SPEC CPU®2017 Floating Point Rate Result

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Hewlett Packard Enterprise

(Test Sponsor: HPE)

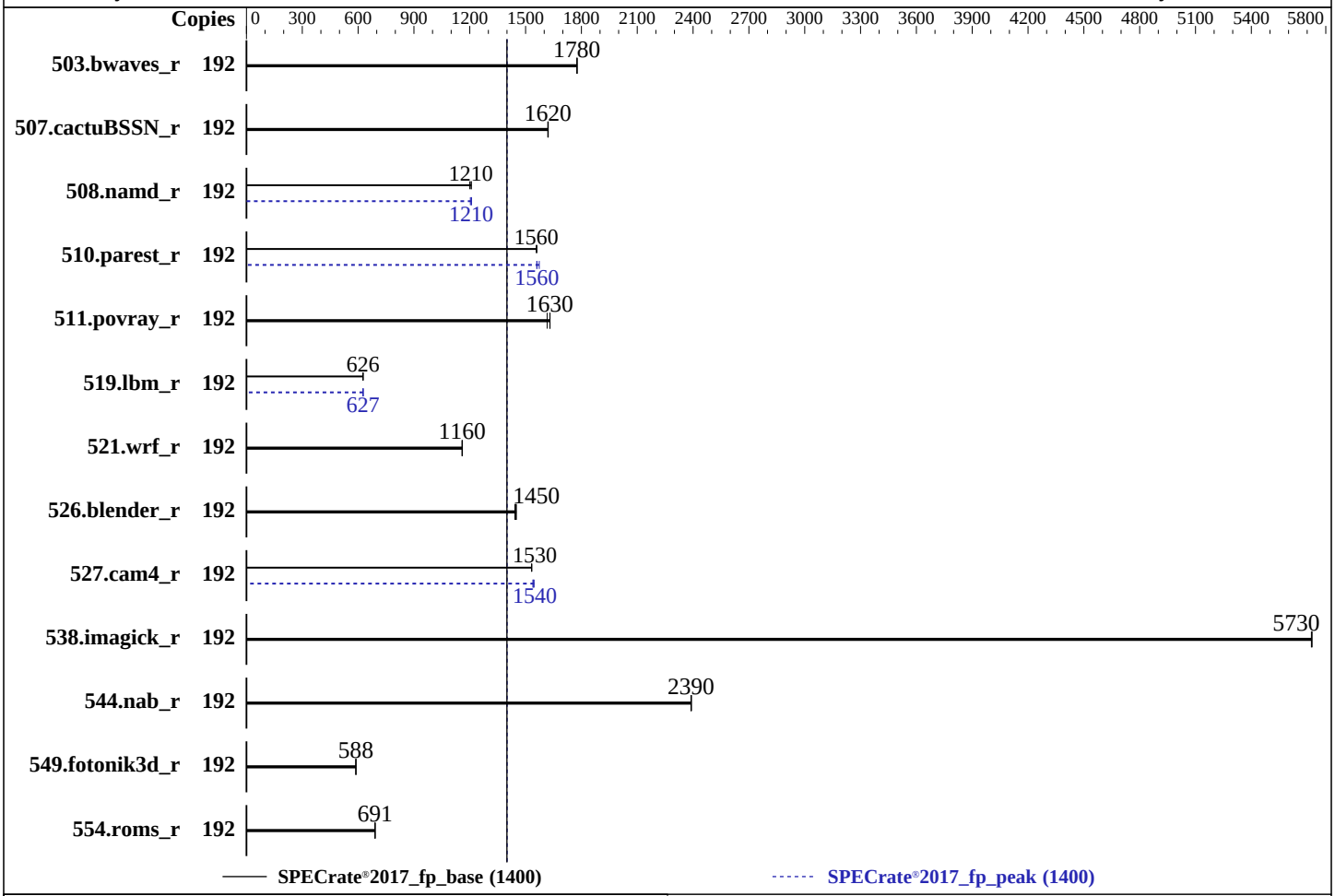
ProLiant DL365 Gen11
(2.40 GHz, AMD EPYC 9654)

SPECrate®2017_fp_base = 1400

SPECrate®2017_fp_peak = 1400

CPU2017 License: 3
Test Sponsor: HPE
Tested by: HPE

Test Date: Oct-2022
Hardware Availability: Dec-2022
Software Availability: Nov-2022



