# SPEC CPU® 2017 Floating Point Speed Result

**Hewlett Packard Enterprise**  
(Test Sponsor: HPE)  
ProLiant DL385 Gen10 Plus v2  
(2.65 GHz, AMD EPYC 7413)

**SPECspeed®2017_fp_base = 189**  
**SPECspeed®2017_fp_peak = 195**

<table>
<thead>
<tr>
<th>SPECspeed</th>
<th>2017_fp_base</th>
<th>189</th>
<th>2017_fp_peak</th>
<th>195</th>
</tr>
</thead>
</table>

## Hardware

**CPU Name:** AMD EPYC 7413  
**Max MHz:** 3600  
**Nominal:** 2650  
**Enabled:** 48 cores, 2 chips, 2 threads/core  
**Orderable:** 1, 2 chip(s)  
**Cache L1:** 32 KB I + 32 KB D on chip per core  
**L2:** 512 KB I+D on chip per core  
**L3:** 128 MB I+D on chip per chip, 32 MB shared / 6 cores  
**Other:** None  
**Memory:** 2 TB (16 x 128 GB 4Rx4 PC4-3200AA-L)  
**Storage:** 1 x 182 GB SATA SSD, RAID 0  
**Other:** None

## Software

**OS:** Ubuntu 20.04.1 LTS (x86_64)  
**Kernel:** 5.4.0-42-generic  
**Compiler:** C/C++/Fortran: Version 3.0.0 of AOCC  
**Parallel:** Yes  
**Firmware:** HPE BIOS Version A42 v2.40 02/15/2021 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 set to prefer performance at the cost of additional power usage
## Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>603.bwaves_s</td>
<td>48</td>
<td>95.5</td>
<td>618</td>
<td>95.1</td>
<td>620</td>
<td>95.3</td>
<td>619</td>
<td>48</td>
<td>95.5</td>
<td>618</td>
<td>95.1</td>
<td>620</td>
<td>95.3</td>
<td>619</td>
</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td>48</td>
<td>56.4</td>
<td>296</td>
<td>56.6</td>
<td>294</td>
<td>56.6</td>
<td>294</td>
<td>48</td>
<td>57.7</td>
<td>289</td>
<td>56.5</td>
<td>295</td>
<td>56.4</td>
<td>296</td>
</tr>
<tr>
<td>619.lbm_s</td>
<td>48</td>
<td>46.5</td>
<td>113</td>
<td>43.7</td>
<td>120</td>
<td>44.2</td>
<td>118</td>
<td>48</td>
<td>46.5</td>
<td>113</td>
<td>43.7</td>
<td>120</td>
<td>44.2</td>
<td>118</td>
</tr>
<tr>
<td>621.wrf_s</td>
<td>48</td>
<td>84.0</td>
<td>158</td>
<td>84.2</td>
<td>157</td>
<td>84.1</td>
<td>157</td>
<td>48</td>
<td>84.0</td>
<td>158</td>
<td>84.2</td>
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<td>84.1</td>
<td>157</td>
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<td>627.cam4_s</td>
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<td>64.1</td>
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<td>64.8</td>
<td>137</td>
<td>48</td>
<td>64.1</td>
<td>138</td>
<td>64.1</td>
<td>138</td>
<td>64.8</td>
<td>137</td>
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<tr>
<td>628.pop2_s</td>
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<td>58.0</td>
<td>204</td>
<td>58.2</td>
<td>193</td>
<td>61.4</td>
<td>48</td>
<td>205</td>
<td>58.0</td>
<td>204</td>
<td>58.2</td>
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<td>61.4</td>
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<td>638.imagick_s</td>
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<td>58.7</td>
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<td>58.4</td>
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<td>59.2</td>
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<td>58.4</td>
<td>247</td>
<td>59.2</td>
<td>244</td>
</tr>
<tr>
<td>644.nab_s</td>
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<td>49.7</td>
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<td>49.7</td>
<td>352</td>
<td>49.7</td>
<td>352</td>
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<td>397</td>
<td>44.0</td>
<td>397</td>
<td>44.0</td>
<td>397</td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>48</td>
<td>80.2</td>
<td>114</td>
<td>84.3</td>
<td>108</td>
<td>80.5</td>
<td>113</td>
<td>48</td>
<td>80.2</td>
<td>114</td>
<td>84.3</td>
<td>108</td>
<td>80.5</td>
<td>113</td>
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<tr>
<td>654.roms_s</td>
<td>48</td>
<td>72.3</td>
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<td>72.8</td>
<td>216</td>
<td>72.3</td>
<td>218</td>
<td>48</td>
<td>61.3</td>
<td>257</td>
<td>61.1</td>
<td>258</td>
<td>61.1</td>
<td>258</td>
</tr>
</tbody>
</table>

### 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.

'n numacl' 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

run cpu command invoked through numacl i.e.: numacl --interleave=all run cpu <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.

