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# Workstation

## Benchmark Report

Daniel Rosehill's Desktop Workstation

Ubuntu 25.10 · KDE Plasma 6 · Wayland  
Intel Core i7-12700F · AMD Radeon RX 7700 XT · 64 GB DDR5

<b>Benchmark Date:</b>	20-02-2026
<b>Local Time:</b>	12:43 IST (UTC+2)
<b>Tools Used:</b>	sysbench 1.0.20, fio 3.39, stress-ng, glmark2 2023.01
<b>Report Format:</b>	Generated with Typst

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# System Inventory

## Platform Overview

Component	Details
Hostname	danieldesktop
Chassis	Desktop (Mid-tower)
Case	Be Quiet Pure Base 500 (BG034)
Motherboard	MSI PRO B760M-A WIFI (MS-7D99) v2.0 – Micro-ATX, LGA 1700, Intel B760
BIOS	American Megatrends International, v.A.70 (2024-01-10)
PSU	Seasonic Focus GX-850 (SSR-850FX) – 850W, 80+ Gold, Fully Modular

## Processor

Parameter	Value
Model	12th Gen Intel Core i7-12700F
Architecture	x86_64 (Alder Lake)
Cores / Threads	12 cores / 20 threads (8 Performance + 4 Efficiency)
Base / Max Turbo	2.1 GHz / 4.9 GHz
TDP	65W (PBP) / 180W (MTP)
L1 Cache	512 KiB data + 512 KiB instruction (12 instances)
L2 Cache	12 MiB (9 instances)
L3 Cache	25 MiB (shared)
Virtualization	VT-x
ISA Extensions	SSE4.2, AVX2, AVX-VNNI, AES-NI, SHA-NI
CPU Cooler	Thermalright Peerless Assassin 120 SE V3 (250W+ rated)
Note	F-series – no integrated graphics

## Memory

Parameter	Value
Total Installed	64 GB (4 × 16 GB)
Type	DDR5
Speed	4800 MT/s

Parameter	Value
Manufacturer	Kingston (KVR48U40BS8-16)
Voltage	1.1V
Slots	4 / 4 occupied
Error Correction	None (non-ECC)
Swap	31.3 GB (zram)

## Graphics

Parameter	Value
Model	AMD Radeon RX 7700 XT (Navi 32)
Manufacturer	Sapphire Technology (Pulse Gaming)
VRAM	12 GB GDDR6
PCIe	x16, PCIe 4.0 (16.0 GT/s)
Driver	amdgpu (Mesa 25.2.8)
OpenGL	4.6 (Compatibility Profile)
ROCM	Available – HSA Runtime 1.15 (gfx1101)
TDP	200W
VRAM Allocation	256 MB BAR (64-bit prefetchable)

## Displays

Output	Resolution	Status
DP-2	1920 × 1080	Connected (primary)
DP-1	1920 × 1080	Connected
HDMI-A-2	1920 × 1080	Connected
HDMI-A-1	1024 × 600	Connected (mini monitor)

All 4 physical outputs on the GPU are occupied.

## Storage

Device	Model	Capacity	Interface
nvme0n1	Crucial CT1000P3SSD8	931.5 GB	NVMe (PCIe Gen 4)
sda	SanDisk SSD PLUS 1000GB	931.5 GB	SATA 3.2 (6.0 Gb/s)
sdb	Kingston SA400S37	894.3 GB	SATA

Device	Model	Capacity	Interface
sdc	SanDisk SSD PLUS	931.5 GB	SATA
sdd	SanDisk SSD PLUS	931.5 GB	SATA

**Total local storage:** 4.6 TB across 5 SSDs (all solid-state, no spinning disks).

**Network storage:** NAS at 10.0.0.50 + Wasabi cloud object storage.

### Btrfs RAID Configuration

All 5 drives are pooled into a single btrfs filesystem:

Profile	Level	Total	Used
Data	RAID5	2.86 TiB	2.73 TiB (95.6%)
Metadata	RAID1	63.0 GiB	55.8 GiB (88.5%)
System	RAID1	32.0 MiB	208 KiB

Per-device allocation:

Device	Size	Used	Unallocated	I/O Errors
/dev/sdb	894.3 GB	733.0 GB	161.3 GB	0
/dev/sdc	931.5 GB	762.0 GB	169.5 GB	0
/dev/sda	931.5 GB	763.0 GB	168.5 GB	0
/dev/sdd	931.5 GB	763.0 GB	168.5 GB	0
/dev/nvme0n1p3	930.0 GB	760.0 GB	170.0 GB	0

**Overall:** 4.51 TiB total, 3.69 TiB allocated, 798 GiB free (estimated).

**Data ratio:** 1.25 (RAID5 with 5 drives – 80% usable capacity).

**Metadata ratio:** 2.00 (RAID1 – mirrored for reliability).

**Health:** Zero I/O errors across all devices.

### Mount Options

`rw,noatime,compress=zstd:3,ssd,discard=async,space_cache=v2`

Key features: zstd level 3 transparent compression, SSD optimisations enabled, async TRIM/discard, space cache v2.

