# SPEC CPU®2017 Floating Point Speed Result

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## Hewlett Packard Enterprise

(Test Sponsor: HPE)

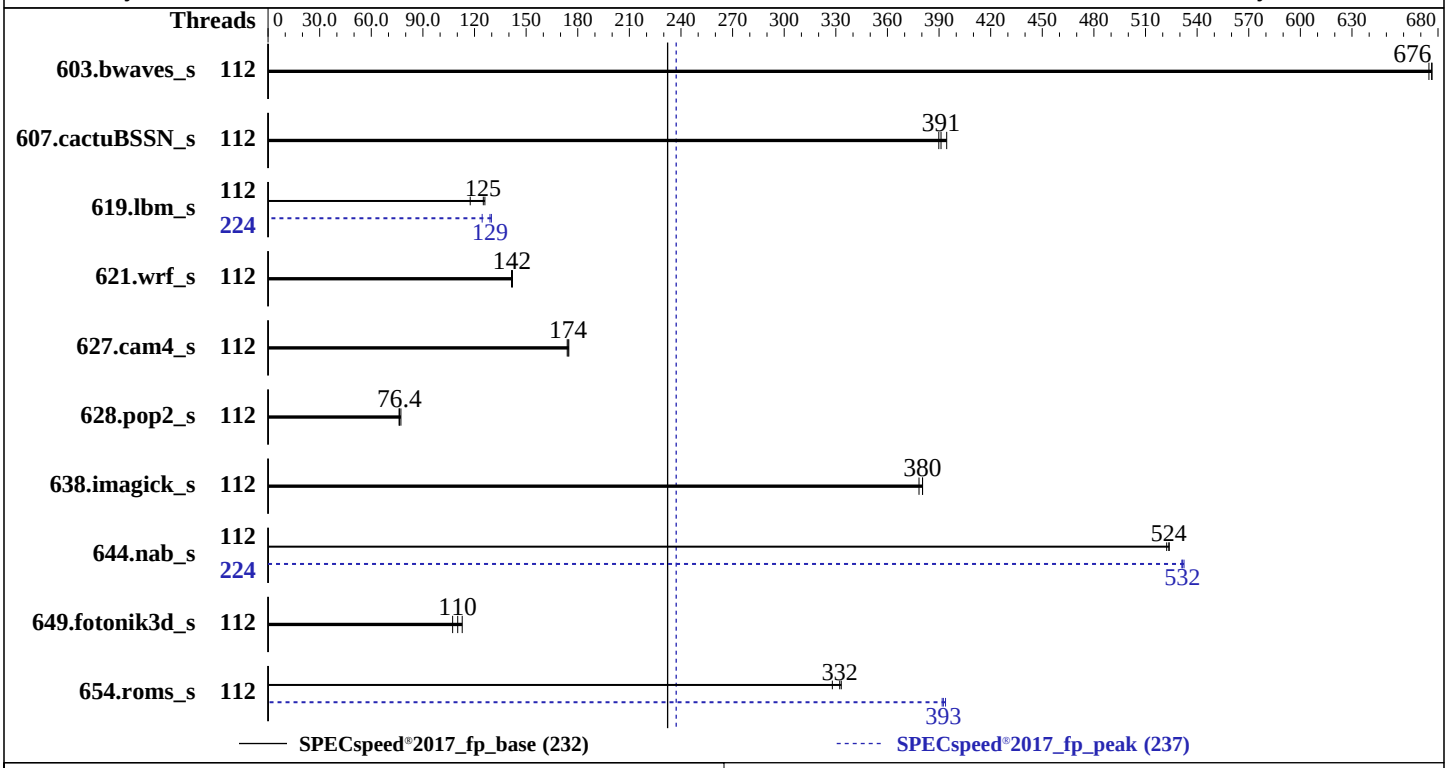
ProLiant DL365 Gen10 Plus
(2.0 GHz, AMD EPYC 7663)

