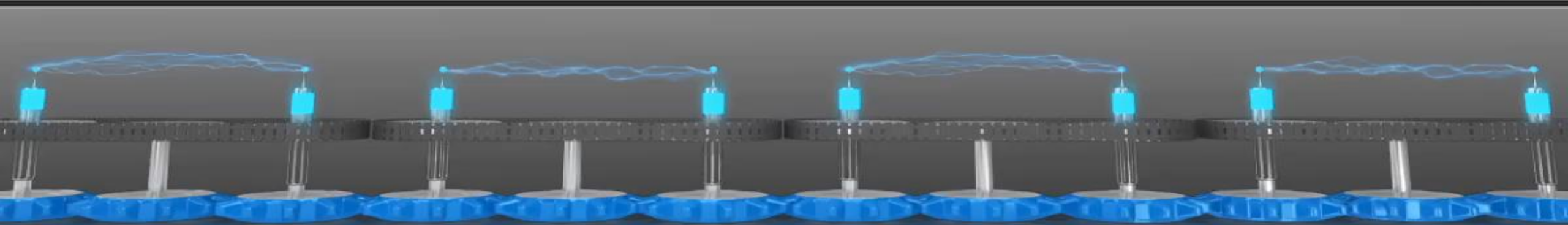
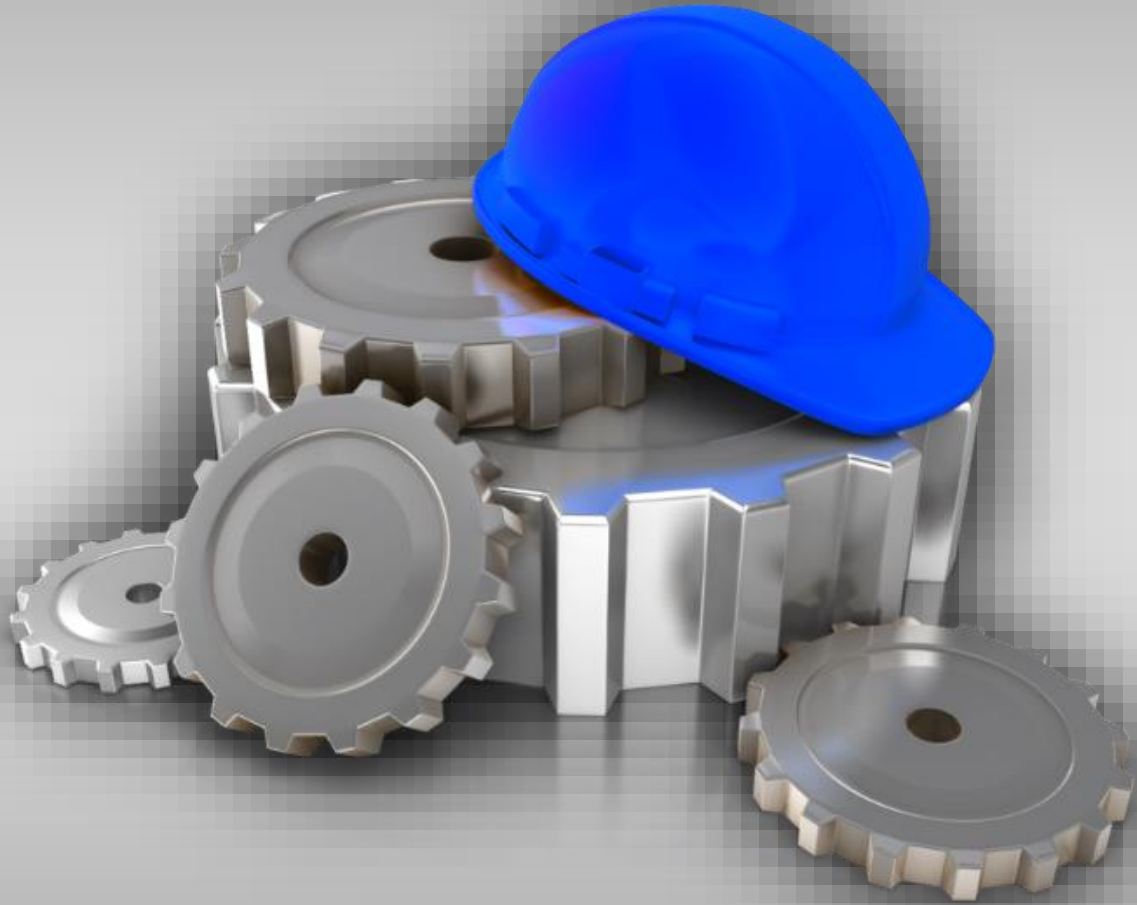


