## SPEC CPU®2017 Floating Point Speed Result

### Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant DL345 Gen10 Plus

(3.70 GHz, AMD EPYC 72F3)

### SPECspeed®2017_fp_base = 78.8

### SPECspeed®2017_fp_peak = 85.4

<table>
<thead>
<tr>
<th>Threads</th>
<th>SPECspeed®2017_fp_base</th>
<th>SPECspeed®2017_fp_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>603.bwaves_s</td>
<td>101</td>
<td>85.4</td>
</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td>36.3</td>
<td>78.8</td>
</tr>
<tr>
<td>619.lbm_s</td>
<td>61.8</td>
<td>61.8</td>
</tr>
<tr>
<td>621.wrf_s</td>
<td>91.0</td>
<td>91.0</td>
</tr>
<tr>
<td>627.cam4_s</td>
<td>41.2</td>
<td>41.2</td>
</tr>
<tr>
<td>628.pop2_s</td>
<td>63.1</td>
<td>63.1</td>
</tr>
<tr>
<td>638.imagick_s</td>
<td>56.2</td>
<td>56.2</td>
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<tr>
<td>644.nab_s</td>
<td>82.1</td>
<td>82.1</td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>64.3</td>
<td>64.3</td>
</tr>
<tr>
<td>654.roms_s</td>
<td>96.4</td>
<td>96.4</td>
</tr>
</tbody>
</table>

### 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 A43 v2.42 04/15/2021 released Apr-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

### Hardware

- **CPU Name:** AMD EPYC 72F3
- **Max MHz:** 4100
- **Nominal:** 3700
- **Enabled:** 8 cores, 1 chip, 2 threads/core
- **Orderable:** 1 chip
- **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 per core
- **Other:** None
- **Memory:** 1 TB (8 x 128 GB 4Rx4 PC4-3200AA-L)
- **Storage:** 1 x 480 GB SAS SSD, RAID 0
- **Other:** None
Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL345 Gen10 Plus
(3.70 GHz, AMD EPYC 72F3)

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

 SPECspeed\textsuperscript{\textregistered}2017\textsubscript{fp}\_base = 78.8
SPECspeed\textsuperscript{\textregistered}2017\textsubscript{fp}\_peak = 85.4

Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Base</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Base</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Peak</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Peak</th>
<th>Seconds</th>
<th>Ratio</th>
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<tbody>
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<td></td>
<td>159</td>
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<tr>
<td>607.cactuBSSN_s</td>
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<td>101</td>
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<tr>
<td>619.ibm_s</td>
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<td>36.3</td>
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<td>84.7</td>
<td>61.8</td>
<td>61.9</td>
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<tr>
<td>621.wrf_s</td>
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<td>91.2</td>
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<td>90.9</td>
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<td>145</td>
<td>91.2</td>
<td>90.9</td>
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<tr>
<td>627.cam4_s</td>
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<td>41.3</td>
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<td>41.2</td>
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<td>256</td>
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<tr>
<td>644.nab_s</td>
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<td>82.1</td>
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<td>82.1</td>
<td>213</td>
<td>82.1</td>
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<td>164</td>
<td>107</td>
<td>106</td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
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<td>142</td>
<td>64.3</td>
<td>142</td>
<td>64.3</td>
<td>142</td>
<td>64.3</td>
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<td>96.7</td>
<td>163</td>
<td>96.4</td>
<td>164</td>
<td>96.1</td>
<td>8</td>
<td>163</td>
<td>96.5</td>
<td>162</td>
<td>96.9</td>
<td></td>
</tr>
</tbody>
</table>

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.: 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.

To enable Transparent Hugepages (THP) for all allocations,
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 = "0-15"
LD_LIBRARY_PATH =
"/home/SPEC_CPU2017/amd_speed_aocc300_milan_B_lib/64;/home/SPEC_CPU2017/
amd_speed_aocc300_milan_B_lib/32:"
MALLOC_CONF = "retain:true"
OMP_DYNAMIC = "false"
OMP_SCHEDULE = "static"
OMP_STACKSIZE = "128M"
OMP_THREAD_LIMIT = "16"

Environment variables set by runcpu during the 619.lbm_s peak run:
GOMP_CPU_AFFINITY = "0 8 1 9 2 10 3 11 4 12 5 13 6 14 7 15"

Environment variables set by runcpu during the 644.nab_s peak run:
GOMP_CPU_AFFINITY = "0 8 1 9 2 10 3 11 4 12 5 13 6 14 7 15"

Environment variables set by runcpu during the 654.roms_s peak run:
GOMP_CPU_AFFINITY = "0-7"

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
jemalloc 5.1.0 is available here:
https://github.com/jemalloc/jemalloc/releases/download/5.1.0/jemalloc-5.1.0.tar.bz2

