Understanding Your Database Performance in SQL Server

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He wants you to make sure you can **restore your data**

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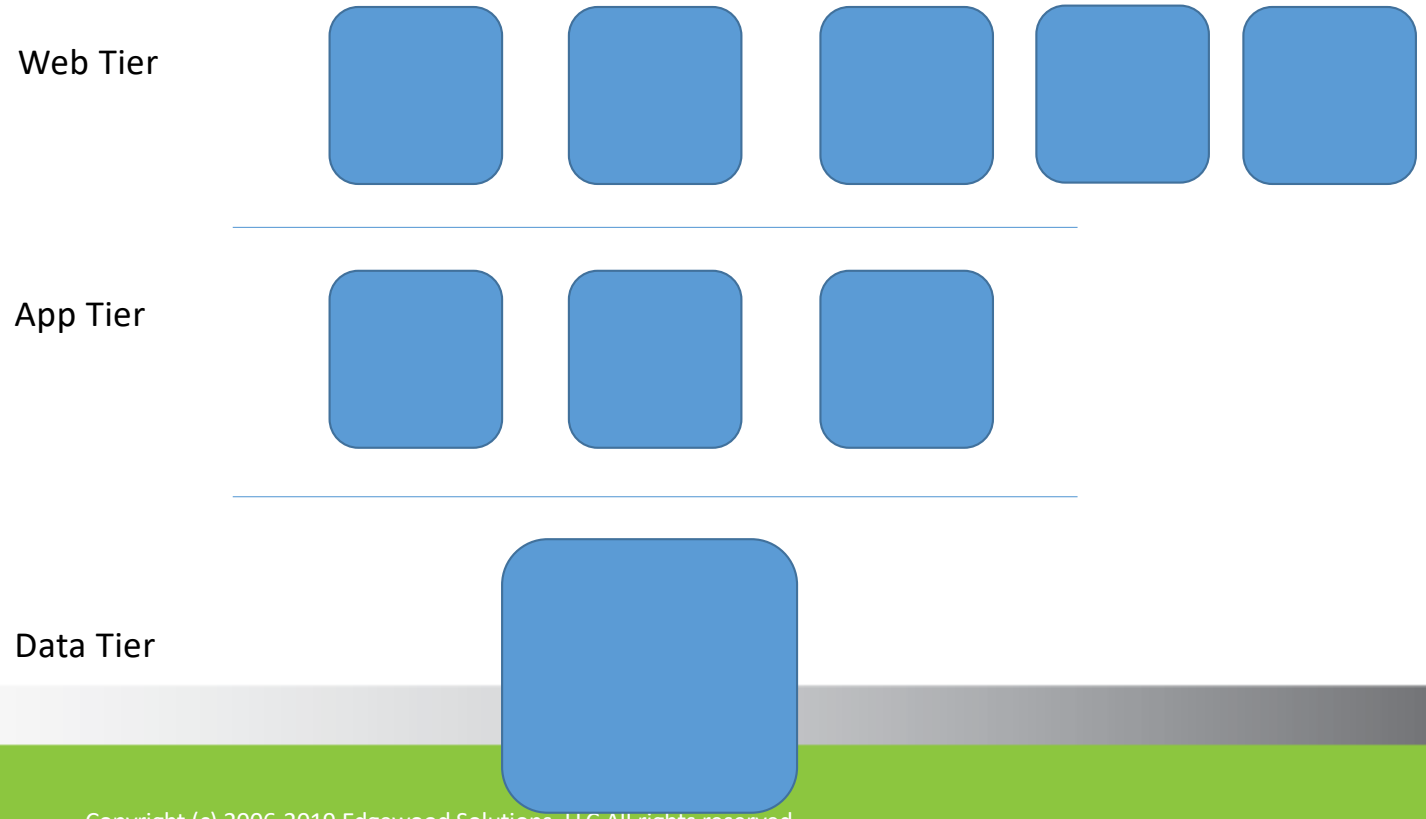
Why is Database Performance so Important?