# PERFORMANCE TUNING SQL SERVER ON CRAPPY HARDWARE



# **FEEDBACK FORMS**



**PLEASE FILL OUT  
AND  
PASS TO YOUR  
HELPER BEFORE  
YOU LEAVE THE  
SESSION**

# MONICA RATHBUN

Consultant

Denny Cherry & Associates Consulting



PASS Mid-Atlantic Regional Mentor

User Group Leader: Hampton Roads VA



MRathbun@sqlespresso.com



sqlespresso.com

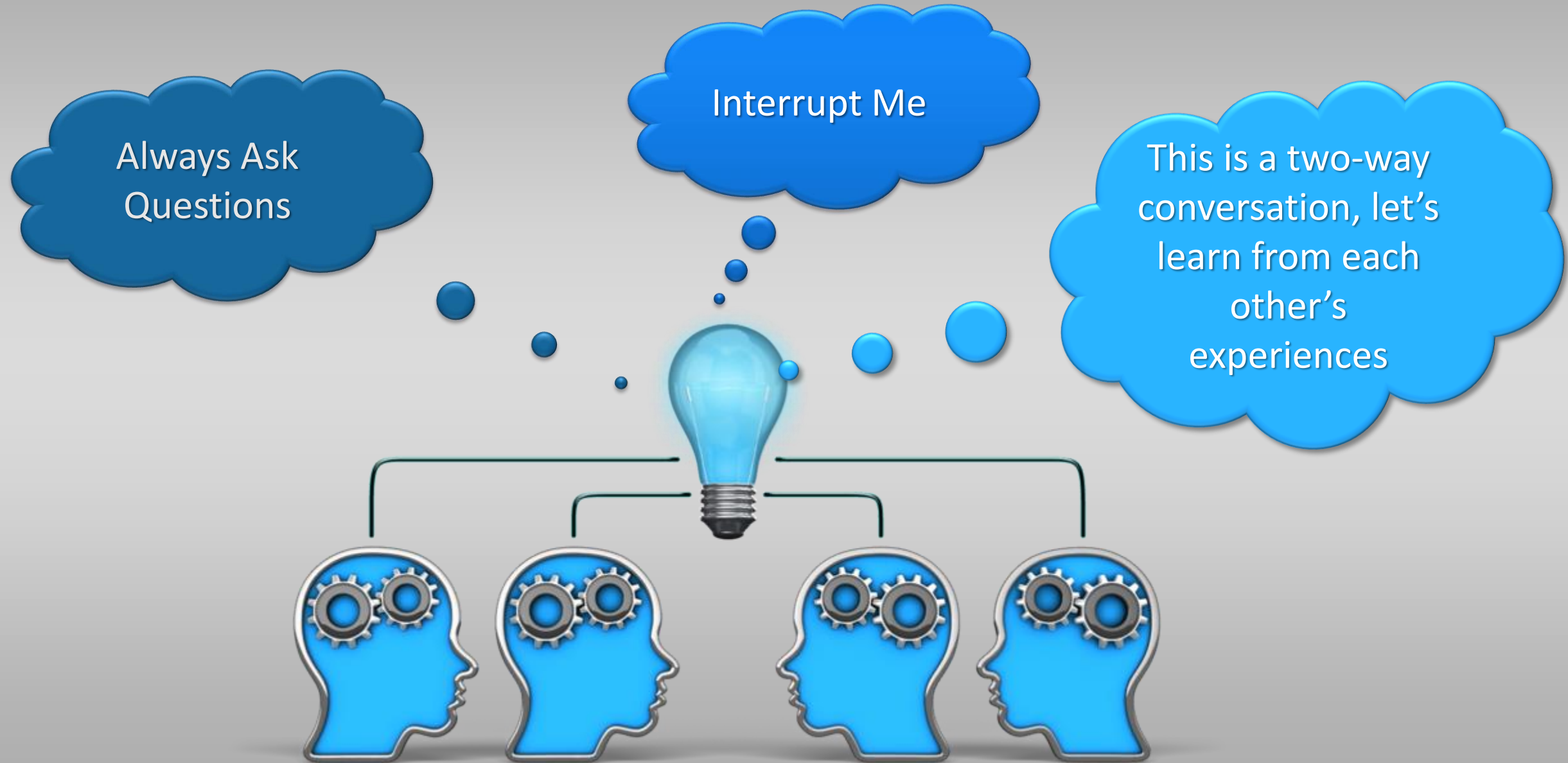


@SQLEspresso

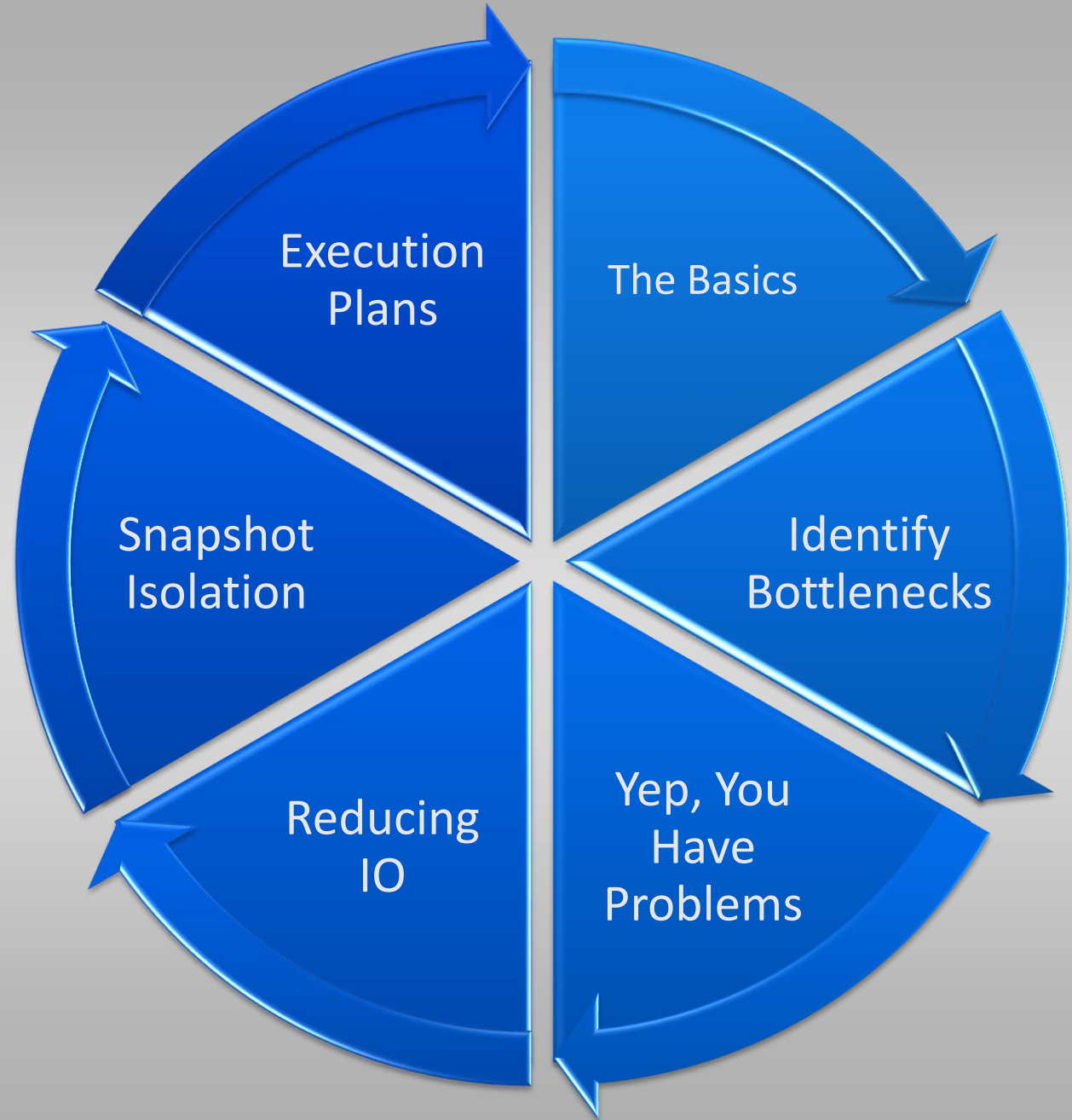
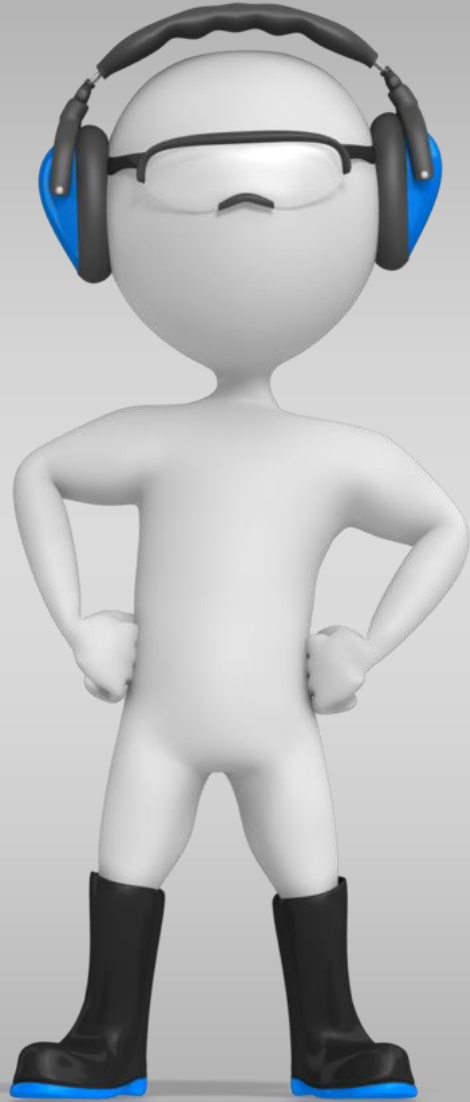