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

**General Notes (Continued)**

Submitted by: "Bhatnagar, Prateek" <prateek.bhatnagar@hpe.com>
Submitted: Mon May 24 12:30:16 EDT 2021
Submission: cpu2017-20210524-26391.sub

## Platform Notes

BIOS Configuration
- Workload Profile set to General Peak Frequency Compute
- Thermal Configuration set to Maximum Cooling
- 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
- Infinity Fabric Power Management set to Disabled
- Infinity Fabric Performance State set to P0
- Workload Profile set to Custom
- Power Regulator set to OS Control Mode

Sysinfo program /home/SPEC_CPU2017/bin/sysinfo
Rev: r6538 of 2020-09-24 e8664e66d2d7080afeaa89d4b38e2f1c
running on ubuntu Wed Apr 1 10:28:45 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 72F3 8-Core Processor
- 1 "physical id"s (chips)
- 16 "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: 8
- siblings: 16
- physical 0: cores 0 1 2 3 4 5 6 7

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): 16
- On-line CPU(s) list: 0-15
- Thread(s) per core: 2
- Core(s) per socket: 8
- Socket(s): 1

(Continued on next page)
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CPU2017 License: 3  
Test Date: May-2021  
Hardware Availability: Jun-2021

Test Sponsor: HPE  
Software Availability: Mar-2021  
Tested by: HPE

**Platform Notes (Continued)**

- NUMA node(s): 8
- Vendor ID: AuthenticAMD
- CPU family: 25
- Model: 1
- Model name: AMD EPYC 72F3 8-Core Processor
- Stepping: 1
- Frequency boost: enabled
- CPU MHz: 1496.974
- CPU max MHz: 3700.0000
- CPU min MHz: 1500.0000
- BogoMIPS: 7385.95
- Virtualization: AMD-V
- L1d cache: 256 KiB
- L1i cache: 256 KiB
- L2 cache: 4 MiB
- L3 cache: 256 MiB
- NUMA node0 CPU(s): 0,8
- NUMA node1 CPU(s): 1,9
- NUMA node2 CPU(s): 2,10
- NUMA node3 CPU(s): 3,11
- NUMA node4 CPU(s): 4,12
- NUMA node5 CPU(s): 5,13
- NUMA node6 CPU(s): 6,14
- NUMA node7 CPU(s): 7,15
- Vulnerability Itlb multihit: Not affected
- Vulnerability Lttf: 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, IBFB conditional, IBRS_FW, STIBP always-on, RSB filling
- Vulnerability Srbd: Not affected
- Vulnerability Tsb 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 movbe popcnt aes xsave avx f16c rdrand lahf_lm cmp_legacy svm extapic cr8_legacy abm sse4a misalgnsse 3dnowprefetch osvw ibs ktm wdt tce topoext perfctr_core perfctr_nb bpsr pbept perfctr_l1l2 mwaitx cmov cx8 rootrbit cpb cat_l3 cdp_l3 invpcid_single hw_pstate ssbd mba ibrs ibpb stibp vmmcall fsgsbase bmi1 avx2 smep bmi2 invpcid cqm rdrt_a rdseed adx smap clflushopt clwb sha_ni xsaveopt xsaves xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbb_total cqm_mbb_local clzero irperf xsaverpr wbnoinvd arat npt lbrv svm_lock nrip_save tsc_scale vmcb_clean flushbyasid decodeassist sse2sdummy pfthreshold

(Continued on next page)
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SPECspeed®2017_fp_base = 78.8
SPECspeed®2017_fp_peak = 85.4

Platform Notes (Continued)

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 8
    node 0 size: 128776 MB
    node 0 free: 128289 MB
    node 1 cpus: 1 9
    node 1 size: 129023 MB
    node 1 free: 128887 MB
    node 2 cpus: 2 10
    node 2 size: 128999 MB
    node 2 free: 128876 MB
    node 3 cpus: 3 11
    node 3 size: 129023 MB
    node 3 free: 128850 MB
    node 4 cpus: 4 12
    node 4 size: 129023 MB
    node 4 free: 128936 MB
    node 5 cpus: 5 13
    node 5 size: 129023 MB
    node 5 free: 128906 MB
    node 6 cpus: 6 14
    node 6 size: 129023 MB
    node 6 free: 128978 MB
    node 7 cpus: 7 15
    node 7 size: 116910 MB
    node 7 free: 116810 MB
node distances:
    node 0  1  2  3  4  5  6  7
   0: 10 11 11 11 11 11 11 11
   1:  11 11 11 11 11 11 11 11
   2:  11 11 10 11 11 11 11 11
   3:  11 11 11 10 11 11 11 11
   4:  11 11 11 11 10 11 11 11
   5:  11 11 11 11 11 10 11 11
   6:  11 11 11 11 11 11 10 11
   7:  11 11 11 11 11 11 11 10

