### Hardware

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU Name:</td>
<td>AMD EPYC 74F3</td>
</tr>
<tr>
<td>Max MHz:</td>
<td>4000</td>
</tr>
<tr>
<td>Nominal:</td>
<td>3200</td>
</tr>
<tr>
<td>Enabled:</td>
<td>24 cores, 1 chip, 2 threads/core</td>
</tr>
<tr>
<td>Orderable:</td>
<td>1 chip</td>
</tr>
<tr>
<td>Cache L1:</td>
<td>32 KB I + 32 KB D on chip per core</td>
</tr>
<tr>
<td>L2:</td>
<td>512 KB I+D on chip per core</td>
</tr>
<tr>
<td>L3:</td>
<td>256 MB I+D on chip per chip, 32 MB shared / 3 cores</td>
</tr>
<tr>
<td>Other:</td>
<td>None</td>
</tr>
<tr>
<td>Memory:</td>
<td>1 TB (8 x 128 GB 4Rx4 PC4-3200AA-L)</td>
</tr>
<tr>
<td>Storage:</td>
<td>1 x 480 GB SAS SSD, RAID 0</td>
</tr>
<tr>
<td>Other:</td>
<td>None</td>
</tr>
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### Software

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>OS:</td>
<td>Ubuntu 20.04.1 LTS (x86_64)</td>
</tr>
<tr>
<td>Compiler:</td>
<td>C/C++/Fortran: Version 3.0.0 of AOCC</td>
</tr>
<tr>
<td>Parallel:</td>
<td>No</td>
</tr>
<tr>
<td>Firmware:</td>
<td>HPE BIOS Version A43 v2.42 04/15/2021 released Apr-2021</td>
</tr>
<tr>
<td>File System:</td>
<td>ext4</td>
</tr>
<tr>
<td>System State:</td>
<td>Run level 5 (multi-user)</td>
</tr>
<tr>
<td>Base Pointers:</td>
<td>64-bit</td>
</tr>
<tr>
<td>Peak Pointers:</td>
<td>64-bit</td>
</tr>
<tr>
<td>Other:</td>
<td>jemalloc: jemalloc memory allocator library v5.1.0</td>
</tr>
<tr>
<td>Power Management:</td>
<td>BIOS set to prefer performance at the cost of additional power usage</td>
</tr>
</tbody>
</table>

### Test Results

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>SPECrate\textsuperscript{®}\textsuperscript{2017} fp_base</th>
<th>SPECrate\textsuperscript{®}\textsuperscript{2017} fp_peak</th>
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<tr>
<td>503.bwaves_r</td>
<td>48</td>
<td>48</td>
<td>48</td>
</tr>
<tr>
<td>507.cactuBSSN_r</td>
<td>48</td>
<td>48</td>
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<tr>
<td>508.namd_r</td>
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<tr>
<td>510.parest_r</td>
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<tr>
<td>511.povray_r</td>
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<tr>
<td>519.lbm_r</td>
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<tr>
<td>526.blender_r</td>
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<tr>
<td>527.cam4_r</td>
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<tr>
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<tr>
<td>549.fotonik3d_r</td>
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<tr>
<td>554.roms_r</td>
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</table>

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**Hewlett Packard Enterprise**

(Test Sponsor: HPE)

ProLiant DL345 Gen10 Plus
(3.20 GHz, AMD EPYC 74F3)

**SPECrater\textsuperscript{®}\textsuperscript{2017} fp_base = 236**

**SPECrater\textsuperscript{®}\textsuperscript{2017} fp_peak = 236**

**CPU2017 License:** 3

**Test Sponsor:** HPE

**Tested by:** HPE

**Test Date:** May-2021

**Hardware Availability:** Jun-2021

**Software Availability:** Mar-2021
Spec CPU® 2017 Floating Point Rate Result
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Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL345 Gen10 Plus
(3.20 GHz, AMD EPYC 74F3)

SPEC CPU® 2017 Floating Point Rate Result
Copyright 2017-2021 Standard Performance Evaluation Corporation

Test Sponsor: HPE
Hardware Availability: Jun-2021
Software Availability: Mar-2021

Results Table

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</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.
'numactl' was used to bind copies to the cores.
See the configuration file for details.

Operating System Notes

'ulimit -s unlimited' was used to set environment stack size limit
'ulimit -l 2097152' was used to set environment locked pages in memory limit
runcpu command invoked through numactl i.e.: 
numactl --interleave=all runcpu <etc>
'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.