- Most database applications are monolithic (single sever)



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SQL Server Performance Elements

CPU—READING PAGES, CALCULATION, JOINS

MEMORY—LOADING PAGES, TEMPDB CONTENTION, LATCHING

TEMPDB—GAM/SGAM PAGE CONTENTION, QUERY SPILLS

PHYSICAL DISKS—WAITING, LATENCY, BAD QUERIES

NETWORK—POOR APPLICATION DESIGN

BLOCKING—CONCURRENCY AND HIGHLY INCONSISTENT RESPONSE TIME

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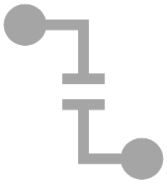
The Database Engine

The Life of a Query

User submits query

SQL Server looks for execution plan in cache

If plan isn't in cache, it generates a new execution plan (CPU)



Plan Submitted

SQL Sever beings to execute plan

Memory is allocated to perform joins in plan (memory)

Looks for data pages in buffer pool (memory)

If pages aren't in pool, SQL Server goes to disk (IO)

Calculations, comparisons, analysis (CPU)

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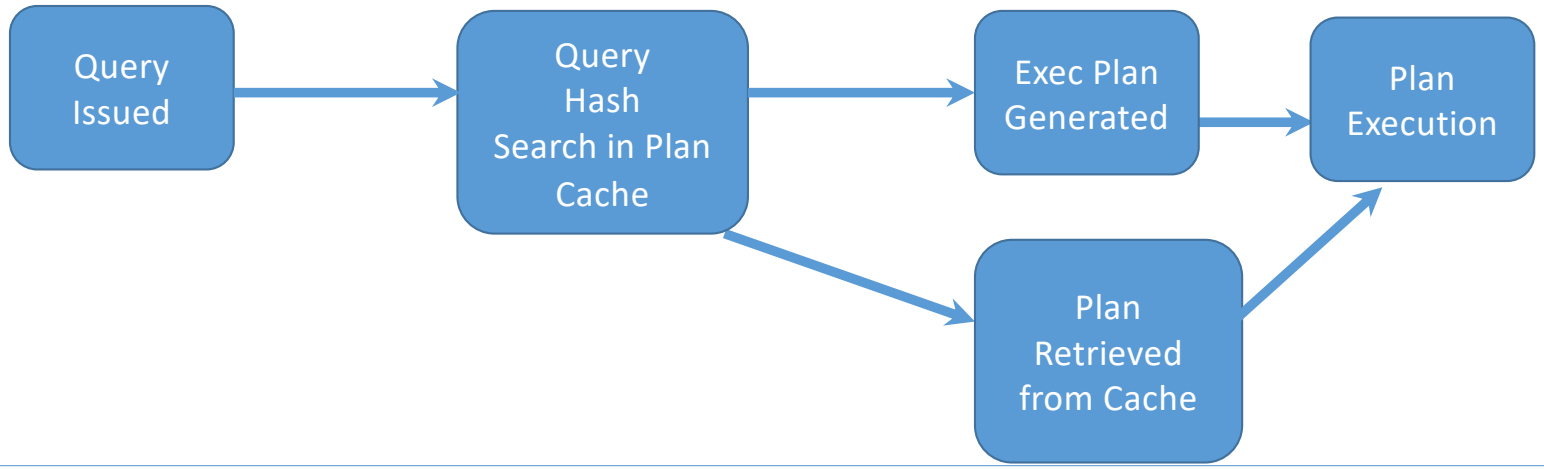
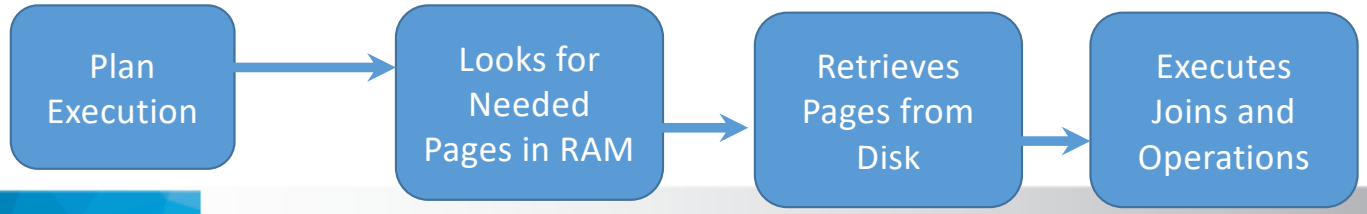
Query Flowchart





