

A Beginner's Guide to Seven Practices That Kill Performance

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Today's Agenda

Administrative Practices

T-SQL Practices

<https://www.github.com/sqlbek>

100-200 Level Session

Will be introducing many intermediate
& advanced topics

Survey session – will not be in-depth

Administrative Practices

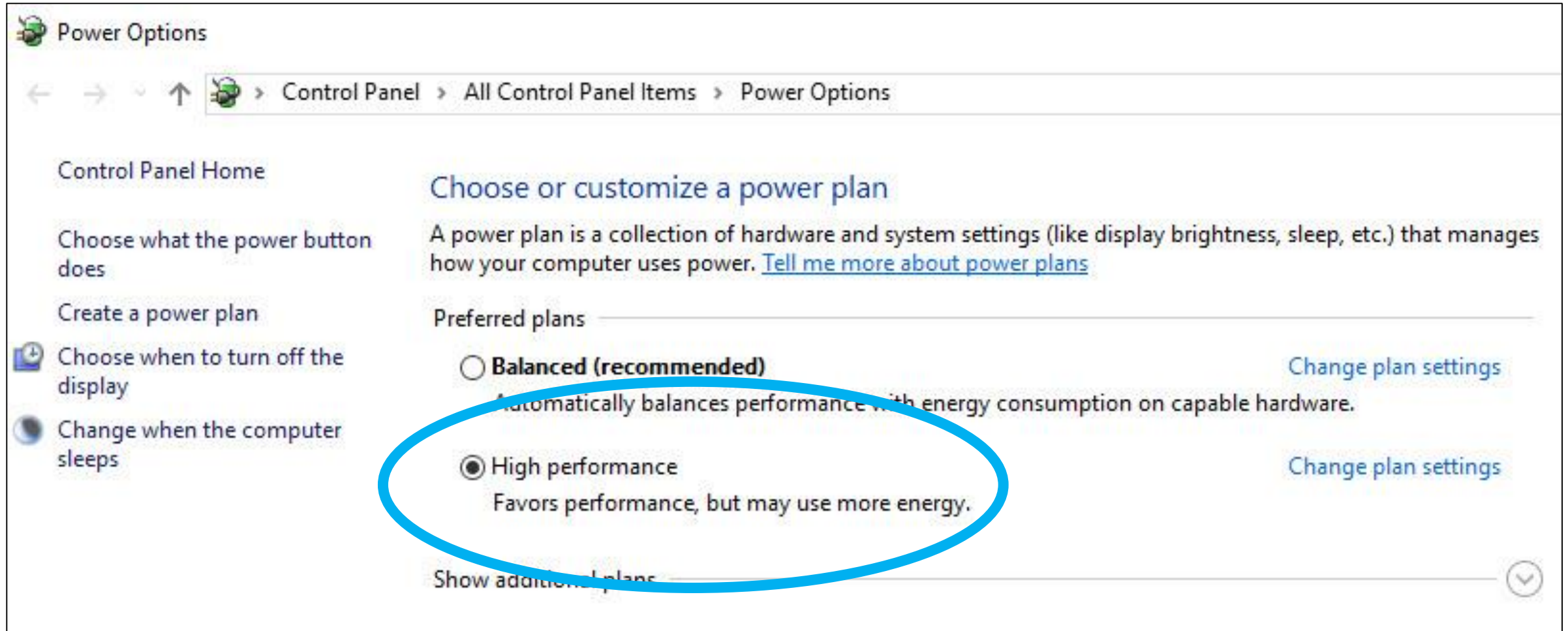
#1 – All The Power

Windows Server - Power Plan

Wrong Setting Throttles CPU

Microsoft Default Makes Me Sad...

#1 – High Performance – Always!