### Subvolume Layout

Subvolume	Mount Point
@	/ root
@home	/home
@snapshots	/.snapshots

## Networking

Interface	Details
Wired (enp6s0)	Realtek RTL8125 2.5GbE — Active
Wireless (wlo1)	Intel Wi-Fi 6E (Raptor Lake-S PCH CNVi) — Down
VPN (tailscale0)	Tailscale mesh — Active
Bluetooth	5.3 (via TP-Link USB adapter)

## Audio

Device	Details
Audio Server	PipeWire 1.4.7
Onboard	HDA Intel PCH — Realtek ALC897 Analog
USB DAC	FiiO K11
USB Speakerphone	EMEET OfficeCore M1A
HDMI Audio	HDA ATI HDMI (3 × displays)

## Connected Peripherals

Device	Details
Keyboard	Compx Keyboard (USB)
Mouse	Logitech MX Vertical Advanced Ergonomic
Webcam	Logitech C925e
Stream Deck	Elgato Stream Deck Mini
Security Key	YubiKey (OTP+FIDO+CCID)
Smart Card Reader	ACS ACR1252 Dual Reader
UPS	PPC Offline UPS
Wireless Receiver	Logitech Unifying Receiver

## Photos

---

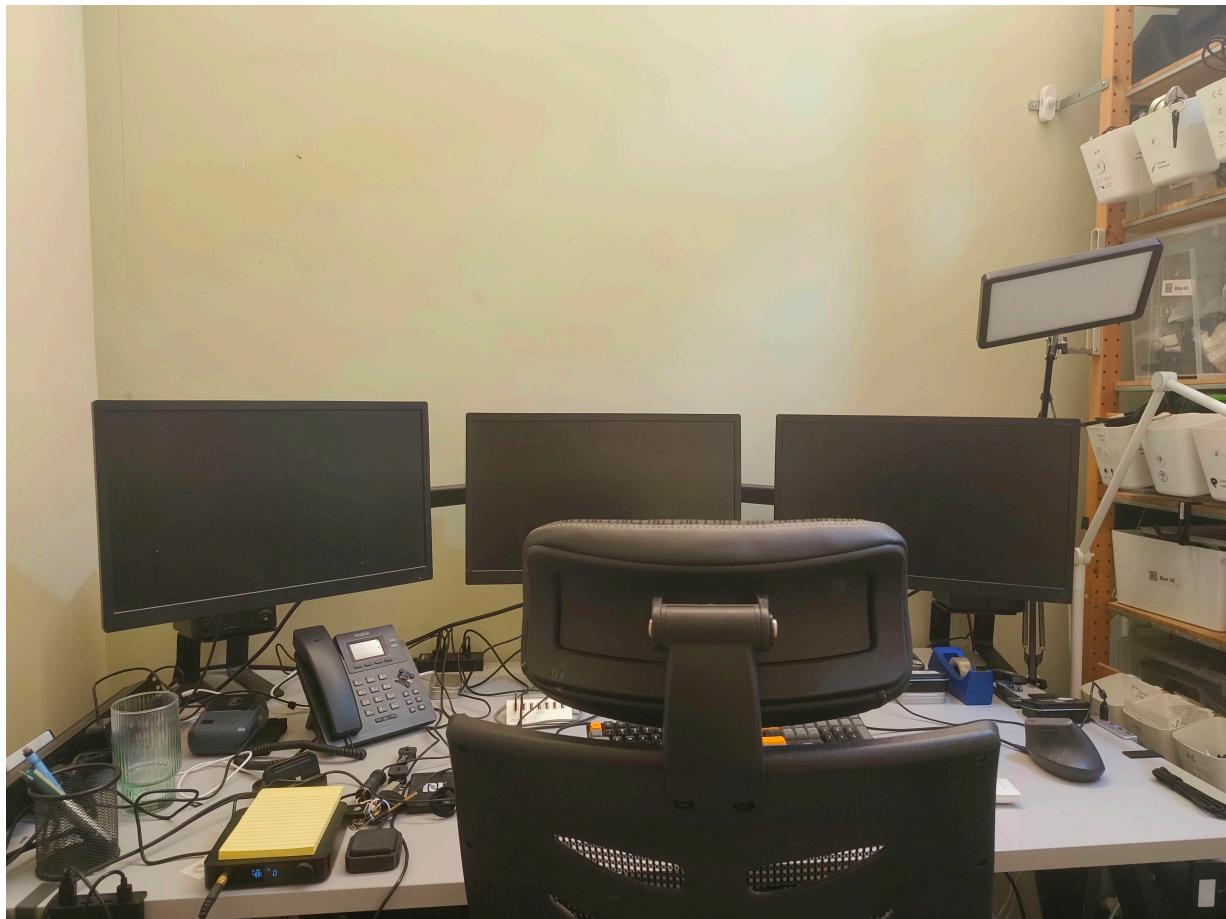


