Benchmarking Like a PRO

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#SqlSat675 – 18/11/2017
Agenda

Baselining & Benchmarking scenarios
Tools
Capturing in production
Running the Replay
Comparing results
WARNING:
I will demo PowerShell scripts
Nobody is going to get hurt. Promised.
Baselining and Benchmarking Scenarios
What is a benchmark?

**Describes performance in a given scenario**

- Evaluates *what if* scenarios
  - HW/Software Upgrade
  - Virtualization...

- Helps rating tuning efforts
  - Server-wide configuration changes
  - Addition / removal of indexes
Benchmarking Scenarios

Patching
SW Upgrade
Consolidation
Virtualization
HW Upgrade
Configuration change
Database Tuning
Synthetic Workload

TPC benchmarks
DVD Store
HammerDB

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Production vs. Test

- **PRODUCTION**
  - CAPTURE
  - BASELINE
- **TEST**
  - REPLAY
  - COMPARE
  - CAPTURE
  - BENCHMARK

Patching
SW Upgrade
Consolidation
Virtualization
HW Upgrade
Test vs. Test

Configuration change
Database Tuning

PRODUCTION

TEST

CAPTURE

REPLAY

CAPTURE

BASELINE

COMPARE

CHANGE

SOMETHING

BENCHMARK

DBA's

LAPTOP

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Tools
Capture Tools

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
Compatible with more analysis/replay tools
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
Capturing in production
What to capture

Queries
- SQL Trace vs. Profiler vs. Extended Events
- Which events?
- Which columns?
- Any templates?

Performance data
- Performance counters
- Which counters?
- PAL threshold file

Database
- Full database backup
- All databases involved
- Synchronize with the trace
Capturing workloads in production
Running the replay
Prepare the environment

Server
  Logins
  Any server object captured in the source workload

Database
  Restore the database(s)

Queries
  Pre-process the trace files
  (Synchronize with the backup time, apply filters...)
## Replay Tools

<table>
<thead>
<tr>
<th></th>
<th>Profiler</th>
<th>Ostress</th>
<th>Distributed Replay</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Multithreading</strong></td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td><strong>Debugging</strong></td>
<td>YES</td>
<td>NO</td>
<td>NO</td>
</tr>
<tr>
<td><strong>Synchronization mode</strong></td>
<td>NO</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td><strong>Stress mode</strong></td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td><strong>Distributed mode</strong></td>
<td>NO</td>
<td>NO</td>
<td>YES</td>
</tr>
<tr>
<td><strong>Input format</strong></td>
<td>Trace</td>
<td>Trace RML SQL XEL</td>
<td>Trace</td>
</tr>
</tbody>
</table>
Running the replay
Comparing executions
RML Reporter
Database Experimentation Assistant
Comparing Executions
Alternatives?

Frequent issues

- Database is too big for backup / restore (e.g. 10 TB)
- Workload is too heavy to capture
  - Too much space on disk, too many .TRC files to analyze
  - Not enough time captured => not meaningful enough

Possible solutions

- Replay events with XEvents streaming API
- Avoid replay completely and run a representative workload
- Query Store
Resources

Samples on GitHub
https://github.com/spaghettidba/DBA-Scripts/tree/master/Replay

RML Utilities
https://support.microsoft.com/en-us/kb/944837

PAL
https://pal.codeplex.com/

ClearTrace
http://www.scalesql.com/cleartrace/

Database Experimentation Assistant
Questions?
More Questions?
Ask me!
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#SqlSat675