#1 – Power to the Shell

Learn More:

dbatools.io: Test-Dbapowerplan & Set-Dbapowerplan

- <https://docs.dbatools.io/#Test-Dbapowerplan>
- <https://docs.dbatools.io/#Set-Dbapowerplan>
- <https://www.sqlskills.com/blogs/glenn/windows-power-plan-effects-on-newer-intel-processors/>

#2 – Change Those Defaults

1. TempDB
2. Max Memory
3. Autogrowth

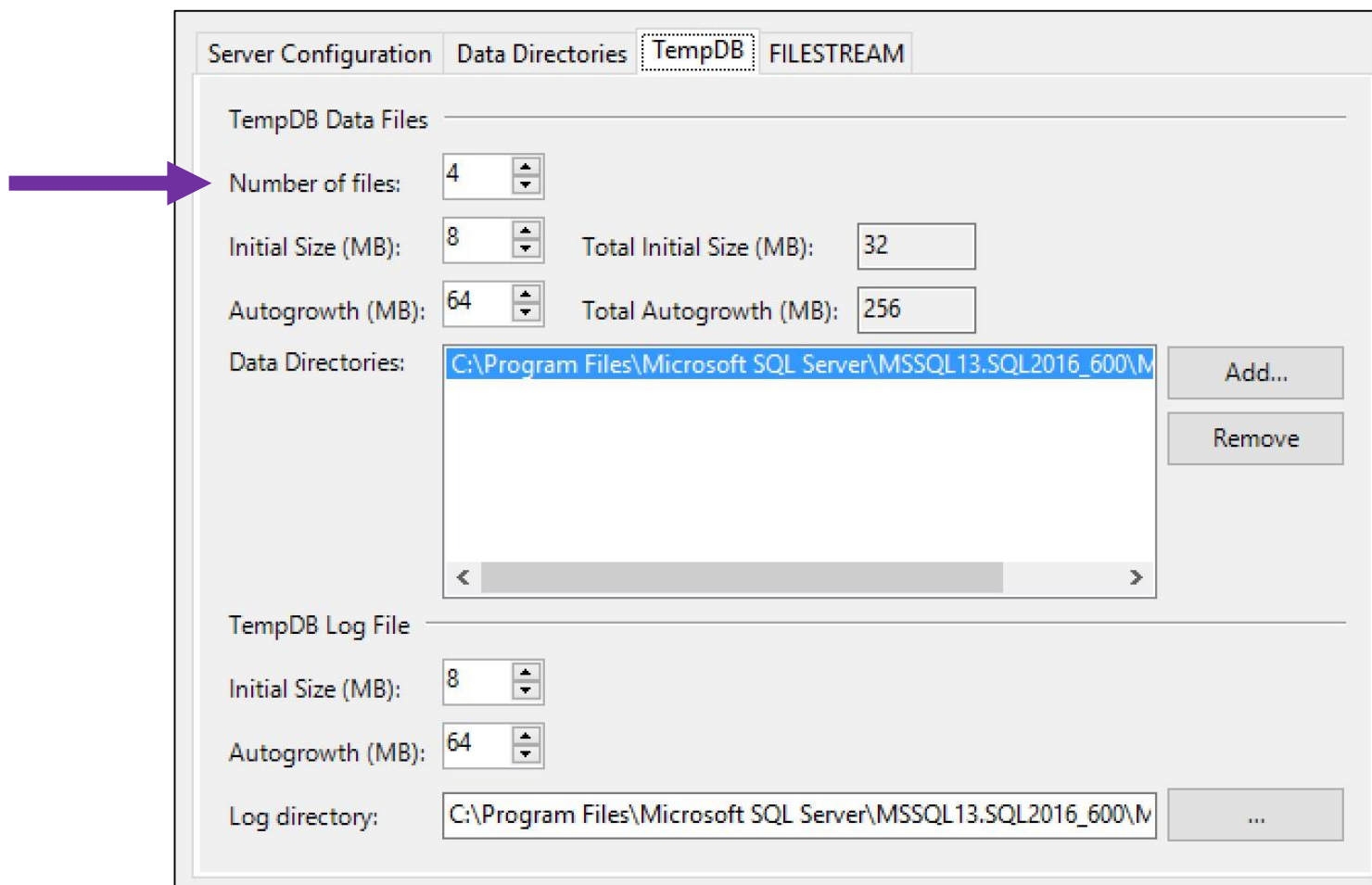
#2.1 – What is TempDB



#2.1 – We need to share



#2.1 – SQL Server 2016



The screenshot displays the 'TempDB' tab in the 'Data Directories' section of the SQL Server Enterprise Manager. The 'TempDB Data Files' section is highlighted, and a purple arrow points to the 'Number of files' dropdown, which is set to 4. Other settings include 'Initial Size (MB)' at 8, 'Autogrowth (MB)' at 64, 