# SPEC CPU®2017 Floating Point Speed Result

## Hewlett Packard Enterprise

**Test Sponsor:** HPE  
**ProLiant DL345 Gen10 Plus**  
**CPU:** 2.65 GHz, AMD EPYC 7413

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### SPECspeed®2017_fp_base = 129

### SPECspeed®2017_fp_peak = 132

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### Hardware

| Threads | 0 | 15.0 | 30.0 | 45.0 | 60.0 | 75.0 | 90.0 | 105 | 120 | 135 | 150 | 165 | 180 | 195 | 210 | 225 | 240 | 255 | 270 | 285 | 300 | 315 | 330 | 345 |
|---------|---|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 603.bwaves_s | 24 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 607.cactuBSSN_s | 24 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 619.lbm_s | 24 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 621.wrf_s | 24 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 627.cam4_s | 24 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 628.pop2_s | 24 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 638.imagick_s | 24 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 644.nab_s | 24 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 649.fotonik3d_s | 24 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |
| 654.roms_s | 24 |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |

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### Software

**OS:** Ubuntu 20.04.1 LTS (x86_64)  
**Kernel:** 5.4.0-56-generic  
**Compiler:** C/C++/Fortran: Version 3.0.0 of AOCC  
**Parallel:** Yes  
**Firmware:** HPE BIOS Version A43 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>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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<tbody>
<tr>
<td>603.bwaves_s</td>
<td>24</td>
<td>173</td>
<td>342</td>
<td>172</td>
<td>342</td>
<td>172</td>
<td>342</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td>24</td>
<td>87.2</td>
<td>191</td>
<td>87.4</td>
<td>191</td>
<td>86.9</td>
<td>192</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>619.lbm_s</td>
<td>24</td>
<td>79.0</td>
<td>66.3</td>
<td>79.0</td>
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<td>79.0</td>
<td>66.3</td>
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<td>621.wrf_s</td>
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<td>75.8</td>
<td>175</td>
<td>75.7</td>
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<td>75.7</td>
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<tr>
<td>627.cam4_s</td>
<td>24</td>
<td>102</td>
<td>86.5</td>
<td>102</td>
<td>86.6</td>
<td>103</td>
<td>86.4</td>
<td>24</td>
<td>102</td>
<td>86.5</td>
<td>102</td>
</tr>
<tr>
<td>628.pop2_s</td>
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<td>137</td>
<td>86.9</td>
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<td>87.4</td>
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<td>87.4</td>
<td>24</td>
<td>137</td>
<td>86.9</td>
<td>136</td>
</tr>
<tr>
<td>638.imagick_s</td>
<td>24</td>
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<td>138</td>
<td>104</td>
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<td>105</td>
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<td>24</td>
<td>105</td>
<td>138</td>
<td>104</td>
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<tr>
<td>644.nab_s</td>
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<td>87.0</td>
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<td>86.9</td>
<td>201</td>
<td>86.9</td>
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<td>48</td>
<td>73.0</td>
<td>239</td>
<td>72.9</td>
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<tr>
<td>649.fotonik3d_s</td>
<td>24</td>
<td>132</td>
<td>69.3</td>
<td>131</td>
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<td>69.1</td>
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<tr>
<td>654.roms_s</td>
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<td>135</td>
<td>116</td>
<td>24</td>
<td>129</td>
<td>122</td>
<td>131</td>
</tr>
</tbody>
</table>

**SPECspeed®2017_fp_base = 129**  
**SPECspeed®2017_fp_peak = 132**

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.

## 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.:  
umactl --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.

To enable Transparent Hugepages (THP) for all allocations,
SPEC CPU®2017 Floating Point Speed Result

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(Test Sponsor: HPE)
ProLiant DL345 Gen10 Plus
(2.65 GHz, AMD EPYC 7413)

SPECspeed®2017_fp_base = 129
SPECspeed®2017_fp_peak = 132

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

Operating System Notes (Continued)

'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 = "0-47"
LD_LIBRARY_PATH =
"/home/SPEC_CPU2017/cpu2017/amd_speed_aocc300_milan_B_lib/64;/home/SPEC_CPU2017/cpu2017/amd_speed_aocc300_milan_B_lib/32;"
MALLOCONF = "retain:true"
OMP_DYNAMIC = "false"
OMP_SCHEDULE = "static"
OMP_STACKSIZE = "128M"
OMP_THREADLIMIT = "48"

Environment variables set by runcpu during the 607.cactuBSSN_s peak run:
GOMP_CPU_AFFINITY = "0-23"

Environment variables set by runcpu during the 619.lbm_s peak run:
GOMP_CPU_AFFINITY = "0-23"

Environment variables set by runcpu during the 644.nab_s peak run:
GOMP_CPU_AFFINITY = "0 24 1 25 2 26 3 27 4 28 5 29 6 30 7 31 8 32 9 33 10 34 11 35 12 36 13 37 14 38 15 39 16 40 17 41 18 42 19 43 20 44 21 45 22 46 23 47"

Environment variables set by runcpu during the 654.roms_s peak run:
GOMP_CPU_AFFINITY = "0-23"

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.

