THE SCARY DBA

Getting Started Reading Execution Plans

Grant Fritchey
grant@scarydba.com

Goals

- Learn the best places to start at when reading an execution plan and why you should start there.
- Take away methods for querying directly against the execution plans that will make you faster at reading the plans.
- Understand how to drill down on the information within plans to arrive at a better understanding of why the optimizer is making these query plans.

Microsoft Most Valuable Professional

grant@scarydba.com

www.scarydba.com

@gfritchey

www.linkedin.com/in/scarydba

Grant Fritchey

Product Evangelist, Red Gate Software

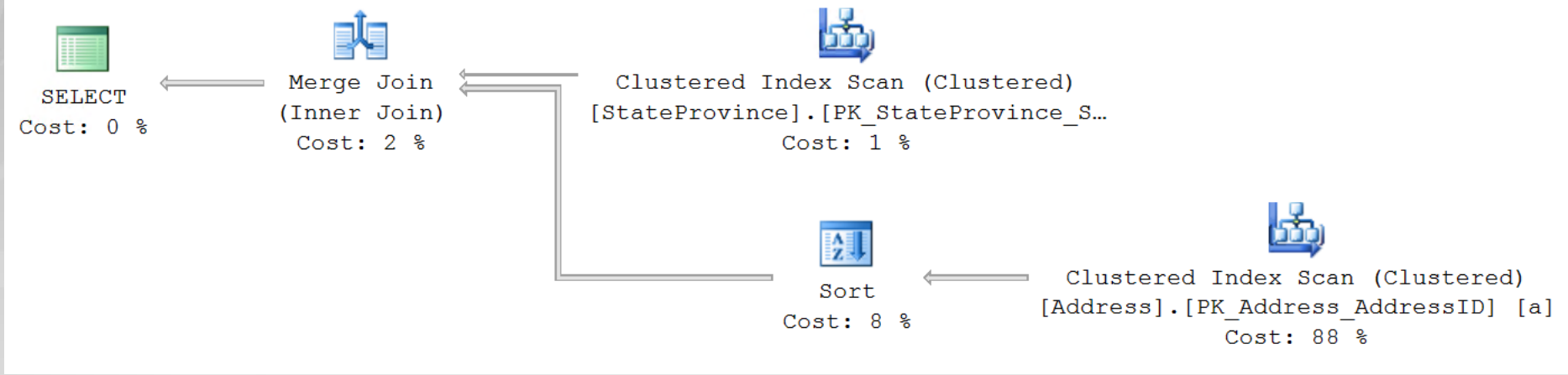
Why Execution Plans?

- Best tool for #1 performance problem
  - » Poor code choices
  - » Poor structure choices
  - » Bad/out of date/missing statistics
- Single best window into decisions made by the query optimizer
- Only way to know "What Happened" when you ran a query

