

# Raspberry Pi 4 - VMware ESXi - BCM2711

Virtual Machine on VMware ESXi 7.0 Release 1.13, Dual-Core Virtual Machine. Host @2100 MHz

Linux raspberrypi4 6.3.0-1-arm64 #1 SMP Debian 6.3.7-1 (2023-06-12) aarch64 GNU/Linux

08.07.2023

sbc-bench v0.9.42

Installing needed tools: Done.

Checking cpufreq OPP. Done (results will be available in 9-14 minutes).

Executing tinymembench. Done.

Executing RAM latency tester. Done.

Executing OpenSSL benchmark. Done.

Executing 7-zip

benchmark...

Done.

Checking cpufreq OPP again. Done (9 minutes elapsed).

Results validation:

\* No swapping

\* Throttling occurred

Memory performance

memcpy: 2421.0 MB/s

memset: 3243.7 MB/s

7-zip total scores (3 consecutive runs): 3341,3410,3393, single-threaded: 1798

OpenSSL results:

| type        | 16 bytes  | 64 bytes  | 256 bytes | 1024 bytes | 8192 bytes | 16384 bytes |
|-------------|-----------|-----------|-----------|------------|------------|-------------|
| aes-128-cbc | 49447.93k | 53976.09k | 55393.79k | 55831.21k  | 55986.86k  | 55907.67k   |

|             |           |           |           |           |           |           |
|-------------|-----------|-----------|-----------|-----------|-----------|-----------|
| aes-128-cbc | 49542.43k | 53921.32k | 55418.20k | 55851.69k | 55965.01k | 56027.82k |
| aes-192-cbc | 42226.14k | 45174.42k | 46304.00k | 46683.14k | 46631.59k | 46830.93k |
| aes-192-cbc | 41792.09k | 44896.04k | 46208.77k | 46623.74k | 46918.31k | 46749.01k |
| aes-256-cbc | 36586.13k | 38903.94k | 39674.79k | 40048.98k | 40012.46k | 40080.73k |
| aes-256-cbc | 36114.35k | 39022.19k | 39820.71k | 39884.12k | 40108.03k | 39927.81k |

Full Result

sbc-bench v0.9.42 VMware Cortex-A72 VM (Sat, 08 Jul 2023 15:08:50 +0200)

Distributor ID:Debian  
Description:Debian GNU/Linux trixie/sid  
Codename:trixie

Device Info:  
Manufacturer: VMware, Inc.  
Product Name: VMware20,1  
Version: 1  
SKU Number: 0000000000000001  
Family: VMware

BIOS/UEFI:  
Vendor: VMware, Inc.  
Version: VMW201.00V.21747440.BA64.2305102224  
Release Date: 05/10/2023

/usr/bin/gcc (Debian 12.3.0-4) 12.3.0

Uptime: 15:08:50 up 7 min, 2 users, load average: 0.08, 0.04, 0.01, °C, 182776534

Linux 6.3.0-1-arm64 (raspberrypi4) 07/08/23 \_aarch64\_(2 CPU)

|          |       |       |         |         |        |       |
|----------|-------|-------|---------|---------|--------|-------|
| avg-cpu: | %user | %nice | %system | %iowait | %steal | %idle |
|          | 0.66  | 0.00  | 1.29    | 0.46    | 0.00   | 97.60 |

|         |       |           |           |           |         |         |
|---------|-------|-----------|-----------|-----------|---------|---------|
| Device  | tps   | kB_read/s | kB_wrtn/s | kB_dscd/s | kB_read | kB_wrtn |
| kB_dscd |       |           |           |           |         |         |
| sda     | 15.09 | 656.11    | 27.82     | 0.00      | 294193  |         |
| 12476   | 0     |           |           |           |         |         |

|       | total | used  | free  | shared | buff/cache | available |
|-------|-------|-------|-------|--------|------------|-----------|
| Mem:  | 974Mi | 189Mi | 754Mi | 572Ki  | 98Mi       | 784Mi     |
| Swap: | 951Mi | 0B    | 951Mi |        |            |           |

FilenameTypeSizeUsedPriority

/dev/sda3partition974844000-2

#####

Checking cpufreq OPP (Cortex-A72):

No cpufreq support available. Measured on cpu1: 1990 MHz (1990.790/1990.163/1989.586)

#####

Executing benchmark on cpu0 (Cortex-A72):

tinymembench v0.4.9-nuumio (simple benchmark for memory throughput and latency)