Hardware

CPU Name:	AMD EPYC 9654
Max MHz:	3700
Nominal:	2400
Enabled:	192 cores, 2 chips
Orderable:	1,2 chips
Cache L1:	32 KB I + 32 KB D on chip per core
L2:	1 MB I+D on chip per core
L3:	384 MB I+D on chip per chip, 32 MB shared / 8 cores
Other:	None
Memory:	768 GB (24 x 32 GB 2Rx8 PC5-4800B-R)
Storage:	2 x 480 GB SATA SSD
Other:	None

Software

OS:	Ubuntu 22.04.1 LTS Kernel 5.15.0-50-generic
Compiler:	C/C++/Fortran: Version 4.0.0 of AOCC
Parallel:	No
Firmware:	HPE BIOS Version v1.10 10/06/2022 released Oct-2022
File System:	ext4
System State:	Run level 5 (multi-user)
Base Pointers:	64-bit
Peak Pointers:	64-bit
Other:	None
Power Management:	BIOS and OS set to prefer performance at the cost of additional power usage

Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
503.bwaves_r	192	1083	1780	**1084**	**1780**	1085	1780	192	1083	1780	**1084**	**1780**	1085	1780
507.cactuBSSN_r	192	150	1620	**150**	**1620**	150	1620	192	150	1620	**150**	**1620**	150	1620
508.namd_r	192	152	1200	151	1210	**151**	**1210**	192	152	1200	**151**	**1210**	151	1210
510.parest_r	192	322	1560	322	1560	**322**	**1560**	192	**322**	**1560**	319	1570	322	1560
511.povray_r	192	277	1620	275	1630	**275**	**1630**	192	277	1620	275	1630	**275**	**1630**
519.lbm_r	192	323	626	**323**	**626**	323	627	192	**323**	**627**	323	627	323	626
521.wrf_r	192	371	1160	**371**	**1160**	371	1160	192	371	1160	**371**	**1160**	371	1160
526.blender_r	192	**202**	**1450**	202	1450	203	1440	192	**202**	**1450**	202	1450	203	1440
527.cam4_r	192	**219**	**1530**	219	1530	219	1530	192	**218**	**1540**	218	1540	217	1550
538.imagick_r	192	83.4	5720	**83.4**	**5730**	83.4	5730	192	83.4	5720	**83.4**	**5730**	83.4	5730
544.nab_r	192	135	2390	**135**	**2390**	135	2390	192	135	2390	**135**	**2390**	135	2390
549.fotonik3d_r	192	**1272**	**588**	1272	588	1272	588	192	**1272**	**588**	1272	588	1272	588
554.roms_r	192	441	692	**441**	**691**	442	691	192	441	692	**441**	**691**	442	691

SPECrate®2017_fp_base = 1400

SPECrate®2017_fp_peak = 1400

Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

Compiler Notes

```
The AMD64 AOCC Compiler Suite is available at
http://developer.amd.com/amd-aocc/
```

Submit Notes

```
The config file option 'submit' was used.
'numactl' was used to bind copies to the cores.
See the configuration file for details.
```

Operating System Notes

```
'ulimit -s unlimited' was used to set environment stack size limit
'ulimit -l 2097152' was used to set environment locked pages in memory limit

runcpu command invoked through numactl i.e.:
numactl --interleave=all runcpu <etc>

To limit dirty cache to 8% of memory, 'sysctl -w vm.dirty_ratio=8' run as root.
To limit swap usage to minimum necessary, 'sysctl -w vm.swappiness=1' run as root.
To free node-local memory and avoid remote memory usage,
'sysctl -w vm.zone_reclaim_mode=1' run as root.
```

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Operating System Notes (Continued)

```
To clear filesystem caches, 'sync; sysctl -w vm.drop_caches=3' run as root.
To disable address space layout randomization (ASLR) to reduce run-to-run
variability, 'sysctl -w kernel.randomize_va_space=0' run as root.

To enable Transparent Hugepages (THP) for all allocations,
'echo always > /sys/kernel/mm/transparent_hugepage/enabled' and
'echo always > /sys/kernel/mm/transparent_hugepage/defrag' run as root.
```

Environment Variables Notes

```
Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH =
     "/home/cpu2017_new/amd_rate_aocc400_genoa_B_lib/lib:/home/cpu2017_new/am
     d_rate_aocc400_genoa_B_lib/lib32:"
MALLOC_CONF = "retain:true"
```