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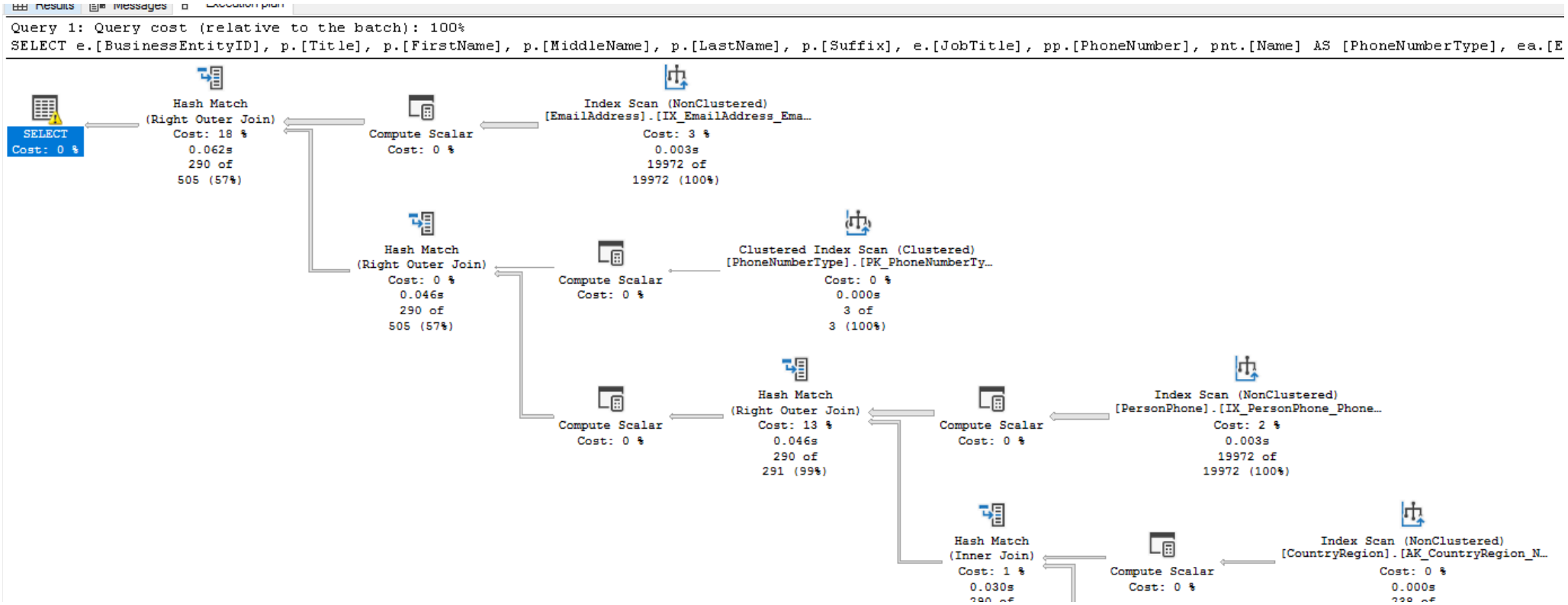
Server Performance

Understand the difference between single query performance

- Slow query runtime
- Poor application response
- Tuning on query tuning to resolve performance

Understanding overall server performance

- Focused on server level metrics (CPU, IO, Memory)
- Overall throughput and concurrency
- You still need to fix queries
- Blocking and locking issues