CFLAGS:

bandwidth test min repeats (-b): 2

bandwidth test max repeats (-B): 3

bandwidth test mem realloc (-M): no (-m for realloc)

latency test repeats (-l): 3

latency test count (-c): 1000000

=====

== Memory bandwidth tests ==

== ==

== Note 1: 1MB = 1000000 bytes ==

== Note 2: Test result is the best of repeated runs. Number of repeats ==

== is shown in brackets ==

== Note 3: Results for 'copy' tests show how many bytes can be ==

== copied per second (adding together read and written ==

== bytes would have provided twice higher numbers) ==

== Note 4: 2-pass copy means that we are using a small temporary buffer ==

== to first fetch data into it, and only then write it to the ==

== destination (source -> L1 cache, L1 cache -> destination) ==

== Note 5: If sample standard deviation exceeds 0.1%, it is shown in ==  
== brackets ==

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|   |   |                        |
|---|---|------------------------|
| C copy backwards                            | : | 2146.2 MB/s (3, 7.9%)  |
| C copy backwards (32 byte blocks)           | : | 2417.3 MB/s (3, 0.7%)  |
| C copy backwards (64 byte blocks)           | : | 2429.6 MB/s (3, 0.8%)  |
| C copy                                      | : | 2430.3 MB/s (3, 0.3%)  |
| C copy prefetched (32 bytes step)           | : | 2416.9 MB/s (3, 1.6%)  |
| C copy prefetched (64 bytes step)           | : | 2420.6 MB/s (2)        |
| C 2-pass copy                               | : | 1559.1 MB/s (3, 0.3%)  |
| C 2-pass copy prefetched (32 bytes step)    | : | 1733.8 MB/s (3, 2.7%)  |
| C 2-pass copy prefetched (64 bytes step)    | : | 1750.9 MB/s (3, 1.1%)  |
| C scan 8                                    | : | 976.3 MB/s (3, 0.3%)   |
| C scan 16                                   | : | 1936.6 MB/s (3, 0.7%)  |
| C scan 32                                   | : | 3675.3 MB/s (3, 1.1%)  |
| C scan 64                                   | : | 4006.4 MB/s (3, 0.6%)  |
| C fill                                      | : | 3276.2 MB/s (3, 0.6%)  |
| C fill (shuffle within 16 byte blocks)      | : | 3272.8 MB/s (2)        |
| C fill (shuffle within 32 byte blocks)      | : | 3267.8 MB/s (3, 0.8%)  |
| C fill (shuffle within 64 byte blocks)      | : | 3269.3 MB/s (3, 0.4%)  |
| ---   |   |                        |
| libc memcpy copy                            | : | 2421.0 MB/s (3, 0.4%)  |
| libc memchr scan                            | : | 4017.9 MB/s (3, 1.2%)  |
| libc memset fill                            | : | 3243.7 MB/s (3, 0.4%)  |
| ---   |   |                        |
| NEON LDP/STP copy                           | : | 2426.9 MB/s (3, 1.7%)  |
| NEON LDP/STP copy pldl2strm (32 bytes step) | : | 2402.2 MB/s (3, 0.5%)  |
| NEON LDP/STP copy pldl2strm (64 bytes step) | : | 2396.6 MB/s (3, 1.6%)  |
| NEON LDP/STP copy pldllkeep (32 bytes step) | : | 2413.2 MB/s (3, 1.9%)  |
| NEON LDP/STP copy pldllkeep (64 bytes step) | : | 1757.2 MB/s (3, 5.9%)  |
| NEON LD1/ST1 copy                           | : | 2426.1 MB/s (3, 1.0%)  |
| NEON LDP load                               | : | 4020.3 MB/s (2)        |
| NEON LDNP load                              | : | 3973.5 MB/s (3, 21.6%) |
| NEON STP fill                               | : | 3220.0 MB/s (3, 8.5%)  |
| NEON STNP fill                              | : | 3063.7 MB/s (3, 3.9%)  |
| ARM LDP/STP copy                            | : | 2343.3 MB/s (3, 19.4%) |
| ARM LDP load                                | : | 4006.4 MB/s (3, 3.5%)  |
| ARM LDNP load                               | : | 4002.0 MB/s (2)        |

|               |   |                       |
|---------------|---|-----------------------|
| ARM STP fill  | : | 3274.8 MB/s (3, 0.2%) |
| ARM STNP fill | : | 3066.6 MB/s (3, 2.9%) |

```
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== Framebuffer read tests.                                ==
==                                                         ==
== Many ARM devices use a part of the system memory as the framebuffer, ==
== typically mapped as uncached but with write-combining enabled.         ==
== Writes to such framebuffers are quite fast, but reads are much          ==
== slower and very sensitive to the alignment and the selection of         ==
== CPU instructions which are used for accessing memory.                  ==
==                                                         ==
== Many x86 systems allocate the framebuffer in the GPU memory,           ==
== accessible for the CPU via a relatively slow PCI-E bus. Moreover,       ==
== PCI-E is asymmetric and handles reads a lot worse than writes.         ==
==                                                         ==
== If uncached framebuffer reads are reasonably fast (at least 100 MB/s ==
== or preferably >300 MB/s), then using the shadow framebuffer layer      ==
== is not necessary in Xorg DDX drivers, resulting in a nice overall      ==
== performance improvement. For example, the xf86-video-fbturbo DDX       ==
== uses this trick.                                                         ==
=====
```

