

Sunday, March 31, 2024

Benchmark Project:

Report

- The purpose of this benchmark study is to evaluate the performance of a computer system across various computational tasks and storage operations. The study encompasses five distinct benchmarks designed to measure the system's capabilities in 32-bit integer operations, 64-bit floating-point operations, memory operations, and hard drive read/write operations.
- Computer Specifications:
 - Brand of CPU: Apple
 - Model of CPU: Apple M2
 - Number of cores on CPU: 8 (4 performance and 4 efficiency)
 - Clock rate of CPU in GHz: 3.5 GHz
 - Amount of memory in GB: 8 GB
 - Speed of memory (e.g., DDR4 3200): LPDDR5 6400
 - Capacity of hard drive: 256 GB
 - Type of hard drive: SSD
 - For SSD:
 - Max sequential read speed: 1477.0 MB/s
 - Max sequential write speed: 1511.8 MB/s
 - Max random read speed: 3000 MB/s
 - Max random write speed: 2600 MB/s

- **Benchmark results::**

- Benchmark 1: 32-bit Integer operation

```
divya@Divyas-MacBook-Air untitled folder % /usr/local/bin/python3 "/Users/divya/Desktop/untitled folder/integer_benchmark.py"
Benchmark 1:
32-bit Integer operation benchmark
Which includes additions, multiplication, and division' is: 313.9469699859619 seconds
divya@Divyas-MacBook-Air untitled folder %
```

- Benchmark 2: 64-bit Floating point operation:

```
divya@Divyas-MacBook-Air untitled folder % /usr/local/bin/python3 "/Users/divya/Desktop/untitled folder/integer_benchmark.py"
Benchmark 2:
64-bit Floating point operation benchmark
Which includes additions, multiplication, and division' is: 370.2985095977783 seconds
divya@Divyas-MacBook-Air untitled folder %
```

- Benchmark 3: Memory Benchmark:

```
divya@Divyas-MacBook-Air untitled folder % /usr/local/bin/python3 "/Users/divya/Desktop/untitled folder/memory.py"
Benchmark 3:
Memory benchmark
Which includes reading from, and writing to array, 4 bytes each time is: 5.67035174369812 seconds
```

- Benchmark 4: Hard-drive Benchmark 1:

```
divya@Divyas-MacBook-Air untitled folder % /usr/local/bin/python3 "/Users/divya/Desktop/untitled folder/integer_benchmark.py"
Benchmark 4:
Hard Drive benchmark 1
Which includes reading from, and writing to file, 100 bytes each time is: 2.9934630393981934 seconds
```

- Benchmark 5: HardDrive Benchmark 2:

```
divya@Divyas-MacBook-Air untitled folder % /usr/local/bin/python3 "/Users/divya/Desktop/untitled folder/memory.py"
Benchmark 5:
Hard Drive benchmark 2
Which includes reading from, and writing to file, 10000 bytes each time is: 1.4713640213012695 seconds
```

Benchmark	Benchmark Recorded Time	Reference Time (seconds)	Benchmark Ratio (Reference Time/ Benchmark Recorded Time)
First Benchmark	313.95	100	0.3185
Second benchmark	370.30	100	0.27
Third benchmark	5.67	100	17.6367
Fourth Benchmark	2.99	250	83.6120
Fifth Benchmark	1.47	10	6.8027

Calculation:

Geometric Mean of all Benchmarks:

$$\begin{aligned}
 & \sqrt[5]{(Benchmark1 \times Benchmark2 \times Benchmark3 \times Benchmark4 \times Benchmark5)} \\
 &= \sqrt[5]{(0.3185 * 0.27 * 17.6367 * 83.6120 * 6.8027)} \\
 &= 3.86
 \end{aligned}$$