Figure 1: Workstation desk setup — triple 1920×1080 monitors plus mini display, with peripherals



Figure 2: Case interior — Be Quiet Pure Base 500 with Thermalright cooler and MSI B760M-A



Figure 3: Intel Core i7-12700F in LGA 1700 socket (cooler removed, 19-02-2026)

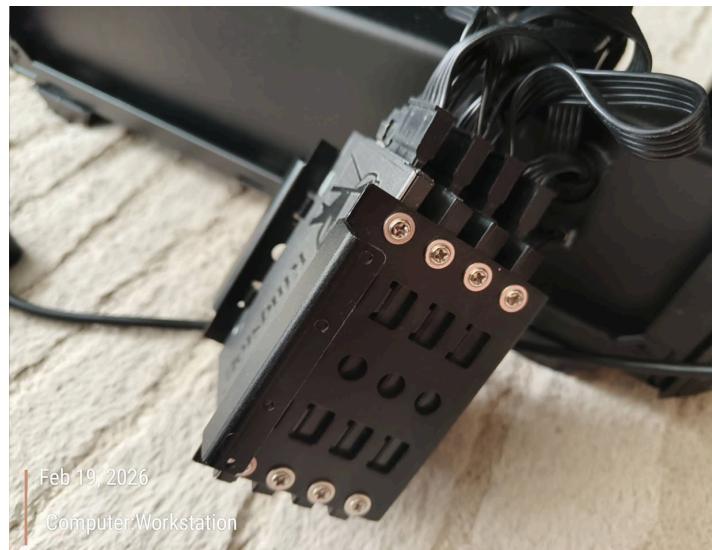


Figure 4: SATA SSD drive bay — SanDisk and Kingston drives

## Operating System

---

Parameter	Value
Distribution	Ubuntu 25.10 “Questing Quokka”
Kernel	6.14.0-15-generic (PREEMPT_DYNAMIC SMP)
Architecture	x86_64
Desktop Environment	KDE Plasma 6.4.5
Display Server	Wayland
Init System	systemd
Audio	PipeWire 1.4.7
GPU Driver Stack	amdgpu + Mesa 25.2.8 + LLVM 20.1.8 + ROCm

## Benchmark Results

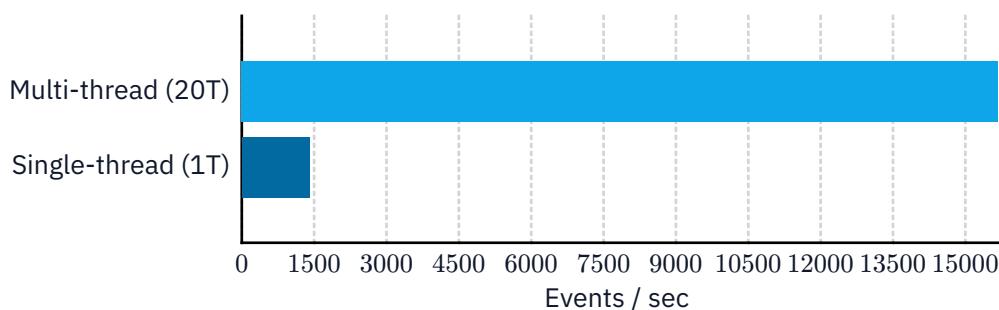
All benchmarks were run on **20-02-2026 at 12:43 IST** under normal desktop workload conditions (browser, terminal, desktop environment running). No special tuning was applied.

