**Hewlett Packard Enterprise**  
(2.00 GHz, AMD EPYC 7702P)

<table>
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<th>SPECspeed®2017_fp_base</th>
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<tr>
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**CPU2017 License:** 003  
**Test Sponsor:** HPE  
**Tested by:** HPE  
**Test Date:** Aug-2019  
**Hardware Availability:** Oct-2019  
**Software Availability:** Aug-2019

---

### Hardware

| Threads | 0 | 45 | 90.0 | 135 | 180 | 225 | 270 | 315 | 360 | 405 | 450 | 495 | 540 | 585 | 630 | 675 | 720 | 765 | 810 | 855 | 900 | 945 | 990 |
|---------|---|----|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 603.bwaves_s | 64 | 454 |       | 354 |       | 330 |       | 306 |       | 282 |       | 258 |       | 234 |       | 210 |       | 186 |       | 162 |       | 138 |       | 114 |       |
| 607.cactuBSSN_s | 64 | 530 |       | 426 |       | 322 |       | 218 |       | 114 |       | 110 |       | 106 |       | 102 |       | 98 |       | 94 |       | 90 |       | 86 |       |
| 619.lbm_s | 64 | 420 |       | 316 |       | 212 |       | 108 |       | 104 |       | 100 |       | 96 |       | 92 |       | 88 |       | 84 |       | 80 |       | 76 |       |
| 621.wrf_s | 64 | 97 |       | 93 |       | 89 |       | 85 |       | 81 |       | 77 |       | 73 |       | 69 |       | 65 |       | 61 |       | 57 |       | 53 |       |
| 627.cam4_s | 64 | 85.9 |       | 84.9 |       | 83.9 |       | 82.9 |       | 81.9 |       | 80.9 |       | 79.9 |       | 78.9 |       | 77.9 |       | 76.9 |       | 75.9 |       | 74.9 |       |
| 628.pop2_s | 64 | 258 |       | 254 |       | 250 |       | 246 |       | 242 |       | 238 |       | 234 |       | 230 |       | 226 |       | 222 |       | 218 |       | 214 |       |
| 638.imagick_s | 64 |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |       |
| 644.nab_s | 64 | 301 |       | 297 |       | 293 |       | 289 |       | 285 |       | 281 |       | 277 |       | 273 |       | 269 |       | 265 |       | 261 |       | 257 |       |
| 649.fotonik3d_s | 64 | 195 |       | 191 |       | 187 |       | 183 |       | 179 |       | 175 |       | 171 |       | 167 |       | 163 |       | 159 |       | 155 |       | 151 |       |
| 654.roms_s | 64 | 41 |       | 37 |       | 33 |       | 29 |       | 25 |       | 21 |       | 17 |       | 13 |       | 9 |       | 5 |       | 1 |       | 1 |       |

- **603.bwaves_s**
- **607.cactuBSSN_s**
- **619.lbm_s**
- **621.wrf_s**
- **627.cam4_s**
- **628.pop2_s**
- **638.imagick_s**
- **644.nab_s**
- **649.fotonik3d_s**
- **654.roms_s**

---

### Software

- **OS:** SUSE Linux Enterprise Server 15 (x86_64) SP1
- **Kernel:** 4.12.14-195-default
- **Compiler:** C/C++/Fortran: Version 2.0.0 of AOCC
- **Parallel:** Yes
- **Firmware:** HPE BIOS Version A41 07/20/2019 released Aug-2019
- **File System:** btrfs
- **System State:** Run level 3 (multi-user)
- **Base Pointers:** 64-bit
- **Peak Pointers:** 64-bit
- **Other:** jemalloc: jemalloc memory allocator library v5.2.0
- **Power Management:** Disabled
SPEC CPU®2017 Floating Point Speed Result

Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL325 Gen10
(2.00 GHz, AMD EPYC 7702P)

<table>
<thead>
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Results appear in the order in which they were run. Bold underlined text indicates a median measurement.
Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL325 Gen10
(2.00 GHz, AMD EPYC 7702P)

SPECspeed®2017_fp_base = 126
SPECspeed®2017_fp_energy_base = 387
SPECspeed®2017_fp_peak = 126
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CPU2017 License: 003
Test Sponsor: HPE
Tested by: HPE

Test Date: Aug-2019
Hardware Availability: Oct-2019
Software Availability: Aug-2019

Peak Results Table

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</table>

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Compiler Notes
The AMD64 AOCC Compiler Suite is available at http://developer.amd.com/amd-aocc/

Submit Notes
The config file option 'submit' was used. 'numactl' was used to bind copies to the cores. See the configuration file for details.