Query Performance

- Understand your poorest performing queries
- If on SQL Server 2016+ use the query store
- Learn how to read execution plans

Fixing Execution Plans

INDEXES ARE YOUR FRIENDS

STORED PROCEDURES CAN OFFER PLAN STABILITY

UP TO DATE STATISTICS ARE IMPORTANT

UNDERSTAND PARAMETER SNIFFING ISSUES

DON’T JUST BLINDLY ADD INDEXES

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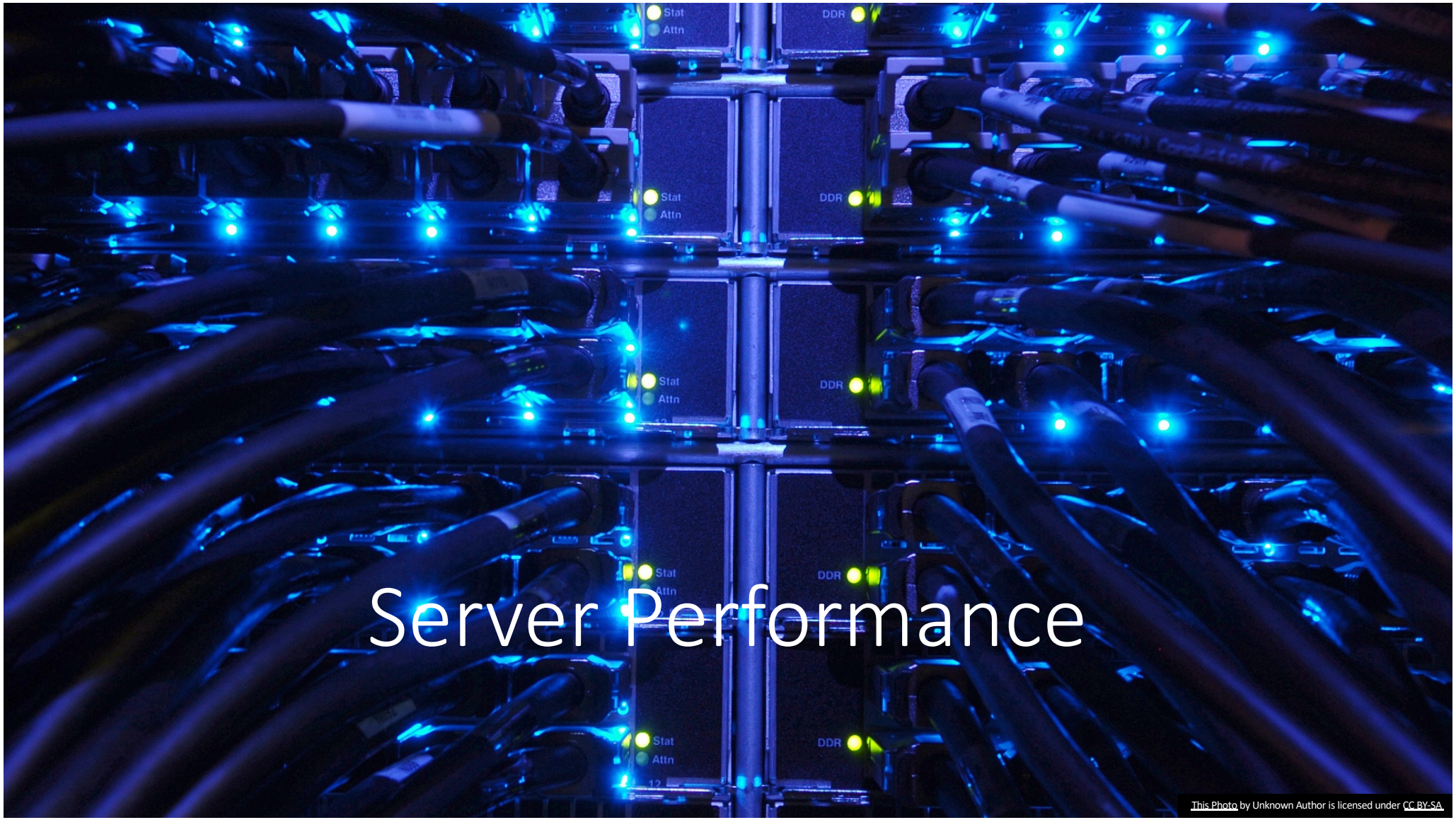