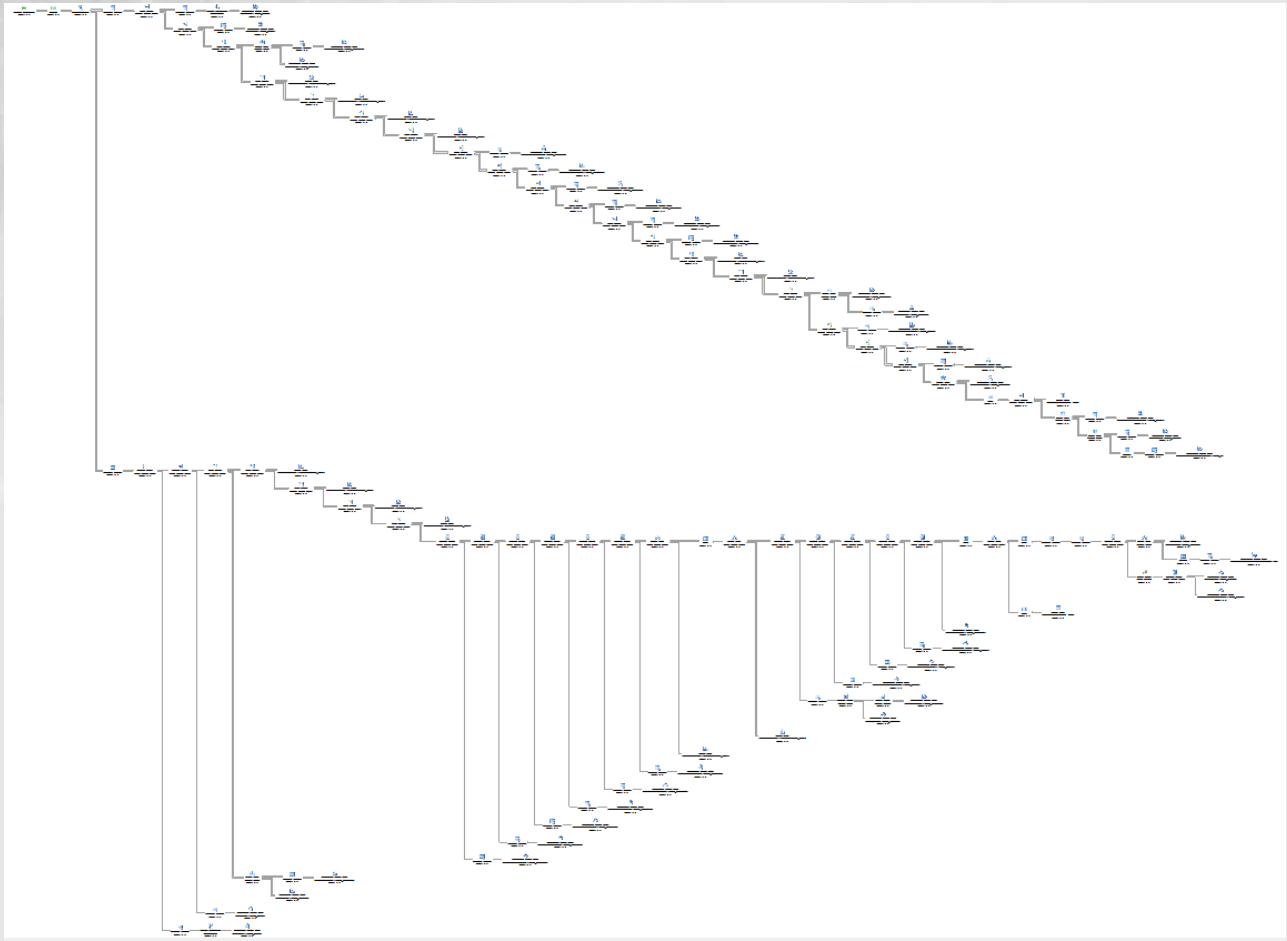
Generating a Plan

- SQL Server Management Studio
  - » Estimated
  - » Actual
- Procedure Cache
  - » Estimated (sort of)
- Extended Events
  - » Estimated
  - » Actual
- Trace Events (not recommended)
  - » Estimated
  - » Actual

Where To Start?

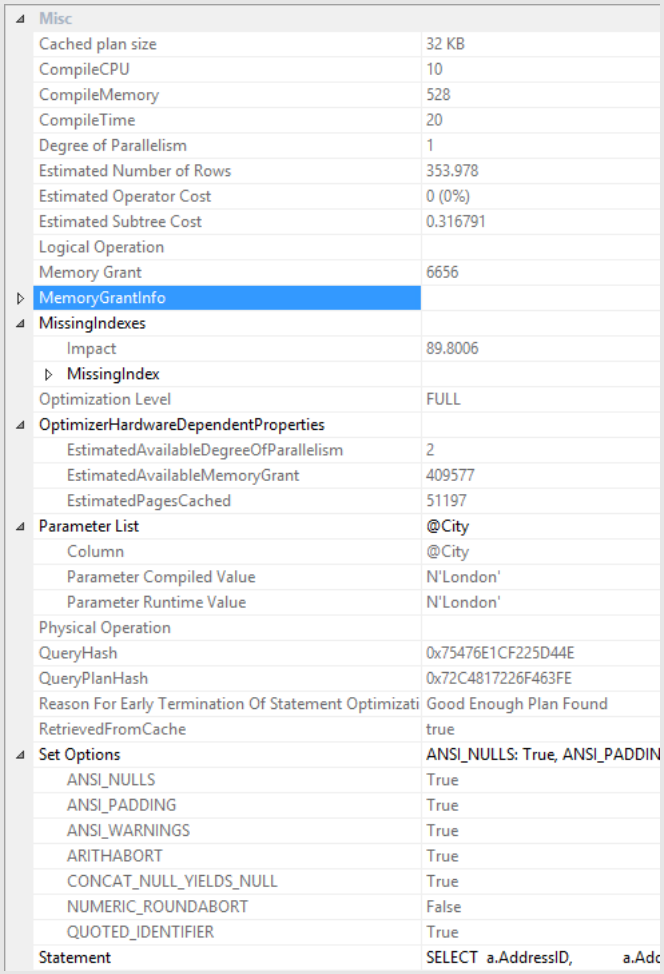


Where To Start?