Operating System Notes
'ulimit -s unlimited' was used to set environment stack size
'ulimit -1 2097152' was used to set environment locked pages in memory limit
runcpu command invoked through numactl i.e.: numactl --interleave=all runcpu <etc>

Set dirty_ratio=8 to limit dirty cache to 8% of memory
Set swappiness=1 to swap only if necessary
Set zone_reclaim_mode=1 to free local node memory and avoid remote memory sync then drop_caches=3 to reset caches before invoking runcpu

dirty_ratio, swappiness, zone_reclaim_mode and drop_caches were all set using privileged echo (e.g. echo 1 > /proc/sys/vm/swappiness).

Transparent huge pages set to 'always' for this run (OS default)
### Environment Variables Notes

Environment variables set by runcpu before the start of the run:

- GOMP_CPU_AFFINITY = "0-63"
- LD_LIBRARY_PATH = 
  
```bash
"/cpu2017/amd_speed_aocc200_rome_C_lib/64;/cpu2017/amd_speed_aocc200_rome_C_lib/32:"
```
- MALLOC_CONF = "retain:true"
- OMP_DYNAMIC = "false"
- OMP_SCHEDULE = "static"
- OMP_STACKSIZE = "128M"
- OMP_THREAD_LIMIT = "64"

Environment variables set by runcpu during the 607.cactuBSSN_s peak run:
- GOMP_CPU_AFFINITY = "0-63"

Environment variables set by runcpu during the 621.wrf_s peak run:
- GOMP_CPU_AFFINITY = "0-63"

Environment variables set by runcpu during the 654.roms_s peak run:
- GOMP_CPU_AFFINITY = "0-63"

### General Notes

Binaries were compiled on a system with 2x AMD EPYC 7601 CPU + 512GB Memory using Fedora 26

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 v9.1.0 in Ubuntu 19.04 with -O3 -znver2 -flto
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: "Bucek, James" <james.bucek@hpe.com>
Submitted: Tue Sep 17 00:02:18 EDT 2019
Submission: cpu2017-20190903-17798.sub

Submitted by: "Bucek, James" <james.bucek@hpe.com>
Submitted: Tue Sep 17 09:00:11 EDT 2019
Submission: cpu2017-20190903-17798.sub
Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL325 Gen10
(2.00 GHz, AMD EPYC 7702P)

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CPU2017 License: 003
Test Sponsor: HPE
Tested by: HPE

Test Date: Aug-2019
Hardware Availability: Oct-2019
Software Availability: Aug-2019

Platform Notes

BIOS Configuration:
- AMD SMT Option set to Disabled
- Thermal Configuration set to Maximum Cooling
- Determinism Control set to Manual
- Performance Determinism set to Power Deterministic
- Memory Patrol Scrubbing set to Disabled
- NUMA memory domains per socket set to Four memory domains per socket
- Workload Profile set to General Peak Frequency Compute
- Minimum Processor Idle Power Core C-State set to C6 State

Sysinfo program /cpu2017/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7ed1be6e46a485a0011
running on dl325gen10 Sat Aug 31 19:41:38 2019

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 7702P 64-Core Processor
1 "physical id"s (chips)
64 "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 : 64
siblings : 64
physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63

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): 64
On-line CPU(s) list: 0-63
Thread(s) per core: 1
Core(s) per socket: 64
Socket(s): 1
NUMA node(s): 4
Vendor ID: AuthenticAMD
CPU family: 23
Model: 49
Model name: AMD EPYC 7702P 64-Core Processor

(Continued on next page)
Hewlett Packard Enterprise  
(Test Sponsor: HPE)  
ProLiant DL325 Gen10  
(2.00 GHz, AMD EPYC 7702P)  

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**CPU2017 License:** 003  
**Test Sponsor:** HPE  
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**Tested by:** HPE  
**Hardware Availability:** Oct-2019  
**Software Availability:** Aug-2019

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**Platform Notes (Continued)**

- Stepping: 0
- CPU MHz: 2000.000
- CPU max MHz: 2000.0000
- CPU min MHz: 1500.0000
- BogoMIPS: 3992.33
- Virtualization: AMD-V
- L1d cache: 32K
- L1i cache: 32K
- L2 cache: 512K
- L3 cache: 16384K
- NUMA node0 CPU(s): 0-15
- NUMA node1 CPU(s): 16-31
- NUMA node2 CPU(s): 32-47
- NUMA node3 CPU(s): 48-63
- Flags:

  - fpu vme de pse tsc msr pae mce cmov pat pse36 clflush mmx fxsr sse sse2 ht syscall nx mmxext fxsr_opt pdpe1gb rdtscp lm
  - constant_tsc rep_good nopl xtopology nonstop_tsc cpuid extd_apicid aperfmperf pni pclmulqdq monitor ssse3 fma cx16 sse4_1 sse4_2 movbe popcnt aes avx avx2 f16c rdrand lahf_lm cmp_legacy svm extapic cr8_legacy abm sse4a misalignsse 3dnowprefetch osvw ibs kINIT tce topoext perfctr_core perfctr_nb bpext perfctr_l2 mwaitx cpb cat_l3 cd_p_l3 hw_pstate ssbd ibrs ibpb vmmcall fsgsbase bmi1 bmi2 aes2 smep bmi2 cmvd rdtp a rdseed adx smap clflushopt clwb sha ni xsaveopt xsavec xgetbv1 xsaves cmq _llc cmq _occup _llc cmq _mbm _total cmq _mbm _local clzero irperf xsaveerptr arat npt lbrv svm _lock nrip_save tsc _scale vmcb_clean flushbyasid decodeassists pausefilter pfthreshold avic v _vmsave _vmload vgfl umip 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: 4 nodes (0-3)
- node 0 cpus: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
- node 0 size: 64290 MB
- node 0 free: 64154 MB
- node 1 cpus: 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
- node 1 size: 64507 MB
- node 1 free: 64367 MB
- node 2 cpus: 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
- node 2 size: 64507 MB
- node 2 free: 64211 MB
- node 3 cpus: 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63
- node 3 size: 64465 MB
- node 3 free: 64330 MB
- node distances:

(Continued on next page)
Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL325 Gen10
(2.00 GHz, AMD EPYC 7702P)

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CPU2017 License: 003
Test Sponsor: HPE
Tested by: HPE
Test Date: Aug-2019
Hardware Availability: Oct-2019
Software Availability: Aug-2019

Platform Notes (Continued)

node 0 1 2 3
0: 10 12 12 12
1: 12 10 12 12
2: 12 12 10 12
3: 12 12 12 10

From /proc/meminfo
MemTotal: 263958144 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

From /etc/*release*/etc/*version*
os-release:
NAME="SLES"
VERSION="15-SP1"
VERSIO_NID="15.1"
PRETTY_NAME="SUSE Linux Enterprise Server 15 SP1"
ID="sles"
ID_LIKE="suse"
ANSI_COLOR="0;32"
CPE_NAME="cpe:/o:suse:sles:15:sp1"

uname -a:
Linux dl325gen10 4.12.14-195-default #1 SMP Tue May 7 10:55:11 UTC 2019 (8fba516)
x86_64 x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:
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: __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Full AMD retpoline, IBPB: conditional, IBRS_FW, STIBP: disabled, RSB filling

run-level 3 Aug 31 13:56

SPEC is set to: /cpu2017
Filesystem Type Size Used Avail Use% Mounted on
/dev/sda2 btrfs 40G 11G 29G 28% /

From /sys/devices/virtual/dmi/id

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

**Hewlett Packard Enterprise**
(Test Sponsor: HPE)

**ProLiant DL325 Gen10**
(2.00 GHz, AMD EPYC 7702P)

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**SPECspeed®2017_fp_base = 126**
**SPECspeed®2017_fp_energy_base = 387**
**SPECspeed®2017_fp_peak = 126**
**SPECspeed®2017_fp_energy_peak = 388**

### Platform Notes (Continued)

- BIOS: HPE A41 07/20/2019
- Vendor: HPE
- Product: ProLiant DL325 Gen10
- Product Family: ProLiant
- Serial: CN781302PS

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 NOT AVAILABLE
  - 8x UNKNOWN NOT AVAILABLE 32 GB 2 rank 2933

(End of data from sysinfo program)

### Power Settings Notes

PTDaemon to measure power and temperature was run on a ProLiant DL360 Gen9 as a controller with 2x Intel Xeon E5-2660 v3 CPU and 128 GB of memory using Windows Server 2012 R2. Power management in the OS was disabled by setting Linux CPU governor to performance for all cores:

```
cpupower frequency-set -r -g performance
```

Power management in the BIOS was default except for any settings mentioned in BIOS Configuration. No power management settings were set in the management firmware. The optional optical drive was not installed. The system was configured with 7 HPE Small Form Factor Hard Drive Blanks (666987-B21), 8 DIMM blanks 2 high performance heatsinks and baffles that fit over the high performance heatsinks in order to produce correct airflow and cooling. The run was started and observed through the management firmware. The Embedded SATA controller was the HPE Smart Array S100i SR Gen10 SW RAID.