(Continued on next page)
Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL345 Gen10 Plus
(3.20 GHz, AMD EPYC 74F3)

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

SPEC CPU®2017 Floating Point Rate Result

SPECrate®2017_fp_base = 236
SPECrate®2017_fp_peak = 236

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Operating System Notes (Continued)

'sysctl -w kernel.randomize_va_space=0' run as root to disable address space layout
randomization (ASLR) to reduce run-to-run variability.
'echo always > /sys/kernel/mm/transparent_hugepage/enabled' and
'echo always > /sys/kernel/mm/transparent_hugepage/defrag' run as root for peak
integer runs and all FP runs to enable Transparent Hugepages (THP).
'echo madvise > /sys/kernel/mm/transparent_hugepage/enabled' run as root for base
integer runs to enable THP only on request.

Environment Variables Notes

Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH =
    "/home/SPEC_CPU2017/cpu2017/amd_rate_aocc300_milan_A_lib/64;/home/SPEC_CPU2017/cpu2017/amd_rate_aocc300_milan_A_lib/32:"
MALLOC_CONF = "retain:true"

General Notes

Binaries were compiled on a system with 2x AMD EPYC 7742 CPU + 512GiB 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

Submitted by: "Bhatnagar, Prateek" <prateek.bhatnagar@hpe.com>
Submitted: Mon May 24 12:30:16 EDT 2021
Submission: cpu2017-20210524-26401.sub

Platform Notes

BIOS Configuration
Workload Profile set to General Throughput Compute
Determinism Control set to Manual
Thermal Configuration set to Maximum Cooling
Performance Determinism set to Power Deterministic
Last-Level Cache (LLC) as NUMA Node set to Enabled

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

**Hewlett Packard Enterprise**
(Test Sponsor: HPE)
ProLiant DL345 Gen10 Plus
(3.20 GHz, AMD EPYC 74F3)

<table>
<thead>
<tr>
<th>CPU2017 License:</th>
<th>3</th>
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<tbody>
<tr>
<td>Test Sponsor:</td>
<td>HPE</td>
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<td>HPE</td>
</tr>
</tbody>
</table>

**SPECrate®2017_fp_base = 236**

**SPECrate®2017_fp_peak = 236**

**Platform Notes (Continued)**

NUMA memory domains per socket set to Four memory domains per socket
Data Fabric C-State Enable set to Force Enabled
Workload Profile set to Custom
L1 HW Prefetcher set to Disabled

Sysinfo program /home/SPEC_CPU2017/cpu2017/bin/sysinfo
Rev: r6538 of 2020-09-24 e8664e66d2d7080afeaa89d4b38e2f1c
running on admin Wed Apr 1 19:00:18 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 74F3 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 4 5 6 8 9 10 12 13 14 16 17 18 20 21 22 24 25 26 28 29 30

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
- Socket(s): 1
- NUMA node(s): 8
- Vendor ID: AuthenticAMD
- CPU family: 25
- Model: 1
- Model name: AMD EPYC 74F3 24-Core Processor
- Stepping: 1
- Frequency boost: enabled
- CPU MHz: 3860.684
- CPU max MHz: 3200.0000
- CPU min MHz: 1500.0000
- BogoMIPS: 6388.47
- Virtualization: AMD-V
- L1d cache: 768 KiB
- L1i cache: 768 KiB

(Continued on next page)
Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL345 Gen10 Plus
(3.20 GHz, AMD EPYC 74F3)

 SPECrate®2017_fp_base = 236
 SPECrate®2017_fp_peak = 236

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

Platform Notes (Continued)

L2 cache: 12 MiB
L3 cache: 256 MiB
NUMA node0 CPU(s): 0-2, 24-26
NUMA node1 CPU(s): 3-5, 27-29
NUMA node2 CPU(s): 6-8, 30-32
NUMA node3 CPU(s): 9-11, 33-35
NUMA node4 CPU(s): 12-14, 36-38
NUMA node5 CPU(s): 15-17, 39-41
NUMA node6 CPU(s): 18-20, 42-44
NUMA node7 CPU(s): 21-23, 45-47
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 sanitization
Vulnerability Spectre v2: Mitigation; Full AMD retpoline, IBPB conditional, IBRS_FW, STIBP always-on, RSB filling
Vulnerability Srbd: 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 sse4_1 sse4_2 movbe popcnt aes xsave avx f16c rdrand lahf_lm cmp_legacy svm extapic cr8_legacy abm sse4a misalgnsse 3nowprefetch osvw ibs skinit wdt tce topoext perfctr_core perfctr_nb bpext perfctr_llc mwaitx cpb cat_l13 cdp_l13 invpcid_single hw_pstate ssbd mba ibrs ibpb stibp vmmcall fsqsgbase bml1 avx2 smep bmi2 invpcid cmp rdt_a rdseed adx smap clflushopt clwb sha_ni xsaveopt xsavec xgetbv vmlinux vmsave_vmload vmsave_load kgdb_load dkeys modrm_offset