linkedin.com/in/sqlespresso

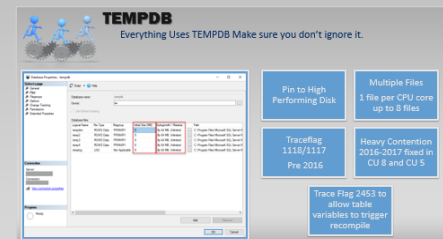
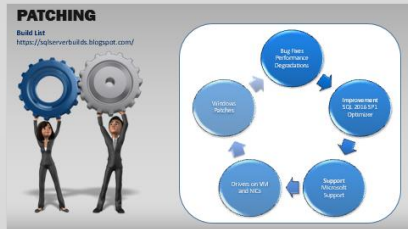
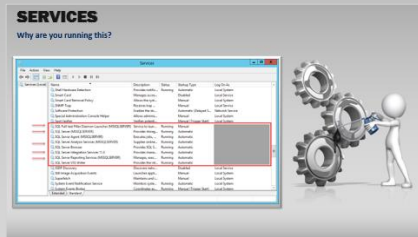
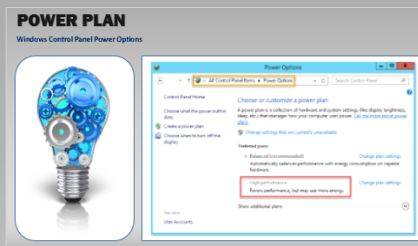
# PRESENTATION RULES



# AGENDA

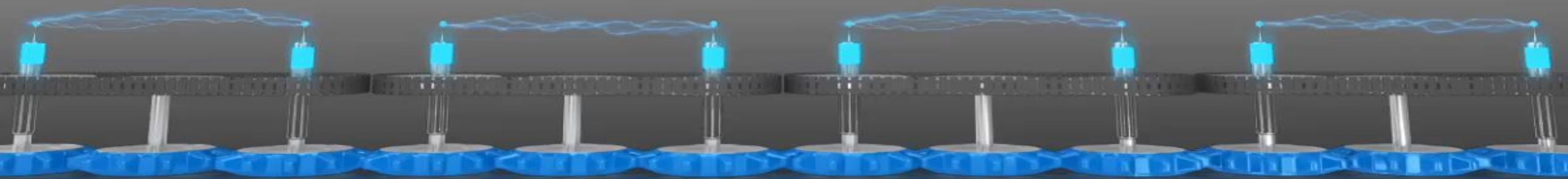






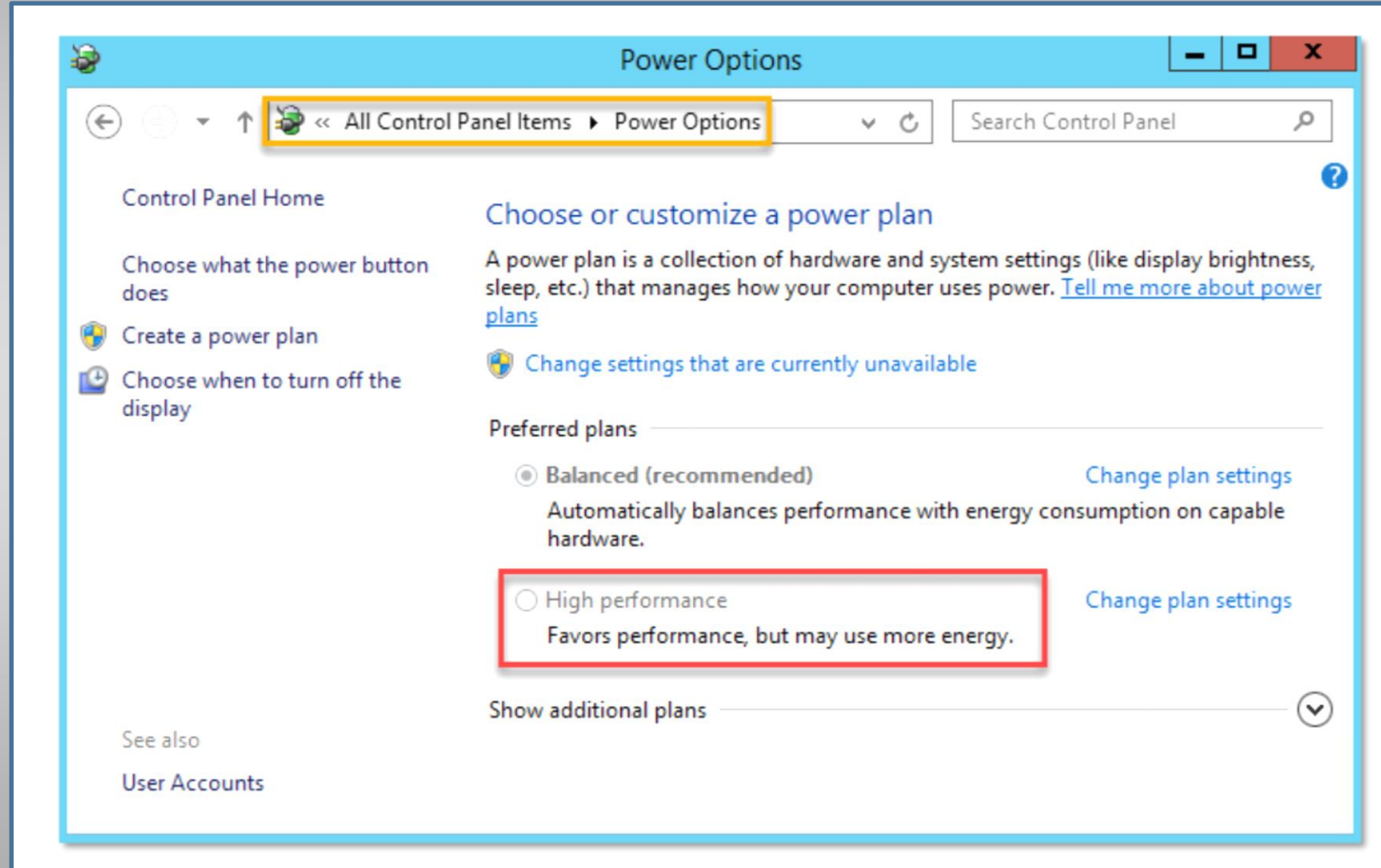
Start with the basics.