First Operator

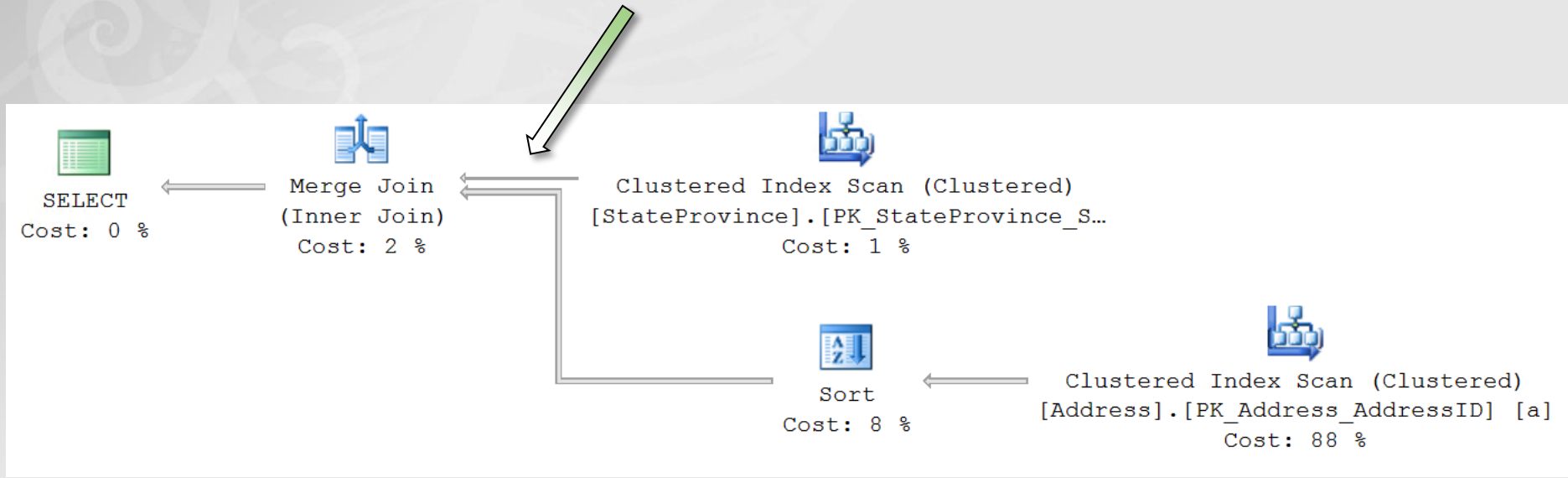
- Plan size
- Compile time
- Memory grant
- Missing Indexes
- Optimization level
- Parameter
  - » Compiled value
  - » Runtime Value
- Query hash
- Reason for early termination
- ANSI settings



Misc	
Cached plan size	32 KB
CompileCPU	10
CompileMemory	528
CompileTime	20
Degree of Parallelism	1
Estimated Number of Rows	353.978
Estimated Operator Cost	0 (0%)
Estimated Subtree Cost	0.316791
Logical Operation	
Memory Grant	6656
MemoryGrantInfo	
MissingIndexes	
Impact	89.8006
MissingIndex	
Optimization Level	FULL
OptimizerHardwareDependentProperties	
EstimatedAvailableDegreeOfParallelism	2
EstimatedAvailableMemoryGrant	409577
EstimatedPagesCached	51197
Parameter List	@City
Column	@City
Parameter Compiled Value	N'London'
Parameter Runtime Value	N'London'
Physical Operation	
QueryHash	0x75476E1CF225D44E
QueryPlanHash	0x72C4817226F463FE
Reason For Early Termination Of Statement Optimizati	Good Enough Plan Found
RetrievedFromCache	true
Set Options	ANSI_NULLS: True, ANSI_PADDIN
ANSI_NULLS	True
ANSI_PADDING	True
ANSI_WARNINGS	True
ARITHABORT	True
CONCAT_NULL_YIELDS_NULL	True
NUMERIC_ROUNDABORT	False
QUOTED_IDENTIFIER	True
Statement	SELECT a.AddressID, a.Adc

Right to Left or Left to Right?