Server Performance

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Fixing CPU Issues

Tune	Tune your queries
Tune	Tune your queries
Add	Add some indexes
Buy	Buy more CPUs

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Memory

- Memory is the cheapest way to add performance your database server environment
- Offers you better execution plans
- Reduces pressure on disk and TempDB
- Makes everything go more smoothly

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Physical Disk Issues

Most physical disk performance issues are database tuning issues

If you're disk performance is consistently bad across servers it's probably a disk issue

This is an expensive fix, and in the cloud may have ultimate limits

Identifying Server Issues

SQL Server Wait Stats—Identify wait statistics to understand what your bottlenecks are

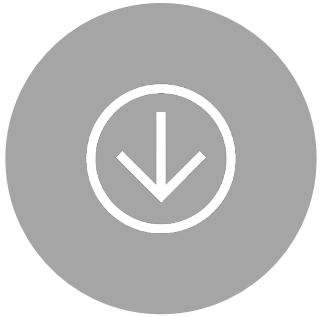
CPU—Just monitor CPU usage/cross reference with SQL Server queries

Memory—You need to look inside of SQL Server, Page Life Expectancy is a good metric to monitor over time

Disk—Check latency on SQL Server data files from sys.dm_os_physical_disks then perfmon (disk reads/sec, disk writes/sec)

Hardware Changes

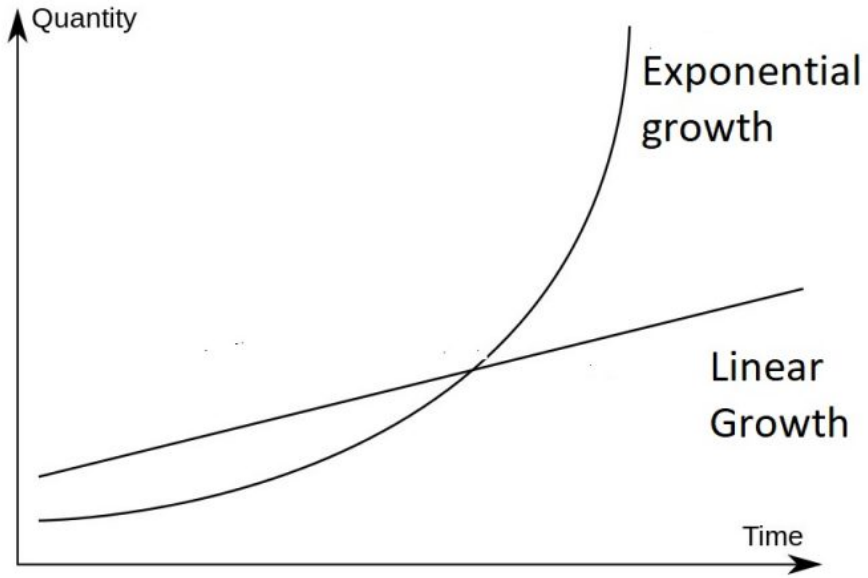
SOMETIMES YOU NEED TO BUY HARDWARE



HARDWARE NEARLY ALWAYS HAS AN ULTIMATE LIMIT EITHER IN PERFORMANCE OR MONEY

TUNING IS ALWAYS IMPORTANT AND CAN GET YOU ASYMMETRICAL GAINS

Performance



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Summary

- Query Tuning is important
- Hardware can’t fix locking and blocking issues
- Hardware has an ultimate performance limit and exponential costs
- Memory is your friend

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