General Notes

```
Binaries were compiled on a system with 2x AMD EPYC 9174F CPU + 1.5TiB Memory using RHEL 8.6

NA: The test sponsor attests, as of date of publication, that CVE-2017-5754 (Meltdown)
is mitigated in the system as tested and documented.
Yes: The test sponsor attests, as of date of publication, that CVE-2017-5753 (Spectre variant 1)
is mitigated in the system as tested and documented.
Yes: The test sponsor attests, as of date of publication, that CVE-2017-5715 (Spectre variant 2)
is mitigated in the system as tested and documented.
```

Platform Notes

```
BIOS Configuration
 Workload Profile set to General Throughput Compute
 AMD SMT Option set to Disabled
 Determinism Control set to Manual
   Performance Determinism set to Power Deterministic
 Last-Level Cache (LLC) as NUMA Node set to Enabled
 NUMA memory domains per socket set to Four memory domains  per socket
 ACPI CST C2 Latency set to 18 microseconds
 Thermal Configuration set to Maximum Cooling
 Workload Profile set to Custom
  L2 HW Prefetcher set to Disabled
  Power Regulator set to OS Control Mode
```

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Platform Notes (Continued)

```
The system ROM used for this result contains microcode version 0xa10110d for the
AMD EPYC 9nn4X family of processors. The reference code/AGESA version used in this
ROM is version GenoaPI 1.0.0.1-L2

 Sysinfo program /home/cpu2017_new/bin/sysinfo
 Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acafc64d
 running on admin1 Wed Nov  2 05:47:41 2022

 SUT (System Under Test) info as seen by some common utilities.
 For more information on this section, see
    https://www.spec.org/cpu2017/Docs/config.html#sysinfo

 From /proc/cpuinfo
    model name : AMD EPYC 9654 96-Core Processor
       2  "physical id"s (chips)
       192 "processors"
    cores, siblings (Caution: counting these is hw and system dependent. The following
    excerpts from /proc/cpuinfo might not be reliable.  Use with caution.)
       cpu cores : 96
       siblings  : 96
       physical 0: cores 0 1 2 3 4 5 6 7 16 17 18 19 20 21 22 23 32 33 34 35 36 37 38 39
       48 49 50 51 52 53 54 55 64 65 66 67 68 69 70 71 80 81 82 83 84 85 86 87 96 97 98 99
       100 101 102 103 112 113 114 115 116 117 118 119 128 129 130 131 132 133 134 135 144
       145 146 147 148 149 150 151 160 161 162 163 164 165 166 167 176 177 178 179 180 181
       182 183
       physical 1: cores 0 1 2 3 4 5 6 7 16 17 18 19 20 21 22 23 32 33 34 35 36 37 38 39
       48 49 50 51 52 53 54 55 64 65 66 67 68 69 70 71 80 81 82 83 84 85 86 87 96 97 98 99
       100 101 102 103 112 113 114 115 116 117 118 119 128 129 130 131 132 133 134 135 144
       145 146 147 148 149 150 151 160 161 162 163 164 165 166 167 176 177 178 179 180 181
       182 183

 From lscpu from util-linux 2.37.2:
      Architecture:                    x86_64
      CPU op-mode(s):                  32-bit, 64-bit
      Address sizes:                   52 bits physical, 57 bits virtual
      Byte Order:                      Little Endian
      CPU(s):                          192
      On-line CPU(s) list:             0-191
      Vendor ID:                       AuthenticAMD
      Model name:                      AMD EPYC 9654 96-Core Processor
      CPU family:                      25
      Model:                           17
      Thread(s) per core:              1
      Core(s) per socket:              96
      Socket(s):                       2
      Stepping:                        1
      Frequency boost:                 enabled
```