SPECspeed®2017_fp_base = 232

SPECspeed®2017_fp_peak = 237

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

**Test Date:** Mar-2021
**Hardware Availability:** Apr-2021
**Software Availability:** Mar-2021




## Hardware

| | |
|---|---|
| CPU Name: | AMD EPYC 7663 |
| Max MHz: | 3500 |
| Nominal: | 2000 |
| Enabled: | 112 cores, 2 chips, 2 threads/core |
| Orderable: | 1,2 chips |
| Cache L1: | 32 KB I + 32 KB D on chip per core |
| L2: | 512 KB I+D on chip per core |
| L3: | 256 MB I+D on chip per chip, 32 MB shared / 7 cores |
| Other: | None |
| Memory: | 2 TB (16 x 128 GB 4Rx4 PC4-3200AA-L) |
| Storage: | 1 x 196 GB SATA SSD, RAID 0 |
| Other: | None |

## Software

| | |
|---|---|
| OS: | Ubuntu 20.04.1 LTS (x86_64)<br>Kernel 5.4.0-56-generic |
| Compiler: | C/C++/Fortran: Version 3.0.0 of AOCC |
| Parallel: | Yes |
| Firmware: | HPE BIOS Version A42 v2.40 02/23/2021 released Feb-2021 |
| File System: | ext4 |
| System State: | Run level 5 (multi-user) |
| Base Pointers: | 64-bit |
| Peak Pointers: | 64-bit |
| Other: | jemalloc: jemalloc memory allocator library v5.1.0 |
| Power Management: | BIOS and OS set to prefer performance at the cost of additional power usage |

## Results Table

| Benchmark | Base | | | | | | | Peak | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Threads | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio | Threads | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio |
| 603.bwaves_s | 112 | 87.2 | 677 | 87.4 | 675 | **87.2** | **676** | 112 | 87.2 | 677 | 87.4 | 675 | **87.2** | **676** |
| 607.cactuBSSN_s | 112 | 42.8 | 390 | **42.6** | **391** | 42.3 | 394 | 112 | 42.8 | 390 | **42.6** | **391** | 42.3 | 394 |
| 619.lbm_s | 112 | 44.6 | 118 | **41.9** | **125** | 41.6 | 126 | 224 | 40.3 | 130 | **40.6** | **129** | 42.1 | 124 |
| 621.wrf_s | 112 | **93.2** | **142** | 93.1 | 142 | 93.5 | 141 | 112 | **93.2** | **142** | 93.1 | 142 | 93.5 | 141 |
| 627.cam4_s | 112 | **50.8** | **174** | 50.7 | 175 | 51.0 | 174 | 112 | **50.8** | **174** | 50.7 | 175 | 51.0 | 174 |
| 628.pop2_s | 112 | 156 | 76.1 | 154 | 77.2 | **155** | **76.4** | 112 | 156 | 76.1 | 154 | 77.2 | **155** | **76.4** |
| 638.imagick_s | 112 | **37.9** | **380** | 37.9 | 380 | 38.1 | 378 | 112 | **37.9** | **380** | 37.9 | 380 | 38.1 | 378 |
| 644.nab_s | 112 | 33.4 | 524 | **33.4** | **524** | 33.5 | 522 | 224 | 32.9 | 531 | **32.9** | **532** | 32.8 | 532 |
| 649.fotonik3d_s | 112 | **82.7** | **110** | 85.0 | 107 | 80.8 | 113 | 112 | **82.7** | **110** | 85.0 | 107 | 80.8 | 113 |
| 654.roms_s | 112 | 47.3 | 333 | 48.0 | 328 | **47.4** | **332** | 112 | 40.2 | 392 | 40.0 | 394 | **40.1** | **393** |

**SPECspeed®2017_fp_base =** **232**

**SPECspeed®2017_fp_peak =** **237**

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
'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>

'echo 8 > /proc/sys/vm/dirty_ratio' run as root to limit dirty cache to 8% of
memory.
'echo 1 > /proc/sys/vm/swappiness' run as root to limit swap usage to minimum
necessary.
'echo 1 > /proc/sys/vm/zone_reclaim_mode' run as root to free node-local memory
and avoid remote memory usage.
'sync; echo 3 > /proc/sys/vm/drop_caches' run as root to reset filesystem caches.
'sysctl -w kernel.randomize_va_space=0' run as root to disable address space layout
randomization (ASLR) to reduce run-to-run variability.
```

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## Operating System Notes (Continued)

