

Gianluca Sartori

Benchmarking in the Cloud

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Agenda

- Migration scenarios
- Benchmarking: tools and challenges
- Benchmarking in the cloud: less tools, more challenges
- DEMO!



What is a benchmark?

Describes performance in a given scenario

Evaluates *whatif* scenarios

HW/Software Upgrade

Virtualization, Migration...

Helps rating tuning efforts

Server-wide configuration changes

Addition / removal of indexes



What's in a Benchmark?



- Performance data

- Batches / sec
- CPU
- Wait Stats

- Source workload

- Queries
- Duration
- CPU
- Reads
- Writes



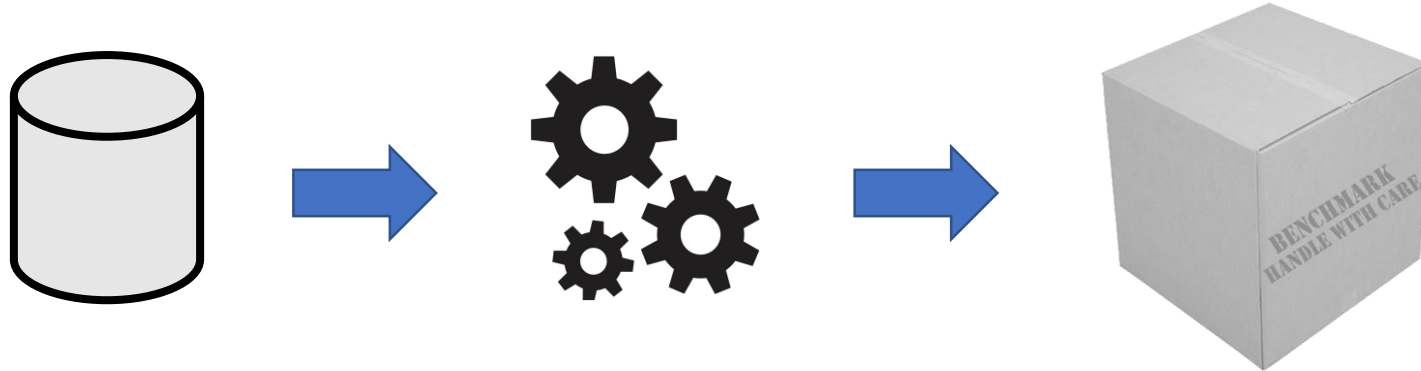
Scenarios

- **Workload Analysis**

Capture Workload

Analyze Captured Data:

- Most Expensive Queries (CPU/Reads/Writes/Duration)
- Most Recurring Queries



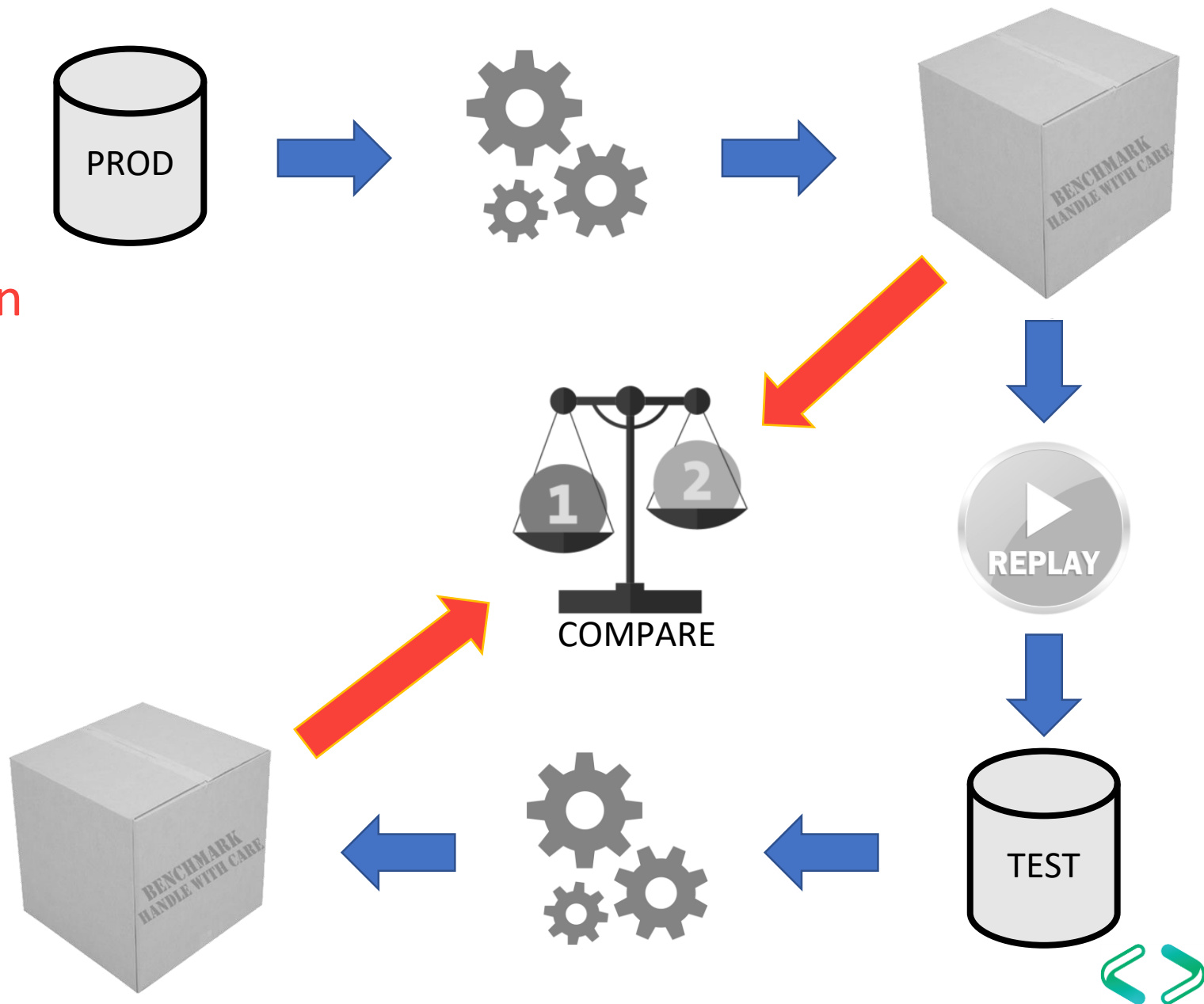
Scenarios

- Performance Comparison

Capture Workload

Replay Workload

Compare Performance



Benchmarking is hard

- Capture source workload and performance data
 - Which tool?
 - What to capture?
- Replay and capture performance data
 - Which tool?
 - What to capture?
- Compare results
 - Which tool?



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Benchmarking Tools

Capture Tools - SQLServer

- **Profiler**

- Non-negligible performance impact on the server

- **Extended Events**

- Low performance overhead

- Big files

- Non compatible with all versions of SQL Server

- **SQL Trace**

- «Old school»