'sysct1 -w kernel.randomize_va_space=0' run as root to disable address space layout randomization (ASLR) to reduce run-to-run variability.

(Continued on next page)
The real test date is Apr-2021. The clock was mistakenly set to 2020 before the benchmark was run. 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 set by runcpu before the start of the run:
GOMP_CPU_AFFINITY = "0-95"
LD_LIBRARY_PATH = "/home/cpu2017_B1/amd_speed_aocc300_milan_B_lib/64;/home/cpu2017_B1/amd_speed_aocc300_milan_B_lib/32;"
MALLOC_CONF = "retain:true"
OMP_DYNAMIC = "false"
OMP_SCHEDULE = "static"
OMP_STACKSIZE = "128M"
OMP_THREAD_LIMIT = "96"

Environment variables set by runcpu during the 607.cactuBSSN_s peak run:
GOMP_CPU_AFFINITY = "0-47"

Environment variables set by runcpu during the 644.nab_s peak run:
GOMP_CPU_AFFINITY = "0 48 1 49 2 50 3 51 4 52 5 53 6 54 7 55 8 56 9 57 10 58 11 59 12 60 13 61 14 62 15 63 16 64 17 65 18 66 19 67 20 68 21 69 22 70 23 71 24 72 25 73 26 74 27 75 28 76 29 77 30 78 31 79 32 80 33 81 34 82 35 83 36 84 37 85 38 86 39 87 40 88 41 89 42 90 43 91 44 92 45 93 46 94 47 95"

Environment variables set by runcpu during the 654.roms_s peak run:
GOMP_CPU_AFFINITY = "0-47"

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)
General Notes (Continued)

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
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/cpu2017_B1/bin/sysinfo
Rev: r6538 of 2020-09-24 e8664e66d2d7080afeaa89d4b38e2f1c
running on dl385g10v2 Wed Apr 1 12:33:41 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

From /proc/cpuinfo
model name : AMD EPYC 7413 24-Core Processor
   2 "physical id"s (chips)
   96 "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 : 24
siblings : 48
   physical 0: cores 0 1 2 3 4 5 8 9 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29
   physical 1: cores 0 1 2 3 4 5 8 9 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29

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

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<td>195</td>
</tr>
</tbody>
</table>

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

**Platform Notes (Continued)**

<table>
<thead>
<tr>
<th>CPU(s)</th>
<th>96</th>
</tr>
</thead>
<tbody>
<tr>
<td>On-line CPU(s) list</td>
<td>0-95</td>
</tr>
<tr>
<td>Thread(s) per core:</td>
<td>2</td>
</tr>
<tr>
<td>Core(s) per socket:</td>
<td>24</td>
</tr>
<tr>
<td>Socket(s):</td>
<td>2</td>
</tr>
<tr>
<td>NUMA node(s):</td>
<td>8</td>
</tr>
<tr>
<td>Vendor ID:</td>
<td>AuthenticAMD</td>
</tr>
<tr>
<td>CPU family:</td>
<td>25</td>
</tr>
<tr>
<td>Model:</td>
<td>1</td>
</tr>
<tr>
<td>Model name:</td>
<td>AMD EPYC 7413 24-Core Processor</td>
</tr>
<tr>
<td>Stepping:</td>
<td>1</td>
</tr>
<tr>
<td>Frequency boost:</td>
<td>enabled</td>
</tr>
<tr>
<td>CPU MHz:</td>
<td>1796.091</td>
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<tr>
<td>CPU max MHz:</td>
<td>2650.0000</td>
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<tr>
<td>CPU min MHz:</td>
<td>1500.0000</td>
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<tr>
<td>BogoMIPS:</td>
<td>5289.82</td>
</tr>
<tr>
<td>Virtualization:</td>
<td>AMD-V</td>
</tr>
<tr>
<td>L1d cache:</td>
<td>1.5 MiB</td>
</tr>
<tr>
<td>L1i cache:</td>
<td>1.5 MiB</td>
</tr>
<tr>
<td>L2 cache:</td>
<td>24 MiB</td>
</tr>
<tr>
<td>L3 cache:</td>
<td>256 MiB</td>
</tr>
<tr>
<td>NUMA node0 CPU(s):</td>
<td>0-5,48-53</td>
</tr>
<tr>
<td>NUMA node1 CPU(s):</td>
<td>6-11,54-59</td>
</tr>
<tr>
<td>NUMA node2 CPU(s):</td>
<td>12-17,60-65</td>
</tr>
<tr>
<td>NUMA node3 CPU(s):</td>
<td>18-23,66-71</td>
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<td>NUMA node4 CPU(s):</td>
<td>24-29,72-77</td>
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<td>NUMA node5 CPU(s):</td>
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<td>NUMA node6 CPU(s):</td>
<td>36-41,84-89</td>
</tr>
<tr>
<td>NUMA node7 CPU(s):</td>
<td>42-47,90-95</td>
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<tr>
<td>Vulnerability Itlb multihit:</td>
<td>Not affected</td>
</tr>
<tr>
<td>Vulnerability L1tf:</td>
<td>Not affected</td>
</tr>
<tr>
<td>Vulnerability Mds:</td>
<td>Not affected</td>
</tr>
<tr>
<td>Vulnerability Meltdown:</td>
<td>Not affected</td>
</tr>
<tr>
<td>Vulnerability Spec store bypass:</td>
<td>Mitigation; Speculative Store Bypass disabled via prctl and seccomp</td>
</tr>
<tr>
<td>Vulnerability Spectre v1:</td>
<td>Mitigation; usercopy/swapgs barriers and __user pointer sanitization</td>
</tr>
<tr>
<td>Vulnerability Spectre v2:</td>
<td>Mitigation; Full AMD retpoline, IBPB conditional, IBRS_FW, STIBP always-on, RSB filling</td>
</tr>
<tr>
<td>Vulnerability Srbd:</td>
<td>Not affected</td>
</tr>
<tr>
<td>Vulnerability Tsx async abort:</td>
<td>Not affected</td>
</tr>
<tr>
<td>Flags:</td>
<td>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 pclid sse4_1 sse4_2 movbe popcnt aes xsave avx f16c rdrand lahf_lm cmp_legacy svm extapic cr8_legacy abm sse4a misalignsse 3dnowprefetch osvw ibs skimt wdt tce topoext perfctr_core perfctr_nb</td>
</tr>
</tbody>
</table>