|   |   |                        |
|---|---|------------------------|
| NEON LDP/STP copy (from framebuffer)        | : | 2541.3 MB/s (3, 15.9%) |
| NEON LDP/STP 2-pass copy (from framebuffer) | : | 1826.7 MB/s (3, 1.4%)  |
| NEON LD1/ST1 copy (from framebuffer)        | : | 2515.2 MB/s (3, 3.5%)  |
| NEON LD1/ST1 2-pass copy (from framebuffer) | : | 1847.8 MB/s (3, 2.8%)  |
| ARM LDP/STP copy (from framebuffer)         | : | 2516.5 MB/s (3, 2.0%)  |
| ARM LDP/STP 2-pass copy (from framebuffer)  | : | 1838.1 MB/s (3, 1.1%)  |

```
=====
== Memory latency test                                          ==
==                                                         ==
== Average time is measured for random memory accesses in the buffers ==
== of different sizes. The larger is the buffer, the more significant ==
== are relative contributions of TLB, L1/L2 cache misses and SDRAM      ==
== accesses. For extremely large buffer sizes we are expecting to see    ==
== page table walk with several requests to SDRAM for almost every      ==
== memory access (though 64MiB is not nearly large enough to experience ==
=====
```

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== this effect to its fullest). ==
==
== Note 1: All the numbers are representing extra time, which needs to ==
== be added to L1 cache latency. The cycle timings for L1 cache ==
== latency can be usually found in the processor documentation. ==
== Note 2: Dual random read means that we are simultaneously performing ==
== two independent memory accesses at a time. In the case if ==
== the memory subsystem can't handle multiple outstanding ==
== requests, dual random read has the same timings as two ==
== single reads performed one after another. ==
=====

```

block size : single random read / dual random read, [MADV\_NOHUGEPAGE]

|            |          |   |          |
|------------|----------|---|----------|
| 1024 :     | 0.0 ns   | / | 0.0 ns   |
| 2048 :     | 0.0 ns   | / | 0.0 ns   |
| 4096 :     | 0.0 ns   | / | 0.0 ns   |
| 8192 :     | 0.0 ns   | / | 0.0 ns   |
| 16384 :    | 0.0 ns   | / | 0.0 ns   |
| 32768 :    | 0.1 ns   | / | 0.0 ns   |
| 65536 :    | 4.4 ns   | / | 6.7 ns   |
| 131072 :   | 6.6 ns   | / | 8.9 ns   |
| 262144 :   | 9.6 ns   | / | 11.9 ns  |
| 524288 :   | 12.2 ns  | / | 14.2 ns  |
| 1048576 :  | 32.1 ns  | / | 49.8 ns  |
| 2097152 :  | 83.8 ns  | / | 120.9 ns |
| 4194304 :  | 113.3 ns | / | 145.0 ns |
| 8388608 :  | 148.5 ns | / | 185.8 ns |
| 16777216 : | 165.1 ns | / | 212.5 ns |
| 33554432 : | 177.4 ns | / | 229.7 ns |
| 67108864 : | 222.1 ns | / | 313.2 ns |

block size : single random read / dual random read, [MADV\_HUGEPAGE]

|         |        |   |        |
|---------|--------|---|--------|
| 1024 :  | 0.0 ns | / | 0.0 ns |
| 2048 :  | 0.0 ns | / | 0.0 ns |
| 4096 :  | 0.0 ns | / | 0.0 ns |
| 8192 :  | 0.0 ns | / | 0.0 ns |
| 16384 : | 0.0 ns | / | 0.0 ns |
| 32768 : | 2.2 ns | / | 3.7 ns |
| 65536 : | 4.4 ns | / | 6.7 ns |

|            |          |   |          |
|------------|----------|---|----------|
| 131072 :   | 6.7 ns   | / | 8.9 ns   |
| 262144 :   | 9.6 ns   | / | 11.9 ns  |
| 524288 :   | 11.6 ns  | / | 14.2 ns  |
| 1048576 :  | 30.6 ns  | / | 50.4 ns  |
| 2097152 :  | 84.6 ns  | / | 120.8 ns |
| 4194304 :  | 111.7 ns | / | 144.5 ns |
| 8388608 :  | 146.8 ns | / | 185.3 ns |
| 16777216 : | 164.5 ns | / | 208.4 ns |