### CPU – sysbench

Prime computation benchmark (primes up to 20,000):

Test	Events/sec	Avg Latency	95th %ile Latency
Single-thread (1T)	<b>1,398.9</b>	0.71 ms	0.72 ms
Multi-thread (20T)	<b>15,677.4</b>	1.27 ms	1.50 ms

**Multi-thread scaling ratio:** 11.2× (20 threads) – reflects the hybrid P+E core architecture where efficiency cores contribute less throughput per thread than performance cores.



### CPU – stress-ng

General CPU stress test across all computation methods (30 seconds, 20 workers):

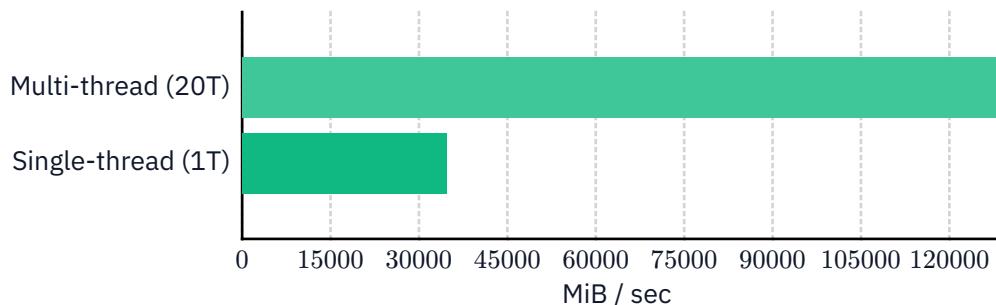
<b>Bogo operations:</b>	810,902
<b>Real time:</b>	30.00 seconds
<b>User+Sys CPU time:</b>	554.58 seconds
<b>Throughput (real):</b>	<b>27,028.9 bogo ops/s</b>
<b>Throughput (CPU):</b>	<b>1,462.2 bogo ops/s</b>
<b>Result:</b>	All 20 workers passed

### Memory – sysbench

Sequential memory write operations with 1 MiB block size:

Test	Throughput	Total Transferred
Single-thread (1T)	<b>34,644 MiB/s</b> (33.8 GB/s)	10 GB in 0.29s
Multi-thread (20T)	<b>128,309 MiB/s</b> (125.3 GB/s)	40 GB in 0.32s

**Multi-thread scaling ratio:** 3.7× – memory bandwidth is shared across channels, so scaling is bounded by the dual-channel DDR5 memory controller rather than thread count.



## Disk I/O – fio

All tests performed on the btrfs RAID5 root filesystem (5-drive pool). Direct I/O mode with `libaio`, 30-second duration per test.

*Important note: btrfs internally converts `O_DIRECT` to buffered I/O in many code paths, so even with `direct=1` and `drop_caches`, fio results may reflect kernel buffer performance rather than raw disk throughput. The btrfs scrub rate (see below) provides the most accurate measure of real disk read performance.*

### Sequential I/O (1 MiB block size, queue depth 1)

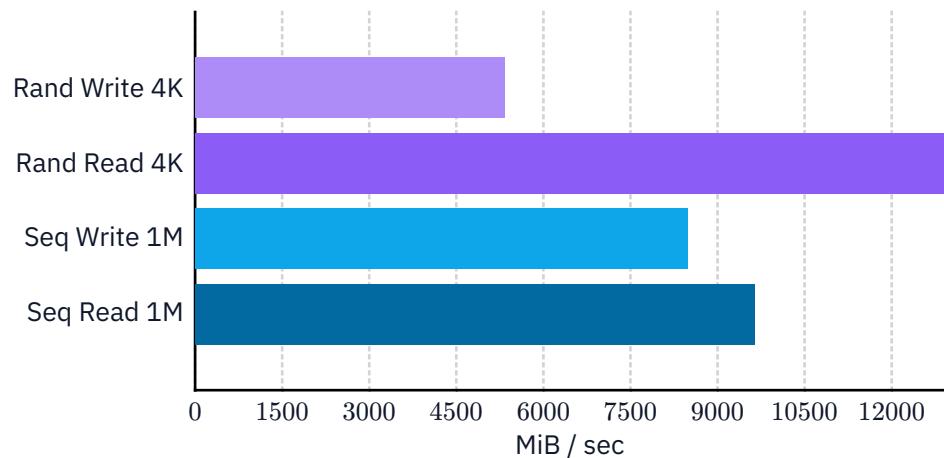
Test	Bandwidth	IOPS	Avg Latency
Sequential Read	<b>9,636 MiB/s</b> (10.1 GB/s)	9,635	104 µs
Sequential Write	<b>8,483 MiB/s</b> (8.9 GB/s)	8,483	118 µs