# BEST PRACTICES



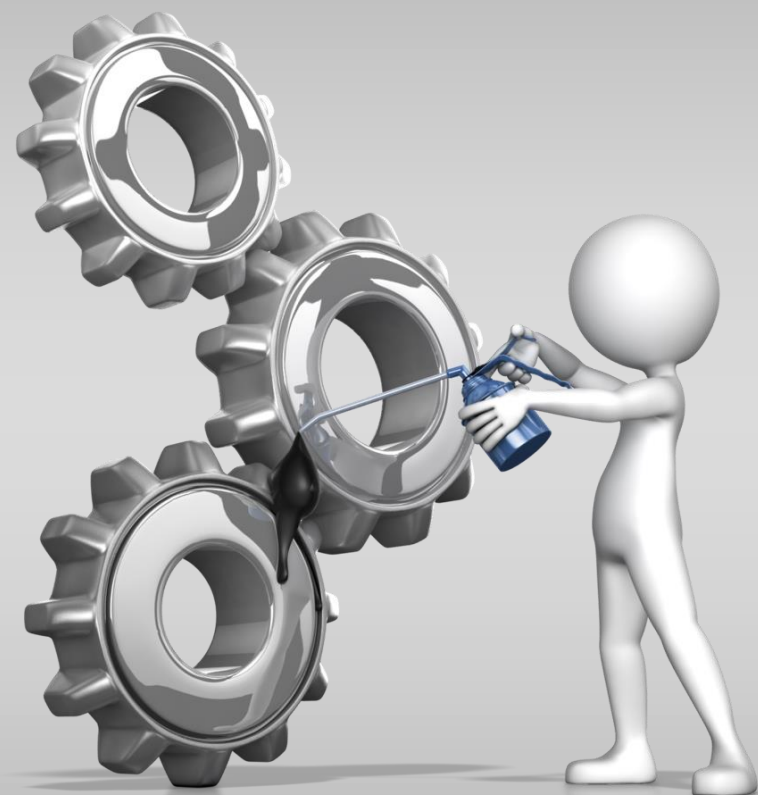
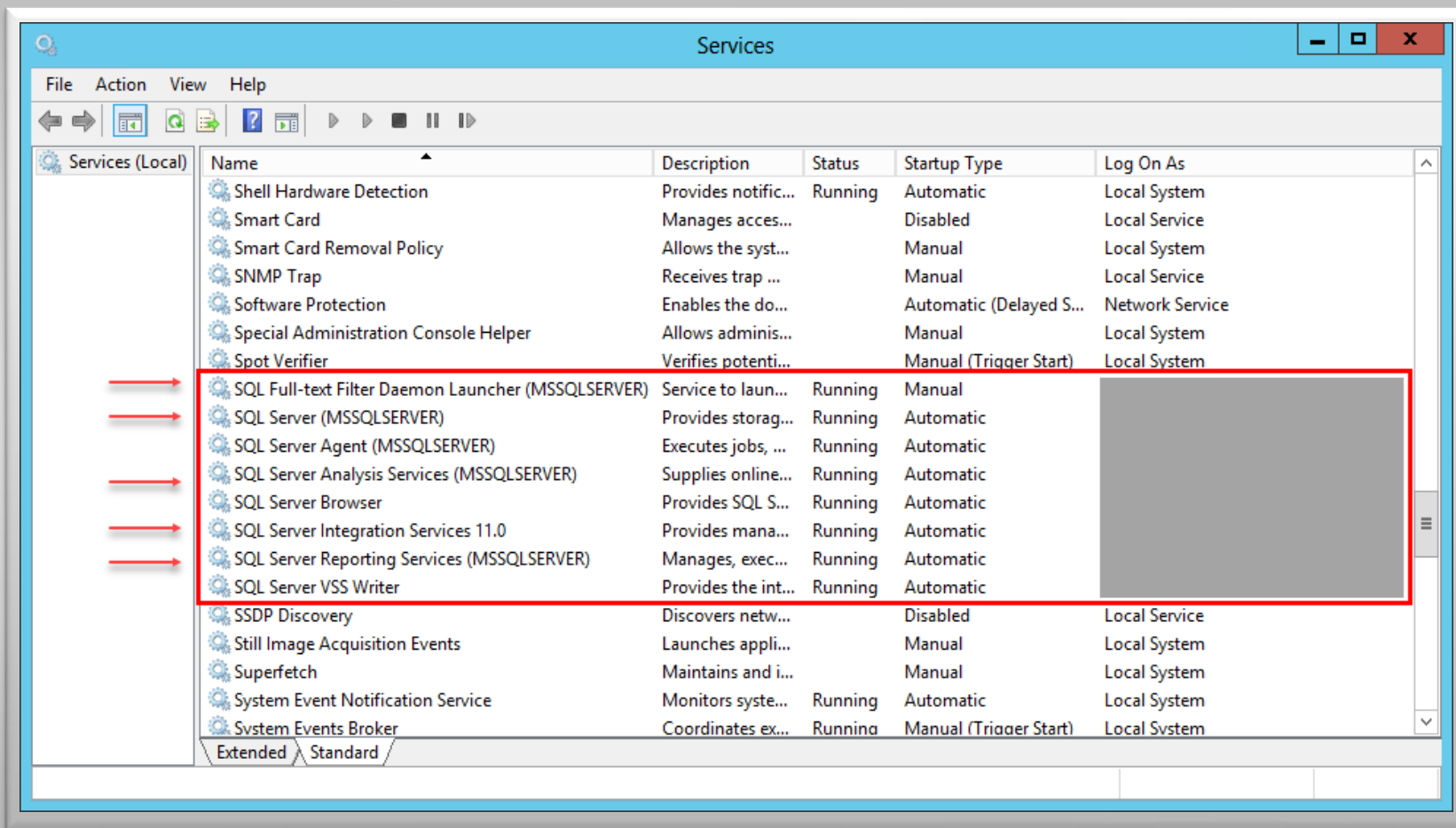
# POWER PLAN

## Windows Control Panel Power Options



# SERVICES

Why are you running this?