### Compiler Version Notes

```
C                          619.lbm_s(base, peak) 638.imagick_s(base, peak) 644.nab_s(base, peak)
```

AOCC.LLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins AOCC_2_0_0-Build#191) (based on LLVM AOCC.LLVM.2.0.0.B191.2019_07_19)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin

(Continued on next page)
Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL325 Gen10
(2.00 GHz, AMD EPYC 7702P)

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Compiler Version Notes (Continued)

C++, C, Fortran | 607.cactuBSSN_s(base, peak)
AOCC.LLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins
AOCC_2_0_0-Build#191) (based on LLVM AOCC.LLVM.2.0.0.B191.2019_07_19)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin
 AOCC.LLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins
AOCC_2_0_0-Build#191) (based on LLVM AOCC.LLVM.2.0.0.B191.2019_07_19)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin

Fortran | 603.bwaves_s(base, peak) 649.fotonik3d_s(base, peak)
654.roms_s(base, peak)
AOCC.LLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins
AOCC_2_0_0-Build#191) (based on LLVM AOCC.LLVM.2.0.0.B191.2019_07_19)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin

Fortran, C | 621.wrf_s(base, peak) 627.cam4_s(base, peak)
628.pop2_s(base, peak)
AOCC.LLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins
AOCC_2_0_0-Build#191) (based on LLVM AOCC.LLVM.2.0.0.B191.2019_07_19)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin
Hewlett Packard Enterprise  
(Test Sponsor: HPE)  
ProLiant DL325 Gen10  
(2.00 GHz, AMD EPYC 7702P)  

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Hardware Availability: Oct-2019  
Software Availability: Aug-2019

Compiler Version Notes ( Continued )
InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/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.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:
-flto -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-vector-library=LIBMVEC
-Wl,-mllvm -Wl,-reduce-array-computations=3 -03 -ffast-math
-march=znver2 -fstruct-layout=3 -mllvm -unroll-threshold=50
-fremap-arrays -mllvm -function-specialize -mllvm -enable-gvn-hoist
-mllvm -reduce-array-computations=3 -mllvm -global-vectorize-slp

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

#### C benchmarks (continued):

- `mllvm -vector-library=LIBMVEC -mllvm -inline-threshold=1000`
- `flv-function-specialization -z muldefs -DSPEC_OPENMP -fopenmp`
- `DUSE_OPENMP -fopenmp=libomp -lomp -lpthread -ldl -lmvec -lamdlibm -ljemalloc -lflang`

#### Fortran benchmarks:

- `flto -Wl,-mllvm -Wl,-function-specialize`
- `-Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-vector-library=LIBMVEC`
- `-mllvm -Wl,-reduce-array-computations=3 -O3 -march=znver2`
- `-funroll-loops -Mrecursive -mllvm -vector-library=LIBMVEC -z muldefs`
- `-Kieee -fno-finite-math-only -DSPEC_OPENMP -fopenmp -DUSE_OPENMP`
- `-fopenmp=libomp -lomp -lpthread -ldl -lmvec -lamdlibm -ljemalloc -lflang`

#### Benchmarks using both Fortran and C:

- `flto -Wl,-mllvm -Wl,-function-specialize`
- `-Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-vector-library=LIBMVEC`
- `-mllvm -Wl,-reduce-array-computations=3 -O3 -ffast-math`
- `-mllvm -Wl,-fstrict-layout=3 -mllvm -unroll-threshold=50`
- `-fremap-arrays -mllvm -function-specialize -mllvm -enable-gvn-hoist`
- `-mllvm -reduce-array-computations=3 -mllvm -global-vectorize-slp`
- `-mllvm -vector-library=LIBMVEC -mllvm -inline-threshold=1000`
- `-flv-function-specialization -funroll-loops -Mrecursive -z muldefs`
- `-Kieee -fno-finite-math-only -DSPEC_OPENMP -fopenmp -DUSE_OPENMP`
- `-fopenmp=libomp -lomp -lpthread -ldl -lmvec -lamdlibm -ljemalloc -lflang`

#### Benchmarks using Fortran, C, and C++:

- `-std=c++98 -flto -Wl,-mllvm -Wl,-function-specialize`
- `-Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-vector-library=LIBMVEC`
- `-Wl,-mllvm -Wl,-reduce-array-computations=3`
- `-Wl,-mllvm -Wl,-suppress-fmas -O3 -ffast-math -march=znver2`
- `-fstruct-layout=3 -mllvm -unroll-threshold=50 -fremap-arrays`
- `-mllvm -function-specialize -mllvm -enable-gvn-hoist`
- `-mllvm -reduce-array-computations=3 -mllvm -global-vectorize-slp`
- `-mllvm -vector-library=LIBMVEC -mllvm -inline-threshold=1000`
- `-flv-function-specialization -mllvm -loop-unswitch-threshold=200000`
- `-mllvm -unroll-threshold=100 -mllvm -enable-partial-unswitch`
- `-funroll-loops -Mrecursive -z muldefs -Kieee -fno-finite-math-only`
- `-DSPEC_OPENMP -fopenmp -DUSE_OPENMP -fopenmp=libomp -lomp -lpthread -ldl -lmvec -lamdlibm -ljemalloc -lflang`
Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL325 Gen10
(2.00 GHz, AMD EPYC 7702P)