(Continued on next page)
General Notes (Continued)

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/SPEC_CPU2017/cpu2017/bin/sysinfo
Rev: r6538 of 2020-09-24 e8664e66d2d7080afeaa89d4b38e2f1c
running on admin Wed Apr 1 20:02:45 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
  1 "physical id"s (chips)
  48 "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

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):  48
On-line CPU(s) list:  0-47
Thread(s) per core:  2
Core(s) per socket:  24

(Continued on next page)
Platform Notes (Continued)

Socket(s):                       1
NUMA node(s):                    4
Vendor ID:                       AuthenticAMD
CPU family:                      25
Model:                           1
Model name:                      AMD EPYC 7413 24-Core Processor
Stepping:                        1
Frequency boost:                 enabled
CPU MHz:                         3570.667
CPU max MHz:                     2650.0000
CPU min MHz:                     1500.0000
BogoMIPS:                        5290.06
Virtualization:                  AMD-V
L1d cache:                       768 KiB
L1i cache:                       768 KiB
L2 cache:                        12 MiB
L3 cache:                        128 MiB
NUMA node0 CPU(s):               0-5,24-29
NUMA node1 CPU(s):               6-11,30-35
NUMA node2 CPU(s):               12-17,36-41
NUMA node3 CPU(s):               18-23,42-47
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 sanitation
Vulnerability Spectre v2:        Mitigation; Full AMD retpoline, IBPB conditional, IBRS_FW, STIBP always-on, RSB filling
Vulnerability Srbds:             Not affected
Vulnerability Txs 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
                                 pdelwb rddevcl lm constant_tsc rep_good nopl nonstop_tsc cpuid extd_apicid
                                 aperfmperf pni pclmulqdq monitor ssse3 fma cx16 pcid sse4_1 sse4_2 movbe popcnt aes
                                 xsave avx f16c rdrand lahf_lm cmp_legacy svm extapic cr8_legacy abm sse4a
                                 misalignsse 3nowprefetch osvw ibs skinit wdt tce topoext perfctr_core perfctr_nb
                                 bptext perfctr_l1c mwaitx cpb cat_l3 cdp_l3 invpcid_single hw_pstate ssbd mba ibrs ibpb stibp
                                 vmmcall fsqsgbase bml1 avx2 smep bmi2 invpcid cqm rdt_a rdsed adx smap
clfushopt clwb sha ni xsaveopt xsaves xgetbv1 xsaves cqm_llc cqm_occup_llc
cqm_mbb_total cqm_mbb_local clzero irperf xsaverptr wbinvd arat npt lbv svm_lock
                                 nrip_save tsc_scale vmcb_clean flushbyasid decodeassisials pfthreshold
                                 v_vmsave_vmload vgif umip pku ospke vaes vpcmnlqdq rdpid overflow_recokr succor smca

/proc/cpuinfo cache data

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

Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL345 Gen10 Plus
(2.65 GHz, AMD EPYC 7413)

SPECspeed®2017_fp_base = 129
SPECspeed®2017_fp_peak = 132

Cache size: 512 KB

From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a physical chip.
available: 4 nodes (0-3)
node 0 cpus: 0 1 2 3 4 5 24 25 26 27 28 29
node 0 size: 257799 MB
node 0 free: 256910 MB
node 1 cpus: 6 7 8 9 10 11 30 31 32 33 34 35
node 1 size: 258020 MB
node 1 free: 257763 MB
node 2 cpus: 12 13 14 15 16 17 36 37 38 39 40 41
node 2 size: 258045 MB
node 2 free: 257786 MB
node 3 cpus: 18 19 20 21 22 23 42 43 44 45 46 47
node 3 size: 245933 MB
node 3 free: 245693 MB
node distances:
node 0 1 2 3
0: 10 11 11 11
1: 11 10 11 11
2: 11 11 10 11
3: 11 11 11 10

From /proc/meminfo
MemTotal: 1044274404 kB
HugePages_Total: 0
Hugepagesize: 2048 kB
/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/"