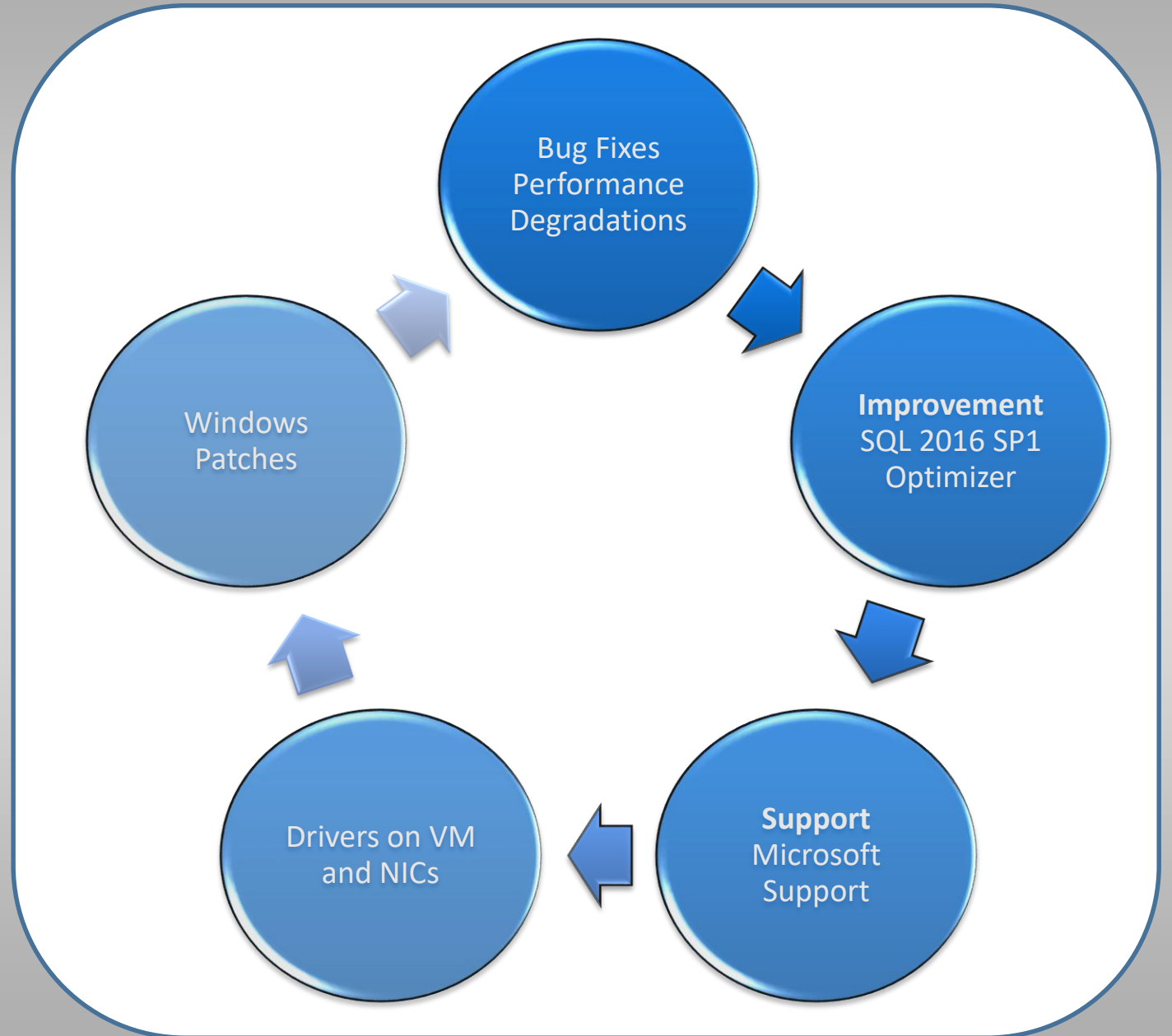




# PATCHING

## Build List

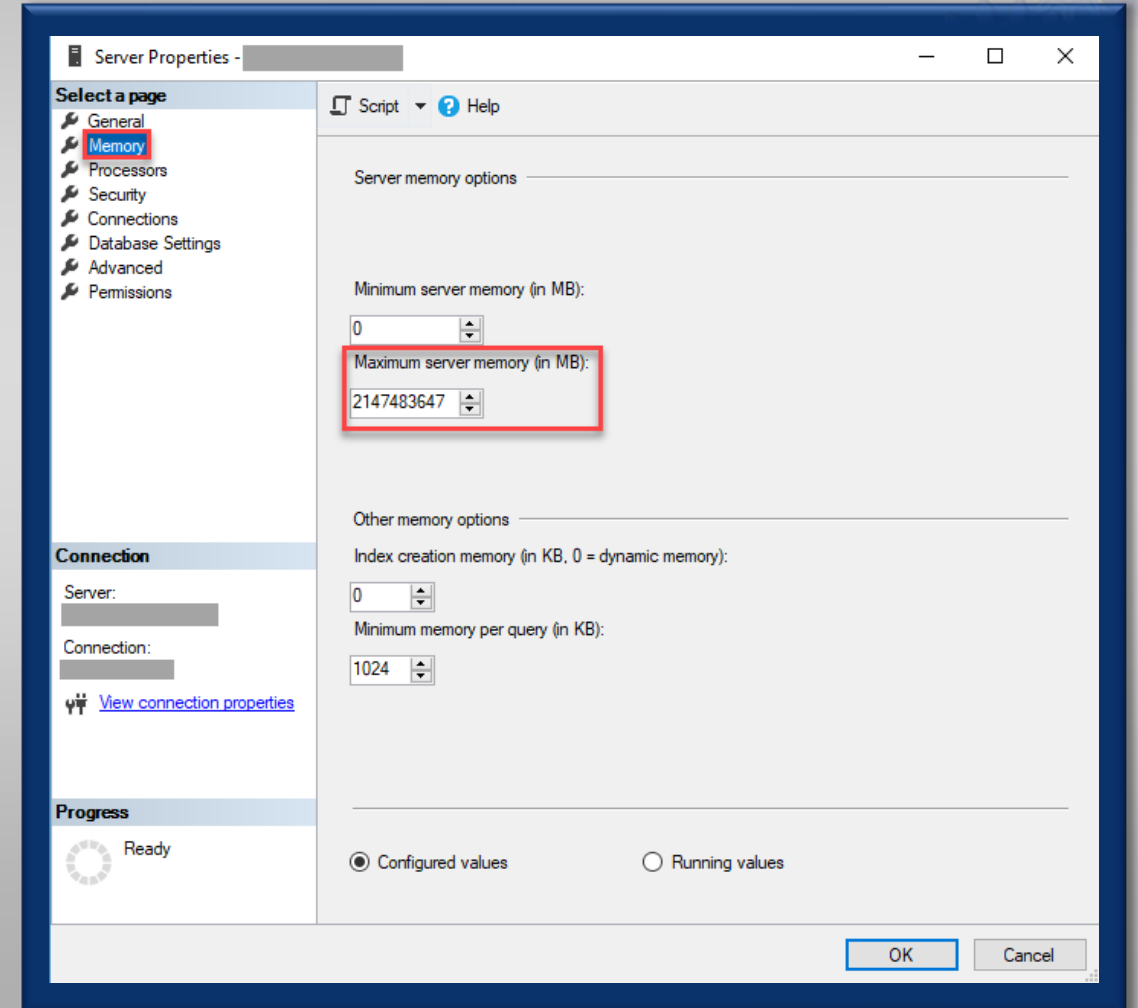
<https://sqlserverbuilds.blogspot.com/>



# MEMORY

Proper configuration is vital

- Min and Max Memory
- Multiple Instances
- Extra Services SSRS, SSIS, SSAS
- Lock Pages in Memory \*
- Set Memory Reservation for Your VM on Host
- Don't over allocate!