| 33554432 : | 173.2 ns | / | 221.4 ns |
| 67108864 : | 179.4 ns | / | 231.5 ns |

#####

Executing ramlat on cpu0 (Cortex-A72), results in ns:

| size:    | 1x32  | 2x32  | 1x64  | 2x64  | 1xPTR | 2xPTR | 4xPTR | 8xPTR |
|----------|-------|-------|-------|-------|-------|-------|-------|-------|
| 4k:      | 2.573 | 2.533 | 2.516 | 2.514 | 2.012 | 2.015 | 2.025 | 4.038 |
| 8k:      | 2.515 | 2.513 | 2.516 | 2.514 | 2.013 | 2.014 | 2.051 | 4.295 |
| 16k:     | 2.535 | 2.516 | 2.515 | 2.538 | 2.013 | 2.012 | 2.711 | 4.028 |
| 32k:     | 2.520 | 2.524 | 2.525 | 2.519 | 2.015 | 2.017 | 2.995 | 4.038 |
| 64k:     | 11.03 | 11.11 | 11.10 | 11.21 | 10.56 | 10.92 | 18.16 | 36.23 |
| 128k:    | 11.09 | 11.11 | 11.10 | 11.14 | 10.59 | 11.68 | 18.37 | 36.45 |
| 256k:    | 17.15 | 16.84 | 16.96 | 16.84 | 16.46 | 16.41 | 19.69 | 36.65 |
| 512k:    | 15.66 | 15.34 | 15.93 | 15.39 | 18.55 | 15.70 | 19.50 | 36.91 |
| 1024k:   | 96.15 | 74.11 | 93.91 | 70.15 | 82.78 | 70.09 | 80.89 | 104.9 |
| 2048k:   | 125.7 | 127.5 | 129.7 | 124.4 | 126.5 | 118.3 | 132.6 | 199.8 |
| 4096k:   | 135.8 | 134.8 | 135.8 | 138.6 | 136.7 | 135.8 | 142.7 | 183.3 |
| 8192k:   | 185.0 | 187.0 | 184.0 | 185.4 | 185.5 | 179.4 | 186.0 | 203.9 |
| 16384k:  | 183.2 | 185.5 | 185.2 | 185.9 | 186.1 | 185.1 | 192.9 | 214.3 |
| 32768k:  | 184.8 | 187.0 | 184.8 | 187.1 | 187.2 | 189.6 | 197.9 | 221.0 |
| 65536k:  | 185.8 | 188.8 | 186.6 | 188.6 | 189.5 | 192.3 | 199.8 | 224.8 |
| 131072k: | 187.2 | 264.9 | 192.4 | 196.3 | 189.5 | 207.5 | 207.1 | 228.6 |

#####

Executing benchmark twice on cluster 0 (Cortex-A72)

OpenSSL 3.0.9, built on 30 May 2023 (Library: OpenSSL 3.0.9 30 May 2023)

|      |          |          |           |            |            |             |
|------|----------|----------|-----------|------------|------------|-------------|
| type | 16 bytes | 64 bytes | 256 bytes | 1024 bytes | 8192 bytes | 16384 bytes |
|------|----------|----------|-----------|------------|------------|-------------|

|             |           |           |           |           |           |
|-------------|-----------|-----------|-----------|-----------|-----------|
| aes-128-cbc | 49447.93k | 53976.09k | 55393.79k | 55831.21k | 55986.86k |
|             | 55907.67k |           |           |           |           |
| aes-128-cbc | 49542.43k | 53921.32k | 55418.20k | 55851.69k | 55965.01k |
|             | 56027.82k |           |           |           |           |
| aes-192-cbc | 42226.14k | 45174.42k | 46304.00k | 46683.14k | 46631.59k |
|             | 46830.93k |           |           |           |           |
| aes-192-cbc | 41792.09k | 44896.04k | 46208.77k | 46623.74k | 46918.31k |
|             | 46749.01k |           |           |           |           |
| aes-256-cbc | 36586.13k | 38903.94k | 39674.79k | 40048.98k | 40012.46k |
|             | 40080.73k |           |           |           |           |
| aes-256-cbc | 36114.35k | 39022.19k | 39820.71k | 39884.12k | 40108.03k |
|             | 39927.81k |           |           |           |           |

#####

Executing benchmark single-threaded on cpu0 (Cortex-A72)

7-Zip (a) [64] 16.02 : Copyright (c) 1999-2016 Igor Pavlov : 2016-05-21  
p7zip Version 16.02 (locale=C,Utf16=off,HugeFiles=on,64 bits,2 CPUs LE)

LE

CPU Freq: - - 64000000 - - - - -

RAM size: 974 MB, # CPU hardware threads: 2  