```
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.
To enable THP only on request for peak runs of 628.pop2_s, and 638.imagick_s,
'echo madvise > /sys/kernel/mm/transparent_hugepage/enabled' run as root.
To disable THP for peak runs of 627.cam4_s, 644.nab_s, 649.fotonik3d_s, and 654.roms_s,
'echo never > /sys/kernel/mm/transparent_hugepage/enabled' run as root.
```

## Environment Variables Notes

```
Environment variables set by runcpu before the start of the run:
GOMP_CPU_AFFINITY = "0-223"
LD_LIBRARY_PATH =
     "/home/cpu2017n/amd_speed_aocc300_milan_B_lib/64;/home/cpu2017n/amd_spee
     d_aocc300_milan_B_lib/32:"
MALLOC_CONF = "retain:true"
OMP_DYNAMIC = "false"
OMP_SCHEDULE = "static"
OMP_STACKSIZE = "128M"
OMP_THREAD_LIMIT = "224"

Environment variables set by runcpu during the 619.lbm_s peak run:
GOMP_CPU_AFFINITY = "0 112 1 113 2 114 3 115 4 116 5 117 6 118 7 119 8 120 9
     121 10 122 11 123 12 124 13 125 14 126 15 127 16 128 17 129 18 130 19
     131 20 132 21 133 22 134 23 135 24 136 25 137 26 138 27 139 28 140 29
     141 30 142 31 143 32 144 33 145 34 146 35 147 36 148 37 149 38 150 39
     151 40 152 41 153 42 154 43 155 44 156 45 157 46 158 47 159 48 160 49
     161 50 162 51 163 52 164 53 165 54 166 55 167 56 168 57 169 58 170 59
     171 60 172 61 173 62 174 63 175 64 176 65 177 66 178 67 179 68 180 69
     181 70 182 71 183 72 184 73 185 74 186 75 187 76 188 77 189 78 190 79
     191 80 192 81 193 82 194 83 195 84 196 85 197 86 198 87 199 88 200 89
     201 90 202 91 203 92 204 93 205 94 206 95 207 96 208 97 209 98 210 99
     211 100 212 101 213 102 214 103 215 104 216 105 217 106 218 107 219 108
     220 109 221 110 222 111 223"

Environment variables set by runcpu during the 644.nab_s peak run:
GOMP_CPU_AFFINITY = "0 112 1 113 2 114 3 115 4 116 5 117 6 118 7 119 8 120 9
     121 10 122 11 123 12 124 13 125 14 126 15 127 16 128 17 129 18 130 19
     131 20 132 21 133 22 134 23 135 24 136 25 137 26 138 27 139 28 140 29
     141 30 142 31 143 32 144 33 145 34 146 35 147 36 148 37 149 38 150 39
     151 40 152 41 153 42 154 43 155 44 156 45 157 46 158 47 159 48 160 49
     161 50 162 51 163 52 164 53 165 54 166 55 167 56 168 57 169 58 170 59
     171 60 172 61 173 62 174 63 175 64 176 65 177 66 178 67 179 68 180 69
     181 70 182 71 183 72 184 73 185 74 186 75 187 76 188 77 189 78 190 79
     191 80 192 81 193 82 194 83 195 84 196 85 197 86 198 87 199 88 200 89
```

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## Environment Variables Notes (Continued)

```
     201 90 202 91 203 92 204 93 205 94 206 95 207 96 208 97 209 98 210 99
     211 100 212 101 213 102 214 103 215 104 216 105 217 106 218 107 219 108
     220 109 221 110 222 111 223"

Environment variables set by runcpu during the 654.roms_s peak run:
GOMP_CPU_AFFINITY = "0-111"
```

## General Notes

```
Binaries were compiled on a system with 2x AMD EPYC 7742 CPU + 1TiB Memory using openSUSE 15.2

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.

jemalloc: configured and built with GCC v4.8.2 in RHEL 7.4 (No options specified)
jemalloc 5.1.0 is available here:
https://github.com/jemalloc/jemalloc/releases/download/5.1.0/jemalloc-5.1.0.tar.bz2
```

## Platform Notes