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Platform Notes (Continued)

```
CPU max MHz:                          3709.0000
CPU min MHz:                          400.0000
BogoMIPS:                             4792.80
Flags:                                fpu vme de pse tsc msr pae mce cx8 apic sep mtrr
pge mca cmov pat pse36 clflush mmx fxsr sse sse2 ht syscall nx mmxext fxsr_opt
pdpe1gb rdtscp lm constant_tsc rep_good nopl nonstop_tsc cpuid extd_apicid
aperfmperf rapl pni pclmulqdq monitor ssse3 fma cx16 pcid sse4_1 sse4_2 x2apic movbe
popcnt aes xsave avx f16c rdrand lahf_lm cmp_legacy svm extapic cr8_legacy abm sse4a
misalignsse 3dnowprefetch osvw ibs skinit wdt tce topoext perfctr_core perfctr_nb
bpext perfctr_llc mwaitx cpb cat_l3 cdp_l3 invpcid_single hw_pstate ssbd mba ibrs
ibpb stibp vmmcall fsgsbase bmi1 avx2 smep bmi2 erms invpcid cqm rdt_a avx512f
avx512dq rdseed adx smap avx512ifma clflushopt clwb avx512cd sha_ni avx512bw
avx512vl xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbm_total
cqm_mbm_local avx512_bf16 clzero irperf xsaveerptr rdpru wbnoinvd amd_ppin cppc arat
npt lbrv svm_lock nrip_save tsc_scale vmcb_clean flushbyasid decodeassists
pausefilter pfthreshold avic v_vmsave_vmload vgif v_spec_ctrl avx512vbmi umip pku
ospke avx512_vbmi2 gfni vaes vpclmulqdq avx512_vnni avx512_bitalg avx512_vpopcntdq
la57 rdpid overflow_recov succor smca fsrm flush_l1d
Virtualization:                       AMD-V
L1d cache:                            6 MiB (192 instances)
L1i cache:                            6 MiB (192 instances)
L2 cache:                             192 MiB (192 instances)
L3 cache:                             768 MiB (24 instances)
NUMA node(s):                         24
NUMA node0 CPU(s):                    0-7
NUMA node1 CPU(s):                    8-15
NUMA node2 CPU(s):                    16-23
NUMA node3 CPU(s):                    24-31
NUMA node4 CPU(s):                    32-39
NUMA node5 CPU(s):                    40-47
NUMA node6 CPU(s):                    48-55
NUMA node7 CPU(s):                    56-63
NUMA node8 CPU(s):                    64-71
NUMA node9 CPU(s):                    72-79
NUMA node10 CPU(s):                   80-87
NUMA node11 CPU(s):                   88-95
NUMA node12 CPU(s):                   96-103
NUMA node13 CPU(s):                   104-111
NUMA node14 CPU(s):                   112-119
NUMA node15 CPU(s):                   120-127
NUMA node16 CPU(s):                   128-135
NUMA node17 CPU(s):                   136-143
NUMA node18 CPU(s):                   144-151
NUMA node19 CPU(s):                   152-159
NUMA node20 CPU(s):                   160-167
NUMA node21 CPU(s):                   168-175
NUMA node22 CPU(s):                   176-183
```

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Platform Notes (Continued)

```
      NUMA node23 CPU(s):              184-191
      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: Mitigation; Speculative Store Bypass disabled via
      prctl and seccomp
      Vulnerability Spectre v1:        Mitigation; usercopy/swapgs barriers and __user
      pointer sanitization
      Vulnerability Spectre v2:        Mitigation; Retpolines, IBPB conditional, IBRS_FW,
      STIBP disabled, RSB filling, PBRSB-eIBRS Not affected
      Vulnerability Srbds:             Not affected
      Vulnerability Tsx async abort:   Not affected

  From lscpu --cache:
      NAME ONE-SIZE ALL-SIZE WAYS TYPE        LEVEL  SETS PHY-LINE COHERENCY-SIZE
      L1d       32K       6M    8 Data            1    64        1             64
      L1i       32K       6M    8 Instruction     1    64        1             64
      L2         1M     192M    8 Unified         2  2048        1             64
      L3        32M     768M   16 Unified         3 32768        1             64

  /proc/cpuinfo cache data
     cache size : 1024 KB

  From numactl --hardware
  WARNING: a numactl 'node' might or might not correspond to a physical chip.
    available: 24 nodes (0-23)
    node 0 cpus: 0 1 2 3 4 5 6 7
    node 0 size: 31943 MB
    node 0 free: 31590 MB
    node 1 cpus: 8 9 10 11 12 13 14 15
    node 1 size: 32253 MB
    node 1 free: 32114 MB
    node 2 cpus: 16 17 18 19 20 21 22 23
    node 2 size: 32253 MB
    node 2 free: 32102 MB
    node 3 cpus: 24 25 26 27 28 29 30 31
    node 3 size: 32253 MB
    node 3 free: 32097 MB
    node 4 cpus: 32 33 34 35 36 37 38 39
    node 4 size: 32253 MB
    node 4 free: 32026 MB
    node 5 cpus: 40 41 42 43 44 45 46 47
    node 5 size: 32253 MB
    node 5 free: 32098 MB
```