RAM usage: 435 MB, # Benchmark threads: 1

|       |             | Compressing |        |  |  | Decompressing |      |        |  |
|-------|-------------|-------------|--------|--|--|---------------|------|--------|--|
| Dict  | Speed Usage | R/U         | Rating |  |  | Speed Usage   | R/U  | Rating |  |
|       | KiB/s %     | MIPS        | MIPS   |  |  | KiB/s %       | MIPS | MIPS   |  |
| 22:   | 1560 100    | 1522        | 1518   |  |  | 24697 100     | 2112 | 2109   |  |
| 23:   | 1500 100    | 1531        | 1529   |  |  | 24158 100     | 2094 | 2091   |  |
| 24:   | 1414 100    | 1524        | 1520   |  |  | 23606 100     | 2076 | 2072   |  |
| 25:   | 1309 100    | 1497        | 1495   |  |  | 23030 100     | 2052 | 2050   |  |
| ----- |             |             |        |  |  | -----         |      |        |  |
| Avr:  | 100         | 1518        | 1516   |  |  | 100           | 2083 | 2081   |  |
| Tot:  | 100         | 1801        | 1798   |  |  |               |      |        |  |

#####

Executing benchmark 3 times multi-threaded on CPUs 0-1

7-Zip (a) [64] 16.02 : Copyright (c) 1999-2016 Igor Pavlov : 2016-05-21  
p7zip Version 16.02 (locale=C,Utf16=off,HugeFiles=on,64 bits,2 CPUs LE)

LE

CPU Freq: - - - - -

RAM size: 974 MB, # CPU hardware threads: 2  
RAM usage: 441 MB, # Benchmark threads: 2

| Dict        | Compressing |       |      |        |  | Decompressing |       |      |        |
|-------------|-------------|-------|------|--------|--|---------------|-------|------|--------|
|             | Speed       | Usage | R/U  | Rating |  | Speed         | Usage | R/U  | Rating |
|             | KiB/s       | %     | MIPS | MIPS   |  | KiB/s         | %     | MIPS | MIPS   |
| 22:         | 2623        | 176   | 1452 | 2553   |  | 47959         | 198   | 2068 | 4095   |
| 23:         | 2613        | 186   | 1435 | 2662   |  | 46837         | 198   | 2050 | 4054   |
| 24:         | 2545        | 187   | 1466 | 2737   |  | 45543         | 198   | 2024 | 3998   |
| 25:         | 2346        | 185   | 1448 | 2679   |  | 44415         | 197   | 2005 | 3953   |
| ----- ----- |             |       |      |        |  |               |       |      |        |
| Avr:        |             | 183   | 1450 | 2658   |  |               | 198   | 2037 | 4025   |
| Tot:        |             | 190   | 1744 | 3341   |  |               |       |      |        |

7-Zip (a) [64] 16.02 : Copyright (c) 1999-2016 Igor Pavlov : 2016-05-21  
p7zip Version 16.02 (locale=C,Utf16=off,HugeFiles=on,64 bits,2 CPUs LE)

LE

CPU Freq: - - - - -

RAM size: 974 MB, # CPU hardware threads: 2  
RAM usage: 441 MB, # Benchmark threads: 2

| Dict | Compressing |       |      |        |  | Decompressing |       |      |        |
|------|-------------|-------|------|--------|--|---------------|-------|------|--------|
|      | Speed       | Usage | R/U  | Rating |  | Speed         | Usage | R/U  | Rating |
|      | KiB/s       | %     | MIPS | MIPS   |  | KiB/s         | %     | MIPS | MIPS   |
| 22:  | 2884        | 186   | 1508 | 2806   |  | 48366         | 199   | 2080 | 4130   |
| 23:  | 2680        | 188   | 1451 | 2731   |  | 47504         | 199   | 2064 | 4112   |

|       |      |     |      |      |  |       |     |      |      |
|-------|------|-----|------|------|--|-------|-----|------|------|