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 24 25 26
node 0 size: 128776 MB
node 0 free: 128312 MB
node 1 cpus: 3 4 5 27 28 29
node 1 size: 129020 MB
node 1 free: 128815 MB

(Continued on next page)
SPEC CPU®2017 Floating Point Rate Result
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Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL345 Gen10 Plus
(3.20 GHz, AMD EPYC 74F3)

SPECrate®2017_fp_base = 236
SPECrate®2017_fp_peak = 236

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

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

Platform Notes (Continued)

node 2 cpus: 6 7 8 30 31 32
node 2 size: 129022 MB
node 2 free: 128866 MB
node 3 cpus: 9 10 11 33 34 35
node 3 size: 129021 MB
node 3 free: 128874 MB
node 4 cpus: 12 13 14 36 37 38
node 4 size: 128998 MB
node 4 free: 128852 MB
node 5 cpus: 15 16 17 39 40 41
node 5 size: 129021 MB
node 5 free: 128849 MB
node 6 cpus: 18 19 20 42 43 44
node 6 size: 129022 MB
node 6 free: 128879 MB
node 7 cpus: 21 22 23 45 46 47
node 7 size: 129008 MB
node 7 free: 128865 MB

node distances:
node   0   1   2   3   4   5   6   7
0:  10  11  12  12  12  12  12  12
1:  11  10  12  12  12  12  12  12
2:  12  12  10  11  12  12  12  12
3:  12  12  11  10  12  12  12  12
4:  12  12  12  12  10  11  12  12
5:  12  12  12  12  11  10  12  12
6:  12  12  12  12  12  12  10  11
7:  12  12  12  12  12  12  11  10

From /proc/meminfo
MemTotal:       1056657948 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*
derbian_version: bullseye/sid
os-release:
  NAME="Ubuntu"
  VERSION="20.04.1 LTS (Focal Fossa)"
  ID=ubuntu
  ID_LIKE=debian

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

Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL345 Gen10 Plus
(3.20 GHz, AMD EPYC 74F3)

SPECratel®2017_fp_base = 236
SPECratel®2017_fp_peak = 236

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

Platform Notes (Continued)

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
CVE-2018-3620 (L1 Terminal Fault): Not affected
Microarchitectural Data Sampling: Not affected
CVE-2017-5754 (Meltdown): Mitigation: Speculative Store Bypass disabled via prctl and seccomp
CVE-2018-3639 (Speculative Store Bypass): Mitigation: usercopy/swapsgs barriers and __user pointer sanitation
CVE-2017-5753 (Spectre variant 1): Mitigation: Full AMD retpoline, IBFB: conditional, IBRS_FW, STIBP: always-on, RSB filling
CVE-2017-5715 (Spectre variant 2): Not affected
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

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

(Continued on next page)
Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL345 Gen10 Plus
(3.20 GHz, AMD EPYC 74F3)

SPECrate®2017_fp_base = 236
SPECrate®2017_fp_peak = 236

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

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

Platform Notes (Continued)

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               | 519.lbm_r(base, peak) 538.imagick_r(base, peak) 544.nab_r(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++             | 508.namd_r(base, peak) 510.parest_r(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          | 511.povray_r(base, peak) 526.blender_r(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

(Continued on next page)
Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL345 Gen10 Plus
(3.20 GHz, AMD EPYC 74F3)

Test Sponsor: HPE
Hardware Availability: Jun-2021
Test Date: May-2021
Software Availability: Mar-2021

CPU2017 License: 3
Tested by: HPE

SPEC CPU®2017 Floating Point Rate Result
Copyright 2017-2021 Standard Performance Evaluation Corporation

SPECrate®2017_fp_base = 236
SPECrate®2017_fp_peak = 236

---

Compiler Version Notes (Continued)

