

Uncovering the hidden gems in execution plans

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Who is this guy?

- Kevan Riley



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- Independent freelance SQL Server
- 15+ years SQL Server
- Moderator at ask.sqlservercentral.com

Microsoft
CERTIFIED
Solutions Expert

Data Platform



redgate
friend of Red Gate 2014

What's it all about?

- Query performance tuning
- Execution plan analysis
- XML
- Some show in graphical
- Don't always get full picture

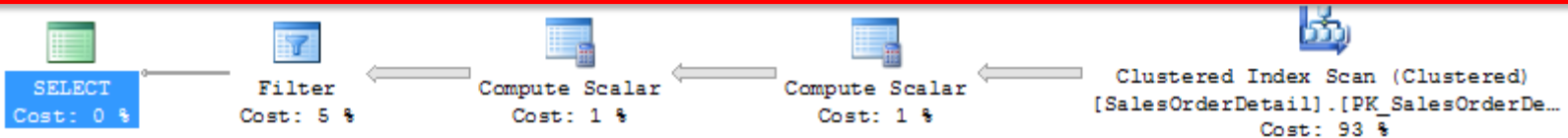
Missing Indexes

- Query level warning
- 2005 'hidden' in XML
- 2008+ Graphical execution plan

Query 1: Query cost (relative to the batch): 100%

~~select * from Sales.SalesOrderDetail where CarrierTrackingNumber = 'E101-4649-85'~~

Missing Index (Impact 99.6587): CREATE NONCLUSTERED INDEX [<Name of Missing Index, sysname,>] ON



Missing Indexes

SSMS Demo

Missing Indexes

```
<MissingIndexes>
  <MissingIndexGroup Impact="99.6587">
    <MissingIndex Database="[AdventureWorks2008R2]" Schema="[Sales]" Table="[SalesOrderDetail]">
      <ColumnGroup Usage="EQUALITY">
        <Column Name="[CarrierTrackingNumber]" ColumnId="3" />
      </ColumnGroup>
    </MissingIndex>
  </MissingIndexGroup>
</MissingIndexes>
```

- Every statement in multi-statement batch
- SSMS only shows one missing index
- Fixed in SQL 2012 SP2 +onwards

Reason for Early Termination

- Plan level attribute
- No graphical indication / No tooltip info
- Available in Properties / XML
 - Reason For Early Termination of Statement Optimization
- 3 values
 - Good enough plan found
 - Timeout
 - Memory limit exceeded

Reason for Early Termination

SSMS Demo

Reason for Early Termination

```
<StmtSimple  
  StatementOptmLevel="FULL" StatementOptmEarlyAbortReason="TimeOut"
```

- Full optimization level
- Timeout – complex query

No Join Predicate Warning

- Operator level warning



Nested Loops
(Inner Join)
Cost: 0 %

Nested Loops
For each row in the top (outer) input, scan the bottom (inner) input, and output matching rows.

Physical Operation	Nested Loops
Logical Operation	Inner Join
Estimated Execution Mode	Row
Estimated Operator Cost	0.0000295 (0%)
Estimated I/O Cost	0
Estimated Subtree Cost	0.0066179
Estimated CPU Cost	272.823
Estimated Number of Executions	1
Estimated Number of Rows	10
Estimated Row Size	11 B
Node ID	1

Output List
[AdventureWorks2008R2].[Sales].
[SalesOrderDetail] SalesOrderID

Warnings
No Join Predicate

No Join Predicate Warning

SSMS Demo

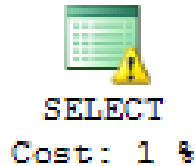
No Join Predicate Warning

```
<Warnings NoJoinPredicate="true" />
```

- Cartesian Product
 - Cross Join
 - 'old' join syntax
- Incomplete predicate
- Complex query (possibly with Timeout)
- Complex predicate

Convert Issue 'Cardinality Estimate'

- Query level warning
- SQL 2012



SELECT	
Cached plan size	8 KB
Estimated Operator Cost	0.003146 (1%)
Estimated Subtree Cost	0.545484
Estimated Number of Rows	9439.5

Statement

```
SELECT  
SalesOrderID, OrderDate  
from Sales.SalesOrderHeader  
where convert(datetime,convert  
(varchar,orderdate,112))  
>= convert(datetime,convert (varchar,dateadd  
(mm,datediff(mm,0,'1 jan 2006'),0),112))
```

Warnings

Type conversion in expression (CONVERT (varchar(30),[AdventureWorks2008R2].[Sales].[SalesOrderHeader].[OrderDate],112)) may affect "CardinalityEstimate" in query plan choice

Convert Issue 'Cardinality Estimate'

SSMS Demo

Convert Issue 'Cardinality Estimate'

```
<Warnings>  
  <PlanAffectingConvert ConvertIssue="Cardinality Estimate"  
    Expression="CONVERT(char(10),[soh].[SalesOrderID],0)" />  
</Warnings>
```

- Potential tuning opportunities
- All conversions

Sort Warnings

- Operator level warning
- Introduced SQL 2012



Sort	
Sort the input.	
Physical Operation	Sort
Logical Operation	Sort
Actual Execution Mode	Row
Estimated Execution Mode	Row
Actual Number of Rows	31465
Actual Number of Batches	0
Estimated Operator Cost	0.535306 (49%)
Estimated I/O Cost	0.0112613
Estimated CPU Cost	0.524047
Estimated Subtree Cost	1.09904
Estimated Number of Executions	1
Number of Executions	1
Estimated Number of Rows	9439.5
Estimated Row Size	341 B
Actual Rebinds	1
Actual Rewinds	0
Node ID	0
Warnings	
Operator used tempdb to spill data during execution with spill level 1	
Order By	
[AdventureWorks2008R2].[Sales]. [SalesOrderHeader].OrderDate Ascending	

Sort Warnings

SSMS Demo

Sort Warnings

```
<Warnings>  
  <SpillToTempDb SpillLevel="1" />  
</Warnings>
```

- Bad stats, bad estimates
- Certain query patterns
- Parameter sniffing
- Spill Level
 - single pass / multiple passes
 - <http://www.sqlskills.com/blogs/joe/spilltotempdb-warning-and-spilllevels-mapping-to-single-versus-multiple-pass>

RetrievedFromCache attribute

- ~~Was plan retrieved from cache?~~
- Was the plan cached?
 - Plan was in cache => True
 - Generated plan now in cache => True
 - Generated plan not in cache => False

RetrievedFromCache attribute

```
<Statements>  
  <StmtSimple  
    RetrievedFromCache="true">
```

- Plan level attribute
- SQL 2012
- No graphical indication / No tooltip info
- Available in Properties / XML

Taking this further

- `sys.dm_exec_cached_plans`
- `sys.dm_exec_query_plan`
- Proactive tuning
- Jason Strate MVP MCM (www.jasonstrate.com)
 - Blog series - Can you dig it?

References

- Grant Fritchey [@GFritchey](#) | [www.scarydba.com](#)
- Paul White [@SQL_Kiwi](#) | [sqlblog.com/blogs/paul_white](#)
- Joseph Sack [@josephsack](#) | [www.sqlskills.com/blogs/joe](#)
- Benjamin Nevarez [@BenjaminNevarez](#) | [www.benjaminnevarez.com](#)
- Jason Strate [@StrateSQL](#) | [www.jasonstrate.com](#)

Questions?

Thanks for listening

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