The image shows the 'Server Properties' dialog box in SQL Server Enterprise Manager, specifically the 'Memory' tab. The 'Memory' tab is selected in the left-hand pane. The 'Server memory options' section contains two spinners: 'Minimum server memory (in MB)' set to 0 and 'Maximum server memory (in MB)' set to 2147483647. The 'Other memory options' section contains two spinners: 'Index creation memory (in KB, 0 = dynamic memory)' set to 0 and 'Minimum memory per query (in KB)' set to 1024. At the bottom, there are radio buttons for 'Configured values' (selected) and 'Running values'. The 'OK' and 'Cancel' buttons are at the bottom right.

Server Properties - [Server Name]

Select a page

- General
- Memory**
- Processors
- Security
- Connections
- Database Settings
- Advanced
- Permissions

Script ? Help

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):

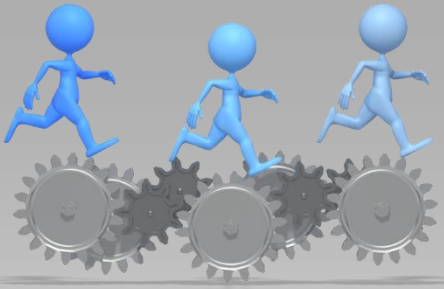
1024

Progress

Ready

☒ Configured values ☐ Running values

OK Cancel



# TEMPDB

Everything Uses TEMPDB Make sure you don't ignore it.

Database Properties - tempdb

Select a page: General, Files, Filegroups, Options, Change Tracking, Permissions, Extended Properties

Script Help

Database name: tempdb  
Owner: sa  
☒ Use full-text indexing

Database files:

Logical Name	File Type	Filegroup	Initial Size (MB)	Autogrowth / Maxsize	Path
tempdev	ROWS Data	PRIMARY	8	By 64 MB, Unlimited	C:\Program Files\Microsoft SQL Server\...
temp2	ROWS Data	PRIMARY	8	By 64 MB, Unlimited	C:\Program Files\Microsoft SQL Server\...
temp3	ROWS Data	PRIMARY	8	By 64 MB, Unlimited	C:\Program Files\Microsoft SQL Server\...
temp4	ROWS Data	PRIMARY	8	By 64 MB, Unlimited	C:\Program Files\Microsoft SQL Server\...
templog	LOG	Not Applicable	8	By 64 MB, Unlimited	C:\Program Files\Microsoft SQL Server\...

Connection: Server: [redacted] Connection: [redacted] [View connection properties](#)

Progress: Ready

Add Remove OK Cancel

Pin to High  
Performing Disk

Multiple Files  
1 file per CPU core  
up to 8 files

Traceflag  
1118/1117  
Pre 2016

Heavy Contention  
2016-2017 fixed in  
CU 8 and CU 5

Trace Flag 2453 to  
allow table  
variables to trigger  
recompile

# MAKE FRIENDS WITH NETWORK & STORAGE ADMINS

Their baby might be ugly





# IDENTIFYING BOTTLENECKS

## Perfmon Counters



### Latency\Queue

- Avg. Disk sec/Read counter
- Avg. Disk sec/Write counter
- Avg. Disk Queue Length



### Memory

- Database Pages
- Page Life Expectancy
- Available MBYTES



### CPU

- Processor\% Processor Time
- Processor\% User Time
- Processor\% Interrupt Time



### Third Party Tools

- SentryOne
- Idera
- SolarWinds
- Red Gate

# YEP YOU HAVE PROBLEMS

Challenges Ahead



Bad\Old  
Hardware

Older Disks

Just Not Fast  
Enough

Limited Physical  
Server

No Memory Slots  
Slow CPU

Budget

No New Hardware

No New Licenses

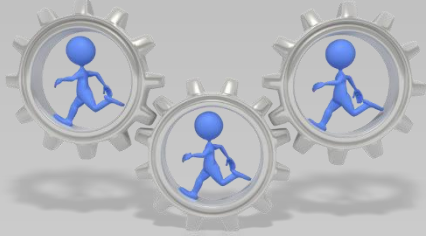
Team Just  
Doesn't  
Get SQL

RAID 5 for ALL

Clones

# VIRTUAL ENVIRONMENTS

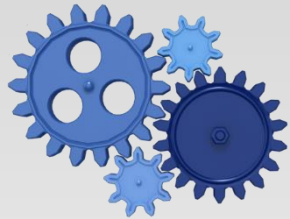
## Over Provisioned Hosts



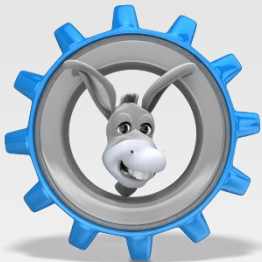
Too Many VMs on One Host



What Happens on One VM Now Effects Another



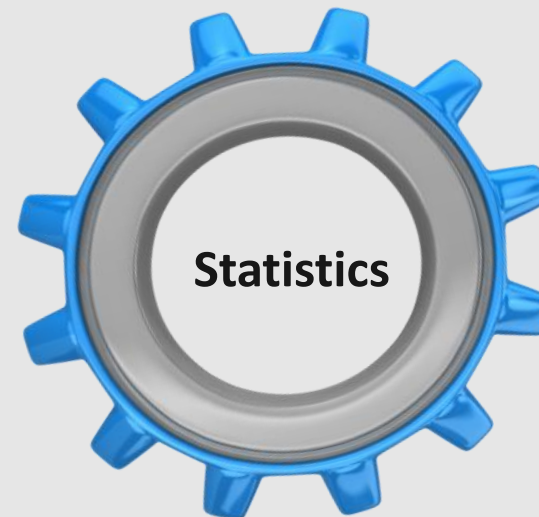
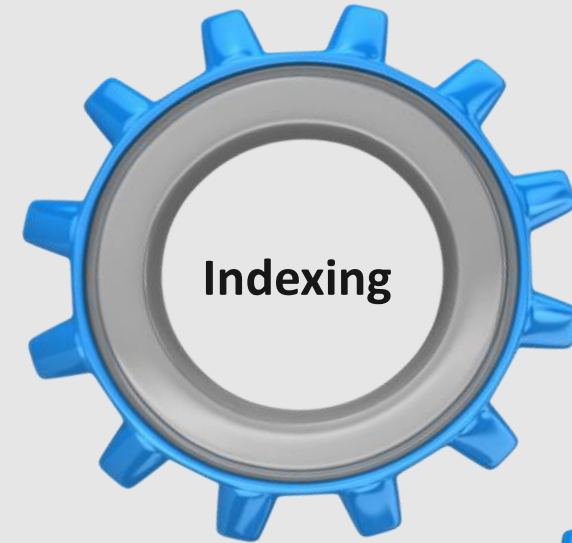
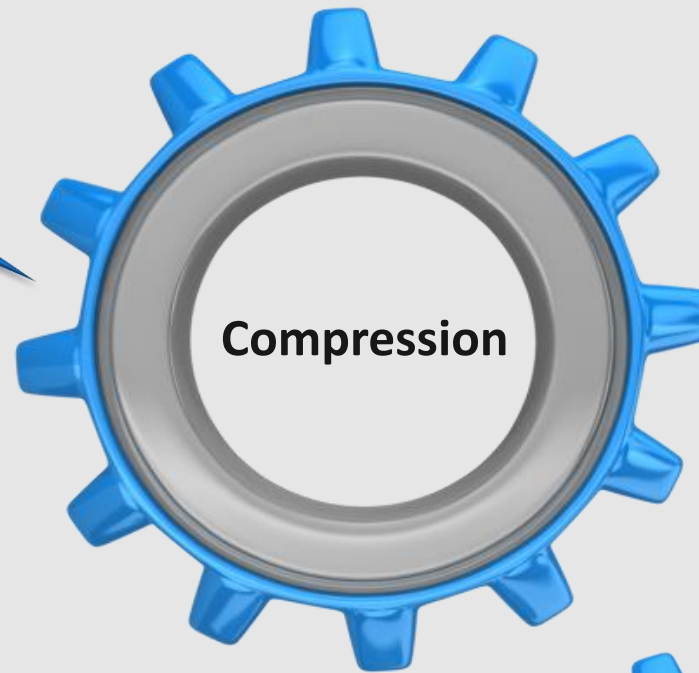
VM Over/Under CPU Allocation