C++, C, Fortran | 507.cactuBSSN_r(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
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// 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 | 503.bwaves_r(base, peak) 549.fotonik3d_r(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 | 521.wrf_r(base, peak) 527.cam4_r(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 DL345 Gen10 Plus  
(3.20 GHz, AMD EPYC 74F3)  

<table>
<thead>
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<th>Test Sponsor:</th>
<th>HPE</th>
<th>Test Date:</th>
<th>May-2021</th>
</tr>
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<tbody>
<tr>
<td>Tested by:</td>
<td>HPE</td>
<td>Hardware Availability:</td>
<td>Jun-2021</td>
</tr>
</tbody>
</table>

### Base Compiler Invocation

C benchmarks:
- `clang`

C++ benchmarks:
- `clang++`

Fortran benchmarks:
- `flang`

Benchmarks using both Fortran and C:
- `flang clang`

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

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

### Base Portability Flags

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

### Base Optimization Flags

C benchmarks:
- `-m64 -flto -Wl,-mltvm -Wl,-region-vectorize`
- `-Wl,-mltvm -Wl,-function-specialize`
- `-Wl,-mltvm -Wl,-align-all-nofallthru-blocks=6`
- `-Wl,-mltvm -Wl,-reduce-array-computations=3 -O3 -ffast-math`
- `-march=znver3 -fveclib=AMDLIBM -fstruct-layout=5`

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

C benchmarks (continued):
-mlvm -unroll-threshold=50 -mlvm -inline-threshold=1000
-fremap-arrays -mlvm -function-specialize -flv-function-specialization
-mlvm -enable-gvn-hoist -mlvm -global-vectorize-slp=true
-mlvm -enable-licm-vrp -mlvm -reduce-array-computations=3 -z muldefs
-lamdllibm -ljemalloc -lflang -lflangrti

C++ benchmarks:
-m64 -std=c++98 -mno-adx -mno-sse4a
-Wl,-mlvm -Wl,-x86-use-vzeroupper=false -flto
-Wl,-mlvm -Wl,-region-vectorize -Wl,-mlvm -Wl,-function-specialize
-Wl,-mlvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mlvm -Wl,-reduce-array-computations=3 -O3 -ffast-math
-march=znver3 -fveclib=AMDLIBM -mlvm -enable-partial-unswitch
-mlvm -unroll-threshold=100 -finline-aggressive
-flv-function-specialization -mlvm -loop-unswitch-threshold=200000
-mlvm -reroll-loops -mlvm -aggressive-loop-unswitch
-mlvm -extra-vectorizer-passes -mlvm -reduce-array-computations=3
-mlvm -global-vectorize-slp=true -mlvm -convert-pow-exp-to-int=false
-z muldefs -lamdllibm -ljemalloc -lflang -lflangrti

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

Benchmarks using both Fortran and C:
-m64 -Wl,-mlvm -Wl,-enable-X86-prefetching
-Wl,-mlvm -Wl,-enable-licm-vrp -flto -Wl,-mlvm -Wl,-region-vectorize
-Wl,-mlvm -Wl,-function-specialize
-Wl,-mlvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mlvm -Wl,-reduce-array-computations=3 -O3 -ffast-math
-march=znver3 -fveclib=AMDLIBM -fstruct-layout=5
-mlvm -unroll-threshold=50 -mlvm -inline-threshold=1000
-fremap-arrays -mlvm -function-specialize -flv-function-specialization
-mlvm -enable-gvn-hoist -mlvm -global-vectorize-slp=true
-mlvm -enable-licm-vrp -mlvm -reduce-array-computations=3 -Hz,1,0x1
-Kieee -Mrecursive -mlvm -fuse-tile-inner-loop -funroll-loops

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

Benchmarks using both Fortran and C (continued):

-mlir -extra-vectorizer-passes -mlir -lsr-in-nested-loop -z muldefs
-landlibm -ljemalloc -lflang -lflangrti

Benchmarks using both C and C++:

-m64 -std=c++98 -mno-adx -mno-sse4a
-Wl,-mlir -Wl,-x86-use-vzeroupper=false -flto
-Wl,-mlir -Wl,-region-vectorize -Wl,-mlir -Wl,-function-specialize
-Wl,-mlir -Wl,-align-all-nofallback-throws=6
-Wl,-mlir -Wl,-reduce-array-computations=3 -O3 -ffast-math
-march=znver3 -fveclib=AMDLIBM -fstruct-layout=5
-mlir -unroll-threshold=50 -mlir -inline-threshold=1000
-freemap-arrays -mlir -function-specialize -flv-function-specialization
-mlir enable-gvn-hoist -mlir -global-vectorize-slp=true
-mlir enable-lcm-vrp -mlir -reduce-array-computations=3
-mlir enable-partial-unswitch -mlir -unroll-threshold=100
-finline-aggressive -mlir -loop-unswitch-threshold=200000
-mlir reroll-loops -mlir -aggressive-loop-unswitch
-mlir -extra-vectorizer-passes -mlir -convert-pow-exp-to-int=false
-mlir -unroll-threshold=50 -mlir -inline-threshold=1000
-freemap-arrays -mlir -function-specialize -flv-function-specialization
-mlir enable-gvn-hoist -mlir -global-vectorize-slp=true
-mlir enable-lcm-vrp -mlir -reduce-array-computations=3
-mlir enable-partial-unswitch -mlir -unroll-threshold=100
-finline-aggressive -mlir -loop-unswitch-threshold=200000
-mlir reroll-loops -mlir -aggressive-loop-unswitch
-mlir -extra-vectorizer-passes -mlir -convert-pow-exp-to-int=false
-Hz,1,0x1 -Kleee -Mrecursive -mlir -fuse-tile-inner-loop
-runroll-loops -mlir -lsr-in-nested-loop -z muldefs -landlibm
-ljemalloc -lflang -lflangrti

**Base Other Flags**

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

(Continued on next page)
## Base Other Flags (Continued)

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

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

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

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

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

## Peak Compiler Invocation

C benchmarks:
- `clang`

C++ benchmarks:
- `clang++`

Fortran benchmarks:
- `flang`

Benchmarks using both Fortran and C:
- `flang clang`

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

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

## Peak Portability Flags

Same as Base Portability Flags
## Peak Optimization Flags

### C benchmarks:

```
519.lbm_r: -m64 -flto -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast
-march=znver3 -fveclib=AMDLIBM -fstruct-layout=7
-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 -lamdlibm -ljemalloc

538.imagick_r: Same as 519.lbm_r

544.nab_r: -m64 -flto -Wl,-mllvm -Wl,-region-vectorize
-Wl,-mllvm -Wl,-function-specialize -Ofast -march=znver3
-fveclib=AMDLIBM -fstruct-layout=7
-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 -lamdlibm -ljemalloc
```

### C++ benchmarks:

```
508.namd_r: basepeak = yes

510.parest_r: -std=c++98 -mno-adx -mno-sse4a
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false
-Wl,-mllvm -Wl,-enable-licm-vrp -flto
-Wl,-mllvm -Wl,-suppress-fmas
-Wl,-mllvm -Wl,-function-specialize -Ofast -march=znver3
-fveclib=AMDLIBM -finline-aggressive
-mllvm -unroll-threshold=100 -flv-function-specialization
-mllvm -enable-licm-vrp -mllvm -reroll-loops
-mllvm -aggressive-loop-unswitch
-mllvm -reduce-array-computations=3
-mllvm -global-vectorize-slp=true -lamdlibm -ljemalloc
```

### Fortran benchmarks:

```
503.bwaves_r: basepeak = yes

549.fotonik3d_r: basepeak = yes

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

554.roms_r: basepeak = yes

Benchmarks using both Fortran and C:

521.wrf_r: basepeak = yes

527.cam4_r: -m64 -Wl,-mllvm -Wl,-enable-X86-prefetching
-Wl,-mllvm -Wl,-enable-licm-vrp -flto
-Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-force-vector-interleave=1 -Ofast
-march=znver3 -fveclib=AMDLIBM -fstruct-layout=7
-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 -03 -ffast-math
-funroll-loops -mllvm -extra-vectorizer-passes
-mllvm -lsr-in-nested-loop -Mrecursive -lamlibm
-ljemalloc -lfang -lfangrti

Benchmarks using both C and C++:

511.povray_r: -m64 -std=c++98 -mno-adx -mno-sse4a
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false
-Wl,-mllvm -Wl,-enable-licm-vrp -flto
-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 -fstruct-layout=7
-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 -lamlibm -ljemalloc

526.blender_r: basepeak = yes

Benchmarks using Fortran, C, and C++:

507.cactuBSSN_r: basepeak = yes
Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL345 Gen10 Plus
(3.20 GHz, AMD EPYC 74F3)

SPECrater®2017_fp_base = 236
SPECrater®2017_fp_peak = 236

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

Peak Other Flags

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

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

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

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

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

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

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/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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