- A clue: English
- Another clue: These things

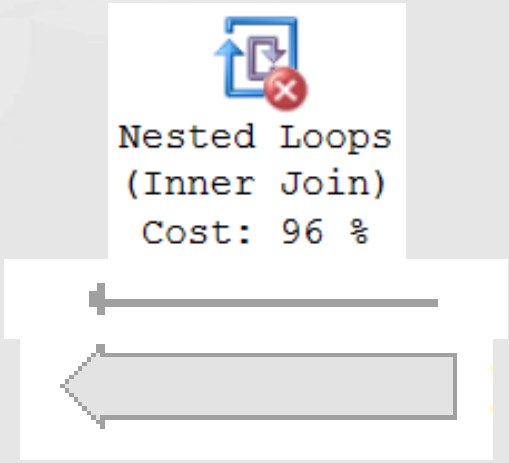


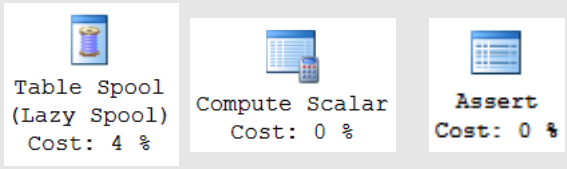
Left to Right or Right to Left

- Answer: Both
- Logical processing order:
  - Represents how the optimizer sees the query
  - Reading it from Left to Right
- Physical processing order
  - Represents the flow of data
  - Follow the arrows/pipes from Right to Left
- Both are necessary to understand certain plans

What Else to Look For

- Warnings
- Most Costly Operations
- Fat Pipes
- Extra Operations
- Scans
- Estimated vs. Actual