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Platform Notes (Continued)

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
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 17:23

SPEC is set to: /home/SPEC_CPU2017/cpu2017
    Filesystem                          Type  Size  Used  Avail  Use% Mounted on
    /dev/mapper/ubuntu--vg-ubuntu--lv  ext4  196G  82G  104G  45%  /

From /sys/devices/virtual/dmi/id
    Vendor:                        HPE
    Product:                      ProLiant DL345 Gen10 Plus
    Product Family:               ProLiant
    Serial:                      J20APP000K

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:
        8x UNKNOWN M386AAG40AM3-CWE 128 GB 4 rank 3200
        8x UNKNOWN NOT AVAILABLE

    BIOS:
        BIOS Vendor:   HPE
        BIOS Version: A43
        BIOS Date:     02/15/2021
        BIOS Revision: 2.40

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

Platform Notes (Continued)

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

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

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Tested by: HPE

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

Compiler Version Notes (Continued)

==============================================================================
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
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

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Hewlett Packard Enterprise
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CPU2017 License: 3
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Tested by: HPE

SPECspeed®2017_fp_base = 129
SPECspeed®2017_fp_peak = 132

Base Portability Flags (Continued)

654.roms_s: -DSPEC_LP64

Base Optimization Flags

C benchmarks:
- m64 -mno-adx -mno-sse4a -W1,-mllvm -W1,-function-specialize
- m64 -mllvm -W1,-function-specialize
- m64 -mllvm -W1,-align-all-nofallthru-blocks=6
- m64 -mllvm -W1,-reduce-array-computations=3 -O3 - march=znver3
  - fveclib=AMDLIBM -ffast-math -flto -fstruct-layout=5
- mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
- freemap-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 -lamlidlibm -ljemalloc
  -lflang -lflangrti

Fortran benchmarks:
- m64 -mno-adx -mno-sse4a -W1,-mllvm -W1,-enable-X86-prefetching
- W1,-mllvm -W1,-enable-licm-vrp -W1,-mllvm -W1,-region-vectorize
- W1,-mllvm -W1,-function-specialize
- W1,-mllvm -W1,-align-all-nofallthru-blocks=6
- W1,-mllvm -W1,-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 -lsl-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 -lamlidlibm -ljemalloc -lflang -lflangrti

Benchmarks using both Fortran and C:
- m64 -mno-adx -mno-sse4a -W1,-mllvm -W1,-enable-X86-prefetching
- W1,-mllvm -W1,-enable-licm-vrp -W1,-mllvm -W1,-region-vectorize
- W1,-mllvm -W1,-function-specialize
- W1,-mllvm -W1,-align-all-nofallthru-blocks=6
- W1,-mllvm -W1,-reduce-array-computations=3 -O3 - march=znver3
  - fveclib=AMDLIBM -ffast-math -flto -fstruct-layout=5
  - mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
  - freemap-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 -lsl-in-nested-loop -z muldefs
  -DSPEC_OPENMP -fopenmp -fopenmp=libomp -lomp -lamlidlibm -ljemalloc

(Continued on next page)
Base Optimization Flags (Continued)

Benchmarks using both Fortran and C (continued):
-`-llflang` `-llflangrti`

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=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` `-llflang` `-llflangrti`

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`

(Continued on next page)
Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL345 Gen10 Plus
(2.65 GHz, AMD EPYC 7413)

SPECspeed®2017_fp_base = 129
SPECspeed®2017_fp_peak = 132

Peak Compiler Invocation (Continued)

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:


638.imagick_s: basepeak = yes


(Continued on next page)
Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL345 Gen10 Plus
(2.65 GHz, AMD EPYC 7413)

SPECspeed®2017_fp_base = 129
SPECspeed®2017_fp_peak = 132

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

Peak Optimization Flags (Continued)

Fortran benchmarks:

603.bwaves_s: basepeak = yes

649.fotonik3d_s: basepeak = yes

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++:

-m64 -mno-adx -mno-sse4a -std=c++98
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -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 -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
-finline-aggressive -mllvm -unroll-threshold=100 -mllvm -reroll-loops
-mllvm -aggressive-loop-unswitch -Mrecursive -DSPEC_OPENMP -fopenmp
-fopenmp=libomp -lomp -lamdlibm -ljemalloc -lflang
SPEC CPU®2017 Floating Point Speed Result

Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL345 Gen10 Plus
(2.65 GHz, AMD EPYC 7413)

SPECspeed®2017_fp_base = 129
SPECspeed®2017_fp_peak = 132

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

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/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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