INFO4990
Benchmark on Analytical Workload for NoSQL Systems

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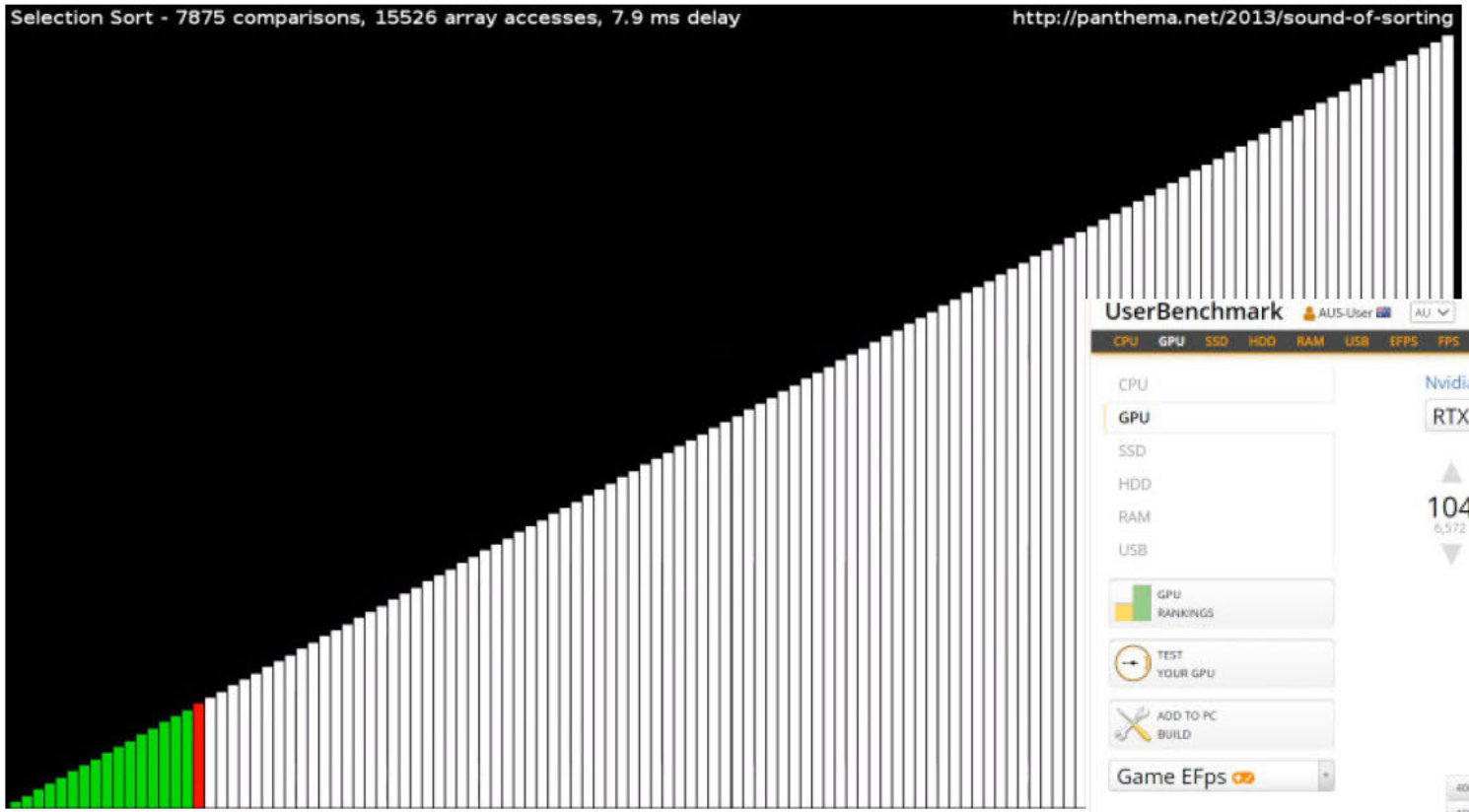
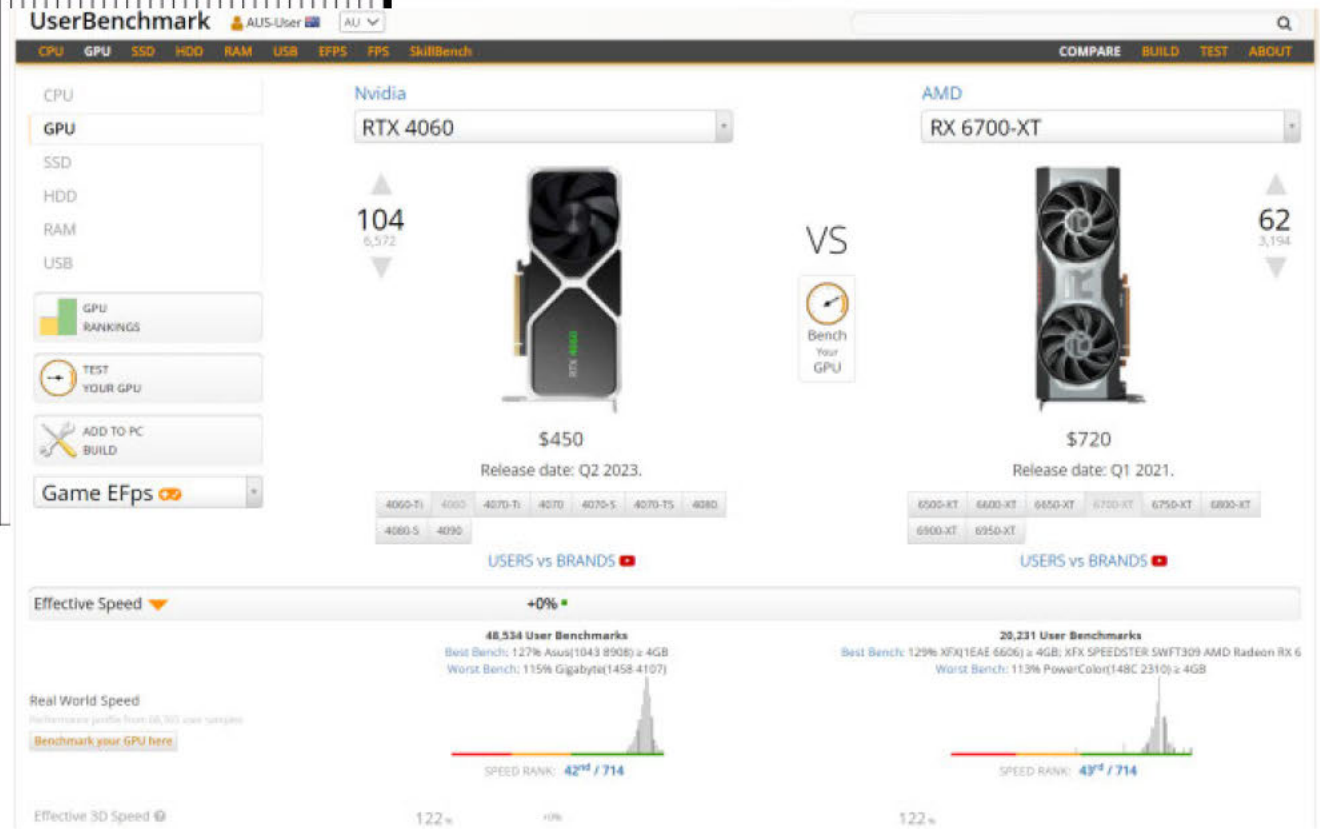
What are Benchmarks?





