The Tools

- At Execution - T-SQL (text-based)
- At Execution – SSMS GUI
- Historic - DMVs/DMFs
- Historic – Query Store

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Tools Demo

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Execution Plans

- Scan vs. Seek
- Key Lookup
- Hash Match, Nested Loops, Merge Joins
- Cost

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Hash Match vs. Nested Loops vs. Merge Joins

- Merge Joins is additive (X table rows + Y table rows)
  - Requires sorted data
  - Tends to be cheapest unless sort is expensive
- Nested Loops is multiplicative (X table rows * Y table rows)
  - Take smaller resultset row-by-row
  - Compare each row of larger resultset
- Hash Match
  - When the other two can’t be used
  - CPU and memory intensive (in comparison)

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Execution Plan Demo

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Statistics

- Used to determine what indexes to use
- Distribution of data (histogram)
- SQL Server cares about cardinality
- Can get out of date

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Example: System Center Configuration Manager

100 %

Results | Messages

	Object	IndexOrAutoStat	auto_created	last_updated	modification_counter
1	PNP_DEVICE_DRIVER_DATA	PNP_DEVICE_DRIVER_DATA_AK	0	2015-02-23 09:38:14.9100000	204318975
2	ClientHealthState	_WA_Sys_00000004_3864608B	1	2015-02-06 08:49:45.1600000	112870478
3	Collections_L	_WA_Sys_0000000C_607251E5	1	2017-06-06 18:39:06.0900000	90905212
4	Collections_L	_WA_Sys_0000000E_607251E5	1	2017-06-06 18:39:06.1170000	90905212
5	Collections_L	_WA_Sys_00000009_607251E5	1	2017-06-06 18:39:06.1270000	90905212
6	Collections_L	_WA_Sys_00000004_607251E5	1	2017-06-06 18:39:06.1300000	90905212
7	Collections_L	_WA_Sys_00000003_607251E5	1	2017-06-06 18:39:06.1330000	90905212
8	POWER_MANAGEMENT_SETTINGS_DATA	POWER_MANAGEMENT_SETTINGS_DATA_AK	0	2015-02-23 09:41:45.4230000	87645902
9	Add_Remove_Programs_HIST	_WA_Sys_0000000B_1A14E395	1	2018-01-09 09:40:48.8700000	65126236
10	Add_Remove_Programs_HIST	_WA_Sys_0000000A_1A14E395	1	2018-01-09 09:40:49.1570000	65126236
11	Add_Remove_Programs_HIST	_WA_Sys_00000009_1A14E395	1	2018-01-09 09:40:49.2930000	65126236
12	Add_Remove_Programs_HIST	_WA_Sys_00000008_1A14E395	1	2018-01-09 09:40:50.5330000	65126236
13	Add_Remove_Programs_HIST	_WA_Sys_00000007_1A14E395	1	2018-01-09 09:40:52.5400000	65126236
14	Add_Remove_Programs_HIST	_WA_Sys_00000004_1A14E395	1	2018-01-09 09:40:52.6970000	65126236
15	SOFTWARE_SHORTCUT_HIST	_WA_Sys_00000014_6EC2D341	1	2016-06-24 17:29:27.0130000	56014596
16	ClientDeploymentState	_WA_Sys_0000000E_37703C52	1	2017-01-10 06:00:00.1300000	54768498
17	CI_AssignmentStatus	_WA_Sys_00000010_778AC167	1	2016-12-20 13:10:07.2630000	42639815

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Indexes

- Clustered = Physical sort (can only be one)
- Non-Clustered based on Clustered (if one exists)
- SQL Server can only use 1 per table for a query
- Bookmark Lookup (Key Lookup) = 2 Reads

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Indexing Demo

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Anti-Patterns

- SARGable vs. non-SARGable *(Search ARGument)*
  - Row-by-Agonzing-Row (RBAR)
- Implicit Conversions
- Unnecessary Sort
- Unnecessary Complexity

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Anti-Patterns Demo

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What We Covered

- The Tools
- How to Read Execution Plans
- Statistics and Indexing
- Anti-Patterns

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Questions? Thank You!

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