- Compatible with all versions and many analysis/replay tools



Capture Tools - Windows

- Performance Counters

Windows general counters

SQL Server specific

- PAL

Provides list of important counters for MS applications

<https://github.com/clinthuffman/PAL>



Analysis Tools

- **RML Utilities**

ReadTrace

Reporter

- **SQLNexus**

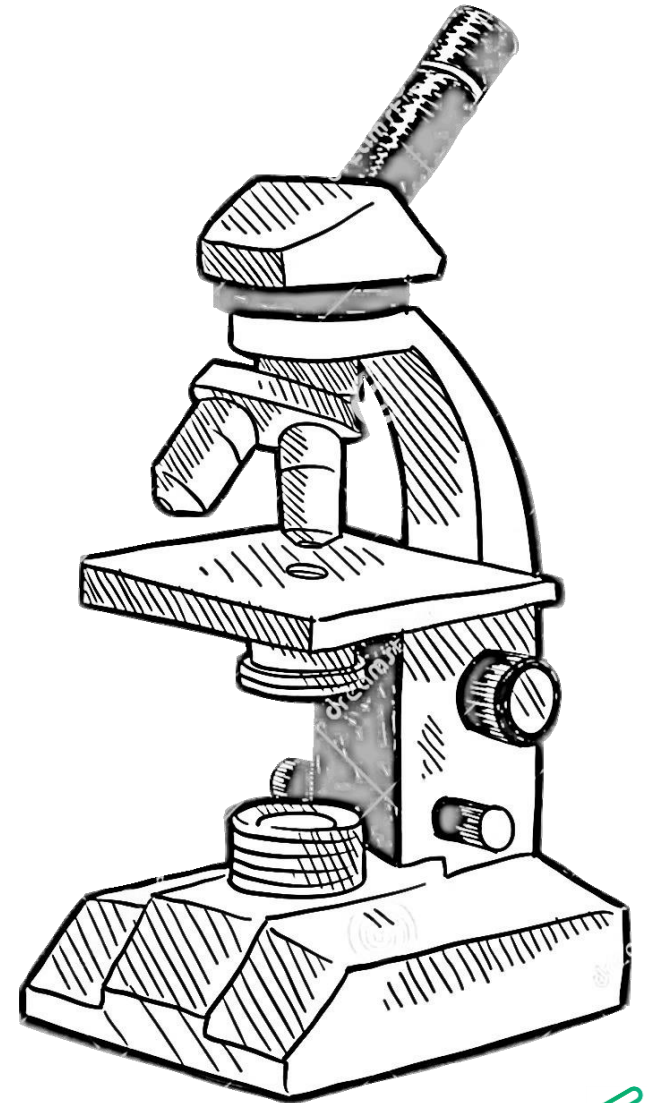
Based on RML Utilities

- **ClearTrace**

Can analyze trace files

- **PAL**

Performance counters analysis with thresholds



Replay Tools

- **Profiler**

Can set breakpoints for debugging

- **RML Utilities**

Ostress

Stress / Replay mode

- **Distributed Replay**

Introduced in SQL Server 2012

Can replay a workload from multiple clients

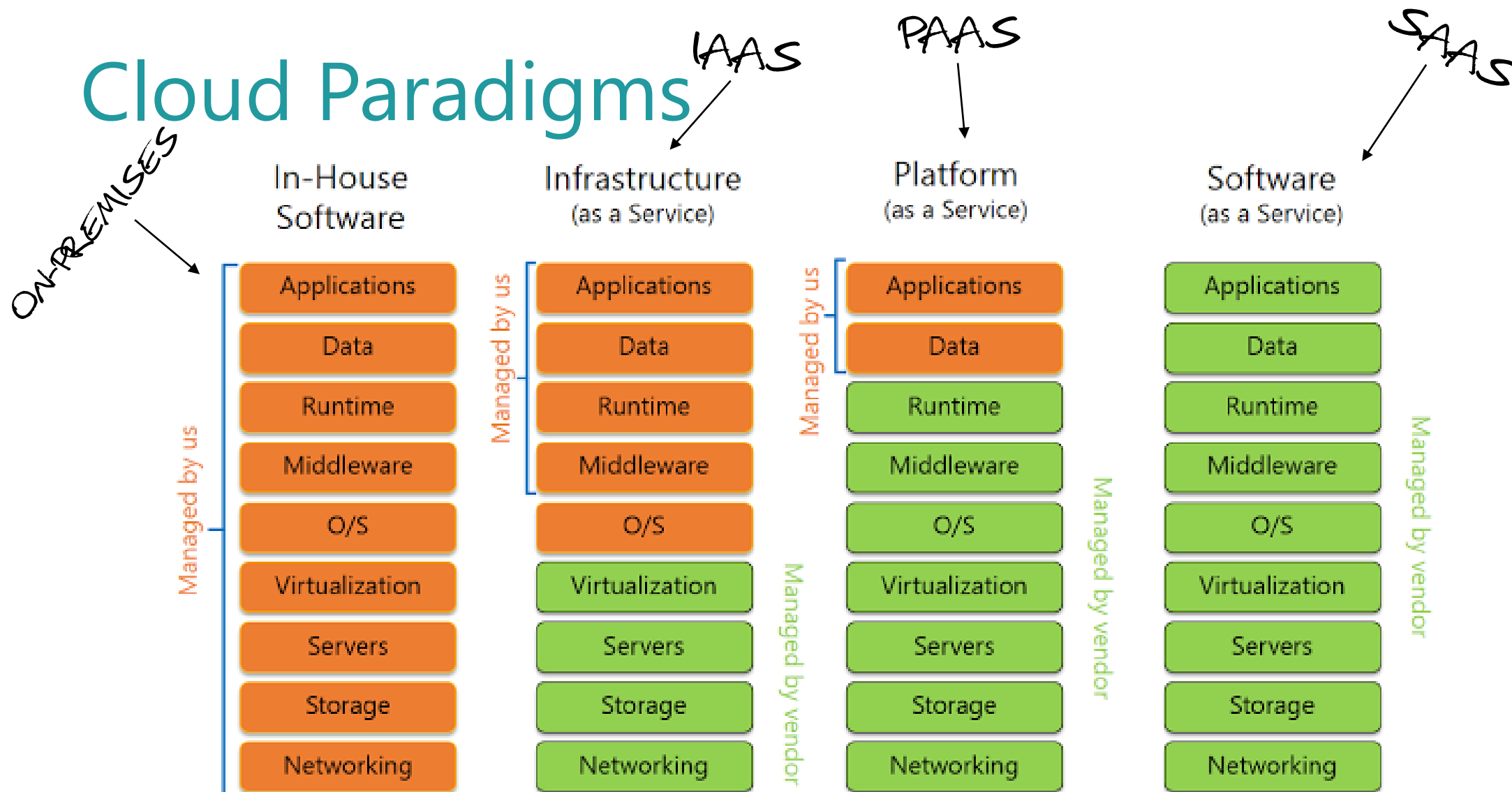
Supports synchronization mode



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Benchmarking In the Cloud

Cloud Paradigms



Cloud Benchmarking Scenarios

- **IAAS: Azure VM**

Same as on-premises

- **PAAS: Managed Instance**

Traces not supported

Supports Extended Events:

- blob storage file target
- event streaming

Perfmon not supported

- **PAAS: SQL Database**

Traces not supported

Supports Extended Events:

- blob storage file target

Perfmon not supported



Introducing WorkloadTools

- Collection of Open Source tools

<https://github.com/spaghettidba/WorkloadTools>

- Takes care of all aspects of benchmarking

Workload capture

Workload analysis

Workload replay

- Works against Azure SQL Database

UNIQUE
FEATURE!!!!



WorkloadTools

- **Multiple Listener types**

- SqlTrace

- Extended Events

- File (saved workload)

- **Multiple Consumer types**

- File (save workload)

- Analysis

- Replay