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### Base Other Flags

C benchmarks:
-Wno-return-type

Fortran benchmarks:
-Wno-return-type

Benchmarks using both Fortran and C:
-Wno-return-type

Benchmarks using Fortran, C, and C++:
-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:

619.lbm_s: basepeak = yes

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

638.imagick_s: basepeak = yes

644.nab_s: basepeak = yes

**Fortran benchmarks:**

603.bwaves_s: basepeak = yes

649.fotonik3d_s: basepeak = yes

654.roms_s: `-flto -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-region-vectorize
-Wl,-mllvm -Wl,-vector-library=LIBMVEC
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-enable-X86-prefetching -O3 -march=znver2
-funroll-loops -Mrecursive -mllvm -vector-library=LIBMVEC
-Kieee -fno-finite-math-only -DSPEC_OPENMP -fopenmp
-DUSE_OPENMP -fopenmp=libomp -lomp -lpthread -ldl
-lmvec -lamlldibm -ljemalloc -lflang`

**Benchmarks using both Fortran and C:**

621.wrf_s: `-flto -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-region-vectorize
-Wl,-mllvm -Wl,-vector-library=LIBMVEC
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast
-march=znver2 -mno-sse4a -fstruct-layout=5
-mllvm -vectorize-memory-aggressively
-mllvm -function-specialize -mllvm -enable-gvn-hoist
-mllvm -unroll-threshold=50 -fremap-arrays
-mllvm -vector-library=LIBMVEC
-mllvm -reduce-array-computations=3
-mllvm -global-vectorize-slp -mllvm -inline-threshold=1000
-fly-function-specialization -O3 -funroll-loops
-Mrecursive -Kieee -fno-finite-math-only -DSPEC_OPENMP
-fopenmp -DUSE_OPENMP -fopenmp=libomp -lomp -lpthread
-lmvec -lamlldibm -ljemalloc -lflang`

627.cam4_s: basepeak = yes

628.pop2_s: basepeak = yes

**Benchmarks using Fortran, C, and C++:**

-std=c++98 -flto -Wl,-mllvm -Wl,-function-specialize

(Continued on next page)
Hewlett Packard Enterprise  
[Test Sponsor: HPE]
ProLiant DL325 Gen10  
(2.00 GHz, AMD EPYC 7702P)

**SPECspeed®2017_fp_base = 126**  
**SPECspeed®2017_fp_energy_base = 387**  
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### Peak Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++ (continued):
- `Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-vector-library=LIBMVEC`  
- `Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast -march=znver2`  
- `mno-sse4a -fstruct-layout=5 -mllvm -vectorize-memory-aggressively`  
- `mllvm -function-specialize -mllvm -enable-gvn-hoist`  
- `mllvm -unroll-threshold=50 -fremap-arrays`  
- `mllvm -vector-library=LIBMVEC -mllvm -reduce-array-computations=3`  
- `mllvm -global-vectorize-slp -mllvm -inline-threshold=1000`  
- `fly-function-specialization -mllvm -unroll-threshold=100`  
- `mllvm -enable-partial-unswitch -mllvm -loop-unswitch-threshold=200000`  
- `O3 -funroll-loops -Mrecursive -Kieee -fno-finite-math-only`  
- `DSPEC_OPENMP -fopenmp -DUSE_OPENMP -fopenmp=libomp -lomp -lpthread`  
- `ldl -lmvec -lamdlibm -ljemalloc -lflang`

### Peak Other Flags

C benchmarks:
- `Wno-return-type`

Fortran benchmarks:
- `Wno-return-type`

Benchmarks using both Fortran and C:
- `Wno-return-type`

Benchmarks using Fortran, C, and C++:
- `Wno-return-type`

The flags files that were used to format this result can be browsed at:


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

**Hewlett Packard Enterprise** (Test Sponsor: HPE)

**ProLiant DL325 Gen10** (2.00 GHz, AMD EPYC 7702P)

| SPECspeed\(^{2017}\) fp_base = 126 | SPECspeed\(^{2017}\) fp_energy_base = 387 |
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