| 24:   | 2540 | 187 | 1460 | 2732 |  | 46113 | 199 | 2039 | 4048 |
| 25:   | 2379 | 184 | 1473 | 2716 |  | 45009 | 199 | 2017 | 4006 |
| ----- |      |     |      |      |  | ----- |     |      |      |
| Avr:  |      | 186 | 1473 | 2746 |  |       | 199 | 2050 | 4074 |
| Tot:  |      | 193 | 1761 | 3410 |  |       |     |      |      |

7-Zip (a) [64] 16.02 : Copyright (c) 1999-2016 Igor Pavlov : 2016-05-21  
p7zip Version 16.02 (locale=C,Utf16=off,HugeFiles=on,64 bits,2 CPUs LE)

LE  
CPU Freq: - - - - -

RAM size: 974 MB, # CPU hardware threads: 2  
RAM usage: 441 MB, # Benchmark threads: 2

| Compressing |       |       |      |        |  | Decompressing |       |      |        |
|-------------|-------|-------|------|--------|--|---------------|-------|------|--------|
| Dict        | Speed | Usage | R/U  | Rating |  | Speed         | Usage | R/U  | Rating |
|             | KiB/s | %     | MIPS | MIPS   |  | KiB/s         | %     | MIPS | MIPS   |
| 22:         | 2686  | 177   | 1480 | 2613   |  | 48604         | 199   | 2088 | 4150   |
| 23:         | 2642  | 188   | 1432 | 2693   |  | 47805         | 200   | 2073 | 4138   |
| 24:         | 2556  | 187   | 1473 | 2749   |  | 46454         | 199   | 2046 | 4078   |
| 25:         | 2363  | 185   | 1461 | 2699   |  | 45247         | 199   | 2024 | 4027   |
| -----       |       |       |      |        |  | -----         |       |      |        |
| Avr:        |       | 184   | 1461 | 2688   |  |               | 199   | 2058 | 4098   |
| Tot:        |       | 192   | 1760 | 3393   |  |               |       |      |        |

Compression: 2658,2746,2688  
Decompression: 4025,4074,4098  
Total: 3341,3410,3393

#####

Testing maximum cpufreq again, still under full load. System health now:

| Time      | CPU n/a | load | %cpu | %sys | %usr | %nice | %io | %irq | Temp |
|-----------|---------|------|------|------|------|-------|-----|------|------|
| 15:17:20: | n/a MHz | 1.95 | 95%  | 2%   | 93%  | 0%    | 0%  | 0%   | °C   |

Checking cpufreq OPP (Cortex-A72):

No cpufreq support available. Measured on cpu1: 1992 MHz (1992.379/1992.304/1992.204)

#####

System health while running tinymembench:

| Time      | CPU n/a | load | %cpu | %sys | %usr | %nice | %io | %irq | Temp |
|-----------|---------|------|------|------|------|-------|-----|------|------|
| 15:08:56: | n/a MHz | 0.15 | 3%   | 1%   | 1%   | 0%    | 0%  | 0%   | °C   |
| 15:09:06: | n/a MHz | 0.28 | 51%  | 0%   | 50%  | 0%    | 0%  | 0%   | °C   |
| 15:09:16: | n/a MHz | 0.39 | 50%  | 0%   | 50%  | 0%    | 0%  | 0%   | °C   |
| 15:09:26: | n/a MHz | 0.56 | 50%  | 0%   | 50%  | 0%    | 0%  | 0%   | °C   |
| 15:09:37: | n/a MHz | 0.63 | 50%  | 0%   | 50%  | 0%    | 0%  | 0%   | °C   |
| 15:09:47: | n/a MHz | 0.69 | 51%  | 0%   | 50%  | 0%    | 0%  | 0%   | °C   |
| 15:09:57: | n/a MHz | 0.74 | 51%  | 0%   | 50%  | 0%    | 0%  | 0%   | °C   |
| 15:10:07: | n/a MHz | 0.78 | 50%  | 0%   | 50%  | 0%    | 0%  | 0%   | °C   |
| 15:10:17: | n/a MHz | 0.81 | 50%  | 0%   | 50%  | 0%    | 0%  | 0%   | °C   |
| 15:10:27: | n/a MHz | 0.84 | 50%  | 0%   | 49%  | 0%    | 0%  | 0%   | °C   |

System health while running ramlat:

| Time      | CPU n/a | load | %cpu | %sys | %usr | %nice | %io | %irq | Temp |
|-----------|---------|------|------|------|------|-------|-----|------|------|
| 15:10:37: | n/a MHz | 0.87 | 11%  | 1%   | 10%  | 0%    | 0%  | 0%   | °C   |