Thin Provisioning

Now  
Available in  
Standard  
Edition

# REDUCE DISK IO READS & WRITES





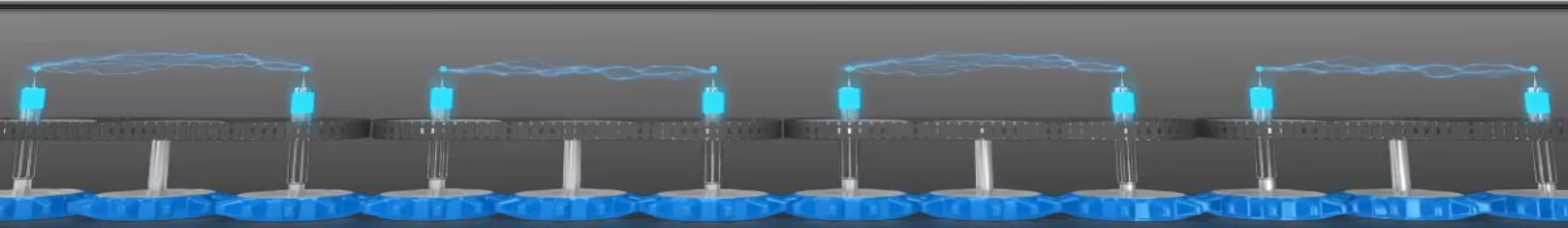


Row/Page Compression -  
More Data In **MEMORY**

Backup Compression: Less  
Data in **STORAGE**

# COMPRESSION

More data in memory – It's the GOLDEN EGG!



# INDEXES

These are not set it and forget it.

**Remove Un-Used  
Indexes**



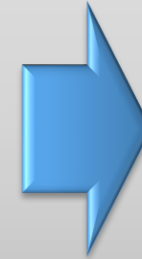
Wasted Write Disk IO  
Disable then Delete

**Find Missing Indexes**

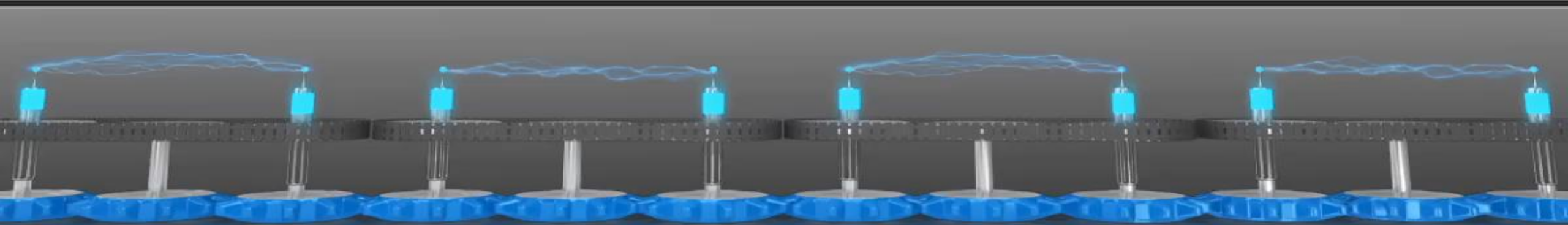


Wasted Read IO  
Avoid Duplicates

**Covering Indexes**



Consolidate Indexes  
Specific Query Tuning – Key Lookups





# STATISTICS

This is the magic sauce that helps the optimizer.

---

Maintain      Keep These Up To Date!