'Total Initial Size (MB)' at 32, and 'Total Autogrowth (MB)' at 256. The 'Data Directories' list shows the path 'C:\Program Files\Microsoft SQL Server\MSSQL13.SQL2016_600\M'. The 'TempDB Log File' section shows 'Initial Size (MB)' at 8 and 'Autogrowth (MB)' at 64, with the 'Log directory' set to 'C:\Program Files\Microsoft SQL Server\MSSQL13.SQL2016_600\M'.

Property	Value
Number of files	4
Initial Size (MB)	8
Autogrowth (MB)	64
Total Initial Size (MB)	32
Total Autogrowth (MB)	256
Data Directories	C:\Program Files\Microsoft SQL Server\MSSQL13.SQL2016_600\M
TempDB Log File Initial Size (MB)	8
TempDB Log File Autogrowth (MB)	64
Log directory	C:\Program Files\Microsoft SQL Server\MSSQL13.SQL2016_600\M

#2.1 – TempDB Recap

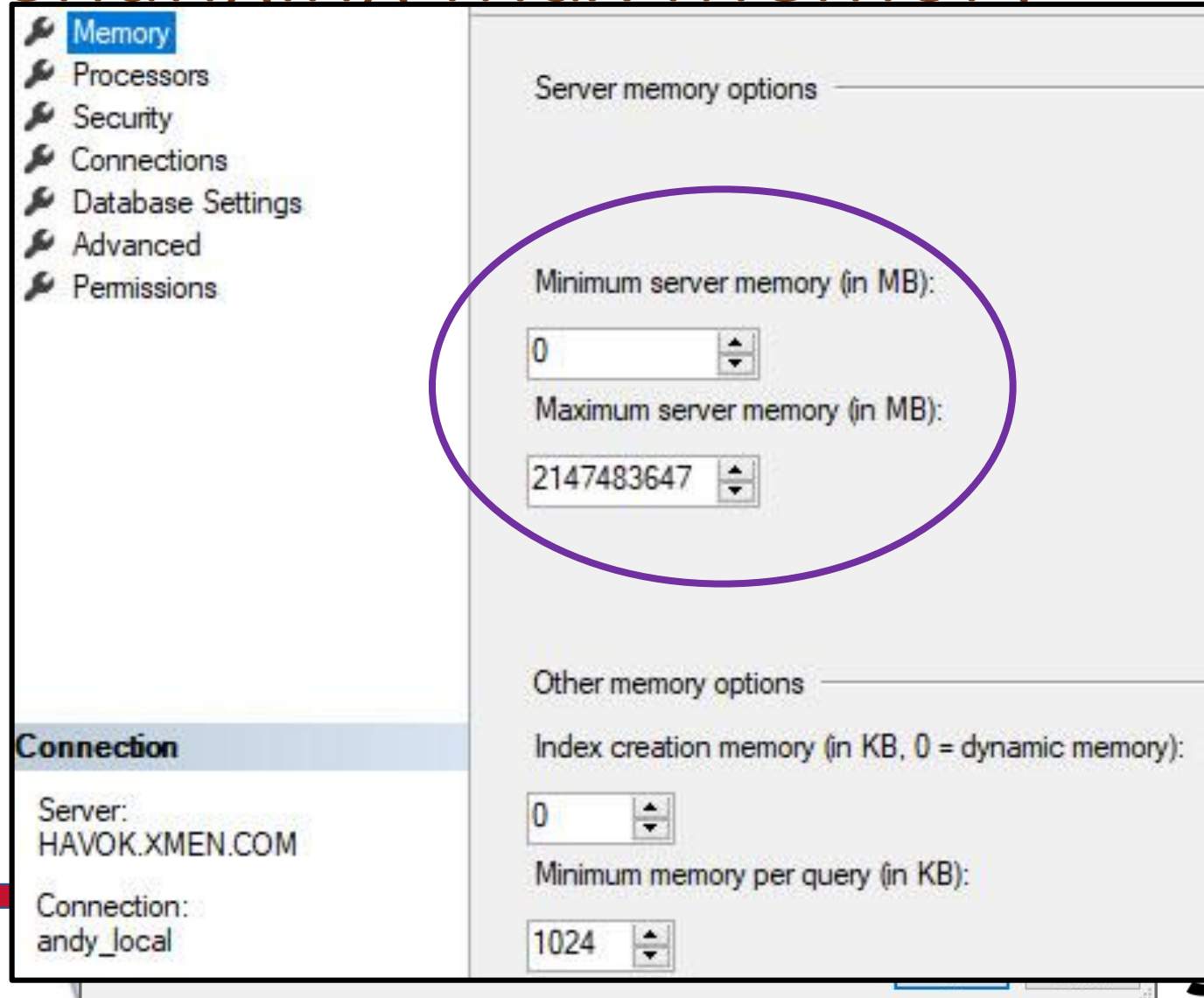
Learn More:

- <https://www.sentryone.com/blog/aaronbertrand/sql-server-2016-tempdb-fixes>
- https://blogs.msdn.microsoft.com/sql_server_team/tempdb-files-and-trace-flags-and-updates-oh-my/
- <https://sqlperformance.com/2019/08/tempdb/tempdb-enhancements-in-sql-server-2019>

#2.2 – Max Memory



#2.2 – Changing Max Memory



The screenshot displays the 'Memory' configuration page in SQL Server Enterprise Manager. The left-hand navigation pane lists various server properties: Memory, Processors, Security, Connections, Database Settings, Advanced, and Permissions. The 'Memory' option is currently selected and highlighted. Below this list, the 'Connection' section identifies the server as 'HAVOK.XMEN.COM' and the connection as 'andy_local'. The main configuration area is divided into two sections. The 'Server memory options' section is circled in purple and contains two settings: 'Minimum server memory (in MB)' set to 0 and 'Maximum server memory (in MB)' set to 2147483647. The 'Other memory options' section contains two settings: 'Index creation memory (in KB, 0 = dynamic memory)' set to 0 and 'Minimum memory per query (in KB)' set to 1024. Each setting is represented by a text box with a numeric value and a small up/down arrow control.

Memory

- Processors
- Security
- Connections
- Database Settings
- Advanced
- Permissions

Connection

Server:
HAVOK.XMEN.COM

Connection:
andy_local

Server memory options

Minimum server memory (in MB):
0

Maximum server memory (in MB):
2147483647

Other memory options

Index creation memory (in KB, 0 = dynamic memory):
0

Minimum memory per query (in KB):
1024

#2.2 – Max Memory Recap

Learn More:

- <https://www.sqlskills.com/blogs/jonathan/how-much-memory-does-my-sql-server-actually-need/>
- <https://straightpathsql.com/archives/2017/02/sql-server-max-memory-best-practices/>
- <https://docs.microsoft.com/en-us/sql/database-engine/configure-windows/server-memory-server-configuration-options?view=sql-server-2017>

#2.3 – Autogrowth



#2.3 – Change Me

Database Properties - AutoDealershipDemo

Select a page

- General
- Files

Script ? Help

Database files:

Logical Name	File Type	Filegroup	Size (MB)	Autogrowth / Maxsize
AutoDealershipDemo	ROWS Data	PRIMARY	4750	By 250 MB, Unlimited ...
AutoDealershipDemo...	LOG	Not Appli...	5782	By 250 MB, Limited to 2097152 MB ...

Connection:
andy_local
[View connection properties](#)

Progress

Ready

Add Remove

OK Cancel

#2.3 – Model After Me

The screenshot shows the SQL Server Enterprise Manager interface. In the Object Explorer on the left, the 'model' database is selected under 'Databases'. The 'Database Properties - model' window is open, showing the 'Files' page. The 'Database files' table is highlighted with a purple circle.