| 15:10:40: | n/a MHz | 0.88 | 50%  | 0%   | 50%  | 0%    | 0%  | 0%   | °C   |
| 15:10:43: | n/a MHz | 0.89 | 50%  | 0%   | 50%  | 0%    | 0%  | 0%   | °C   |
| 15:10:46: | n/a MHz | 0.89 | 50%  | 0%   | 50%  | 0%    | 0%  | 0%   | °C   |
| 15:10:49: | n/a MHz | 0.90 | 50%  | 0%   | 50%  | 0%    | 0%  | 0%   | °C   |
| 15:10:52: | n/a MHz | 0.90 | 50%  | 0%   | 50%  | 0%    | 0%  | 0%   | °C   |
| 15:10:55: | n/a MHz | 0.90 | 50%  | 0%   | 50%  | 0%    | 0%  | 0%   | °C   |
| 15:10:58: | n/a MHz | 0.91 | 50%  | 0%   | 49%  | 0%    | 0%  | 0%   | °C   |
| 15:11:01: | n/a MHz | 0.91 | 50%  | 0%   | 50%  | 0%    | 0%  | 0%   | °C   |
| 15:11:04: | n/a MHz | 0.92 | 50%  | 0%   | 49%  | 0%    | 0%  | 0%   | °C   |
| 15:11:07: | n/a MHz | 0.93 | 50%  | 1%   | 49%  | 0%    | 0%  | 0%   | °C   |
| 15:11:11: | n/a MHz | 0.93 | 51%  | 1%   | 48%  | 0%    | 0%  | 0%   | °C   |

System health while running OpenSSL benchmark:

| Time      | CPU n/a | load | %cpu | %sys | %usr | %nice | %io | %irq | Temp |
|-----------|---------|------|------|------|------|-------|-----|------|------|
| 15:11:12: | n/a MHz | 0.93 | 14%  | 1%   | 12%  | 0%    | 0%  | 0%   | °C   |

|           |         |      |     |    |     |    |    |    |    |
|-----------|---------|------|-----|----|-----|----|----|----|----|
| 15:11:28: | n/a MHz | 0.95 | 50% | 0% | 50% | 0% | 0% | 0% | °C |
| 15:11:44: | n/a MHz | 0.96 | 50% | 0% | 50% | 0% | 0% | 0% | °C |
| 15:12:00: | n/a MHz | 0.97 | 50% | 0% | 50% | 0% | 0% | 0% | °C |
| 15:12:16: | n/a MHz | 0.98 | 50% | 0% | 50% | 0% | 0% | 0% | °C |
| 15:12:32: | n/a MHz | 0.98 | 50% | 0% | 50% | 0% | 0% | 0% | °C |
| 15:12:48: | n/a MHz | 0.99 | 50% | 0% | 50% | 0% | 0% | 0% | °C |

System health while running 7-zip single core benchmark:

| Time      | CPU n/a | load | %cpu | %sys | %usr | %nice | %io | %irq | Temp |
|-----------|---------|------|------|------|------|-------|-----|------|------|
| 15:13:00: | n/a MHz | 0.99 | 19%  | 1%   | 18%  | 0%    | 0%  | 0%   | °C   |
| 15:13:07: | n/a MHz | 0.99 | 50%  | 0%   | 49%  | 0%    | 0%  | 0%   | °C   |
| 15:13:14: | n/a MHz | 0.99 | 50%  | 0%   | 50%  | 0%    | 0%  | 0%   | °C   |
| 15:13:21: | n/a MHz | 0.99 | 50%  | 1%   | 49%  | 0%    | 0%  | 0%   | °C   |
| 15:13:28: | n/a MHz | 1.00 | 50%  | 0%   | 49%  | 0%    | 0%  | 0%   | °C   |
| 15:13:35: | n/a MHz | 1.00 | 50%  | 1%   | 49%  | 0%    | 0%  | 0%   | °C   |
| 15:13:42: | n/a MHz | 1.00 | 50%  | 1%   | 49%  | 0%    | 0%  | 0%   | °C   |
| 15:13:49: | n/a MHz | 1.00 | 50%  | 0%   | 49%  | 0%    | 0%  | 0%   | °C   |
| 15:13:56: | n/a MHz | 1.00 | 50%  | 1%   | 48%  | 0%    | 0%  | 0%   | °C   |
| 15:14:03: | n/a MHz | 1.00 | 50%  | 1%   | 49%  | 0%    | 0%  | 0%   | °C   |
| 15:14:10: | n/a MHz | 1.00 | 50%  | 1%   | 49%  | 0%    | 0%  | 0%   | °C   |
| 15:14:18: | n/a MHz | 1.00 | 50%  | 0%   | 49%  | 0%    | 0%  | 0%   | °C   |

System health while running 7-zip multi core benchmark:

| Time      | CPU n/a | load | %cpu | %sys | %usr | %nice | %io | %irq | Temp |
|-----------|---------|------|------|------|------|-------|-----|------|------|
| 15:14:23: | n/a MHz | 1.16 | 23%  | 1%   | 21%  | 0%    | 0%  | 0%   | °C   |
| 15:14:52: | n/a MHz | 1.63 | 96%  | 1%   | 94%  | 0%    | 0%  | 0%   | °C   |
| 15:15:21: | n/a MHz | 1.91 | 95%  | 2%   | 92%  | 0%    | 0%  | 0%   | °C   |
