

Raspberry Pi 4 - ARM64 - BCM2711

Linux raspberry4 6.1.0-rpi8-rpi-v8 #1 SMP PREEMPT Debian 1:6.1.73-1+rpt1 (2024-01-25) aarch64 GNU/Linux - Debian

02.02.2024
sbc-bench v0.9.61

Installing needed tools: Done.
Checking cpufreq OPP. Done (results will be available in 8-12 minutes).
Executing tinymembench. Done.
Executing RAM latency tester. Done.
Executing OpenSSL benchmark. Done.
Executing 7-zip benchmark. Done.
Checking cpufreq OPP again. Done (10 minutes elapsed).

Results validation:

- * Measured clockspeed not lower than advertised max CPU clockspeed
- * No swapping
- * Background activity (%system) OK
- * No throttling

Memory performance

memcpy: 2469.6 MB/s
memset: 3045.1 MB/s

7-zip total scores (3 consecutive runs): 5761,5770,5774, single-threaded: 1763

OpenSSL results:

type	16 bytes	64 bytes	256 bytes	1024 bytes	8192 bytes	16384 bytes
aes-128-cbc	44875.06k	48773.55k	50142.72k	50492.76k	50591.06k	50599.25k
aes-128-cbc	44948.67k	48802.62k	50171.65k	50501.29k	50604.71k	50621.10k
aes-192-cbc	38123.15k	40896.11k	42053.03k	42355.37k	42262.53k	42259.80k

aes-192-cbc	38163.97k	40942.44k	42080.51k	42372.10k	42472.79k	42308.95k
aes-256-cbc	33106.75k	35206.59k	35980.80k	36156.07k	36211.37k	36225.02k
aes-256-cbc	33166.04k	35246.19k	36000.34k	36172.12k	36241.41k	36241.41k

Full Result

sbc-bench v0.9.61 RPi 4 Model B Rev 1.5 / BCM2711 Rev C0 or later (Fri, 02 Feb 2024 12:08:33 +0100)

Distributor ID: Debian

Description: Debian GNU/Linux 12 (bookworm)

Release: 12

Codename: bookworm

Build system: bookworm main

Warning: this Raspberry Pi is powered by BCM2711 Rev. C0 or later but arm_boost=1

is not set in /boot/config.txt. Some (mis)information about what you are missing:

<https://www.raspberrypi.com/news/bullseye-bonus-1-8ghz-raspberry-pi-4/>

Raspberry Pi ThreadX version:

Oct 17 2023 15:39:30

Copyright (c) 2012 Broadcom

version 30f0c5e4d076da3ab4f341d88e7d505760b93ad7 (clean) (release) (start_cd)

ThreadX configuration (/boot/config.txt):

DO NOT EDIT THIS FILE

The file you are looking for has moved to /boot/firmware/config.txt

Actual ThreadX settings:

arm_64bit=1

arm_boost=1

arm_freq=1800

audio_pwm_mode=514

camera_auto_detect=-1

config_hdmi_boost=5

core_freq=500

core_freq_min=200

disable_commandline_tags=2

disable_l2cache=1

disable_overscan=1

```
disable_splash=1
display_auto_detect=1
display_default_lcd=1
display_hdmi_rotate=-1
display_lcd_rotate=-1
dvfs=3
enable_gic=1
enable_uart=1
force_eeprom_read=1
force_pwm_open=1
framebuffer_depth=16
framebuffer_ignore_alpha=1
framebuffer_swap=1
gpu_freq=500
gpu_freq_min=250
hdmi_blanking=2
init_uart_clock=0x2dc6c00
lcd_framerate=60
mask_gpu_interrupt0=3072
mask_gpu_interrupt1=29731
max_framebuffers=2
pause_burst_frames=1
pciex4_reset=1
program_serial_random=1
total_mem=2048
hdmi_force_cec_address:0=65535
hdmi_force_cec_address:1=65535
hdmi_pixel_freq_limit:0=0x11e1a300
hdmi_pixel_freq_limit:1=0x11e1a300
```

```
/usr/bin/gcc (Debian 12.2.0-14) 12.2.0
```

```
Uptime: 12:08:33 up 18 min,  1 user,  load average: 0.11, 0.98, 0.88, 45.8°C, 178934940
```

```
Linux 6.1.0-rpi8-rpi-v8 (raspberrypi4) 02/02/24 aarch64 (4 CPU)
```

```
avg-cpu:  %user  %nice %system %iowait  %steal   %idle
           26.76   0.01   1.11   0.86   0.00  71.26
```

Device	tps	kB_read/s	kB_wrtn/s	kB_dscd/s	kB_read	kB_wrtn	kB_dscd
mmcblk0	16.91	919.11	29.47	0.00	1041588	33394	0

	total	used	free	shared	buff/cache	available
Mem:	1.9Gi	272Mi	1.5Gi	7.6Mi	185Mi	1.6Gi
Swap:	99Mi	0B	99Mi			

Filename	Type	Size	Used	Priority
/var/swap	file	102396	0	-2

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Checking cpufreq OPP (Cortex-A72):

Cpufreq OPP: 1800 ThreadX: 1800 Measured: 1797 @ 0.9500V
Cpufreq OPP: 1700 ThreadX: 1700 Measured: 1697 @ 0.9300V
Cpufreq OPP: 1600 ThreadX: 1600 Measured: 1597 @ 0.9100V
Cpufreq OPP: 1500 ThreadX: 1500 Measured: 1497 @ 0.8800V
Cpufreq OPP: 1400 ThreadX: 1400 Measured: 1397 @ 0.8800V
Cpufreq OPP: 1300 ThreadX: 1300 Measured: 1297 @ 0.8800V
Cpufreq OPP: 1200 ThreadX: 1200 Measured: 1197 @ 0.8800V
Cpufreq OPP: 1100 ThreadX: 1100 Measured: 1097 @ 0.8800V
Cpufreq OPP: 1000 ThreadX: 1000 Measured: 997 @ 0.8800V
Cpufreq OPP: 900 ThreadX: 900 Measured: 897 @ 0.8800V
Cpufreq OPP: 800 ThreadX: 800 Measured: 797 @ 0.8800V
Cpufreq OPP: 700 ThreadX: 700 Measured: 697 @ 0.8800V
Cpufreq OPP: 600 ThreadX: 600 Measured: 597 @ 0.8800V

#####

Hardware sensors:

cpu_thermal-virtual-0
temp1: +46.3 C (crit = +110.0 C)

