## SPEC CPU®2017 Floating Point Speed Result

**Hewlett Packard Enterprise**  
(Test Sponsor: HPE)  
ProLiant DL365 Gen11  
(2.70 GHz, AMD EPYC 9334)

<table>
<thead>
<tr>
<th>SPECspeed®2017_fp_base</th>
<th>321</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECspeed®2017_fp_peak</td>
<td>326</td>
</tr>
</tbody>
</table>

**CPU2017 License:** 3  
**Test Date:** Dec-2022  
**Test Sponsor:** HPE  
**Hardware Availability:** Dec-2022  
**Tested by:** HPE  
**Software Availability:** Nov-2022

### Software

<table>
<thead>
<tr>
<th>OS: Ubuntu 22.04.1 LTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compiler: C/C++/Fortran: Version 4.0.0 of AOCC</td>
</tr>
<tr>
<td>Parallel: Yes</td>
</tr>
<tr>
<td>Firmware: HPE BIOS Version v1.12 11/24/2022 released</td>
</tr>
<tr>
<td>File System: ext4</td>
</tr>
<tr>
<td>System State: Run level 5 (multi-user)</td>
</tr>
<tr>
<td>Base Pointers: 64-bit</td>
</tr>
<tr>
<td>Peak Pointers: 64-bit</td>
</tr>
<tr>
<td>Power Management: BIOS and OS set to prefer performance at the cost of additional power usage</td>
</tr>
</tbody>
</table>

### Hardware

<table>
<thead>
<tr>
<th>CPU Name: AMD EPYC 9334</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max MHz: 3900</td>
</tr>
<tr>
<td>Nominal: 2700</td>
</tr>
<tr>
<td>Enabled: 64 cores, 2 chips</td>
</tr>
<tr>
<td>Orderable: 1.2 chips</td>
</tr>
<tr>
<td>Cache L1: 32 KB I + 32 KB D on chip per core</td>
</tr>
<tr>
<td>L2: 1 MB I+D on chip per core</td>
</tr>
<tr>
<td>L3: 128 MB I+D on chip per chip, 32 MB shared / 8 cores</td>
</tr>
<tr>
<td>Other: None</td>
</tr>
<tr>
<td>Memory: 1536 GB (24 x 64 GB 2Rx4 PC5-4800B-R)</td>
</tr>
<tr>
<td>Storage: 1 x 480 GB SATA SSD</td>
</tr>
<tr>
<td>Other: None</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Threads</th>
</tr>
</thead>
<tbody>
<tr>
<td>603.bwaves_s 64</td>
</tr>
<tr>
<td>607.cactuBSSN_s 64</td>
</tr>
<tr>
<td>619.lbm_s 64</td>
</tr>
<tr>
<td>621.wrf_s 64</td>
</tr>
<tr>
<td>627.cam4_s 64</td>
</tr>
<tr>
<td>628.pop2_s 64</td>
</tr>
<tr>
<td>638.imagick_s 64</td>
</tr>
<tr>
<td>644.nab_s 64</td>
</tr>
<tr>
<td>649.fotonik3d_s 64</td>
</tr>
<tr>
<td>654.roms_s 64</td>
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| SPECspeed®2017_fp_base (321) |
| SPECspeed®2017_fp_peak (326) |
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SPEC®2017_fp_base = 321
SPEC®2017_fp_peak = 326

Results Table

<table>
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<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>603.bwaves_s</td>
<td>64</td>
<td>39.8</td>
<td>1480</td>
<td>39.8</td>
<td>1480</td>
<td>39.8</td>
<td>1480</td>
<td>39.8</td>
<td>1480</td>
<td>39.8</td>
<td>1480</td>
<td>39.8</td>
<td>1480</td>
</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td>64</td>
<td>35.3</td>
<td>472</td>
<td>35.4</td>
<td>471</td>
<td>35.2</td>
<td>473</td>
<td>35.4</td>
<td>471</td>
<td>35.2</td>
<td>473</td>
<td>35.4</td>
<td>471</td>
</tr>
<tr>
<td>619.lbm_s</td>
<td>64</td>
<td>26.5</td>
<td>198</td>
<td>26.4</td>
<td>198</td>
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<td>198</td>
<td>26.4</td>
<td>198</td>
<td>26.5</td>
<td>198</td>
<td>26.4</td>
<td>198</td>
</tr>
<tr>
<td>621.wrf_s</td>
<td>64</td>
<td>64.7</td>
<td>204</td>
<td>65.0</td>
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<td>65.8</td>
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<td>59.3</td>
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<td>627.cam4_s</td>
<td>64</td>
<td>42.5</td>
<td>209</td>
<td>42.6</td>
<td>208</td>
<td>42.5</td>
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<td>42.6</td>
<td>208</td>
<td>42.4</td>
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<td>42.4</td>
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<tr>
<td>628.pop2_s</td>
<td>64</td>
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<td>72.4</td>
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<td>75.9</td>
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<tr>
<td>638.imagick_s</td>
<td>64</td>
<td>33.0</td>
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<td>32.9</td>
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<td>431</td>
<td>32.9</td>
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<td>33.4</td>
<td>431</td>
<td>33.4</td>
<td>431</td>
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<tr>
<td>644.nab_s</td>
<td>64</td>
<td>29.0</td>
<td>603</td>
<td>28.9</td>
<td>604</td>
<td>28.9</td>
<td>605</td>
<td>28.9</td>
<td>604</td>
<td>28.9</td>
<td>605</td>
<td>28.9</td>
<td>604</td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>64</td>
<td>43.4</td>
<td>210</td>
<td>43.1</td>
<td>211</td>
<td>43.4</td>
<td>210</td>
<td>43.6</td>
<td>209</td>
<td>43.0</td>
<td>212</td>
<td>43.3</td>
<td>211</td>
</tr>
<tr>
<td>654.roms_s</td>
<td>64</td>
<td>31.8</td>
<td>495</td>
<td>32.0</td>
<td>492</td>
<td>31.7</td>
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<td>495</td>
<td>32.0</td>
<td>492</td>
<td>31.7</td>
<td>496</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.
'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>