- **Easy to configure**

- Accepts .json configuration files

- Scriptable via PowerShell

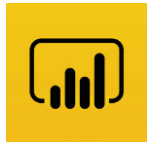
- **Easy to visualize**

- PowerBI for data analysis

- WorkloadViewer

- Workload Analysis

- Workload Comparison



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Benchmarking with WorkloadTools

PROBLEM #1: Analyzing a Workload

- What to capture?

 - SqlTrace?

 - Extended Events?

 - Which Events?

 - Templates?

- How to analyze the workload?

 - Reports?

 - Queries?



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Capture Workload and Analyze Performance

PROBLEM #2: Capturing a workload for replay

- What type of format to use?

Raw capture format (SqlTrace, Extended Events)?

Open Standard format?





Capture Workload to a Workload file

DEMO

PROBLEM #3: Replaying a Workload

- How to execute the replay?
- Should I consume the query results?
 - Might be a non-negligible part of the query duration
- What about network latency?
 - Choose the appropriate location
- What happens when a query fails?
- How do I measure the replay?
 - Tools for this?





Replay a Workload file

DEMO

PROBLEM #4: Comparing benchmarks

- How do I make sense out of the data I capture?
- Which visualization tools?





Compare performance

DEMO

PROBLEM #5: Realtime Replay

- How do I deal with huge workloads?





Replay in Real-Time

DEMO

Benchmarking is ~~hard~~ as easy as pie!

- Capture source workload and performance data

- Which tool?
- What to capture?

- Replay and capture performance data

- Which tool?
- What to capture?

- Compare results

- Which tool?

WorkloadTools



QUESTIONS?

ASK ME!

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