Logical Name	File Type	Filegroup	Size (MB)	Autogrowth / Maxsize
modeldev	ROWS...	PRIMARY	8	By 64 MB, Unlimited
modellog	LOG	Not Applicable	8	By 64 MB, Unlimited

#2.3 – AutoGrowth Recap

Learn More:

- <https://www.sqlskills.com/blogs/paul/importance-of-data-file-size-management/>
- <https://www.sqlskills.com/blogs/paul/importance-of-proper-transaction-log-size-management/>
- <https://sqlperformance.com/2014/12/io-subsystem/proactive-sql-server-health-checks-1>

BONUS: <https://www.sqlskills.com/blogs/paul/why-you-should-not-shrink-your-data-files/>

#2 –Defaults Suck

1. TempDB
2. Max Memory
3. Autogrowth

#3 –Parallelism

Controlled via two SQL Server settings:

- MAXDOP - # of cores
- Cost Threshold for Parallelism – minimum execution plan cost to consider parallelism

Don't Fear Parallelism

#3 – How Does It Work?

Sounds great, right?

- Pros
- Cons

#3 – Change Me

```
71 -- Check sys.configurations
72 SELECT
73     name, value, value_in_use
74 FROM sys.configurations
75 WHERE name IN ('cost', 'max degree of parallelism');
76 GO
77
```

DEMO

150 %

Results Messages

	name	value	value_in_use
1	cost threshold for parallelism	5	5
2	max degree of parallelism	0	0

#3 – Cost Threshold for Parallelism Recap

Learn More:

- <https://www.sqlskills.com/blogs/jonathan/tuning-cost-threshold-for-parallelism-from-the-plan-cache/>
- <https://docs.microsoft.com/en-us/sql/database-engine/configure-windows/configure-the-cost-threshold-for-parallelism-server-configuration-option?view=sql-server-2017>
- <https://www.brentozar.com/archive/2017/03/why-cost-threshold-for-parallelism-shouldnt-be-set-to-5/>

#3 – MAXDOP Recap

Learn More:

- <https://www.sqlskills.com/blogs/paul/maxdop-configuration-survey-results/>
- <https://docs.microsoft.com/en-us/sql/database-engine/configure-windows/configure-the-max-degree-of-parallelism-server-configuration-option?view=sql-server-2017>

BONUS: <https://blogs.vmware.com/apps/2018/09/sql-server-on-vmware-august-2018.html>

Recap

1. Power Plan
2. SQL Server Defaults
3. Parallelism

T-SQL Practices

#4 – Large Queries

Ever see a query where... ?

Tried to write a query that does everything?

Get X, SUM(Y), Count of Z...

#4 – Languages Matter

Procedural/Imperative - HOW

- Defines HOW to do something
- What you tell it to do, it will do

Declarative - WHAT

- Defines WHAT you would like to happen
- The HOW is left up to the language parser

#4 – Follow The Recipe

Ingredients:

- 1 cup dry spaghetti
- 1 16oz jar tomato sauce
- 1 1lb ground beef
- 1 1/2 small onion
- 1 16oz box mushrooms
- 3 garlic cloves
- 1 tbsp dried oregano
- 1 tbsp dried basil
- Salt & pepper

Steps:

1. Retrieve onion, & mushrooms from fridge.
2. Retrieve chef knife, cutting board from cabinet.
3. Retrieve garlic, oregano, basil, & tomato sauce from pantry.
4. Chop onion & mushrooms.
5. Retrieve saute pan from cabinet.
6. Saute garlic & onion. Remove & set aside.
7. Saute mushrooms. Remove & set aside.
8. Retrieve ground beef from fridge.
9. Brown beef.
10. Return garlic, onion, & mushrooms to saute pan with ground beef.
11. Add tomato sauce, salt & pepper, reduce to simmer, & cover.
12. Wait 15 minutes, stirring occasionally.
13. Retrieve spaghetti & salt from pantry.
14. Measure desired amount of spaghetti.
15. Retrieve stock pot from cabinet.
16. Fill stock pot with 6 qt. water from sink.
17. Add 2 tbsp salt to stock pot & bring water to boil on stove.
18. Add spaghetti to boiling water.
19. Wait 10 minutes.
20. Drain water from stock pot.
21. Combine pasta with sauce & serve.