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Platform Notes (Continued)

```
node 6 cpus: 48 49 50 51 52 53 54 55
node 6 size: 32253 MB
node 6 free: 32104 MB
node 7 cpus: 56 57 58 59 60 61 62 63
node 7 size: 32253 MB
node 7 free: 32123 MB
node 8 cpus: 64 65 66 67 68 69 70 71
node 8 size: 32218 MB
node 8 free: 32011 MB
node 9 cpus: 72 73 74 75 76 77 78 79
node 9 size: 32253 MB
node 9 free: 32114 MB
node 10 cpus: 80 81 82 83 84 85 86 87
node 10 size: 32253 MB
node 10 free: 32109 MB
node 11 cpus: 88 89 90 91 92 93 94 95
node 11 size: 32253 MB
node 11 free: 32078 MB
node 12 cpus: 96 97 98 99 100 101 102 103
node 12 size: 32253 MB
node 12 free: 32110 MB
node 13 cpus: 104 105 106 107 108 109 110 111
node 13 size: 32253 MB
node 13 free: 32104 MB
node 14 cpus: 112 113 114 115 116 117 118 119
node 14 size: 32253 MB
node 14 free: 32120 MB
node 15 cpus: 120 121 122 123 124 125 126 127
node 15 size: 32253 MB
node 15 free: 32110 MB
node 16 cpus: 128 129 130 131 132 133 134 135
node 16 size: 32253 MB
node 16 free: 32121 MB
node 17 cpus: 136 137 138 139 140 141 142 143
node 17 size: 32253 MB
node 17 free: 32113 MB
node 18 cpus: 144 145 146 147 148 149 150 151
node 18 size: 32253 MB
node 18 free: 32114 MB
node 19 cpus: 152 153 154 155 156 157 158 159
node 19 size: 32253 MB
node 19 free: 32121 MB
node 20 cpus: 160 161 162 163 164 165 166 167
node 20 size: 32253 MB
node 20 free: 32106 MB
node 21 cpus: 168 169 170 171 172 173 174 175
node 21 size: 32200 MB
```

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Platform Notes (Continued)

```
node 21 free: 32053 MB
node 22 cpus: 176 177 178 179 180 181 182 183
node 22 size: 32253 MB
node 22 free: 32123 MB
node 23 cpus: 184 185 186 187 188 189 190 191
node 23 size: 32253 MB
node 23 free: 32107 MB
node distances:
node   0   1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16  17  18  19
20  21  22  23
  0:  10  12  12  12  11  12  12  12  11  12  12  12  32  32  32  32  32  32  32  32
  32  32  32  32
  1:  12  10  12  12  12  11  12  12  12  11  12  12  32  32  32  32  32  32  32  32
  32  32  32  32
  2:  12  12  10  12  12  12  11  12  12  12  11  12  32  32  32  32  32  32  32  32
  32  32  32  32
  3:  12  12  12  10  12  12  12  11  12  12  12  11  32  32  32  32  32  32  32  32
  32  32  32  32
  4:  11  12  12  12  10  12  12  12  11  12  12  12  32  32  32  32  32  32  32  32
  32  32  32  32
  5:  12  11  12  12  12  10  12  12  12  11  12  12  32  32  32  32  32  32  32  32
  32  32  32  32
  6:  12  12  11  12  12  12  10  12  12  12  11  12  32  32  32  32  32  32  32  32
  32  32  32  32
  7:  12  12  12  11  12  12  12  10  12  12  12  11  32  32  32  32  32  32  32  32
  32  32  32  32
  8:  11  12  12  12  11  12  12  12  10  12  12  12  32  32  32  32  32  32  32  32
  32  32  32  32
  9:  12  11  12  12  12  11  12  12  12  10  12  12  32  32  32  32  32  32  32  32
  32  32  32  32
 10:  12  12  11  12  12  12  11  12  12  12  10  12  32  32  32  32  32  32  32  32
 32  32  32  32
 11:  12  12  12  11  12  12  12  11  12  12  12  10  32  32  32  32  32  32  32  32
 32  32  32  32
 12:  32  32  32  32  32  32  32  32  32  32  32  32  10  12  12  12  11  12  12  12
 11  12  12  12
 13:  32  32  32  32  32  32  32  32  32  32  32  32  12  10  12  12  12  11  12  12
 12  11  12  12
 14:  32  32  32  32  32  32  32  32  32  32  32  32  12  12  10  12  12  12  11  12
 12  12  11  12
 15:  32  32  32  32  32  32  32  32  32  32  32  32  12  12  12  10  12  12  12  11
 12  12  12  11
 16:  32  32  32  32  32  32  32  32  32  32  32  32  11  12  12  12  10  12  12  12
 11  12  12  12
 17:  32  32  32  32  32  32  32  32  32  32  32  32  12  11  12  12  12  10  12  12
 12  11  12  12
 18:  32  32  32  32  32  32  32  32  32  32  32  32  12  12  11  12  12  12  10  12
```