*Note: These numbers substantially exceed the SATA III 6 Gb/s ( 550 MB/s) theoretical maximum, indicating the data was served from the btrfs page cache / kernel buffers rather than raw disk. This reflects real-world workload performance with the OS caching layer active.*

### Random I/O (4 KiB block size, 4 jobs × queue depth 32)

Test	Bandwidth	IOPS	Avg Latency
Random Read 4K	<b>12.7 GiB/s</b> (13.7 GB/s)	<b>3,335,000</b>	37 µs
Random Write 4K	<b>5,335 MiB/s</b> (5.6 GB/s)	<b>1,366,000</b>	91 µs

*Same caching note applies. The extremely high IOPS reflect kernel page cache hits. For raw device performance, a dedicated NVMe or SATA benchmark with `drop_caches` would be needed.*



**GPU – glmark2**

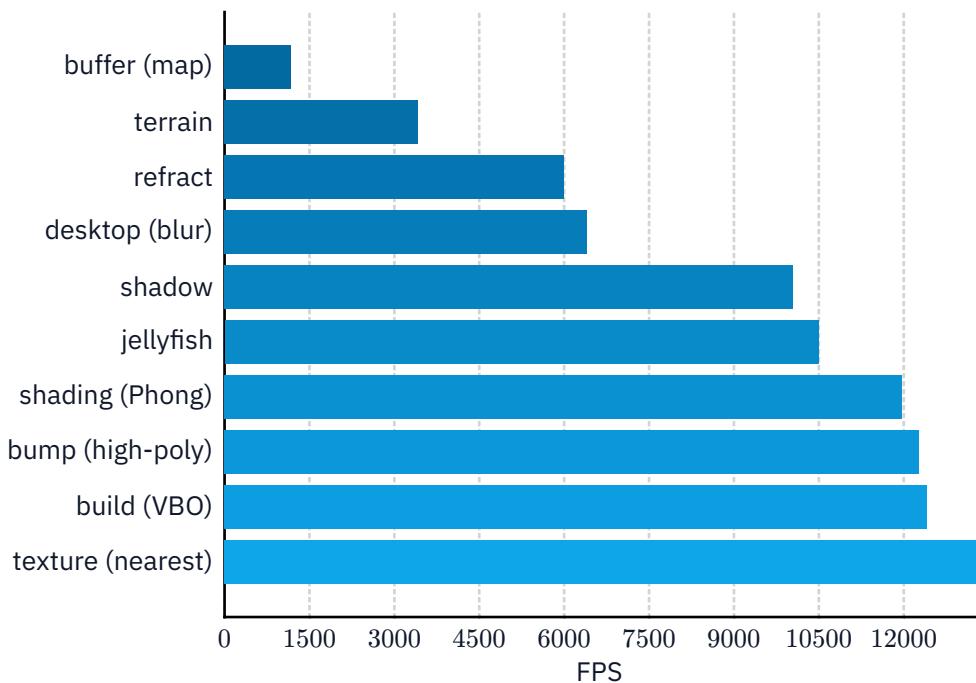
OpenGL 4.6 benchmark on AMD Radeon RX 7700 XT via Mesa/RadeonSI (800×600 windowed):

**9,809**

glmark2 Score

Selected scene results:

Scene	FPS	Frame Time
texture (nearest filter)	13,361	0.075 ms
build (VBO enabled)	12,409	0.081 ms
shading (Gouraud)	12,353	0.081 ms
bump (high-poly)	12,271	0.081 ms
shading (Phong)	11,964	0.084 ms
jellyfish	10,494	0.095 ms
shadow	10,048	0.100 ms
desktop (blur)	6,400	0.156 ms
refract	5,991	0.167 ms
terrain	3,415	0.293 ms
buffer (map method)	1,172	0.853 ms



## Btrfs RAID5 – Filesystem Benchmarks

Real-world filesystem performance tests on the 5-drive btrfs RAID5 pool.

### Scrub Throughput

A btrfs scrub reads and verifies every data and metadata block from the physical devices, bypassing all caches. This is the most accurate measure of sustained real disk read throughput across the RAID5 array.