```
BIOS Configuration
 Workload Profile set to General Peak Frequency Compute
 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 One memory domain per socket
 Thermal Configuration set to Maximum Cooling
 Workload Profile set to Custom
 Infinity Fabric Power Management set to Disabled
  Infinity Fabric Performance State set to P0
 Power Regulator set to OS Control Mode

 Sysinfo program /home/cpu2017n/bin/sysinfo
 Rev: r6538 of 2020-09-24 e8664e66d2d7080afeaa89d4b38e2f1c
 running on admin Thu Apr  2 00:55:52 2020

 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
```

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## Platform Notes (Continued)

```
From /proc/cpuinfo
   model name : AMD EPYC 7663 56-Core Processor
      2  "physical id"s (chips)
      224 "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 : 56
      siblings  : 112
      physical 0: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27
      28 29 30 32 33 34 35 36 37 38 40 41 42 43 44 45 46 48 49 50 51 52 53 54 56 57 58 59
      60 61 62
      physical 1: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27
      28 29 30 32 33 34 35 36 37 38 40 41 42 43 44 45 46 48 49 50 51 52 53 54 56 57 58 59
      60 61 62

From lscpu:
     Architecture:                    x86_64
     CPU op-mode(s):                  32-bit, 64-bit
     Byte Order:                      Little Endian
     Address sizes:                   48 bits physical, 48 bits virtual
     CPU(s):                          224
     On-line CPU(s) list:             0-223
     Thread(s) per core:              2
     Core(s) per socket:              56
     Socket(s):                       2
     NUMA node(s):                    16
     Vendor ID:                       AuthenticAMD
     CPU family:                      25
     Model:                           1
     Model name:                      AMD EPYC 7663 56-Core Processor
     Stepping:                        1
     Frequency boost:                 enabled
     CPU MHz:                         2377.460
     CPU max MHz:                     2000.0000
     CPU min MHz:                     1500.0000
     BogoMIPS:                        3992.56
     Virtualization:                  AMD-V
     L1d cache:                       3.5 MiB
     L1i cache:                       3.5 MiB
     L2 cache:                        56 MiB
     L3 cache:                        512 MiB
     NUMA node0 CPU(s):               0-6,112-118
     NUMA node1 CPU(s):               7-13,119-125
     NUMA node2 CPU(s):               14-20,126-132
     NUMA node3 CPU(s):               21-27,133-139
     NUMA node4 CPU(s):               28-34,140-146
     NUMA node5 CPU(s):               35-41,147-153
```

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## Platform Notes (Continued)

```
      NUMA node6 CPU(s):               42-48,154-160
      NUMA node7 CPU(s):               49-55,161-167
      NUMA node8 CPU(s):               56-62,168-174
      NUMA node9 CPU(s):               63-69,175-181
      NUMA node10 CPU(s):              70-76,182-188
      NUMA node11 CPU(s):              77-83,189-195
      NUMA node12 CPU(s):              84-90,196-202
      NUMA node13 CPU(s):              91-97,203-209
      NUMA node14 CPU(s):              98-104,210-216
      NUMA node15 CPU(s):              105-111,217-223
      Vulnerability Itlb multihit:     Not affected
      Vulnerability L1tf:              Not affected
      Vulnerability Mds:               Not affected
      Vulnerability Meltdown:          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; Full AMD retpoline, IBPB conditional,
      IBRS_FW, STIBP always-on, RSB filling
      Vulnerability Srbds:             Not affected
      Vulnerability Tsx async abort:   Not affected
      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 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 invpcid cqm rdt_a rdseed adx smap
      clflushopt clwb sha_ni xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc
      cqm_mbm_total cqm_mbm_local clzero irperf xsaveerptr wbnoinvd arat npt lbrv svm_lock
      nrip_save tsc_scale vmcb_clean flushbyasid decodeassists pausefilter pfthreshold
      v_vmsave_vmload vgif umip pku ospke vaes vpclmulqdq rdpid overflow_recov succor smca