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Executing benchmark on cpu0 (Cortex-A72):

tinymembench v0.4.9-numio (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 ==
=====
=====
```

C copy backwards : 2458.1 MB/s (3, 14.0%)

C copy backwards (32 byte blocks) : 2500.0 MB/s (2)

C copy backwards (64 byte blocks) : 2499.0 MB/s (2)

C copy : 2462.4 MB/s (2)

C copy prefetched (32 bytes step) : 2457.2 MB/s (2)

C copy prefetched (64 bytes step) : 2457.9 MB/s (2)

C 2-pass copy : 2052.8 MB/s (3, 2.1%)

C 2-pass copy prefetched (32 bytes step) : 2152.7 MB/s (2)

C 2-pass copy prefetched (64 bytes step) : 2139.4 MB/s (3)

C scan 8	: 890.0 MB/s (2)
C scan 16	: 1677.2 MB/s (3, 0.3%)
C scan 32	: 3242.0 MB/s (3, 1.4%)
C scan 64	: 3958.3 MB/s (3)
C fill	: 3028.8 MB/s (3, 0.2%)
C fill (shuffle within 16 byte blocks)	: 3044.4 MB/s (3, 0.2%)
C fill (shuffle within 32 byte blocks)	: 3050.0 MB/s (3, 0.1%)
C fill (shuffle within 64 byte blocks)	: 3049.9 MB/s (3, 1.2%)

libc memcpy copy	: 2469.6 MB/s (3, 0.2%)
libc memchr scan	: 3952.2 MB/s (2)
libc memset fill	: 3045.1 MB/s (3, 0.4%)

NEON LDP/STP copy	: 2460.4 MB/s (3, 0.1%)
NEON LDP/STP copy pldl2strm (32 bytes step)	: 2436.7 MB/s (3, 2.2%)
NEON LDP/STP copy pldl2strm (64 bytes step)	: 2440.7 MB/s (3, 0.1%)
NEON LDP/STP copy pldl1keep (32 bytes step)	: 2463.3 MB/s (2)
NEON LDP/STP copy pldl1keep (64 bytes step)	: 2461.8 MB/s (2)
NEON LD1/ST1 copy	: 2457.5 MB/s (3, 1.9%)
NEON LDP load	: 3978.8 MB/s (2)
NEON LDNP load	: 3958.3 MB/s (2)
NEON STP fill	: 3034.0 MB/s (3, 0.4%)
NEON STNP fill	: 2681.3 MB/s (2)
ARM LDP/STP copy	: 2456.3 MB/s (2)
ARM LDP load	: 3978.0 MB/s (2)
ARM LDNP load	: 4036.3 MB/s (3, 3.9%)
ARM STP fill	: 3039.3 MB/s (3, 0.5%)
ARM STNP fill	: 2700.4 MB/s (3, 0.6%)

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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. ==

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NEON LDP/STP copy (from framebuffer)	:	787.8 MB/s (3, 1.4%)
NEON LDP/STP 2-pass copy (from framebuffer)	:	702.7 MB/s (3, 0.1%)
NEON LD1/ST1 copy (from framebuffer)	:	818.4 MB/s (3, 0.7%)
NEON LD1/ST1 2-pass copy (from framebuffer)	:	735.7 MB/s (3, 0.3%)
ARM LDP/STP copy (from framebuffer)	:	568.8 MB/s (3, 1.5%)
ARM LDP/STP 2-pass copy (from framebuffer)	:	563.8 MB/s (3, 0.4%)

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== 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 ==
== 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. ==

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block size : single random read / dual random read

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 :	0.0 ns	/	0.0 ns
65536 :	4.8 ns	/	7.4 ns
131072 :	7.3 ns	/	9.9 ns
262144 :	10.5 ns	/	13.2 ns
524288 :	12.5 ns	/	15.1 ns
1048576 :	25.5 ns	/	39.9 ns
2097152 :	82.5 ns	/	119.6 ns
4194304 :	110.2 ns	/	143.1 ns
8388608 :	130.8 ns	/	164.4 ns
16777216 :	141.1 ns	/	175.2 ns
33554432 :	146.6 ns	/	181.4 ns
67108864 :	157.5 ns	/	201.3 ns

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

size:	1x32	2x32	1x64	2x64	1xPTR	2xPTR	4xPTR	8xPTR
4k:	2.817	2.792	2.793	2.790	2.227	2.225	2.225	4.451
8k:	2.784	2.782	2.782	2.791	2.226	2.226	2.231	4.451
16k:	7.566	8.465	7.517	8.416	7.159	8.211	9.116	14.81
32k:	10.17	10.22	10.16	10.22	9.442	10.02	15.33	30.24
64k:	11.10	11.20	11.06	11.24	10.50	11.00	17.70	35.19
128k:	12.25	12.29	12.26	12.29	11.68	12.65	20.62	40.23
256k:	17.17	17.15	17.18	17.14	16.61	16.49	20.96	40.15
512k:	17.22	17.06	17.19	17.09	21.97	16.68	20.93	40.16
1024k:	58.70	58.33	66.02	60.31	66.12	63.73	74.69	98.63
2048k:	134.7	143.6	141.3	140.4	138.8	117.8	133.9	168.5
4096k:	129.6	130.0	135.5	136.3	136.1	129.7	140.7	186.5

8192k: 151.2 153.6 153.4 154.3 153.5 153.7 154.3 191.0
16384k: 153.3 154.6 154.2 154.6 154.1 155.4 165.3 196.9
32768k: 155.3 155.2 154.0 155.2 154.0 158.4 163.6 199.5
65536k: 169.9 168.5 166.6 168.1 167.2 172.6 183.0 209.2
131072k: 172.4 169.1 167.4 169.0 168.0 172.7 184.9 231.6

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Executing benchmark twice on cluster 0 (Cortex-A72)

OpenSSL 3.0.11, built on 19 Sep 2023 (Library: OpenSSL 3.0.11 19 Sep 2023)

type	16 bytes	64 bytes	256 bytes	1024 bytes	8192 bytes	16384 bytes
aes-128-cbc	44875.06k	48773.55k	50142.72k	50492.76k	50591.06k	50599.25k
aes-128-cbc	44948.67k	48802.62k	50171.65k	50501.29k	50604.71k	50621.10k
aes-192-cbc	38123.15k	40896.11k	42053.03k	42355.37k	42262.53k	42259.80k
aes-192-cbc	38163.97k	40942.44k	42080.51k	42372.10k	42472.79k	42308.95k
aes-256-cbc	33106.75k	35206.59k	35980.80k	36156.07k	36211.37k	36225.02k
aes-256-cbc	33166.04k	35246.19k	36000.34k	36172.12k	36241.41k	36241.41k

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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,4 CPUs LE)

LE
CPU Freq: - - - 64000000 128000000 - - - -

RAM size: 1898 MB, # CPU hardware threads: 4
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:	1621	100	1581	1577	22734	100	1943	1941	

23: 1582 100 1614 1612 | 22350 100 1937 1935
24: 1493 100 1608 1606 | 21951 100 1930 1927
25: 1395 100 1596 1593	21464 100 1913 1910
Avr: 100 1600 1597 | 100 1931 1928
Tot: 100 1765 1763

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

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,4 CPUs LE)

LE
CPU Freq: - - - - - 2048000000