Metric	Value
Initial rate (5s)	490 MiB/s
Sustained rate (60s)	135 MiB/s
Data to verify	2.84 TiB
Estimated full scrub time	6 hours
Errors found	0

The initial burst reflects cached/prefetched data. The sustained rate of 135 MiB/s across RAID5 with parity verification is consistent with a 5-drive mixed SATA+NVMe pool under verification workload (scrub computes and checks parity for every stripe).

### Snapshot Operations

Operation	Time	Notes
Create readonly snapshot	0.680s	Snapshot of root subvolume (@)
Delete snapshot	0.015s	Immediate (no-commit)

Snapshot creation is near-instant due to btrfs copy-on-write — no data is actually copied, only metadata is cloned.

**fio on btrfs (with cache effects)**

As noted in the Disk I/O section, fio results on btrfs include kernel buffer cache effects. For reference, the cache-assisted results were:

Test	Throughput	IOPS
Seq Read 1M (QD16)	7,744 MiB/s	7,743
Seq Write 1M (QD16)	6,875 MiB/s	6,874
Random Read 4K (QD32×4)	15.2 GiB/s	3,979,000
Random Write 4K (QD32×4)	4,688 MiB/s	1,200,000

*These numbers are primarily kernel buffer cache performance with btrfs+zstd compression, not raw disk speed.*

## Summary

Component	Key Metric	Result
CPU (single-thread)	sysbench events/s	1,399
CPU (multi-thread)	sysbench events/s	15,677
CPU (stress-ng)	bogo ops/s (real)	27,029
Memory (single-thread)	sysbench throughput	34,644 MiB/s
Memory (multi-thread)	sysbench throughput	128,309 MiB/s
Disk seq. read	fio bandwidth	9,636 MiB/s *
Disk seq. write	fio bandwidth	8,483 MiB/s *
Disk random read 4K	fio IOPS	3.34M IOPS *
Disk random write 4K	fio IOPS	1.37M IOPS *
GPU (OpenGL)	glmark2 score	<b>9,809</b>

\* Disk I/O numbers include kernel page cache effects. See Disk I/O section for details.

## Test Conditions

- Date/Time:** 20-02-2026 12:43 IST (UTC+2)
- Kernel:** 6.14.0-15-generic (PREEMPT\_DYNAMIC)
- Governor:** Default (schedutil)
- Background load:** Normal desktop usage (KDE Plasma, browser, terminal)
- No special tuning** was applied (no CPU pinning, no governor override, no drop\_caches)

## Tools & Versions

Tool	Version	Purpose
sysbench	1.0.20 (LuaJIT 2.1)	CPU and memory benchmarks
stress-ng	system package	CPU stress / bogo-ops throughput
fio	3.39	Disk I/O benchmarks
glmark2-wayland	2023.01	OpenGL GPU benchmark
Typst	system install	Report generation

## Appendix: Raw Benchmark Output

### A.1 – sysbench CPU (Single-Thread)

```
sysbench 1.0.20 (using system LuaJIT 2.1.1731486438)

Running the test with following options:
Number of threads: 1
Prime numbers limit: 20000

Threads started!

CPU speed:
events per second: 1398.88

General statistics:
total time: 10.0004s
total number of events: 13992

Latency (ms):
min: 0.68
avg: 0.71
max: 4.16
95th percentile: 0.72
sum: 9998.25

Threads fairness:
events (avg/stddev): 13992.0000/0.00
execution time (avg/stddev): 9.9982/0.00
```

### A.2 – sysbench CPU (Multi-Thread, 20T)

```
sysbench 1.0.20 (using system LuaJIT 2.1.1731486438)

Running the test with following options:
Number of threads: 20
Prime numbers limit: 20000

Threads started!

CPU speed:
events per second: 15677.35

General statistics:
total time: 10.0009s
total number of events: 156802

Latency (ms):
min: 0.70
avg: 1.27
max: 26.59
95th percentile: 1.50
sum: 199899.22

Threads fairness:
events (avg/stddev): 7840.1000/791.70
execution time (avg/stddev): 9.9950/0.01
```

### A.3 – sysbench Memory (Single-Thread)

```
sysbench 1.0.20 (using system LuaJIT 2.1.1731486438)

Running memory speed test with the following options:
block size: 1024KiB
total size: 10240MiB
operation: write
scope: global

Number of threads: 1
```

```
Total operations: 10240 (34644.25 per second)
10240.00 MiB transferred (34644.25 MiB/sec)

General statistics:
    total time:          0.2907s
    total number of events: 10240

Latency (ms):
    min:          0.02
    avg:          0.03
    max:          0.20
    95th percentile: 0.03
    sum:         289.04
```