#4 – Procedural: Follow The Directions



#4 – Declarative: Doing It My Way



#4 – Declarative: Doing It My Way

Ingredients:

- 1 cup dry spaghetti
- 1 16oz jar tomato sauce
- 1 1lb ground beef
- 1 1/2 small onion
- 1 16oz box mushrooms
- 3 garlic cloves
- 1 tbsp dried oregano
- 1 tbsp dried basil
- Salt & pepper

Steps:

1. Retrieve onion from fridge.
2. Retrieve cheese from cabinet.
3. Retrieve garlic from tomato sauce.
4. Chop onion & set aside.
5. Retrieve sauce from cabinet.
6. Saute garlic & onion aside.
7. Saute mushrooms & set aside.
8. Retrieve ground beef from freezer.
9. Brown beef.
10. Return garlic, onion, & mushrooms to saute pan with ground beef.



11. Add tomato sauce, salt & pepper, reduce to simmer, & cover.
12. Wait 15 minutes, stirring occasionally.
13. Retrieve spaghetti & salt from pantry.
14. Measure desired amount of spaghetti.
15. Retrieve stock pot from cabinet.
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18. Add spaghetti to boiling water.
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21. Combine pasta with sauce & serve.

#4 – How to Solve?

Consolidate and/or Break It Up

Temp Tables are y

DEMO

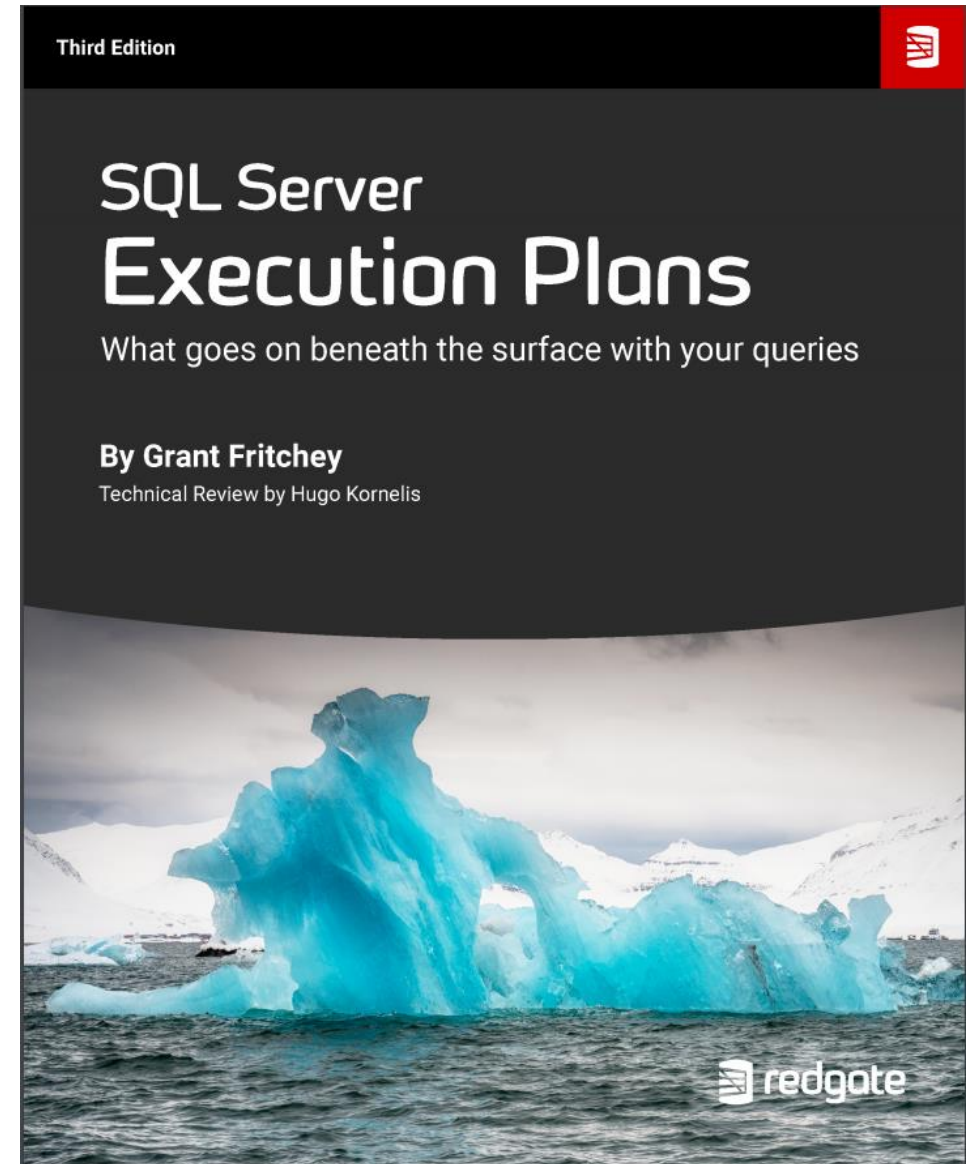
- But Beware Table variables

#4 – Large Query Recap

Learn More:

- <https://erikdarlingdata.com/2019/07/stop-writing-big-queries/>
- <https://michaeljswart.com/2014/01/sql-simplicity-methods/>
- eBook by Grant Fritchey

<https://www.red-gate.com/simple-talk/books/sql-server-execution-plans-third-edition-by-grant-fritchey/>



#5 – Key Lookups (& Indexes)

Cookbook

- Table of Contents
- Index (1 or more)
 - Alphabetical Recipe
 - Meal Course
 - Cuisine
 - Ingredient

#5 – Look It Up

Andy's Awesome Cheeseburger: Page 16

- Bacon, Cheddar, Worcestershire Sauce

DEMO

Roasted Chicken