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Platform Notes (Continued)

```
    12  12  11  12
    19:  32  32  32  32  32  32  32  32  32  32  32  32  12  12  12  11  12  12  12  10
    12  12  12  11
    20:  32  32  32  32  32  32  32  32  32  32  32  32  11  12  12  12  11  12  12  12
    10  12  12  12
    21:  32  32  32  32  32  32  32  32  32  32  32  32  12  11  12  12  12  11  12  12
    12  10  12  12
    22:  32  32  32  32  32  32  32  32  32  32  32  32  12  12  11  12  12  12  11  12
    12  12  10  12
    23:  32  32  32  32  32  32  32  32  32  32  32  32  12  12  12  11  12  12  12  11
    12  12  12  10

  From /proc/meminfo
     MemTotal:       792263924 kB
     HugePages_Total:       0
     Hugepagesize:       2048 kB

  /sbin/tuned-adm active
      Current active profile: balanced

  /sys/devices/system/cpu/cpu*/cpufreq/scaling_governor has
     performance

  /usr/bin/lsb_release -d
     Ubuntu 22.04.1 LTS

  From /etc/*release* /etc/*version*
     debian_version: bookworm/sid
     os-release:
        PRETTY_NAME="Ubuntu 22.04.1 LTS"
        NAME="Ubuntu"
        VERSION_ID="22.04"
        VERSION="22.04.1 LTS (Jammy Jellyfish)"
        VERSION_CODENAME=jammy
        ID=ubuntu
        ID_LIKE=debian
        HOME_URL="https://www.ubuntu.com/"

  uname -a:
     Linux admin1 5.15.0-50-generic #56-Ubuntu SMP Tue Sep 20 13:23:26 UTC 2022 x86_64
     x86_64 x86_64 GNU/Linux

  Kernel self-reported vulnerability status:

  CVE-2018-12207 (iTLB Multihit):                        Not affected
  CVE-2018-3620 (L1 Terminal Fault):                     Not affected
  Microarchitectural Data Sampling:                      Not affected
```

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Platform Notes (Continued)

```
 CVE-2017-5754 (Meltdown):                          Not affected
 mmio_stale_data:                                   Not affected
 retbleed:                                          Not affected
 CVE-2018-3639 (Speculative Store Bypass):          Mitigation: Speculative Store
                                                    Bypass disabled via prctl and
                                                    seccomp
 CVE-2017-5753 (Spectre variant 1):                 Mitigation: usercopy/swapgs
                                                    barriers and __user pointer
                                                    sanitization
 CVE-2017-5715 (Spectre variant 2):                 Mitigation: Retpolines, IBPB:
                                                    conditional, IBRS_FW, STIBP:
                                                    disabled, RSB filling,
                                                    PBRSB-eIBRS: Not affected
 CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
 CVE-2019-11135 (TSX Asynchronous Abort):           Not affected

 run-level 5 Jun 28 00:00

 SPEC is set to: /home/cpu2017_new
    Filesystem                     Type  Size  Used Avail Use% Mounted on
    /dev/mapper/ubuntu--vg-ubuntu--lv ext4  437G  155G  264G  37% /

 From /sys/devices/virtual/dmi/id
     Vendor:         HPE
     Product:        ProLiant DL365 Gen11
     Product Family: ProLiant
     Serial:         DL365G11-001

 Additional information from dmidecode 3.3 follows.  WARNING: Use caution when you
 interpret this section. The 'dmidecode' program reads system data which is "intended to
 allow hardware to be accurately determined", but the intent may not be met, as there are
 frequent changes to hardware, firmware, and the "DMTF SMBIOS" standard.
   Memory:
     24x Hynix HMCG88MEBRA113N 32 GB 2 rank 4800

 BIOS:
    BIOS Vendor:       HPE
    BIOS Version:      1.10
    BIOS Date:         10/06/2022
    BIOS Revision:     1.10
    Firmware Revision: 1.10

 (End of data from sysinfo program)
```