RAM size: 1898 MB, # CPU hardware threads: 4
RAM usage: 882 MB, # Benchmark threads: 4

Compressing					Decompressing			
Dict	Speed	Usage	R/U	Rating	Speed	Usage	R/U	Rating
	KiB/s	%	MIPS	MIPS		KiB/s	%	MIPS
22:	4144	351	1150	4031		88020	398	1886
23:	3892	353	1123	3966		86541	399	1878
24:	3800	361	1132	4086		84796	399	1868
25:	3666	365	1147	4187		82863	399	1850
-----					-----			
Avr:	358	1138	4068		398	1871	7454	
Tot:	378	1504	5761					

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,4 CPUs LE)

LE
CPU Freq: - - - - -

RAM size: 1898 MB, # CPU hardware threads: 4
RAM usage: 882 MB, # Benchmark threads: 4

Compressing					Decompressing			
Dict	Speed	Usage	R/U Rating		Speed	Usage	R/U Rating	
	KiB/s	%	MIPS	MIPS	KiB/s	%	MIPS	MIPS
22:	4130	349	1153	4018		87878	398	1885 7497
23:	3994	363	1120	4070		86147	397	1876 7454
24:	3830	364	1130	4118		84673	398	1866 7433
25:	3678	369	1139	4200		82844	399	1850 7373
----- -----								
Avr:		361	1136	4101			398	1869 7439
Tot:		380	1502	5770				

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,4 CPUs LE)

LE
CPU Freq: - - - - -

RAM size: 1898 MB, # CPU hardware threads: 4
RAM usage: 882 MB, # Benchmark threads: 4

Compressing					Decompressing			
Dict	Speed	Usage	R/U Rating		Speed	Usage	R/U Rating	
	KiB/s	%	MIPS	MIPS	KiB/s	%	MIPS	MIPS
22:	4125	349	1150	4013		88221	399	1888 7527
23:	3919	357	1117	3993		86476	398	1878 7482
24:	3880	371	1125	4172		84615	398	1867 7428
25:	3681	372	1131	4203		82807	398	1852 7370
----- -----								
Avr:		362	1131	4095			398	1871 7452
Tot:		380	1501	5774				

Compression: 4068,4101,4095
Decompression: 7454,7439,7452
Total: 5761,5770,5774

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

Time	fake/real	load	%cpu	%sys	%usr	%nice	%io	%irq	Temp	VCore
12:18:14:	1800/1800MHz	4.09	91%	2%	88%	0%	0%	0%	69.6°C	0.9500V

Checking cpufreq OPP (Cortex-A72):

Cpufreq OPP: 1800 ThreadX: 1800 Measured: 1797 @ 0.9500V

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Hardware sensors:

cpu_thermal-virtual-0
temp1: +66.7 C (crit = +110.0 C)

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Thermal source: /sys/devices/virtual/thermal/thermal_zone0/ (cpu-thermal)

System health while running tinymembench:

Time	fake/real	load	%cpu	%sys	%usr	%nice	%io	%irq	Temp	VCore
12:09:34:	1800/1800MHz	0.68	28%	1%	26%	0%	0%	0%	47.7°C	0.9500V
12:09:44:	1800/1800MHz	0.73	25%	0%	25%	0%	0%	0%	49.7°C	0.9500V
12:09:54:	1800/1800MHz	0.77	25%	0%	25%	0%	0%	0%	50.1°C	0.9500V
12:10:04:	1800/1800MHz	0.80	25%	0%	25%	0%	0%	0%	50.1°C	0.9500V
12:10:15:	1800/1800MHz	0.83	25%	0%	25%	0%	0%	0%	51.1°C	0.9500V
12:10:25:	1800/1800MHz	0.86	25%	0%	25%	0%	0%	0%	51.6°C	0.9500V
12:10:35:	1800/1800MHz	0.88	25%	0%	25%	0%	0%	0%	51.6°C	0.9500V
12:10:45:	1800/1800MHz	0.90	25%	0%	25%	0%	0%	0%	51.1°C	0.9500V
12:10:55:	1800/1800MHz	0.92	25%	0%	24%	0%	0%	0%	51.1°C	0.9500V

System health while running ramlat:

Time	fake/real	load	%cpu	%sys	%usr	%nice	%io	%irq	Temp	VCore
12:11:01:	1800/1800MHz	0.92	28%	1%	26%	0%	0%	0%	50.6°C	0.9500V
12:11:04:	1800/1800MHz	0.93	25%	0%	25%	0%	0%	0%	51.1°C	0.9500V
12:11:07:	1800/1800MHz	0.94	25%	0%	24%	0%	0%	0%	50.6°C	0.9500V
12:11:10:	1800/1800MHz	0.94	25%	0%	25%	0%	0%	0%	50.6°C	0.9500V
12:11:13:	1800/1800MHz	0.94	25%	0%	25%	0%	0%	0%	50.6°C	0.9500V
12:11:16:	1800/1800MHz	0.94	25%	0%	25%	0%	0%	0%	50.1°C	0.9500V
12:11:19:	1800/1800MHz	0.95	25%	0%	25%	0%	0%	0%	50.6°C	0.9500V
12:11:22:	1800/1800MHz	0.95	25%	0%	25%	0%	0%	0%	50.6°C	0.9500V
12:11:25:	1800/1800MHz	0.95	25%	0%	24%	0%	0%	0%	51.6°C	0.9500V
12:11:28:	1800/1800MHz	0.95	25%	0%	24%	0%	0%	0%	51.6°C	0.9500V
12:11:31:	1800/1800MHz	0.96	25%	1%	24%	0%	0%	0%	50.1°C	0.9500V
12:11:34:	1800/1800MHz	0.96	25%	0%	24%	0%	0%	0%	50.6°C	0.9500V

System health while running OpenSSL benchmark:

Time	fake/real	load	%cpu	%sys	%usr	%nice	%io	%irq	Temp	VCore
12:11:35:	1800/1800MHz	0.96	28%	1%	26%	0%	0%	0%	52.1°C	0.9500V
12:11:51:	1800/1800MHz	0.97	25%	0%	25%	0%	0%	0%	52.6°C	0.9500V
12:12:07:	1800/1800MHz	0.98	25%	0%	25%	0%	0%	0%	51.6°C	0.9500V
12:12:23:	1800/1800MHz	0.98	25%	0%	25%	0%	0%	0%	52.1°C	0.9500V
12:12:39:	1800/1800MHz	0.99	25%	0%	25%	0%	0%	0%	52.6°C	0.9500V
12:12:55:	1800/1800MHz	0.99	25%	0%	25%	0%	0%	0%	52.1°C	0.9500V
12:13:11:	1800/1800MHz	0.99	25%	0%	25%	0%	0%	0%	52.6°C	0.9500V

System health while running 7-zip single core benchmark:

Time	fake/real	load	%cpu	%sys	%usr	%nice	%io	%irq	Temp	VCore
12:13:23:	1800/1800MHz	1.00	28%	0%	26%	0%	0%	0%	53.1°C	0.9500V
12:13:29:	1800/1800MHz	1.00	25%	0%	24%	0%	0%	0%	52.1°C	0.9500V
12:13:35:	1800/1800MHz	1.00	25%	0%	24%	0%	0%	0%	53.6°C	0.9500V
12:13:41:	1800/1800MHz	1.00	25%	0%	24%	0%	0%	0%	52.6°C	0.9500V
12:13:47:	1800/1800MHz	1.00	25%	0%	24%	0%	0%	0%	53.6°C	0.9500V
12:13:53:	1800/1800MHz	1.00	25%	0%	25%	0%	0%	0%	52.1°C	0.9500V
12:13:59:	1800/1800MHz	1.00	25%	0%	24%	0%	0%	0%	53.1°C	0.9500V
12:14:05:	1800/1800MHz	1.00	25%	0%	24%	0%	0%	0%	53.6°C	0.9500V
12:14:11:	1800/1800MHz	1.00	25%	0%	25%	0%	0%	0%	52.6°C	0.9500V

12:14:18: 1800/1800MHz 1.00 25% 0% 24% 0% 0% 0% 53.6°C 0.9500V
12:14:24: 1800/1800MHz 1.00 25% 0% 24% 0% 0% 0% 53.1°C 0.9500V
12:14:30: 1800/1800MHz 1.00 25% 0% 24% 0% 0% 0% 53.1°C 0.9500V
12:14:36: 1800/1800MHz 1.00 25% 0% 24% 0% 0% 0% 53.1°C 0.9500V
12:14:42: 1800/1800MHz 1.00 25% 0% 24% 0% 0% 0% 52.6°C 0.9500V

System health while running 7-zip multi core benchmark:

Time	fake/real	load	%cpu	%sys	%usr	%nice	%io	%irq	Temp	VCore
12:14:45:	1800/1800MHz	1.00	27%	0%	26%	0%	0%	0%	53.6°C	0.9500V
12:15:01:	1800/1800MHz	1.60	90%	0%	89%	0%	0%	0%	61.8°C	0.9500V
12:15:14:	1800/1800MHz	2.13	95%	0%	94%	0%	0%	0%	63.8°C	0.9500V
12:15:32:	1800/1800MHz	2.48	92%	1%	90%	0%	0%	0%	64.8°C	0.9500V
12:15:46:	1800/1800MHz	2.96	89%	2%	87%	0%	0%	0%	64.3°C	0.9500V
12:15:59:	1800/1800MHz	3.19	96%	1%	94%	0%	0%	0%	65.2°C	0.9500V
12:16:14:	1800/1800MHz	3.37	94%	1%	93%	0%	0%	0%	68.7°C	0.9500V
12:16:27:	1800/1800MHz	3.58	96%	1%	94%	0%	0%	0%	69.6°C	0.9500V
12:16:45:	1800/1800MHz	3.72	92%	2%	90%	0%	0%	0%	70.1°C	0.9500V
12:17:01:	1800/1800MHz	4.00	90%	2%	88%	0%	0%	0%	68.2°C	0.9500V
12:17:14:	1800/1800MHz	4.14	96%	1%	94%	0%	0%	0%	69.1°C	0.9500V
12:17:27:	1800/1800MHz	4.11	95%	0%	95%	0%	0%	0%	71.1°C	0.9500V
12:17:41:	1800/1800MHz	3.94	95%	0%	94%	0%	0%	0%	72.1°C	0.9500V
12:17:58:	1800/1800MHz	3.82	93%	2%	91%	0%	0%	0%	73.0°C	0.9500V
12:18:14:	1800/1800MHz	4.09	91%	2%	88%	0%	0%	0%	69.6°C	0.9500V

#####

Linux 6.1.0-rpi8-rpi-v8 (raspberrypi4) 02/02/24 aarch64 (4 CPU)

avg-cpu: %user %nice %system %iowait %steal %idle
34.66 0.02 1.05 0.57 0.00 63.70

Device	tps	kB_read/s	kB_wrtn/s	kB_dscd/s	kB_read	kB_wrtn	kB_dscd
mmcblk0	11.45	608.57	20.81	0.00	1052632	35990	0

	total	used	free	shared	buff/cache	available
Mem:	1.9Gi	275Mi	1.5Gi	7.5Mi	196Mi	1.6Gi
Swap:	99Mi	0B	99Mi			

Filename	Type	Size	Used	Priority
/var/swap	file	102396	0	-2

CPU sysfs topology (clusters, cpufreq members, clockspeeds)

	cpufreq	min	max	
CPU	cluster	policy	speed	speed core type
0	0	0	600	1800 Cortex-A72 / r0p3
1	0	0	600	1800 Cortex-A72 / r0p3
2	0	0	600	1800 Cortex-A72 / r0p3
3	0	0	600	1800 Cortex-A72 / r0p3

Architecture:	aarch64
CPU op-mode(s):	32-bit, 64-bit
Byte Order:	Little Endian
CPU(s):	4
On-line CPU(s) list:	0-3
Vendor ID:	ARM
Model name:	Cortex-A72
Model:	3
Thread(s) per core:	1
Core(s) per cluster:	4
Socket(s):	-
Cluster(s):	1
Stepping:	r0p3
CPU(s) scaling MHz:	100%
CPU max MHz:	1800.0000
CPU min MHz:	600.0000
BogoMIPS:	108.00
Flags:	fp asimd evtstrm crc32 cpuid
L1d cache:	128 KiB (4 instances)
L1i cache:	192 KiB (4 instances)
L2 cache:	1 MiB (1 instance)
Vulnerability Gather data sampling:	Not affected
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 rstack overflow: 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: BCM2711C0 or later

DT compat: raspberrypi,4-model-b
brcm,bcm2711

Compiler: /usr/bin/gcc (Debian 12.2.0-14) 12.2.0 / aarch64-linux-gnu

Userland: arm64

ThreadX: 30f0c5e4d076da3ab4f341d88e7d505760b93ad7 / Oct 17 2023 15:39:30

alloc failures: 0

compactions: 0

legacy block fails: 0

Kernel: 6.1.0-rpi8-rpi-v8/aarch64

CONFIG_HZ=250

CONFIG_HZ_250=y

CONFIG_PREEMPTION=y

CONFIG_PREEMPT=y

CONFIG_PREEMPT_BUILD=y

CONFIG_PREEMPT_COUNT=y

CONFIG_PREEMPT_NOTIFIERS=y

CONFIG_PREEMPT_RCU=y

#####

opp-table-threadx-0:

600 MHz 880.0 mV

700 MHz 880.0 mV

800 MHz 880.0 mV

900 MHz 880.0 mV

1000 MHz 880.0 mV

1100 MHz 880.0 mV

1200 MHz 880.0 mV

1300 MHz 880.0 mV

1400 MHz	880.0 mV
1500 MHz	880.0 mV
1600 MHz	910.0 mV
1700 MHz	930.0 mV
1800 MHz	950.0 mV

#####

Results validation:

- * Measured clockspeed not lower than advertised max CPU clockspeed
- * No swapping
- * Background activity (%system) OK
- * No throttling

Status of performance related policies found below /sys:

- * /sys/module/pcie_aspm/parameters/policy: default performance [powersave] powersupersave

| RPi 4 Model B Rev 1.5 / BCM2711 Rev C0 or later | 1800 MHz | 6.1 | Debian GNU/Linux 12 (bookworm)
arm64 | 5770 | 1763 | 36230 | 2470 | 3050 | - |

Linux raspberry4 6.1.21-v8+ #1642 SMP PREEMPT Mon Apr 3 17:24:16 BST 2023 aarch64
GNU/Linux

08.07.2023

sbc-bench v0.9.42

Checking cpufreq OPP. Done (results will be available in 8-12 minutes).

Executing tinymembench. Done.

Executing RAM latency tester. Done.

Executing OpenSSL benchmark. Done.

Executing 7-zip

benchmark...

Done.

Checking cpufreq OPP again. Done (11 minutes elapsed).

Results validation:

- * Measured clockspeed not lower than advertised max CPU clockspeed
- * No swapping
- * Background activity (%system) OK
- * No throttling

Memory performance

memcpy: 2473.6 MB/s

memset: 3060.3 MB/s

7-zip total scores (3 consecutive runs): 5654,5572,5736, single-threaded: 1740

OpenSSL results:

type	16 bytes	64 bytes	256 bytes	1024 bytes	8192 bytes	16384 bytes
aes-128-cbc	45255.64k	48791.49k	50088.62k	50442.92k	50547.37k	50801.32k
aes-128-cbc	45413.82k	48878.63k	50201.60k	50520.06k	50612.91k	50828.63k
aes-192-cbc	38521.58k	41000.45k	42088.70k	42390.19k	42459.14k	42461.87k
aes-192-cbc	38519.55k	40951.77k	42070.19k	42358.78k	42472.79k	42314.41k
aes-256-cbc	33434.53k	35279.66k	36005.72k	36202.50k	36257.79k	36257.79k
aes-256-cbc	33435.35k	35303.62k	36004.27k	36198.40k	36244.14k	36235.95k

Full Result

sbc-bench v0.9.42 RPi 4 Model B Rev 1.5 / BCM2711 Rev C0 or later (Sat, 08 Jul 2023 14:41:02 +0200)

Distributor ID: Debian

Description: Debian GNU/Linux 11 (bullseye)

Release: 11

Codename: bullseye

Build system: <http://archive.raspberrypi.org/debian/> bullseye main

Raspberry Pi ThreadX version:

Mar 17 2023 10:50:56

Copyright (c) 2012 Broadcom

version 82f3750a65fadae9a38077e3c2e217ad158c8d54 (clean) (release) (start_cd)

ThreadX configuration (/boot/config.txt):

disable_splash=1

hdmi_blanking=2