## A.4 – sysbench Memory (Multi-Thread, 20T)

```
sysbench 1.0.20 (using system LuaJIT 2.1.1731486438)

Running memory speed test with the following options:
  block size: 1024KiB
  total size: 40960MiB
  operation: write
  scope: global

Number of threads: 20

Total operations: 40960 (128309.41 per second)
40960.00 MiB transferred (128309.41 MiB/sec)

General statistics:
    total time:          0.3180s
    total number of events: 40960

Latency (ms):
    min:          0.03
    avg:          0.14
    max:          7.47
    95th percentile: 0.21
    sum:         5609.92
```

## A.5 – stress-ng CPU (30s, All Methods)

```
stress-ng: dispatching hogs: 20 cpu
stress-ng: stressor      bogo ops real time   usr time   sys time   bogo ops/s   bogo ops/s
stress-ng:                      (secs)   (secs)   (secs)   (real time) (usr+sys time)
stress-ng: cpu           810902    30.00    552.78     1.80    27028.85     1462.19
stress-ng: passed: 20: cpu (20)
stress-ng: failed: 0
stress-ng: successful run completed in 30.01 secs
```

## A.6 – fio Sequential Read

```
seq_read: (groupid=0, jobs=1): err= 0
  read: IOPS=9635, BW=9636MiB/s (10.1GB/s)(282GiB/30001msec)
    slat (usec): min=85, max=697, avg=103.03, stdev=15.45
    clat (nsec): min=354, max=31165, avg=498.24, stdev=239.15
    lat (usec): min=85, max=700, avg=103.53, stdev=15.59
    clat percentiles (nsec):
      | 1.00th=[ 398], 5.00th=[ 418], 10.00th=[ 426],
      | 50.00th=[ 462], 90.00th=[ 564], 99.00th=[ 1012]
  bw (MiB/s): min=7556, max=9898, avg=9636.17, stdev=359.26

  READ: bw=9636MiB/s (10.1GB/s), io=282GiB (303GB), run=30001msec
```

## A.7 – fio Sequential Write

```
seq_write: (groupid=0, jobs=1): err= 0
  write: IOPS=8483, BW=8483MiB/s (8895MB/s)(249GiB/30001msec)
    slat (usec): min=73, max=1264, avg=116.97, stdev=27.85
```

```

clat (nsec): min=388, max=59167, avg=587.23, stdev=449.04
lat (usec): min=74, max=1269, avg=117.55, stdev=28.13
clat percentiles (nsec):
| 1.00th=[ 442], 5.00th=[ 458], 10.00th=[ 466],
| 50.00th=[ 506], 90.00th=[ 692], 99.00th=[ 2352]
bw (MiB/s): min=7580, max=9038, avg=8483.53, stdev=389.78

WRITE: bw=8483MiB/s (8895MB/s), io=249GiB (267GB), run=30001msec

```

## A.8 – fio Random Read 4K

```

rand_read: (groupid=0, jobs=4): err= 0
read: IOPS=3335k, BW=12.7GiB/s (13.7GB/s)(382GiB/30001msec)
  slat (nsec): min=423, max=806682, avg=820.46, stdev=476.11
  clat (nsec): min=786, max=916178, avg=37402.13, stdev=10059.35
  lat (nsec): min=1578, max=917491, avg=38222.59, stdev=10232.22
  clat percentiles (usec):
| 1.00th=[ 35], 5.00th=[ 35], 10.00th=[ 35],
| 50.00th=[ 37], 90.00th=[ 40], 99.00th=[ 64]
bw (MiB/s): min=11223, max=13616, avg=13027.23, stdev=120.47

READ: bw=12.7GiB/s (13.7GB/s), io=382GiB (410GB), run=30001msec

```

## A.9 – fio Random Write 4K

```

rand_write: (groupid=0, jobs=4): err= 0
write: IOPS=1366k, BW=5335MiB/s (5594MB/s)(156GiB/30001msec)
  slat (nsec): min=554, max=3073.6k, avg=2473.64, stdev=3374.50
  clat (nsec): min=919, max=3372.8k, avg=91064.59, stdev=28717.21
  lat (usec): min=3, max=3383, avg=93.54, stdev=29.26
  clat percentiles (usec):
| 1.00th=[ 73], 5.00th=[ 77], 10.00th=[ 79],
| 50.00th=[ 87], 90.00th=[ 101], 99.00th=[ 229]
bw (MiB/s): min=4437, max=5854, avg=5334.70, stdev=81.06

WRITE: bw=5335MiB/s (5594MB/s), io=156GiB (168GB), run=30001msec