  /proc/cpuinfo cache data
     cache size : 512 KB

  From numactl --hardware  WARNING: a numactl 'node' might or might not correspond to a
  physical chip.
    available: 16 nodes (0-15)
    node 0 cpus: 0 1 2 3 4 5 6 112 113 114 115 116 117 118
    node 0 size: 128775 MB
    node 0 free: 128529 MB
    node 1 cpus: 7 8 9 10 11 12 13 119 120 121 122 123 124 125
    node 1 size: 129020 MB
    node 1 free: 128742 MB
```

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## Platform Notes (Continued)

```
node 2 cpus: 14 15 16 17 18 19 20 126 127 128 129 130 131 132
node 2 size: 129020 MB
node 2 free: 128773 MB
node 3 cpus: 21 22 23 24 25 26 27 133 134 135 136 137 138 139
node 3 size: 129020 MB
node 3 free: 128778 MB
node 4 cpus: 28 29 30 31 32 33 34 140 141 142 143 144 145 146
node 4 size: 128996 MB
node 4 free: 128831 MB
node 5 cpus: 35 36 37 38 39 40 41 147 148 149 150 151 152 153
node 5 size: 129020 MB
node 5 free: 128817 MB
node 6 cpus: 42 43 44 45 46 47 48 154 155 156 157 158 159 160
node 6 size: 129020 MB
node 6 free: 128818 MB
node 7 cpus: 49 50 51 52 53 54 55 161 162 163 164 165 166 167
node 7 size: 116907 MB
node 7 free: 116535 MB
node 8 cpus: 56 57 58 59 60 61 62 168 169 170 171 172 173 174
node 8 size: 129020 MB
node 8 free: 128777 MB
node 9 cpus: 63 64 65 66 67 68 69 175 176 177 178 179 180 181
node 9 size: 129020 MB
node 9 free: 128825 MB
node 10 cpus: 70 71 72 73 74 75 76 182 183 184 185 186 187 188
node 10 size: 129020 MB
node 10 free: 128881 MB
node 11 cpus: 77 78 79 80 81 82 83 189 190 191 192 193 194 195
node 11 size: 129020 MB
node 11 free: 128864 MB
node 12 cpus: 84 85 86 87 88 89 90 196 197 198 199 200 201 202
node 12 size: 129020 MB
node 12 free: 128867 MB
node 13 cpus: 91 92 93 94 95 96 97 203 204 205 206 207 208 209
node 13 size: 129020 MB
node 13 free: 128877 MB
node 14 cpus: 98 99 100 101 102 103 104 210 211 212 213 214 215 216
node 14 size: 129020 MB
node 14 free: 128873 MB
node 15 cpus: 105 106 107 108 109 110 111 217 218 219 220 221 222 223
node 15 size: 129014 MB
node 15 free: 128863 MB
node distances:
node   0   1   2   3   4   5   6   7   8   9  10  11  12  13  14  15
  0:  10  11  11  11  11  11  11  11  32  32  32  32  32  32  32  32
  1:  11  10  11  11  11  11  11  11  32  32  32  32  32  32  32  32
  2:  11  11  10  11  11  11  11  11  32  32  32  32  32  32  32  32
```

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## Platform Notes (Continued)

```
     3:  11  11  11  10  11  11  11  11  32  32  32  32  32  32  32  32
     4:  11  11  11  11  10  11  11  11  32  32  32  32  32  32  32  32
     5:  11  11  11  11  11  10  11  11  32  32  32  32  32  32  32  32
     6:  11  11  11  11  11  11  10  11  32  32  32  32  32  32  32  32
     7:  11  11  11  11  11  11  11  10  32  32  32  32  32  32  32  32
     8:  32  32  32  32  32  32  32  32  10  11  11  11  11  11  11  11
     9:  32  32  32  32  32  32  32  32  11  10  11  11  11  11  11  11
    10:  32  32  32  32  32  32  32  32  11  11  10  11  11  11  11  11
    11:  32  32  32  32  32  32  32  32  11  11  11  10  11  11  11  11
    12:  32  32  32  32  32  32  32  32  11  11  11  11  10  11  11  11
    13:  32  32  32  32  32  32  32  32  11  11  11  11  11  10  11  11
    14:  32  32  32  32  32  32  32  32  11  11  11  11  11  11  10  11
    15:  32  32  32  32  32  32  32  32  11  11  11  11  11  11  11  10