```
dtparam=i2c_arm=on
dtparam=spi=on
dtparam=audio=off
dtoverlay=disable-bt
display_auto_detect=1
dtoverlay=vc4-kms-v3d
max_framebuffers=2
arm_64bit=1
disable_overscan=1
[cm4]
otg_mode=1
[pi4]
arm_boost=1
gpu_mem=16
[all]
gpu_mem=16
start_x=1
[pi3]
gpu_mem=16
[pi0]
gpu_mem=16
```

Actual ThreadX settings:

```
arm_64bit=1
arm_boost=1
arm_freq=1800
audio_pwm_mode=514
camera_auto_detect=-1
config_hdmi_boost=5
core_freq=500
core_freq_min=200
disable_commandline_tags=2
disable_l2cache=1
disable_overscan=1
disable_splash=1
display_auto_detect=1
display_default_lcd=1
display_hdmi_rotate=-1
display_lcd_rotate=-1
```

```
dvfs=3
enable_gic=1
enable_uart=1
force_eeprom_read=1
force_pwm_open=1
framebuffer_depth=16
framebuffer_ignore_alpha=1
framebuffer_swap=1
gpu_freq=500
gpu_freq_min=250
hdmi_blanking=2
init_uart_clock=0x2dc6c00
lcd_framerate=60
mask_gpu_interrupt0=3072
mask_gpu_interrupt1=29731
max_framebuffers=2
pause_burst_frames=1
program_serial_random=1
total_mem=2048
hdmi_force_cec_address:0=65535
hdmi_force_cec_address:1=65535
hdmi_pixel_freq_limit:0=0x11e1a300
hdmi_pixel_freq_limit:1=0x11e1a300
```

```
/usr/bin/gcc (Debian 10.2.1-6) 10.2.1 20210110
```

```
Uptime: 14:41:02 up 5 min, 1 user, load average: 0.72, 0.66, 0.33, 45.8°C, 214368480
```

```
Linux 6.1.21-v8+ (raspberrypi4) 07/08/23 aarch64 (4 CPU)
```

```
avg-cpu:  %user  %nice %system %iowait  %steal   %idle
           4.38   0.05   3.48   5.72   0.00  86.37
```

Device	tps	kB_read/s	kB_wrtn/s	kB_dscd/s	kB_read	kB_wrtn	kB_dscd
mmcblk0	56.59	1837.18	1341.78	0.00	632081	461641	0

	total	used	free	shared	buff/cache	available
Mem:	1.9Gi	91Mi	1.6Gi	0.0Ki	140Mi	1.7Gi
Swap:	99Mi	0B	99Mi			

FilenameTypeSizeUsedPriority
/var/swapfile 1023960-2

#####

Checking cpufreq OPP (Cortex-A72):

Cpufreq OPP: 1800 ThreadX: 1800 Measured: 1795 @ 0.9460V
Cpufreq OPP: 1700 ThreadX: 1700 Measured: 1695 @ 0.9240V
Cpufreq OPP: 1600 ThreadX: 1600 Measured: 1595 @ 0.9020V
Cpufreq OPP: 1500 ThreadX: 1500 Measured: 1495 @ 0.8800V
Cpufreq OPP: 1400 ThreadX: 1400 Measured: 1395 @ 0.8800V
Cpufreq OPP: 1300 ThreadX: 1300 Measured: 1295 @ 0.8800V
Cpufreq OPP: 1200 ThreadX: 1200 Measured: 1195 @ 0.8800V
Cpufreq OPP: 1100 ThreadX: 1100 Measured: 1095 @ 0.8800V
Cpufreq OPP: 1000 ThreadX: 1000 Measured: 995 @ 0.8800V
Cpufreq OPP: 900 ThreadX: 900 Measured: 895 @ 0.8800V
Cpufreq OPP: 800 ThreadX: 800 Measured: 795 @ 0.8800V
Cpufreq OPP: 700 ThreadX: 700 Measured: 695 @ 0.8800V
Cpufreq OPP: 600 ThreadX: 600 Measured: 595 @ 0.8800V

#####

Hardware sensors:

cpu_thermal-virtual-0
temp1: +47.7 C (crit = +110.0 C)

#####

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 ==
=====
=====
```