From /proc/meminfo
    MemTotal:       1044278056 kB
    HugePages_Total:       0
    Hugepagesize:       2048 kB

(Continued on next page)
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Copyright 2017-2021 Standard Performance Evaluation Corporation

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Test Date: May-2021
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Software Availability: Mar-2021

Platform Notes (Continued)

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

/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 ubuntu 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 sanitation
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 10:23

SPEC is set to: /home/SPEC_CPU2017

Filesystem Type Size Used Avail Use% Mounted on
/dev/mapper/vgubuntu-root ext4 365G 25G 322G 7% /

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Platform Notes (Continued)

From /sys/devices/virtual/dmi/id
Vendor: HPE
Product: ProLiant DL345 Gen10 Plus
Product Family: ProLiant
Serial: J20APP0014

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

BIOS:
  BIOS Vendor: HPE
  BIOS Version: A43
  BIOS Date: 04/15/2021
  BIOS Revision: 2.42
  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)

(Continued on next page)
**Compiler Version Notes (Continued)**

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
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Base Compiler Invocation (Continued)

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 -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 -03 -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 -lamlblibm -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 -03
-march=znver3 -fveclib=AMDLIBM -ffast-math -Mrecursive
-mllvm -fuse-tile-inner-loop -funroll-loops

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

Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL345 Gen10 Plus
(3.70 GHz, AMD EPYC 72F3)

SPECspeed® 2017_fp_base = 78.8
SPECspeed® 2017_fp_peak = 85.4

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

Base Optimization Flags (Continued):

Fortran benchmarks (continued):
-mlir -extra-vectorizer-passes -mlir -lsr-in-nested-loop
-mlir -enable-licm-vrp -mlir -reduce-array-computations=3
-mlir -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,-mlir -Wl,-enable-X86-prefetching
-Wl,-mlir -Wl,-enable-licm-vrp -Wl,-mlir -Wl,-region-vectorize
-Wl,-mlir -Wl,-function-specialize
-Wl,-mlir -Wl,-align-all-nofallthru-blocks=6
-Wl,-mlir -Wl,-reduce-array-computations=3 -O3 -march=znver3
-fveclib=AMDLIBM -ffast-math -fno-fsstruct-layout=5
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-fremap-arrays -mlir -function-specialize -flv-function-specialization
-mllvm -enable-gvn-hoist -mlir -global-vectorize-slp=true
-mllvm -reduce-array-computations=3 -Hz,1,0x1
-Mrecursive -mllvm -fuse-tile-inner-loop -funroll-loops
-mllvm -extra-vectorizer-passes -mlir -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,-mlir -Wl,-x86-use-vzeroupper=false
-Wl,-mlir -Wl,-region-vectorize -Wl,-mlir -Wl,-function-specialize
-Wl,-mlir -Wl,-align-all-nofallthru-blocks=6
-Wl,-mlir -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 -mlir -function-specialize -flv-function-specialization
-mllvm -reduce-array-computations=3
-mllvm -enable-partial-unswitch -mllvm -unroll-threshold=100
-fINLINE-aggressive -mlir -loop-unswitch-threshold=200000
-mllvm -reroll-loops -mlir -aggressive-loop-unswitch
-mllvm -extra-vectorizer-passes -mlir -convert-pow-exp-to-int=false
-Hz,1,0x1 -Mrecursive -mlir -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 DL345 Gen10 Plus**
(3.70 GHz, AMD EPYC 72F3)

<table>
<thead>
<tr>
<th>SPECspeed®2017_fp_peak</th>
<th>85.4</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECspeed®2017_fp_base</td>
<td>78.8</td>
</tr>
</tbody>
</table>

**CPU2017 License:** 3
**Test Sponsor:** HPE
**Test Date:** May-2021

**Tested by:** HPE
**Hardware Availability:** Jun-2021
**Software Availability:** Mar-2021

### 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:**

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

619.lbm_s (continued):
-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 -ldl -ljemalloc -lrt

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
-mllvm -fveclib=AMDLIBM -ffast-math -march=znver3
-mllvm -unroll-threshold=5 -fremap-arrays
-mllvm -function-specialize -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 -ldl -ljemalloc -lrt

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 -mllvm -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 -ldl -ljemalloc

Benchmarks using both Fortran and C:

621.wrf_s: basepeak = yes

627.cam4_s: basepeak = yes

628.pop2_s: basepeak = yes
Hewlett Packard Enterprise  
ProLiant DL345 Gen10 Plus  
(3.70 GHz, AMD EPYC 72F3)

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

Test Date: May-2021  
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SPECspeed®2017_fp_base = 78.8  
SPECspeed®2017_fp_peak = 85.4

Peak Optimization Flags (Continued)

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/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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For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

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