Estimated Number of Rows	1.66667
Actual Number of Rows	434

Where to Look

- Tool tips
  - » Eh
- Properties
  - » Lots of Details

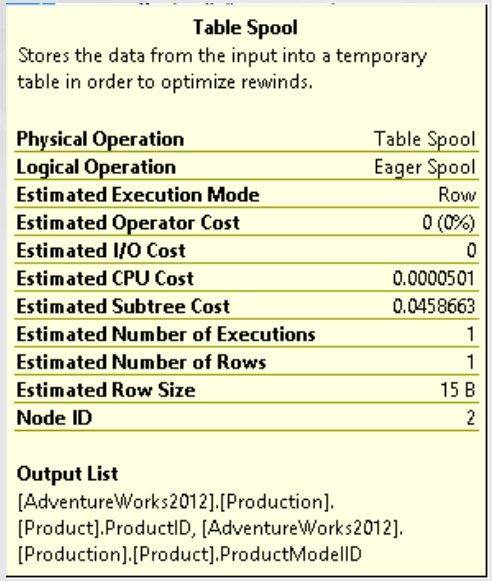


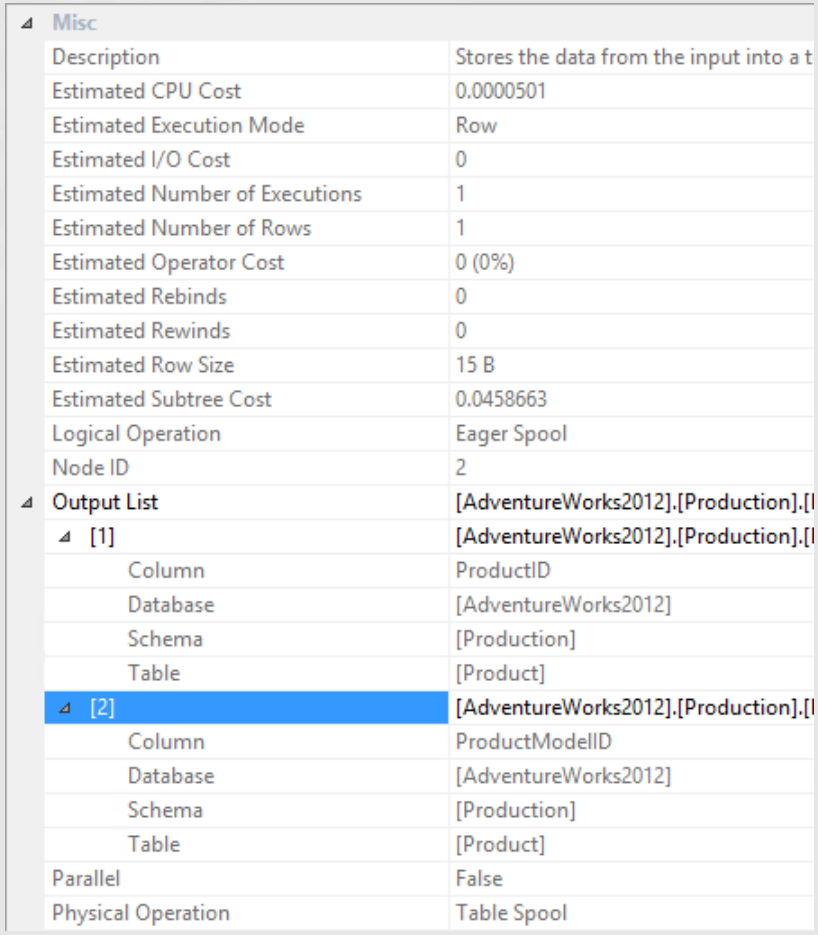
Table Spool

Stores the data from the input into a temporary table in order to optimize rewinds.

Physical Operation	Table Spool
Logical Operation	Eager Spool
Estimated Execution Mode	Row
Estimated Operator Cost	0 (0%)
Estimated I/O Cost	0
Estimated CPU Cost	0.0000501
Estimated Subtree Cost	0.0458663
Estimated Number of Executions	1
Estimated Number of Rows	1
Estimated Row Size	15 B
Node ID	2

Output List

[AdventureWorks2012].[Production].[Product].ProductID, [AdventureWorks2012].[Production].[Product].ProductModelID



Misc	
Description	Stores the data from the input into a t
Estimated CPU Cost	0.0000501
Estimated Execution Mode	Row
Estimated I/O Cost	0
Estimated Number of Executions	1
Estimated Number of Rows	1
Estimated Operator Cost	0 (0%)
Estimated Rebinds	0
Estimated Rewinds	0
Estimated Row Size	15 B
Estimated Subtree Cost	0.0458663
Logical Operation	Eager Spool
Node ID	2
Output List	[AdventureWorks2012].[Production].[I
[1]	[AdventureWorks2012].[Production].[I
Column	ProductID
Database	[AdventureWorks2012]
Schema	[Production]
Table	[Product]
[2]	[AdventureWorks2012].[Production].[I
Column	ProductModelID
Database	[AdventureWorks2012]
Schema	[Production]
Table	[Product]
Parallel	False
Physical Operation	Table Spool

DEMO

Query For The Plan

- Sys.dm_exec_query_plan
- Cache dependent

```
SELECT  deps.type_desc,
        deps.last_execution_time,
        deps.execution_count,
        deps.total_logical_reads,
        dest.encrypted AS EncryptedText,
        dest.text,
        deqp.query_plan,
        deqp.encrypted AS EncryptedPlan
FROM    sys.dm_exec_procedure_stats AS deps
        CROSS APPLY sys.dm_exec_sql_text(deps.sql_handle) AS dest
        CROSS APPLY sys.dm_exec_query_plan(deps.plan_handle) AS deqp
WHERE   dest.text LIKE 'CREATE PROCEDURE dbo.GetSalesDetails%';
```

Query the Plan

- Standard execution plans are all XML
- XML can be queried
- XQuery

```
WITH XMLNAMESPACES(DEFAULT
N'http://schemas.microsoft.com/sqlserver/2004/07/showplan'),
QueryPlans AS
(
SELECT RelOp.pln.value(N'@PhysicalOp', N'varchar(50)') AS
OperatorName,
RelOp.pln.value(N'@NodeId',N'integer') AS NodeId,
RelOp.pln.value(N'@EstimateCPU', N'decimal') AS CPUCost,
RelOp.pln.value(N'@EstimateIO', N'float') AS IOCost
FROM @QueryPlan.nodes(N'//RelOp') RelOp (pln)
)
```

Demo Title

Subtitle

DEMO

References

- Performance Tuning with SQL Server Dynamic Management Views
  - Louis Davidson and Tim Ford
- SQL Server Execution Plans | Second Edition
- SQL Server 2012 Internals
  - Kalen Delaney, Bob Beauchemin, Conor Cunningham, Jonathan Kehayias, Paul Randal, Benjamin Nevarez
- SQL Server 2012 Query Performance Tuning

Goals

- Learn the best places to start at when reading an execution plan and why you should start there.
- Take away methods for querying directly against the execution plans that will make you faster at reading the plans.
- Understand how to drill down on the information within plans to arrive at a better understanding of why the optimizer is making these query plans.