  From /proc/meminfo
     MemTotal:       2101190680 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 20.04.1 LTS

  From /etc/*release* /etc/*version*
     debian_version: bullseye/sid
     os-release:
        NAME="Ubuntu"
        VERSION="20.04.1 LTS (Focal Fossa)"
        ID=ubuntu
        ID_LIKE=debian
        PRETTY_NAME="Ubuntu 20.04.1 LTS"
        VERSION_ID="20.04"
        HOME_URL="https://www.ubuntu.com/"
        SUPPORT_URL="https://help.ubuntu.com/"

  uname -a:
     Linux admin 5.4.0-56-generic #62-Ubuntu SMP Mon Nov 23 19:20:19 UTC 2020 x86_64 x86_64
     x86_64 GNU/Linux

  Kernel self-reported vulnerability status:

  CVE-2018-12207 (iTLB Multihit):                         Not affected
```

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## Platform Notes (Continued)

```
 CVE-2018-3620 (L1 Terminal Fault):                    Not affected
 Microarchitectural Data Sampling:                     Not affected
 CVE-2017-5754 (Meltdown):                             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: Full AMD retpoline,
                                                      IBPB: conditional, IBRS_FW, STIBP:
                                                       always-on, RSB filling
 CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
 CVE-2019-11135 (TSX Asynchronous Abort):              Not affected

 run-level 5 Apr 1 17:24

 SPEC is set to: /home/cpu2017n
    Filesystem                     Type  Size  Used Avail Use% Mounted on
    /dev/mapper/ubuntu--vg-ubuntu--lv ext4  196G   50G  137G  27% /

 From /sys/devices/virtual/dmi/id
     Vendor:         HPE
     Product:        ProLiant DL365 Gen10 Plus
     Product Family: ProLiant
     Serial:         CN70430NKR

 Additional information from dmidecode 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:
     16x UNKNOWN M386AAG40AM3-CWE 128 GB 4 rank 3200
     16x UNKNOWN NOT AVAILABLE

 BIOS:
    BIOS Vendor:       HPE
    BIOS Version:      A42
    BIOS Date:         02/23/2021
    BIOS Revision:     2.40
    Firmware Revision: 2.40

 (End of data from sysinfo program)
```

## Compiler Version Notes

```
==============================================================================
C               | 619.lbm_s(base, peak) 638.imagick_s(base, peak)
                | 644.nab_s(base, peak)
------------------------------------------------------------------------------
AMD clang version 12.0.0 (CLANG: AOCC_3.0.0-Build#78 2020_12_10) (based on
  LLVM Mirror.Version.12.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.0.0/bin
------------------------------------------------------------------------------

==============================================================================
C++, C, Fortran | 607.cactuBSSN_s(base, peak)
------------------------------------------------------------------------------
AMD clang version 12.0.0 (CLANG: AOCC_3.0.0-Build#78 2020_12_10) (based on
  LLVM Mirror.Version.12.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.0.0/bin
AMD clang version 12.0.0 (CLANG: AOCC_3.0.0-Build#78 2020_12_10) (based on
  LLVM Mirror.Version.12.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.0.0/bin
AMD clang version 12.0.0 (CLANG: AOCC_3.0.0-Build#78 2020_12_10) (based on
  LLVM Mirror.Version.12.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.0.0/bin
------------------------------------------------------------------------------

==============================================================================
Fortran         | 603.bwaves_s(base, peak) 649.fotonik3d_s(base, peak)
                | 654.roms_s(base, peak)
------------------------------------------------------------------------------
AMD clang version 12.0.0 (CLANG: AOCC_3.0.0-Build#78 2020_12_10) (based on
  LLVM Mirror.Version.12.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.0.0/bin
------------------------------------------------------------------------------

==============================================================================
Fortran, C      | 621.wrf_s(base, peak) 627.cam4_s(base, peak)
                | 628.pop2_s(base, peak)
------------------------------------------------------------------------------
AMD clang version 12.0.0 (CLANG: AOCC_3.0.0-Build#78 2020_12_10) (based on
```

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## Compiler Version Notes (Continued)