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SPECspeed®2017_fp_base = 189
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CPU2017 License: 3
Test Sponsor: HPE
Tested by: HPE
Test Date: Apr-2021
Hardware Availability: Apr-2021
Software Availability: Mar-2021

Platform Notes (Continued)

bpext perfctr_llc mwaitx cpb cat_l3 cdp_l3 invpcid_single hw_pstate ssbd mba ibrs
ibpb stibp vmmcall fsqgbase bml1 avx2 smep bmi2 invpcid cqm rdt_a rdseed adx smap
ciflushopt clwb sha ni xsaveopt xsavec xgetnv1 xsaves cqm_llc cqm_occu_llc
cqm_mmb_total cqm_mmb_local clzero irperf xsavesrptr wbnoinvd arat np tlbv svm_lock
nírp_save tsc_scale vmcb_clean flushbyasid decodeassist 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: 8 nodes (0-7)
node 0 cpus: 0 1 2 3 4 5 48 49 50 51 52 53
node 0 size: 257798 MB
node 0 free: 257539 MB
node 1 cpus: 6 7 8 9 10 11 54 55 56 57 58 59
node 1 size: 258045 MB
node 1 free: 257848 MB
node 2 cpus: 12 13 14 15 16 17 60 61 62 63 64 65
node 2 size: 258045 MB
node 2 free: 257832 MB
node 3 cpus: 18 19 20 21 22 23 66 67 68 69 70 71
node 3 size: 245909 MB
node 3 free: 245710 MB
node 4 cpus: 24 25 26 27 28 29 72 73 74 75 76 77
node 4 size: 258045 MB
node 4 free: 257849 MB
node 5 cpus: 30 31 32 33 34 35 78 79 80 81 82 83
node 5 size: 258045 MB
node 5 free: 257839 MB
node 6 cpus: 36 37 38 39 40 41 84 85 86 87 88 89
node 6 size: 258045 MB
node 6 free: 257880 MB
node 7 cpus: 42 43 44 45 46 47 90 91 92 93 94 95
node 7 size: 258042 MB
node 7 free: 257766 MB
node distances:
node 0 1 2 3 4 5 6 7
 0: 10 11 11 11 32 32 32 32
 1: 11 10 11 11 32 32 32 32
 2: 11 11 10 11 32 32 32 32
 3: 11 11 11 10 32 32 32 32
 4: 32 32 32 32 10 11 11 11
 5: 32 32 32 32 11 10 11 11
 6: 32 32 32 32 11 11 10 11
 7: 32 32 32 32 11 11 11 10

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Platform Notes (Continued)

From /proc/meminfo
    MemTotal: 2101224144 kB
    HugePages_Total: 0
    Hugepagesize: 2048 kB

/sbin/tuned-adm active
   Current active profile: throughput-performance

/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 dl385g10v2 5.4.0-42-generic #46-Ubuntu SMP Fri Jul 10 00:24:02 UTC 2020 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
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/swaps 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

(Continued on next page)
Platform Notes (Continued)