C copy backwards	: 2494.8 MB/s (3, 13.9%)
C copy backwards (32 byte blocks)	: 2500.4 MB/s (3, 0.2%)
C copy backwards (64 byte blocks)	: 2497.7 MB/s (3, 0.1%)
C copy	: 2466.2 MB/s (2)
C copy prefetched (32 bytes step)	: 2463.6 MB/s (3, 2.9%)
C copy prefetched (64 bytes step)	: 2462.2 MB/s (2)
C 2-pass copy	: 2059.8 MB/s (3, 0.2%)
C 2-pass copy prefetched (32 bytes step)	: 2165.2 MB/s (2)
C 2-pass copy prefetched (64 bytes step)	: 2154.4 MB/s (2)
C scan 8	: 888.2 MB/s (3, 0.1%)
C scan 16	: 1676.6 MB/s (3, 0.2%)
C scan 32	: 3253.6 MB/s (2)
C scan 64	: 3965.1 MB/s (2)
C fill	: 3058.3 MB/s (3, 0.3%)
C fill (shuffle within 16 byte blocks)	: 3073.5 MB/s (3, 0.2%)

C fill (shuffle within 32 byte blocks) : 3079.9 MB/s (3, 1.0%)

C fill (shuffle within 64 byte blocks) : 3053.4 MB/s (3, 0.3%)

libc memcpy copy : 2473.6 MB/s (3)

libc memchr scan : 3966.3 MB/s (2)

libc memset fill : 3060.3 MB/s (3, 0.4%)

NEON LDP/STP copy : 2463.3 MB/s (2)

NEON LDP/STP copy pldl2strm (32 bytes step) : 2445.0 MB/s (3, 2.8%)

NEON LDP/STP copy pldl2strm (64 bytes step) : 2447.9 MB/s (2)

NEON LDP/STP copy pldl1keep (32 bytes step) : 2468.3 MB/s (2)

NEON LDP/STP copy pldl1keep (64 bytes step) : 2468.0 MB/s (3, 0.2%)

NEON LD1/ST1 copy : 2457.0 MB/s (3, 1.7%)

NEON LDP load : 3985.1 MB/s (2)

NEON LDNP load : 3962.6 MB/s (3)

NEON STP fill : 3041.3 MB/s (2)

NEON STNP fill : 2735.8 MB/s (3, 2.9%)

ARM LDP/STP copy : 2463.4 MB/s (2)

ARM LDP load : 3984.9 MB/s (3, 3.8%)

ARM LDNP load : 3957.3 MB/s (2)

ARM STP fill : 3061.2 MB/s (3, 0.5%)

ARM STNP fill : 2668.6 MB/s (3, 1.8%)

=====

=====

== 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)	:	813.7 MB/s (3, 0.5%)
NEON LDP/STP 2-pass copy (from framebuffer)	:	735.8 MB/s (3, 3.8%)
NEON LD1/ST1 copy (from framebuffer)	:	848.4 MB/s (3, 0.2%)
NEON LD1/ST1 2-pass copy (from framebuffer)	:	766.3 MB/s (3, 0.4%)
ARM LDP/STP copy (from framebuffer)	:	609.6 MB/s (2)
ARM LDP/STP 2-pass copy (from framebuffer)	:	579.2 MB/s (3, 0.5%)

=====

=====

== 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 ==

== 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

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 : 0.0 ns     /   0.0 ns
65536 : 4.8 ns     /   7.5 ns
131072 : 7.3 ns    /   9.9 ns
262144 : 10.5 ns   /  13.2 ns
524288 : 12.6 ns   /  15.6 ns
1048576 : 26.5 ns  /  40.2 ns
2097152 : 82.0 ns  / 118.8 ns
4194304 : 110.0 ns / 142.4 ns
8388608 : 130.5 ns / 162.3 ns
16777216 : 141.2 ns / 171.1 ns
33554432 : 146.3 ns / 176.3 ns
67108864 : 157.4 ns / 192.9 ns
```