```

## A.10 – glmark2 GPU Benchmark (Full Output)

```

glmark2 2023.01
OpenGL Information
  GL_VENDOR:      AMD
  GL_RENDERER:   AMD Radeon RX 7700 XT (radeonsi, navi32,
                  LLVM 20.1.8, DRM 3.61, 6.14.0-15-generic)
  GL_VERSION:    4.6 (Compatibility Profile) Mesa 25.2.8
  Surface Config: buf=32 r=8 g=8 b=8 a=8 depth=24 stencil=0
  Surface Size:  800x600 windowed

[build] use-vbo=false:                      FPS: 9088
[build] use-vbo=true:                       FPS: 12409
[texture] texture-filter=nearest:           FPS: 13361
[texture] texture-filter=linear:             FPS: 12550
[texture] texture-filter=mipmap:             FPS: 12153
[shading] shading=gouraud:                  FPS: 12353
[shading] shading=blinn-phong-inf:          FPS: 12186
[shading] shading=phong:                    FPS: 11964
[shading] shading=cel:                     FPS: 11403
[bump] bump-render=high-poly:              FPS: 12271
[bump] bump-render=normals:                FPS: 11673
[bump] bump-render=height:                 FPS: 11616
[effect2d] kernel=0,1;0,-4,1;0,1,0,:       FPS: 12385
[effect2d] kernel=1,1,1,1;1,1,1,1;...:       FPS: 11224
[pulsar] light=false:quads=5:texture=false: FPS: 11777
[desktop] blur-radius=5:passes=1:windows=4:  FPS: 6400
[desktop] effects=shadow:windows=4:         FPS: 7971
[buffer] columns=200:update-method=map:     FPS: 1172
[buffer] columns=200:update-method=subdata:  FPS: 2152
[buffer] columns=200:interleave=true:map:    FPS: 1366
[ideas] speed=duration:                   FPS: 4495
[jellyfish] <default>:                   FPS: 10494
[terrain] <default>:                      FPS: 3415
[shadow] <default>:                      FPS: 10048

```

```
[refract] <default>: FPS: 5991
[conditionals] fragment-steps=0:vertex=0: FPS: 11591
[conditionals] fragment-steps=5:vertex=0: FPS: 11757
[conditionals] fragment-steps=0:vertex=5: FPS: 12061
[function] fragment-complexity=low:steps=5: FPS: 11547
[function] fragment-complexity=medium:steps=5: FPS: 11054
[loop] fragment-loop=false:steps=5:vertex=5: FPS: 11747
[loop] fragment-uniform=false:steps=5:vertex=5: FPS: 11129
[loop] fragment-uniform=true:steps=5:vertex=5: FPS: 10943
```

glmark2 Score: 9809

## A.11 – lscpu Output

```
Architecture:          x86_64
CPU op-mode(s):       32-bit, 64-bit
Address sizes:        39 bits physical, 48 bits virtual
Byte Order:           Little Endian
CPU(s):              20
On-line CPU(s) list: 0-19
Vendor ID:            GenuineIntel
Model name:           12th Gen Intel(R) Core(TM) i7-12700F
CPU family:          6
Model:                151
Thread(s) per core:  2
Core(s) per socket:  12
Socket(s):           1
Stepping:             2
CPU max MHz:         4900.0000
CPU min MHz:         800.0000
BogoMIPS:             4224.00
Virtualization:      VT-x
L1d cache:           512 KiB (12 instances)
L1i cache:           512 KiB (12 instances)
L2 cache:             12 MiB (9 instances)
L3 cache:             25 MiB (1 instance)
NUMA node(s):         1
```

## A.12 – Memory Configuration (dmidecode)

```
Error Correction Type: None

DIMM 1: 16 GB Controller0-DIMMA1 DDR5 4800 MT/s Kingston
DIMM 2: 16 GB Controller0-DIMMA2 DDR5 4800 MT/s Kingston
DIMM 3: 16 GB Controller1-DIMMB1 DDR5 4800 MT/s Kingston
DIMM 4: 16 GB Controller1-DIMMB2 DDR5 4800 MT/s Kingston

Total: 4 x 16 GB = 64 GB DDR5 @ 4800 MT/s
```