CVE-2019-11135 (TSX Asynchronous Abort): Not affected
run-level 5 Apr 1 12:23

SPEC is set to: /home/cpu2017_B1
Filesystem Type Size Used Avail Use% Mounted on
/dev/mapper/ubuntu--vg-ubuntu--lv ext4 182G 43G 131G 25% /

From /sys/devices/virtual/dmi/id
Vendor: HPE
Product: ProLiant DL385 Gen10 Plus
Product Family: ProLiant
Serial: CN79340HC3

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: 02/15/2021
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: A0CC_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)

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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 LLVM Mirror.Version.12.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.0.0/bin

---------------------------------------------------------------------
Hewlett Packard Enterprise
ProLiant DL385 Gen10 Plus v2
(2.65 GHz, AMD EPYC 7413)

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

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.ibm_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 -Os -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-lcm-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

(Continued on next page)
**SPEC CPU®2017 Floating Point Speed Result**

**Hewlett Packard Enterprise**

(Test Sponsor: HPE)

**ProLiant DL385 Gen10 Plus v2**

(2.65 GHz, AMD EPYC 7413)

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**CPU2017 License:** 3  
**Test Date:** Apr-2021  
**Test Sponsor:** HPE  
**Hardware Availability:** Apr-2021  
**Tested by:** HPE  
**Software Availability:** Mar-2021

**Base Optimization Flags (Continued):**

Fortran benchmarks (continued):

- `-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`
- `-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`
**SPEC CPU®2017 Floating Point Speed Result**

Hewlett Packard Enterprise  
(Test Sponsor: HPE)  
ProLiant DL385 Gen10 Plus v2  
(2.65 GHz, AMD EPYC 7413)  

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

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### 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`

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

### Peak Portability Flags

Same as Base Portability Flags

### Peak Optimization Flags

- **C benchmarks:**  
  1. `619.lbm_s: basepeak = yes`
  2. `638.imagick_s: basepeak = yes`
  3. `644.nab_s: -m64 -mno-adx -mno-sse4a -Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-function-specialize -Ofast -march=znver3`

(Continued on next page)
Hewlett Packard Enterprise
(Test Sponsor: HPE)
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SPECspeed®2017_fp_base = 189
SPECspeed®2017_fp_peak = 195

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

Peak Optimization Flags (Continued)

644.nab_s (continued):
-ffast-math -flto -fstruct-layout=5
-mlvm -unroll-threshold=50 -fremap-arrays
-flv-function-specialization -mllv -inline-threshold=1000
-mllv -enable-gvn-hoist -mllv -global-vectorize-slp=true
-mllv -function-specialize -mllv -enable-licm-vrp
-mllv -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
654.roms_s: -m64 -mno-adx -mno-sse4a
-Wl,-mllv -Wl,-enable-X86-prefetching
-Wl,-mllv -Wl,-enable-licm-vrp
-Wl,-mllv -Wl,-function-specialize
-Wl,-mllv -Wl,-align-all-nofallback-blocks=6
-Wl,-mllv -Wl,-reduce-array-computations=3 -Ofast
-march=znver3 -ffast-math -mrecursive
-mllv -reduce-array-computations=3
-mllv -global-vectorize-slp=true -mllv -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++:
-m64 -mno-adx -mno-sse4a -std=c++98
-Wl,-mllv -Wl,-x86-use-vzeroupper=false -Wl,-mllv -Wl,-enable-licm-vrp
-Wl,-mllv -Wl,-function-specialize
-Wl,-mllv -Wl,-align-all-nofallback-blocks=6
-Wl,-mllv -Wl,-reduce-array-computations=3 -Ofast -march=znver3
-ffast-math -flto -fstruct-layout=5
-mllv -inline-threshold=1000 -mllv -enable-gvn-hoist
-mllv -global-vectorize-slp=true -mllv -function-specialize
-mllv -enable-licm-vrp -mllv -reduce-array-computations=3

(Continued on next page)
Hewlett Packard Enterprise
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PECs®2017_fp_base = 189
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Peak Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++ (continued):
-
-finline-aggressive
-mlir
-unroll-threshold=100

-mlir
-aggressive-loop-unswitch
-Mrecursive
-DSPEC_OPENMP
-fopenmp

-fopenmp=libomp
-lomp
-lamdlbm
-ljemalloc
-lflang

Peak Other Flags

C benchmarks:
-\texttt{-Wno-unused-command-line-argument}
-\texttt{-Wno-return-type}

Fortran benchmarks:
-\texttt{-Wno-unused-command-line-argument}
-\texttt{-Wno-return-type}

Benchmarks using both Fortran and C:
-\texttt{-Wno-unused-command-line-argument}
-\texttt{-Wno-return-type}

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

The flags files that were used to format this result can be browsed at
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/HPE-Platform-Flags-AMD-V1.2-EPYC-revP.xml

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