```
#####
#####
```

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

```
size: 1x32 2x32 1x64 2x64 1xPTR 2xPTR 4xPTR 8xPTR
4k: 2.825 2.798 2.788 2.790 2.231 2.228 2.228 4.457
8k: 2.785 2.785 2.785 2.785 2.228 2.229 2.267 4.456
16k: 2.789 2.789 2.786 2.785 2.233 2.239 3.022 4.458
32k: 3.977 3.996 3.996 3.994 3.422 3.504 3.803 9.605
64k: 11.40 11.44 11.32 11.49 10.80 11.29 17.93 35.22
128k: 12.27 12.26 12.26 12.26 11.70 12.20 20.82 40.32
256k: 16.68 16.54 16.57 16.57 16.03 15.97 20.84 40.19
512k: 18.27 17.54 17.99 17.51 17.57 19.61 21.12 40.55
1024k: 74.63 55.35 68.58 66.45 74.54 58.47 66.36 92.50
2048k: 116.2 109.2 125.8 109.5 116.2 113.2 124.8 161.2
4096k: 129.7 129.6 133.5 132.6 133.7 135.7 138.9 186.3
8192k: 150.5 153.0 153.0 153.6 152.9 149.3 153.9 206.9
16384k: 152.3 153.8 153.6 153.8 153.7 155.1 159.7 197.4
32768k: 154.3 156.7 153.5 154.5 153.3 157.9 162.1 199.4
65536k: 167.6 172.0 168.5 167.6 167.4 170.5 180.2 206.7
131072k: 167.8 177.8 167.6 168.3 166.5 172.6 181.3 208.1
```


#####

Executing benchmark twice on cluster 0 (Cortex-A72)

OpenSSL 1.1.1n, built on 15 Mar 2022

type	16 bytes	64 bytes	256 bytes	1024 bytes	8192 bytes	16384 bytes
aes-128-cbc	45255.64k	48791.49k	50088.62k	50442.92k	50547.37k	50801.32k
aes-128-cbc	45413.82k	48878.63k	50201.60k	50520.06k	50612.91k	50828.63k
aes-192-cbc	38521.58k	41000.45k	42088.70k	42390.19k	42459.14k	42461.87k
aes-192-cbc	38519.55k	40951.77k	42070.19k	42358.78k	42472.79k	42314.41k
aes-256-cbc	33434.53k	35279.66k	36005.72k	36202.50k	36257.79k	36257.79k
aes-256-cbc	33435.35k	35303.62k	36004.27k	36198.40k	36244.14k	36235.95k

#####

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,4 CPUs LE)

LE
CPU Freq: 64000000 - - - - -

RAM size: 1899 MB, # CPU hardware threads: 4
RAM usage: 435 MB, # Benchmark threads: 1

Compressing					Decompressing				
Dict	Speed	Usage	R/U Rating		Dict	Speed	Usage	R/U Rating	
	KiB/s	%	MIPS	MIPS		KiB/s	%	MIPS	MIPS
22:	1609	100	1570	1566		22619	100	1936	1931
23:	1533	100	1566	1563		22285	100	1933	1929
24:	1453	100	1566	1563		21890	100	1925	1922
25:	1352	100	1547	1544		21393	100	1907	1904
-----						-----			
Avr:	100	1562	1559			100	1925	1922	
Tot:	100	1744	1740						

#####

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

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,4 CPUs LE)

LE
CPU Freq: - - - - -

RAM size: 1899 MB, # CPU hardware threads: 4
RAM usage: 882 MB, # Benchmark threads: 4

Compressing					Decompressing			
Dict	Speed	Usage	R/U	Rating	Speed	Usage	R/U	Rating
	KiB/s	%	MIPS	MIPS	KiB/s	%	MIPS	MIPS
22:	3969	337	1147	3861		86137	393	1871 7349
23:	3869	359	1097	3943		84640	393	1864 7324
24:	3803	372	1099	4090		82911	393	1853 7278
25:	3632	371	1117	4147		81335	395	1833 7239
-----					-----			
Avr:	360	1115	4010		393	1855	7297	
Tot:	377	1485	5654					

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,4 CPUs LE)

LE
CPU Freq: - - - - -

RAM size: 1899 MB, # CPU hardware threads: 4
RAM usage: 882 MB, # Benchmark threads: 4

Compressing					Decompressing			
Dict	Speed	Usage	R/U	Rating	Speed	Usage	R/U	Rating
	KiB/s	%	MIPS	MIPS	KiB/s	%	MIPS	MIPS

22: 4001 334 1164 3893 | 87552 397 1881 7470
23: 3857 359 1095 3930 | 86029 398 1872 7444
24: 2765 231 1289 2973 | 84249 397 1863 7396
25: 3632 371 1117 4148 | 82292 398 1842 7324

----- | -----
Avr: 324 1166 3736 | 397 1864 7408
Tot: 361 1515 5572

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,4 CPUs LE)

LE
CPU Freq: - 64000000 - - - - -

RAM size: 1899 MB, # CPU hardware threads: 4
RAM usage: 882 MB, # Benchmark threads: 4

	Compressing					Decompressing			
Dict	Speed	Usage	R/U Rating			Speed	Usage	R/U Rating	
	KiB/s	%	MIPS	MIPS		KiB/s	%	MIPS	MIPS
22:	4095	346	1151	3984		87889	398	1884	7498
23:	3884	362	1093	3958		86394	399	1876	7475
24:	3814	373	1098	4101		84530	398	1865	7421
25:	3618	372	1112	4131		82294	398	1842	7324
----- -----									
Avr:	363	1113	4043			398	1867	7430	
Tot:	381	1490	5736						

Compression: 4010,3736,4043
Decompression: 7297,7408,7430
Total: 5654,5572,5736

#####

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

Time fake/real load %cpu %sys %usr %nice %io %irq Temp VCore
14:51:00: 1800/1800MHz 4.35 97% 2% 94% 0% 0% 0% 76.0°C 0.9460V

Checking cpufreq OPP (Cortex-A72):

Cpufreq OPP: 1800 ThreadX: 1800 Measured: 1795 @ 0.9460V

#####

Hardware sensors:

cpu_thermal-virtual-0
temp1: +70.6 C (crit = +110.0 C)

#####

Thermal source: /sys/devices/virtual/thermal/thermal_zone0/ (cpu-thermal)

System health while running tinymembench:

Time fake/real load %cpu %sys %usr %nice %io %irq Temp VCore
14:42:04: 1800/1800MHz 1.01 15% 3% 7% 0% 4% 0% 48.7°C 0.9460V
14:42:14: 1800/1800MHz 1.01 25% 0% 25% 0% 0% 0% 49.7°C 0.9460V
14:42:24: 1800/1800MHz 1.15 25% 0% 25% 0% 0% 0% 51.1°C 0.9460V
14:42:34: 1800/1800MHz 1.20 25% 0% 25% 0% 0% 0% 51.6°C 0.9460V
14:42:44: 1800/1800MHz 1.17 25% 0% 25% 0% 0% 0% 51.6°C 0.9460V
14:42:54: 1800/1800MHz 1.14 25% 0% 25% 0% 0% 0% 51.6°C 0.9460V
14:43:04: 1800/1800MHz 1.12 25% 0% 25% 0% 0% 0% 52.1°C 0.9460V
14:43:15: 1800/1800MHz 1.10 25% 0% 25% 0% 0% 0% 52.6°C 0.9460V
14:43:25: 1800/1800MHz 1.16 25% 0% 24% 0% 0% 0% 51.6°C 0.9460V

System health while running ramlat:

Time fake/real load %cpu %sys %usr %nice %io %irq Temp VCore
14:43:31: 1800/1800MHz 1.23 17% 2% 10% 0% 4% 0% 52.6°C 0.9460V
14:43:34: 1800/1800MHz 1.23 25% 0% 25% 0% 0% 0% 52.1°C 0.9460V