| 15:15:51: | n/a MHz | 2.01 | 96%  | 1%   | 95%  | 0%    | 0%  | 0%   | °C   |
| 15:16:21: | n/a MHz | 2.08 | 95%  | 2%   | 93%  | 0%    | 0%  | 0%   | °C   |
| 15:16:50: | n/a MHz | 1.91 | 96%  | 1%   | 94%  | 0%    | 0%  | 0%   | °C   |
| 15:17:20: | n/a MHz | 1.95 | 95%  | 2%   | 93%  | 0%    | 0%  | 0%   | °C   |

#####

Linux 6.3.0-1-arm64 (raspberrypi4) 07/08/23 \_aarch64\_(2 CPU)

avg-cpu: %user %nice %system %iowait %steal %idle

35.36 0.02 1.27 0.22 0.00 63.12

| Device  | tps  | kB_read/s | kB_wrtn/s | kB_dscd/s | kB_read | kB_wrtn |
|---------|------|-----------|-----------|-----------|---------|---------|
| kB_dscd |      |           |           |           |         |         |
| sda     | 7.70 | 312.14    | 15.57     | 0.00      | 301621  |         |
| 15048   | 0    |           |           |           |         |         |

|       | total | used  | free  | shared | buff/cache | available |
|-------|-------|-------|-------|--------|------------|-----------|
| Mem:  | 974Mi | 202Mi | 734Mi | 568Ki  | 106Mi      | 772Mi     |
| Swap: | 951Mi | 0B    | 951Mi |        |            |           |

FilenameTypeSizeUsedPriority  
/dev/sda3partition974844000-2

CPU sysfs topology (clusters, cpufreq members, clockspeeds)

|     |         | cpufreq | min   | max   |                   |
|-----|---------|---------|-------|-------|-------------------|
| CPU | cluster | policy  | speed | speed | core type         |
| 0   | 36      | 0       | -     | -     | Cortex-A72 / r0p3 |
| 1   | 36      | 0       | -     | -     | Cortex-A72 / r0p3 |

Architecture: aarch64  
CPU op-mode(s): 32-bit, 64-bit  
Byte Order: Little Endian  
CPU(s): 2  
On-line CPU(s) list: 0,1  
Vendor ID: ARM  
BIOS Vendor ID: Arm  
Model name: Cortex-A72  
BIOS Model name: Arm Cortex-A72 r0p3 CPU @ 0.0GHz  
BIOS CPU family: 280  
Model: 3  
Thread(s) per core: 1  
Core(s) per socket: 2  
Socket(s): 1  
Stepping: r0p3  
BogoMIPS: 108.00  
Flags: fp asimd evtstrm crc32 cpuid  
L1d cache: 64 KiB (2 instances)  
L1i cache: 96 KiB (2 instances)

L2 cache: 2 MiB (2 instances)  
NUMA node(s): 1  
NUMA node0 CPU(s): 0,1  
Vulnerability Itlb multihit: Not affected  
Vulnerability L1tf: Not affected  
Vulnerability Mds: Not affected  
Vulnerability Meltdown: Not affected  
Vulnerability Mmio stale data: Not affected  
Vulnerability Retbleed: Not affected  
Vulnerability Spec store bypass: Vulnerable  
Vulnerability Spectre v1: Mitigation; \_\_user pointer sanitization  
Vulnerability Spectre v2: Vulnerable  
Vulnerability Srbds: Not affected  
Vulnerability Tsx async abort: Not affected

SoC guess: NXP LS1028A / guess flawed since running in vmware

Compiler: /usr/bin/gcc (Debian 12.3.0-4) 12.3.0 / aarch64-linux-gnu

Userland: arm64

Kernel: 6.3.0-1-arm64/aarch64 (vmware)

CONFIG\_HZ=250

CONFIG\_HZ\_250=y

CONFIG\_PREEMPT\_NOTIFIERS=y

CONFIG\_PREEMPT\_VOLUNTARY=y

CONFIG\_PREEMPT\_VOLUNTARY\_BUILD=y

#####

Results validation:

- \* No swapping
- \* Throttling occurred

Status of performance related policies found below /sys:

\* /sys/module/pcie\_aspm/parameters/policy: [default] performance powersave  
powersupersave

| VMware Cortex-A72 VM | ~2000 MHz | 6.3 | Debian GNU/Linux trixie/sid arm64 | 3380 | 1798  
| 40000 | 2420 | 3240 | - |

Revision #2

Created 8 July 2023 12:57:33 by XeroX

Updated 8 July 2023 13:39:17 by XeroX