- Butter, Rosemary, Thyme, Garlic

Romantic Spaghetti: Page 62

- Parmesan, Romano, Lemon Zest

#5 – Key Lookups Recap

Learn More:

- <https://sqlespresso.com/2019/04/03/whats-a-key-lookup/>
- <https://www.sqlskills.com/blogs/jonathan/finding-key-lookups-inside-the-plan-cache/>
- <https://sqlperformance.com/2016/05/sql-indexes/rid-lookup-faster-key-lookup>

BONUS: Plan Explorer Index Analysis

<https://www.sentryone.com/blog/devonleannwilson/t-sql-tuesday-101>

#6 – TempDB Spills

I Need Some Space

Memory Grants

DEMO



#6 – TempDB Spills Recap

Learn More:

- <https://erikdarlingdata.com/2019/07/spills-week-when-sort-spills-might-not-matter/>
- <https://sqlperformance.com/2019/06/sql-memory/troubleshooting-variable-memory-grants>

BONUS: Advanced

<https://sqlperformance.com/2016/09/sql-plan/sort-spills-level-15000>

#6 – TempDB Spills Recap

Learn More:

- <https://www.sqlskills.com/blogs/kimberly/understanding-tempdb-table-variables-v-temp-tables-and-improving-throughput-for-tempdb/>

#7 – Code Re-Use

Functions

- Scalar
- Inline Table Valued
- Multi-Statement Table Valued

DEMO

Views

#7 – Code Re-Use

Learn More:

- https://sqlbits.com/Sessions/Event16/Performance_Pitfalls_of_Code_Reuse
- <http://blog.waynesheffield.com/wayne/archive/2012/02/comparing-inline-and-multistatement-table-valued-functions/>
- <https://sqlperformance.com/2015/06/sql-server-2016/sys-dm-exec-function-stats>
- <https://sqlperformance.com/2017/08/t-sql-queries/multi-statement-tvfs-dynamics-crm>

Session Recap

1. Power Plan
2. SQL Server Defaults
3. Parallelism
4. Large Queries
5. Key Lookups
6. TempDB Spills
7. Code Re-Use

Thank you!

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<http://sqlbek.wordpress.com>

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