NoSQL and Analytical Workload

NoSQL

- High performance, availability and scalability

Analytical Workload

- Complex queries running on large data sets
- Identify trends, relationships and insights
- Common workload in NoSQL as it requires high throughput and concurrency

Motivation

Why not a lot of NoSQL benchmarks?

- Long history of RDBMS vs 20 years of NoSQL existence
- Structured Schema vs NoSQL's diverse data models
- Hard to stay relevant

Objectives

Research Question:

How to design a Benchmark on Analytical Workload for NoSQL

- Objective
  - Develop Benchmark on Analytical Workloads for NoSQL
    - READ operations of Joins (Links), Filtering and Aggregation
    - Updates
  - Needs to at least provide:
    - data model (schema) – Collections of documents
    - data generator
    - query generator

Benchmark Evaluation Aspect Comparisons

Benchmark Name	Throughput	Scalability	Freshness	Query Complexity	Workload Customisation
TPC-C [1]	□	X	X	Low	X
TPC-H [2]	□	X	X	Medium	X
CH2 [9]	□	□	X	Medium	□
HTAPBench [10]	□	□	□	Medium	□
BigDataBench [11]	□	□	X	High	□
DeepBench [12]	□	□	X	High	□
CNSSB [13]	X	□	X	Low	X

Benchmark Requirements

- Common Use Cases for NoSQL – real-time analytics & continuous monitoring

Our Benchmark:

- Provides Data model, Data & Query Generator
- Tests READ and UPDATE operations
  - READ: complex analytical queries involving links, aggregations and filters
- Tests:
  - Latency: Query Response Time, 95th percentile latency
  - Scalability: Concurrency
  - Resource Utilisation: CPU, memory, I/O utilisation
  - Data Freshness: Time taken from UPDATE to query-able
  - Different Data Size: Load Time, QueryResponseTime/DataSize

System Research Method (Design > Implement > Evaluate)

Consulted professionals,
Identify
- Workloads
- Datasets
- Queries

Via Open-Source Projects

Run Benchmark on systems
- Test different query
- Test optimisation plans
- Test indexing technique
- Evaluate Query Advisor

Literature Review
- Identify NoSQL systems' common use cases
- Identify current benchmark limitations

Implementation (Build Benchmark)
- JSON doc store
- And then expand

Finish Research

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Intended Contributions

Develop benchmark so that

- Provide more **NoSQL benchmarking Options**
- Evaluate Optimisation Techniques
- Evaluate Query Plans
  - E.g. Query Advisor
- Improve the state-of-the-art of NoSQL systems