```
  LLVM Mirror.Version.12.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.0.0/bin
AMD clang version 12.0.0 (CLANG: AOCC_3.0.0-Build#78 2020_12_10) (based on
  LLVM Mirror.Version.12.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.0.0/bin
------------------------------------------------------------------------------
```

## Base Compiler Invocation

C benchmarks:
`clang`

Fortran benchmarks:
`flang`

Benchmarks using both Fortran and C:
`flang clang`

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

## Base Portability Flags

603.bwaves_s: `-DSPEC_LP64`
607.cactuBSSN_s: `-DSPEC_LP64`
619.lbm_s: `-DSPEC_LP64`
621.wrf_s: `-DSPEC_CASE_FLAG -Mbyteswapio -DSPEC_LP64`
627.cam4_s: `-DSPEC_CASE_FLAG -DSPEC_LP64`
628.pop2_s: `-DSPEC_CASE_FLAG -Mbyteswapio -DSPEC_LP64`
638.imagick_s: `-DSPEC_LP64`
644.nab_s: `-DSPEC_LP64`
649.fotonik3d_s: `-DSPEC_LP64`
654.roms_s: `-DSPEC_LP64`

## Base Optimization Flags

C benchmarks:
```
-m64 -mno-adx -mno-sse4a -Wl,-mllvm -Wl,-region-vectorize
-Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -O3 -march=znver3
-fveclib=AMDLIBM -ffast-math -flto -fstruct-layout=5
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-fremap-arrays -mllvm -function-specialize -flv-function-specialization
-mllvm -enable-gvn-hoist -mllvm -global-vectorize-slp=true
-mllvm -enable-licm-vrp -mllvm -reduce-array-computations=3 -z muldefs
-DSPEC_OPENMP -fopenmp -fopenmp=libomp -lomp -lamdlibm -ljemalloc
-lflang -lflangrti
```

Fortran benchmarks:
```
-m64 -mno-adx -mno-sse4a -Wl,-mllvm -Wl,-enable-X86-prefetching
-Wl,-mllvm -Wl,-enable-licm-vrp -Wl,-mllvm -Wl,-region-vectorize
-Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Hz,1,0x1 -O3
-march=znver3 -fveclib=AMDLIBM -ffast-math -Mrecursive
-mllvm -fuse-tile-inner-loop -funroll-loops
-mllvm -extra-vectorizer-passes -mllvm -lsr-in-nested-loop
-mllvm -enable-licm-vrp -mllvm -reduce-array-computations=3
-mllvm -global-vectorize-slp=true -z muldefs -DSPEC_OPENMP -fopenmp
-fopenmp=libomp -lomp -lamdlibm -ljemalloc -lflang -lflangrti
```

Benchmarks using both Fortran and C:
```
-m64 -mno-adx -mno-sse4a -Wl,-mllvm -Wl,-enable-X86-prefetching
-Wl,-mllvm -Wl,-enable-licm-vrp -Wl,-mllvm -Wl,-region-vectorize
-Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -O3 -march=znver3
-fveclib=AMDLIBM -ffast-math -flto -fstruct-layout=5
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-fremap-arrays -mllvm -function-specialize -flv-function-specialization
-mllvm -enable-gvn-hoist -mllvm -global-vectorize-slp=true
-mllvm -enable-licm-vrp -mllvm -reduce-array-computations=3 -Hz,1,0x1
-Mrecursive -mllvm -fuse-tile-inner-loop -funroll-loops
-mllvm -extra-vectorizer-passes -mllvm -lsr-in-nested-loop -z muldefs
-DSPEC_OPENMP -fopenmp -fopenmp=libomp -lomp -lamdlibm -ljemalloc
-lflang -lflangrti
```

Benchmarks using Fortran, C, and C++:
```
-m64 -mno-adx -mno-sse4a -std=c++98
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false
-Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-function-specialize
```

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## Base Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++ (continued):
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -O3 -march=znver3
-fveclib=AMDLIBM -ffast-math -flto -fstruct-layout=5
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-fremap-arrays -mllvm -function-specialize -flv-function-specialization
-mllvm -enable-gvn-hoist -mllvm -global-vectorize-slp=true
-mllvm -enable-licm-vrp -mllvm -reduce-array-computations=3
-mllvm -enable-partial-unswitch -mllvm -unroll-threshold=100