To limit dirty cache to 8% of memory, 'sysctl -w vm.dirty_ratio=8' run as root.
To limit swap usage to minimum necessary, 'sysctl -w vm.swappiness=1' run as root.
To free node-local memory and avoid remote memory usage,
'sysctl -w vm.zone_reclaim_mode=1' run as root.
To clear filesystem caches, 'sync; sysctl -w vm.drop_caches=3' run as root.
To disable address space layout randomization (ASLR) to reduce run-to-run variability,
'sysctl -w kernel.randomize_va_space=0' run as root.

To enable Transparent Hugepages (THP) for all allocations,
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CPU2017 License: 3  
Test Sponsor: HPE  
Tested by: HPE  
Test Date: Dec-2022  
Hardware Availability: Dec-2022  
Software Availability: Nov-2022

**Operating System Notes (Continued)**

'echo always > /sys/kernel/mm/transparent_hugepage/evil' and  
'echo always > /sys/kernel/mm/transparent_hugepage/defrag' run as root.  
To always enable THP for peak runs of:  
603.bwaves_s, 607.cactuBSSN_s, 619.lbm_s, 627.cam4_s, 628.pop2_s, 638.imagick_s, 644.nab_s, 649.fotonik3d_s:  
'echo madvise > /sys/kernel/mm/transparent_hugepage/evil; echo always > /sys/kernel/mm/transparent_hugepage/defrag' run as root.  
To disable THP for peak runs of 621.wrf_s:  
'echo never > /sys/kernel/mm/transparent_hugepage/evil; echo always > /sys/kernel/mm/transparent_hugepage/defrag' run as root.  
To enable THP only on request for peak runs of 654.roms_s:  
'echo madvise > /sys/kernel/mm/transparent_hugepage/evil; echo madvise > /sys/kernel/mm/transparent_hugepage/defrag' run as root.

**Environment Variables Notes**

Environment variables set by runcpu before the start of the run:  
GOMP_CPU_AFFINITY = "0-63"  
LD_LIBRARY_PATH = "/home/cpu2017/amd_speed_aocc400_genoa_B_lib/lib:"  
LIBOMP_NUM_HIDDEN_HELPER_THREADS = "0"  
MALLOCONF = "oversize_threshold:0,retain:true"  
OMP_DYNAMIC = "false"  
OMP_SCHEDULE = "static"  
OMP_STACKSIZE = "128M"  
OMP_THREAD_LIMIT = "64"

Environment variables set by runcpu during the 603.bwaves_s peak run:  
GOMP_CPU_AFFINITY = "0-63"

Environment variables set by runcpu during the 619.lbm_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 627.cam4_s peak run:  
GOMP_CPU_AFFINITY = "0-63"

Environment variables set by runcpu during the 628.pop2_s peak run:  
GOMP_CPU_AFFINITY = "0-63"

Environment variables set by runcpu during the 638.imagick_s peak run:  
GOMP_CPU_AFFINITY = "0-63"

Environment variables set by runcpu during the 649.fotonik3d_s peak run:  
GOMP_CPU_AFFINITY = "0-63"  
PGHPF_ZMEM = "yes"
General Notes

Binaries were compiled on a system with 2x AMD EPYC 9174F CPU + 1.5TiB Memory using RHEL 8.6

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.

