UNDERSTANDING DATABASE PERFORMANCE

Claudiu Spac
Tech Lead





HI!
I'M CLAUDIU.

12 Years of experience.
Makes last minute changes to PUG sessions.
Hopes to no longer work on my sessions at 4AM.
Could play the guitar at a beginner level a couple years ago.

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ABOUT WAYFARE

We've supported businesses of different sizes and across multiple industries to achieve their goals.

TOP TALENT, SHARED KNOWLEDGE, CLOSE COLLABORATION

Our cost-effective solutions and active community engagement foster innovation and efficiency.

We offer tailored services including Modernization, New Development, Maintenance & Support, Quality Assurance, UI/UX Design, Consultancy and Project Delivery.



OUR EXPERTISE

PROGRESS
OpenEdge, CorticonJS, Sitefinity

MOBILE React Native

DEVOPS Docker, Kubernetes, Jenkins

MANUAL AND AUTOMATION TESTING

WEB TECHNOLOGIES
Angular, React, Vue.JS, NodeJS, JS, TypeScript, Java, .Net

CLOUD AWS, Azure, Google Cloud Platform

UI/UX Figma, XD, Zeplin, Illustrator

LOW CODE/ NO-CODE FRAMEWORKS

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AGENDA

Overall session goals

What is ParkBenchDB

What is ParkBench

ParkBench guided experience

Benchmarking system

Read improvements

Write improvements

Q&A

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GOALS

- Introduce a usefull tool
- Use the tool to gather data
- Present some simple and useful DB performance findings
- Highlight weird or unexpected results

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WHAT IS PARKBENCH DB

- Database creation tool
- Actual database as well
- Simple to use
- AI Generated

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USING PARKBENCH DB

- python3 tools/gen_db_files.py schema/parkbench-schema.yaml
- db/build_db.sh /data/parkbench
- db/server.sh start /data/parkbench/parkbench --workers 8
- db/pbgen.sh init --db /data/parkbench/parkbench
- db/pbgen.sh plan --db /data/parkbench/parkbench --size-gb 10
- db/pbgen.sh run --db /data/parkbench/parkbench --workers 8

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WHAT IS PARKBENCH

- Benchmarking tool
- Orchestrator
- Load generator
- Visualization helper
- Metrics provider

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this is the part where the demo fails catastrophically

BENCHMARKING “SERVER”

- CPU: AMD AM5 7900x
  - 24 processors
  - 12 physical cores
  - 2 CPU dies
- Memory: 32 Gib 6000MT/s
- Disk: 1 x Samsung 970 Evo NVME
  - PCIE gen 3

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RESOURCE ALLOCATION

- 1 physical CPU die dedicated to the DB
- 20Gib memory limit for the DB
- 11 Processors assigned to PASOE instance(s)
- 1 processort assigned to the platform

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READ BASELINE

Parameters

- -spin = 20,000
- -B = ~1GB

Results

DB CPU%
1,041%

PAS CPU%
890%

Buffer Hit Rate%
PRM: 77% ALT: N/A

Records Read
1.3M/s
235.5M Total

Latch Waits
LRU: 84,000
BHT: 23,000
BFN: 5,500

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READ BASELINE WITH B2

Parameters

- -spin = 20,000
- -B = ~1GB - 70k Blk.
- -B2 = 600MB

Results

DB CPU% **-3.67%**
1,000%

PAS CPU% **+1.8%**
906%

Buffer Hit Rate% **-7.7pp**
PRM: 69.8% ALT: 100%

Records Read **-4.5%**
1.24M/s
224.9M Total

Latch Waits

LRU: 106,200 **+25%**
BHT: 20,800 **-9.7%**
BFN: 6,500 **+18%**

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-B INCREASE

Parameters

- -spin = 20,000
- -B = ~4GB - 70k Blk.
- -B2 = 600MB

Results

DB CPU% **-6.51%**
937%

PAS CPU% **-3.17%**
878%

Buffer Hit Rate% **+13.8pp**
PRM: 83.7% ALT: 100%

Records Read **-6.34%**
1.17M/s
210.6M Total

Latch Waits

LRU: 67.700 **-36%**
BHT: 9,800 **-52%**
BFN: 14,500 **+123%**

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-B INCREASE

Parameters

- -spin = 20,000
- -B = 16GB - 70k Blk.
- -B2 = 600MB

Results

DB CPU% **-6.31%**
938%

PAS CPU% **+12%**
1017%

Buffer Hit Rate% **+29pp**
PRM: 99% ALT: 100%

Records Read **+37%**
1.72M/s
309.7M Total

Latch Waits

LRU: 5.700 **-94.6%**
BHT: 7,700 **-62%**
BFN: 11,300 **+111%**

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-B INCREASE W/ -B2 VS. NO -B2