---

Updates      Sync vs Async

Defaulted in  
SQL 2016

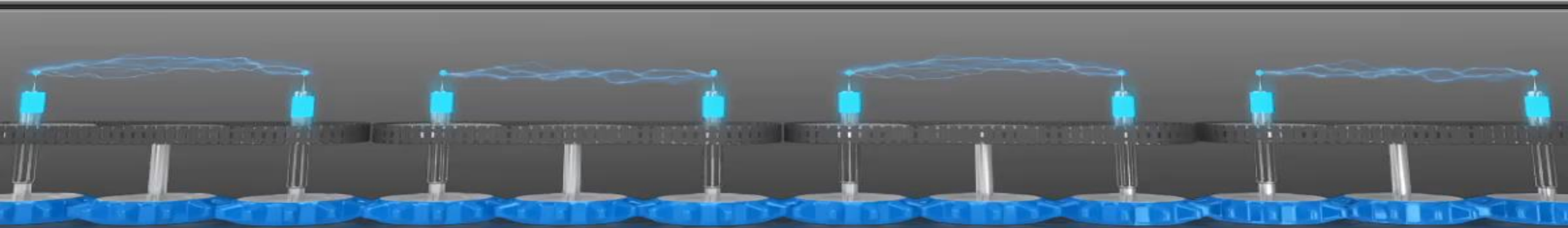
---

Trace Flags      Trace Flag 2371

---

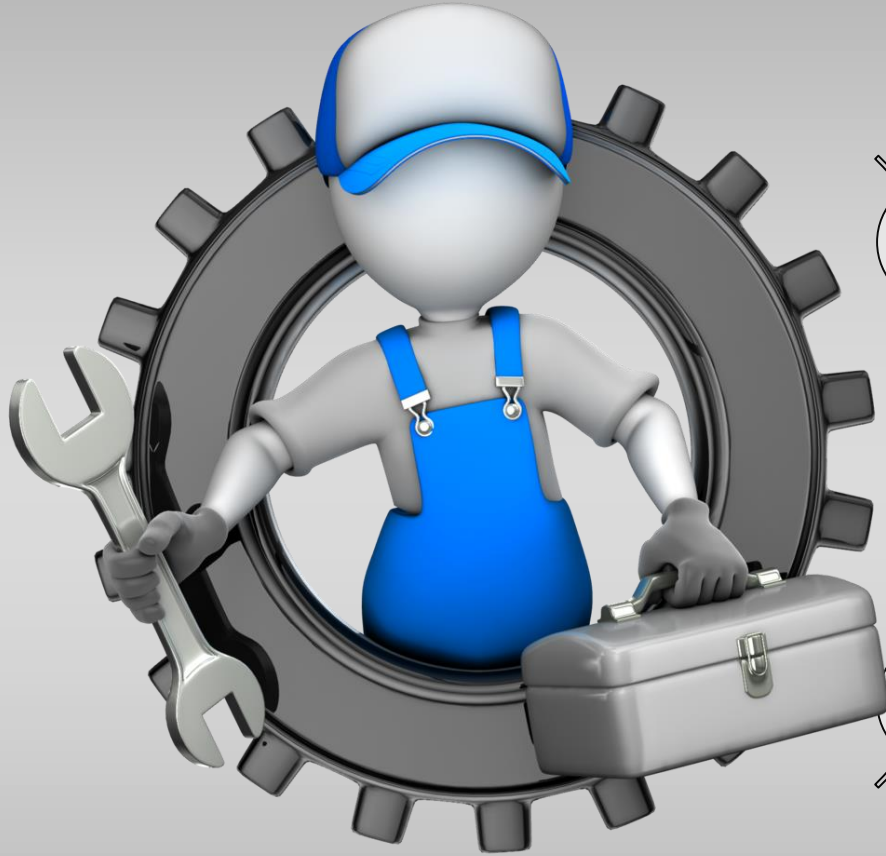
Missing Stats      Did You Know You Can Make Your Own?

---



# DATA LOADS

Know Your Environment



- Avoid Truncate and Reload
- Replication
- Change Data Capture
- SSIS



# ALLOW SNAPSHOT ISOLATION & READ COMMITTED SNAPSHOT ISOLATION (RSCI)

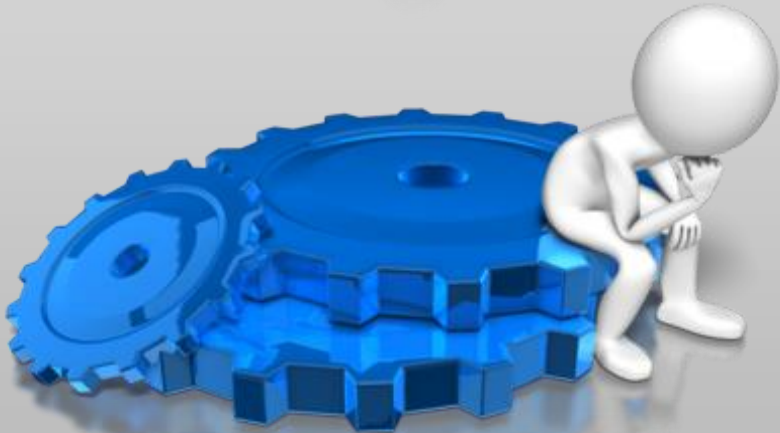


**Ta-dah!**

READERS CANT BLOCK WRITERS  
AND  
WRITERS CANT BLOCK READERS

ion

sions for each  
ntained in tempdb.



**RCSI** option

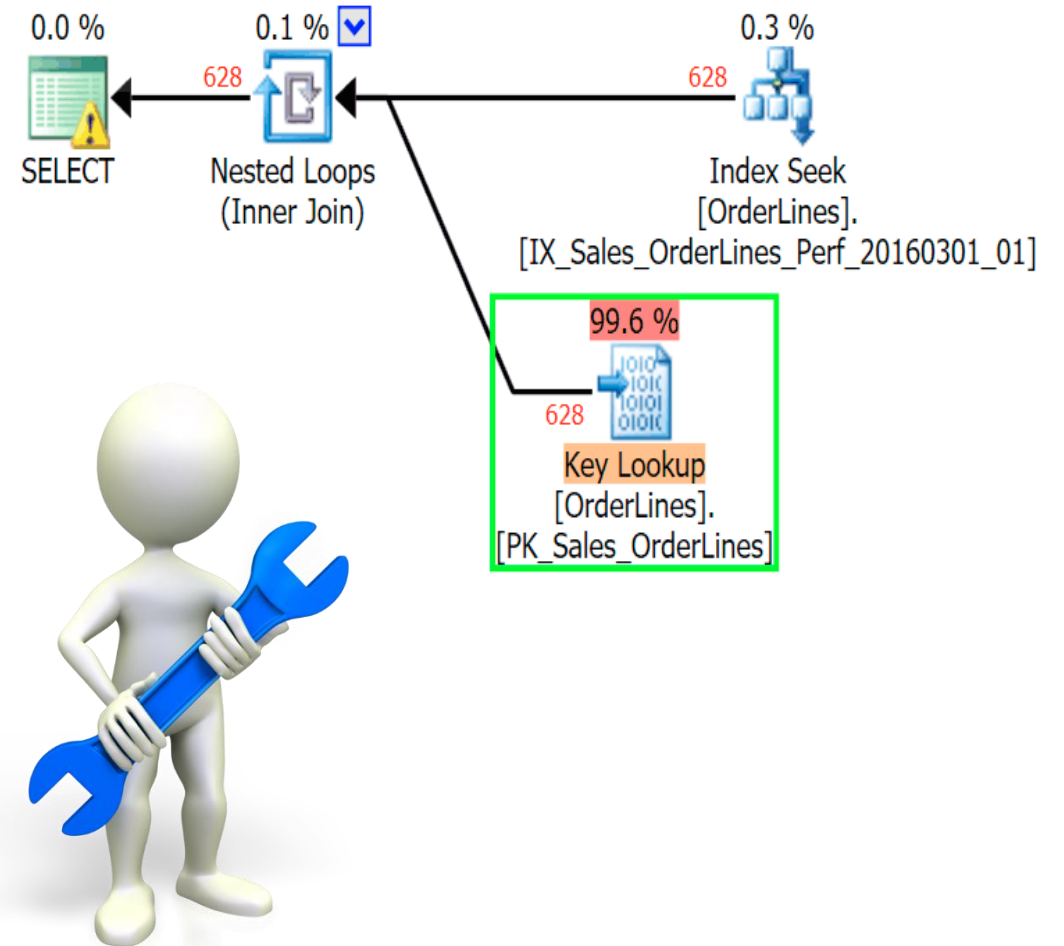
Allows access to versioned rows under the default READ COMMITTED isolation level.

If set to OFF, you must explicitly set the level for each session in order to access versioned rows

# EXECUTION PLANS

## Easy things to look at

Index Needs	More Granular Review
	Missing Includes
	Scans
Sorts	Does the data need to be sorted?
	Can it be done elsewhere?
Key Lookups	Extra Reads
	Easily Avoided in Most Cases
Spills	Spills to TempDB
	Forced to go to Disk



# THANK YOU!



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& Associates Consulting

Your Data, Our Expertise

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323-686-1478

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Optimize licensing.

Reduce your IT footprint.

Pay off technical debt.

Unburden your environment.