Compiler Version Notes

```
==============================================================================
C               | 519.lbm_r(base, peak) 538.imagick_r(base, peak)
                | 544.nab_r(base, peak)
------------------------------------------------------------------------------
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on
  LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
------------------------------------------------------------------------------

==============================================================================
C++             | 508.namd_r(base, peak) 510.parest_r(base, peak)
------------------------------------------------------------------------------
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on
  LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
------------------------------------------------------------------------------

==============================================================================
C++, C          | 511.povray_r(base, peak) 526.blender_r(base, peak)
------------------------------------------------------------------------------
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on
  LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on
  LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
------------------------------------------------------------------------------

==============================================================================
C++, C, Fortran | 507.cactuBSSN_r(base, peak)
------------------------------------------------------------------------------
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on
  LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on
  LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
```

(Continued on next page)

Compiler Version Notes (Continued)

```
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on
  LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
------------------------------------------------------------------------------

==============================================================================
Fortran         | 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak)
                | 554.roms_r(base, peak)
------------------------------------------------------------------------------
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on
  LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
------------------------------------------------------------------------------

==============================================================================
Fortran, C      | 521.wrf_r(base, peak) 527.cam4_r(base, peak)
------------------------------------------------------------------------------
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on
  LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on
  LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
------------------------------------------------------------------------------
```

Base Compiler Invocation

C benchmarks:
`clang`

C++ benchmarks:
`clang++`

Fortran benchmarks:
`flang`

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Base Compiler Invocation (Continued)

Benchmarks using both Fortran and C:
flang clang

Benchmarks using both C and C++:
clang++ clang

Benchmarks using Fortran, C, and C++:
clang++ clang flang

Base Portability Flags

503.bwaves_r: -DSPEC_LP64
507.cactuBSSN_r: -DSPEC_LP64
508.namd_r: -DSPEC_LP64
510.parest_r: -DSPEC_LP64
511.povray_r: -DSPEC_LP64
519.lbm_r: -DSPEC_LP64
521.wrf_r: -DSPEC_CASE_FLAG -Mbyteswapio -DSPEC_LP64
526.blender_r: -funsigned-char -DSPEC_LP64
527.cam4_r: -DSPEC_CASE_FLAG -DSPEC_LP64
538.imagick_r: -DSPEC_LP64
544.nab_r: -DSPEC_LP64
549.fotonik3d_r: -DSPEC_LP64
554.roms_r: -DSPEC_LP64

Base Optimization Flags

C benchmarks:
-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-ldist-scalar-expand -fenable-aggressive-gather -O3
-march=znver4 -fveclib=AMDLIBM -ffast-math -fstruct-layout=7
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-fremap-arrays -fstrip-mining -mllvm -reduce-array-computations=3
-zopt -lamdlibm -lamdalloc -lflang

C++ benchmarks:
-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -mllvm -unroll-threshold=100
-finline-aggressive -mllvm -loop-unswitch-threshold=200000

(Continued on next page)

Base Optimization Flags (Continued)

C++ benchmarks (continued):
-mllvm -reduce-array-computations=3 -zopt -lamdlibm -lamdalloc
-lflang

Fortran benchmarks:
-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-enable-X86-prefetching -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -Kieee -Mrecursive -funroll-loops
-mllvm -lsr-in-nested-loop -mllvm -reduce-array-computations=3
-fepilog-vectorization-of-inductions -zopt -lamdlibm -lamdalloc
-lflang

Benchmarks using both Fortran and C:
-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-enable-X86-prefetching -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -fstruct-layout=7
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-fremap-arrays -fstrip-mining -mllvm -reduce-array-computations=3
-zopt -Kieee -Mrecursive -funroll-loops -mllvm -lsr-in-nested-loop
-fepilog-vectorization-of-inductions -lamdlibm -lamdalloc -lflang

Benchmarks using both C and C++:
-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -fstruct-layout=7
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-fremap-arrays -fstrip-mining -mllvm -reduce-array-computations=3
-zopt -mllvm -unroll-threshold=100 -finline-aggressive
-mllvm -loop-unswitch-threshold=200000 -lamdlibm -lamdalloc -lflang