Parameters

- -B = 16GB
- -B2 = 0

Results

DB CPU% **-1.23%**

954%

PAS CPU% **-1.4%**

1008%

Buffer Hit Rate% **-2pp**

PRM: 97.2% ALT: N/A

Records Read **-9.2%**

1.57M/s

281.8M Total

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DON’T MAKE BLIND CHANGES!

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-LRUSKIPS

Parameters

- -lruskips = 500

Results

DB CPU% **-0.45%**
934%

PAS CPU% **+3.3%**
984%

Buffer Hit Rate% **-0.5pp**
PRM: 98.5% ALT: 100%

Records Read **-4.5%**
1.64M/s
296.3M Total

Latch Waits

LRU: 3.600 **-36.4%**
BHT: 8,400 **+8.2%**
BFN: 12,300 **+8.8%**

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PAS TO DB LATENCY

Parameters

- Latency = 2ms

Results

DB CPU% **-78%**

205%

PAS CPU% **-80%**

199.7%

Buffer Hit Rate% **-0.5pp**

PRM: 98.5% ALT: 100%

Records Read **-68.7%**

539K/s

96.9M Total

Latch Waits

LRU: 450	**-92.2%**
BHT: 60	**-99.2%**
BFN: 50	**-99.3%**

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PAS TO DB LATENCY

Parameters

- Latency = 10ms

Results

DB CPU% **-94%**
52%

PAS CPU% **95%**
51%

Buffer Hit Rate% **-0.03pp**
PRM: 99% ALT: 100%

Records Read **-90.8%**
162K/s
28.3M Total

Latch Waits

LRU: ~0	**-99.9%**
BHT: ~0	**-99.9%**
BFN: ~0	**-99.9%**

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PREFETCH & MESSAGE BUFFER SIZE

Parameters

- Latency = 2ms
- -Mm = 16384
- -prefetchNumRecs = 32766

Results

DB CPU% **+30%**

268%

PAS CPU% **+30%**

288%

Buffer Hit Rate% **0.00pp**

PRM: 99% ALT: 100%

Records Read **+45.9%**

786K/s

141.4M Total

Latch Waits

LRU: 520

BHT: 100

BFN: 220

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OTHER CHANGES #1

- Database structure
  - Tables spread across areas and disks
  - Tuning RPB for better performance
  - LOBs using dedicated areas
- Schema changes
  - Avoid LOBs
  - Avoid unnecessary indexes
- Other parameters
  - Do not use -prefetchDelay
  - -prefetchPriority
  - -pinshm
  - -hash -nap -napMax -napStep

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OTHER CHANGES #2

- Database physical layout
  - When loading a block into cache, you should ideally need all the data within it.
  - Do a tablereorg using the most commonly used index

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this is the part where the demo fails catastrophically again


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ASK ME
A QUESTION

Our PUG Challenge sessions

PROVIDENCE



CARLA

AI Security Auditor: Real-Time Threat Detection for OpenEdge Applications

Monday, October 5, 11:00 AM

AMSTERDAM



ALEXANDRU

Exploring Local AI: Capabilities and Limits of Self-Hosted Models for Development and Documentation

Thursday, November 5, 3:15 PM



CARLA

AI Security Auditor: Real-Time Threat Detection for OpenEdge Applications

Friday, November 6, 10:15 AM



CLAUDIU

Understanding database performance

Friday, November 6, 1:45 PM



DIANA

One BA, two teams: How I standardized workflows without slowing anyone down

Friday, November 6, 9:00 AM



DIANA

RAG 2.0 - The Next Generation of RAG Systems

Wednesday, November 4, 4:15 PM



OANA

Guideline to an Accessible Web Application

Thursday, November 5, 9:00 AM

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thank you

https://github.com/claudiu-spac-wf

And maybe some other surprises on on there soon

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