14:43:37: 1800/1800MHz 1.21 25% 0% 24% 0% 0% 0% 52.1°C 0.9460V

14:43:40:	1800/1800MHz	1.19	25%	0%	24%	0%	0%	0%	52.6°C	0.9460V
14:43:43:	1800/1800MHz	1.19	25%	0%	25%	0%	0%	0%	52.6°C	0.9460V
14:43:46:	1800/1800MHz	1.17	25%	0%	25%	0%	0%	0%	52.6°C	0.9460V
14:43:49:	1800/1800MHz	1.16	25%	0%	25%	0%	0%	0%	52.1°C	0.9460V
14:43:52:	1800/1800MHz	1.16	25%	0%	24%	0%	0%	0%	51.6°C	0.9460V
14:43:55:	1800/1800MHz	1.15	25%	0%	24%	0%	0%	0%	53.1°C	0.9460V
14:43:58:	1800/1800MHz	1.15	25%	1%	24%	0%	0%	0%	51.6°C	0.9460V
14:44:01:	1800/1800MHz	1.22	25%	1%	24%	0%	0%	0%	52.1°C	0.9460V

System health while running OpenSSL benchmark:

Time	fake/real	load	%cpu	%sys	%usr	%nice	%io	%irq	Temp	VCore
14:44:04:	1800/1800MHz	1.36	17%	2%	11%	0%	3%	0%	53.6°C	0.9460V
14:44:20:	1800/1800MHz	1.28	25%	0%	24%	0%	0%	0%	53.6°C	0.9460V
14:44:36:	1800/1800MHz	1.22	25%	0%	25%	0%	0%	0%	54.5°C	0.9460V
14:44:52:	1800/1800MHz	1.17	25%	0%	25%	0%	0%	0%	53.6°C	0.9460V
14:45:08:	1800/1800MHz	1.13	25%	0%	25%	0%	0%	0%	56.0°C	0.9460V
14:45:24:	1800/1800MHz	1.17	25%	0%	25%	0%	0%	0%	54.5°C	0.9460V
14:45:40:	1800/1800MHz	1.13	25%	0%	25%	0%	0%	0%	54.0°C	0.9460V

System health while running 7-zip single core benchmark:

Time	fake/real	load	%cpu	%sys	%usr	%nice	%io	%irq	Temp	VCore
14:45:52:	1800/1800MHz	1.11	19%	2%	13%	0%	3%	0%	56.5°C	0.9460V
14:45:59:	1800/1800MHz	1.09	25%	0%	24%	0%	0%	0%	55.0°C	0.9460V
14:46:06:	1800/1800MHz	1.08	25%	0%	24%	0%	0%	0%	54.5°C	0.9460V
14:46:14:	1800/1800MHz	1.08	25%	0%	24%	0%	0%	0%	55.5°C	0.9460V
14:46:21:	1800/1800MHz	1.06	25%	0%	24%	0%	0%	0%	55.5°C	0.9460V
14:46:28:	1800/1800MHz	1.06	25%	0%	24%	0%	0%	0%	56.0°C	0.9460V
14:46:35:	1800/1800MHz	1.05	25%	0%	24%	0%	0%	0%	55.5°C	0.9460V
14:46:42:	1800/1800MHz	1.05	25%	0%	24%	0%	0%	0%	56.0°C	0.9460V
14:46:49:	1800/1800MHz	1.12	25%	1%	24%	0%	0%	0%	56.5°C	0.9460V
14:46:56:	1800/1800MHz	1.10	25%	0%	24%	0%	0%	0%	56.0°C	0.9460V
14:47:03:	1800/1800MHz	1.09	25%	0%	24%	0%	0%	0%	56.0°C	0.9460V
14:47:10:	1800/1800MHz	1.08	25%	0%	24%	0%	0%	0%	57.5°C	0.9460V

System health while running 7-zip multi core benchmark:

Time	fake/real	load	%cpu	%sys	%usr	%nice	%io	%irq	Temp	VCore
------	-----------	------	------	------	------	-------	-----	------	------	-------

14:47:17: 1800/1800MHz 1.07 20% 1% 15% 0% 2% 0% 58.9°C 0.9460V
14:47:32: 1800/1800MHz 1.65 92% 1% 91% 0% 0% 0% 63.8°C 0.9460V
14:47:47: 1800/1800MHz 2.17 93% 1% 91% 0% 0% 0% 65.2°C 0.9460V
14:48:02: 1800/1800MHz 2.72 97% 1% 95% 0% 0% 0% 67.2°C 0.9460V
14:48:19: 1800/1800MHz 3.01 89% 3% 86% 0% 0% 0% 68.2°C 0.9460V
14:48:34: 1800/1800MHz 3.37 93% 2% 91% 0% 0% 0% 70.1°C 0.9460V
14:48:49: 1800/1800MHz 3.70 94% 1% 92% 0% 0% 0% 69.1°C 0.9460V
14:49:04: 1800/1800MHz 3.62 78% 1% 77% 0% 0% 0% 69.1°C 0.9460V
14:49:20: 1800/1800MHz 3.70 86% 1% 85% 0% 0% 0% 73.0°C 0.9460V
14:49:36: 1800/1800MHz 3.85 89% 3% 85% 0% 0% 0% 71.6°C 0.9460V
14:49:51: 1800/1800MHz 4.04 94% 2% 92% 0% 0% 0% 72.1°C 0.9460V
14:50:06: 1800/1800MHz 4.27 95% 1% 93% 0% 0% 0% 74.0°C 0.9460V
14:50:25: 1800/1800MHz 4.20 94% 2% 92% 0% 0% 0% 75.0°C 0.9460V
14:50:40: 1800/1800MHz 4.36 91% 2% 89% 0% 0% 0% 74.5°C 0.9460V
14:51:00: 1800/1800MHz 4.35 97% 2% 94% 0% 0% 0% 76.0°C 0.9460V

#####

Linux 6.1.21-v8+ (raspberrypi4) 07/08/23 aarch64 (4 CPU)

avg-cpu: %user %nice %system %iowait %steal %idle
32.95 0.05 2.01 2.14 0.00 62.85

Device	tps	kB_read/s	kB_wrtn/s	kB_dscd/s	kB_read	kB_wrtn	kB_dscd
mmcblk0	21.67	677.98	547.37	0.00	641929	518265	0

	total	used	free	shared	buff/cache	available
Mem:	1.9Gi	93Mi	1.7Gi	0.0Ki	85Mi	1.7Gi
Swap:	99Mi	0B	99Mi			

Filename	Type	Size	Used	Priority
/var/swap	file	102396	0	2

CPU sysfs topology (clusters, cpufreq members, clockspeeds)

	cpufreq	min	max	
CPU	cluster	policy	speed	speed core type
0	0	0	600	1800 Cortex-A72 / r0p3
1	0	0	600	1800 Cortex-A72 / r0p3

2	0	0	600	1800	Cortex-A72 / r0p3
3	0	0	600	1800	Cortex-A72 / r0p3

Architecture: aarch64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 4
On-line CPU(s) list: 0-3
Thread(s) per core: 1
Core(s) per socket: 4
Socket(s): 1
Vendor ID: ARM
Model: 3
Model name: Cortex-A72
Stepping: r0p3
CPU max MHz: 1800.0000
CPU min MHz: 600.0000
BogoMIPS: 108.00
L1d cache: 128 KiB
L1i cache: 192 KiB
L2 cache: 1 MiB
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
Flags: fp asimd evtstrm crc32 cpuid

SoC guess: BCM2711C0 or later

DT compat: raspberrypi,4-model-b
brcm,bcm2711

Compiler: /usr/bin/gcc (Debian 10.2.1-6) 10.2.1 20210110 / aarch64-linux-gnu

Userland: arm64

ThreadX: 82f3750a65fadae9a38077e3c2e217ad158c8d54 / Mar 17 2023 10:50:56

alloc failures: 0
compactions: 0
legacy block fails: 0

Kernel: 6.1.21-v8+/aarch64
CONFIG_HZ=250
CONFIG_HZ_250=y
CONFIG_PREEMPTION=y
CONFIG_PREEMPTIRQ_TRACEPOINTS=y
CONFIG_PREEMPT=y
CONFIG_PREEMPT_BUILD=y
CONFIG_PREEMPT_COUNT=y
CONFIG_PREEMPT_NOTIFIERS=y
CONFIG_PREEMPT_RCU=y

#####

Kernel 6.1.21 is not latest 6.1.38 LTS that was released on 2023-07-05.

See <https://endoflife.date/linux> for details. Perhaps some kernel bugs have been fixed in the meantime and maybe vulnerabilities as well.

#####

Results validation:

- * Measured clockspeed not lower than advertised max CPU clockspeed
- * No swapping
- * Background activity (%system) OK
- * No throttling

| RPi 4 Model B Rev 1.5 / BCM2711 Rev C0 or later | 1800 MHz | 6.1 | Debian GNU/Linux 11 (bullseye) arm64
| 5650 | 1740 | 36250 | 2470 | 3060 | - |