Benchmarks using Fortran, C, and C++:
-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -fstruct-layout=7
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-fremap-arrays -fstrip-mining -mllvm -reduce-array-computations=3
-zopt -mllvm -unroll-threshold=100 -finline-aggressive
-mllvm -loop-unswitch-threshold=200000 -Kieee -Mrecursive
-funroll-loops -mllvm -lsr-in-nested-loop
-fepilog-vectorization-of-inductions -lamdlibm -lamdalloc -lflang

Base Other Flags

C benchmarks:
`-Wno-unused-command-line-argument`

C++ benchmarks:
`-Wno-unused-command-line-argument`

Fortran benchmarks:
`-Wno-unused-command-line-argument`

Benchmarks using both Fortran and C:
`-Wno-unused-command-line-argument`

Benchmarks using both C and C++:
`-Wno-unused-command-line-argument`

Benchmarks using Fortran, C, and C++:
`-Wno-unused-command-line-argument`

Peak Compiler Invocation

C benchmarks:
`clang`

C++ benchmarks:
`clang++`

Fortran benchmarks:
`flang`

Benchmarks using both Fortran and C:
`flang clang`

Benchmarks using both C and C++:
`clang++ clang`

Benchmarks using Fortran, C, and C++:
`clang++ clang flang`

Peak Portability Flags

`Same as Base Portability Flags`

Peak Optimization Flags

C benchmarks:

519.lbm_r: `-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6 -Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast -march=znver4 -fveclib=AMDLIBM -ffast-math -fstruct-layout=7 -mllvm -unroll-threshold=50 -fremap-arrays -fstrip-mining -mllvm -inline-threshold=1000 -mllvm -reduce-array-computations=3 -zopt -lamdlibm -lamdalloc`

538.imagick_r: `basepeak = yes`

544.nab_r: `basepeak = yes`

C++ benchmarks:

508.namd_r: `-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6 -Wl,-mllvm -Wl,-reduce-array-computations=3 -Wl,-mllvm -Wl,-x86-use-vzeroupper=false -Ofast -march=znver4 -fveclib=AMDLIBM -ffast-math -finline-aggressive -mllvm -unroll-threshold=100 -mllvm -reduce-array-computations=3 -zopt -lamdlibm -lamdalloc`

510.parest_r: `-m64 -flto -Wl,-mllvm -Wl,-suppress-fmas -Wl,-mllvm -Wl,-x86-use-vzeroupper=false -Ofast -march=znver4 -fveclib=AMDLIBM -ffast-math -finline-aggressive -mllvm -unroll-threshold=100 -mllvm -reduce-array-computations=3 -zopt -lamdlibm -lamdalloc`

Fortran benchmarks:

503.bwaves_r: `basepeak = yes`

549.fotonik3d_r: `basepeak = yes`

554.roms_r: `basepeak = yes`

Benchmarks using both Fortran and C:

521.wrf_r: `basepeak = yes`

527.cam4_r: `-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6 -Wl,-mllvm -Wl,-reduce-array-computations=3`

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Peak Optimization Flags (Continued)

527.cam4_r (continued):
-Wl,-mllvm -Wl,-enable-X86-prefetching -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -fstruct-layout=7
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-fremap-arrays -mllvm -reduce-array-computations=3 -zopt
-Kieee -Mrecursive -funroll-loops
-mllvm -lsr-in-nested-loop
-fepilog-vectorization-of-inductions -lamdlibm -lamdalloc
-lflang

Benchmarks using both C and C++:

511.povray_r: basepeak = yes

526.blender_r: basepeak = yes

Benchmarks using Fortran, C, and C++:

507.cactuBSSN_r: basepeak = yes

Peak Other Flags

C benchmarks:
-Wno-unused-command-line-argument

C++ benchmarks:
-Wno-unused-command-line-argument

Fortran benchmarks:
-Wno-unused-command-line-argument

Benchmarks using both Fortran and C:
-Wno-unused-command-line-argument

Benchmarks using both C and C++:
-Wno-unused-command-line-argument

Benchmarks using Fortran, C, and C++:
-Wno-unused-command-line-argument

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/aocc400-flags.html
http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-AMD-Genoa-rev2.0.html

You can also download the XML flags sources by saving the following links:

http://www.spec.org/cpu2017/flags/aocc400-flags.xml
http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-AMD-Genoa-rev2.0.xml

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