-finline-aggressive -mllvm -loop-unswitch-threshold=200000
-mllvm -reroll-loops -mllvm -aggressive-loop-unswitch
-mllvm -extra-vectorizer-passes -mllvm -convert-pow-exp-to-int=false
-Hz,1,0x1 -Mrecursive -mllvm -fuse-tile-inner-loop -funroll-loops
-mllvm -lsr-in-nested-loop -z muldefs -DSPEC_OPENMP -fopenmp
-fopenmp=libomp -lomp -lamdlibm -ljemalloc -lflang -lflangrti

## Base Other Flags

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

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

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

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

## Peak Compiler Invocation

C benchmarks:
clang

Fortran benchmarks:
flang

Benchmarks using both Fortran and C:
flang clang

**(Continued on next page)**

## Peak Compiler Invocation (Continued)

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

## Peak Portability Flags

Same as Base Portability Flags

## Peak Optimization Flags

C benchmarks:

619.lbm_s: -m64 -mno-adx -mno-sse4a
-Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast
-march=znver3 -fveclib=AMDLIBM -ffast-math -flto
-fstruct-layout=5 -mllvm -unroll-threshold=50
-fremap-arrays -flv-function-specialization
-mllvm -inline-threshold=1000 -mllvm -enable-gvn-hoist
-mllvm -global-vectorize-slp=true
-mllvm -function-specialize -mllvm -enable-licm-vrp
-mllvm -reduce-array-computations=3 -DSPEC_OPENMP -fopenmp
-fopenmp=libomp -lomp -lamdlibm -ljemalloc -lflang

638.imagick_s: basepeak = yes

644.nab_s: -m64 -mno-adx -mno-sse4a -Wl,-mllvm -Wl,-region-vectorize
-Wl,-mllvm -Wl,-function-specialize -Ofast -march=znver3
-fveclib=AMDLIBM -ffast-math -flto -fstruct-layout=5
-mllvm -unroll-threshold=50 -fremap-arrays
-flv-function-specialization -mllvm -inline-threshold=1000
-mllvm -enable-gvn-hoist -mllvm -global-vectorize-slp=true
-mllvm -function-specialize -mllvm -enable-licm-vrp
-mllvm -reduce-array-computations=3 -DSPEC_OPENMP -fopenmp
-fopenmp=libomp -lomp -lamdlibm -ljemalloc -lflang

Fortran benchmarks:

603.bwaves_s: basepeak = yes

649.fotonik3d_s: basepeak = yes

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## Peak Optimization Flags (Continued)

654.roms_s: `-m64 -mno-adx -mno-sse4a`
`-Wl,-mllvm -Wl,-enable-X86-prefetching`
`-Wl,-mllvm -Wl,-enable-licm-vrp`
`-Wl,-mllvm -Wl,-function-specialize`
`-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6`
`-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast`
`-march=znver3 -fveclib=AMDLIBM -ffast-math -Mrecursive`
`-mllvm -reduce-array-computations=3`
`-mllvm -global-vectorize-slp=true -mllvm -enable-licm-vrp`
`-DSPEC_OPENMP -fopenmp -fopenmp=libomp -lomp -lamdlibm`
`-ljemalloc -lflang`

Benchmarks using both Fortran and C:

621.wrf_s: `basepeak = yes`

627.cam4_s: `basepeak = yes`

628.pop2_s: `basepeak = yes`

Benchmarks using Fortran, C, and C++:

607.cactuBSSN_s: `basepeak = yes`

## Peak Other Flags

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

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

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

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

The flags files that were used to format this result can be browsed at
`http://www.spec.org/cpu2017/flags/aocc300-flags-A1.html`
`http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-AMD-V1.2-EPYC-revP.html`

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

```
http://www.spec.org/cpu2017/flags/aocc300-flags-A1.xml
http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-AMD-V1.2-EPYC-revP.xml
```


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