Platform Notes

BIOS Configuration
Workload Profile set to General Peak Frequency Compute
Determinism Control set to Manual
Performance Determinism set to Power Deterministic
AMD SMT Option set to Disabled
Last-Level Cache (LLC) as NUMA Node set to Enabled
ACPI CST C2 Latency set to 18 microseconds
Memory PStates set to Disabled
Thermal Configuration set to Maximum Cooling

The system ROM used for this result contains microcode version 0xa10110e for the AMD EPYC 9nn4X family of processors. The reference code/AGESA version used in this ROM is version GenoaPI 1.0.0.1-L6

Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16aaca64d
running on admin1 Thu Dec  8 23:21:07 2022

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 9334 32-Core Processor
  2 "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 : 32
siblings : 32
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
physical 1: 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

(Continued on next page)
Platform Notes (Continued)

From lscpu from util-linux 2.37.2:

- **Architecture:** x86_64
- **CPU op-mode(s):** 32-bit, 64-bit
- **Address sizes:** 52 bits physical, 57 bits virtual
- **Byte Order:** Little Endian
- **CPU(s):** 64
- **On-line CPU(s) list:** 0-63
- **Vendor ID:** AuthenticAMD
- **Model name:** AMD EPYC 9334 32-Core Processor
- **CPU family:** 25
- **Model:** 17
- **Thread(s) per core:** 1
- **Core(s) per socket:** 32
- **Socket(s):** 2
- **Stepping:** 1
- **Frequency boost:** enabled
- **CPU max MHz:** 3911.0000
- **CPU min MHz:** 400.0000
- **BogoMIPS:** 5391.92
- **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 r apl pni pclmulqdq monitor ssse3 fma cx16 pcid sse4_1 sse4_2 x2apic movbe popcnt aes xsave avx f16c rdrand lahf_lm cmp_legacy svm extapic cr8_legacy abm sse4a misaligndcache 3dnowprefetch osvw ibr skinit wdt tce topoext perfctr_core perfctr_nb bext perfctr_11c mwaitx cpb_cat_13 cpd_13 invpcid_single hw_pstate ssbd mba ibrs ibpb stibp vmmcall fsqgsbase bm1 avx2 smp bsl2 erms invpcid cmq rdt_a avx512f avx512dq rdseed adx smap avx512ifma clflushopt clwb avx512cd sha ni avx512bw avx512vl xsaveopt xsave xgetbv1 xsaveav xsaveavemmm intel_crc32a cmx256 avx2 bmi1 bmi2 invpcid cmq cpuid cmq_cx8 cmq_11c cmq_occupp_11c cmq_mbb_total cmq_mbb_local avx512_bf16 clzero irperf xsave rpr rdpru wbinvd amd_pinn ccpp arat npt lbrv swwm_lock np env tesc_scale vmcb_clean flushbyasid decodeassists pausesfilter pfthreshold avic v_mvsavemload vgif v_spec_ctrl avx512vbmi umip pku ospe avx512_vbmi2 gfin vaes vpcm12ld avx512_vnni avx512_bitalg avx512_vpopcntdq la57 rdpid overflow_recover succor smca fsrm flush_lld

**Virtualization:**

AMD-V

**L1d cache:** 2 MiB (64 instances)

**L1i cache:** 2 MiB (64 instances)

**L2 cache:** 64 MiB (64 instances)

**L3 cache:** 256 MiB (8 instances)

**NUMA node(s):** 8

**NUMA node0 CPU(s):** 0-7

**NUMA node1 CPU(s):** 16-23

**NUMA node2 CPU(s):** 24-31

**NUMA node3 CPU(s):** 8-15

**NUMA node4 CPU(s):** 32-39

**NUMA node5 CPU(s):** 48-55

(Continued on next page)
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CPU2017 License: 3
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Software Availability: Nov-2022

Platform Notes (Continued)

NUMA node6 CPU(s): 56–63
NUMA node7 CPU(s): 40–47
Vulnerability Itlb multihit: Not affected
Vulnerability L1tf: Not affected
Vulnerability Mds: Not affected
Vulnerability Meltdown: Not affected
Vulnerability Mmio stale data: 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; Retpolines, IBPB conditional, IBRS_FW, STIBP disabled, RSB filling
Vulnerability Srbds: Not affected
Vulnerability Tsx async abort: Not affected

From lscpu --cache:
NAME ONE-SIZE ALL-SIZE WAYS TYPE LEVEL SETS PHY-LINE COHERENCY-SIZE
L1d 32K 2M 8 Data 1 64 1 64
L1i 32K 2M 8 Instruction 1 64 1 64
L2 1M 64M 8 Unified 2 2048 1 64
L3 32M 256M 16 Unified 3 32768 1 64

From numactl --hardware
WARNING: a numactl 'node' might or might not correspond to a physical chip.
available: 8 nodes (0-7)
node 0 cpus: 0 1 2 3 4 5 6 7
node 0 size: 193223 MB
node 0 free: 192742 MB
node 1 cpus: 16 17 18 19 20 21 22 23
node 1 size: 193533 MB
node 1 free: 193092 MB
node 2 cpus: 24 25 26 27 28 29 30 31
node 2 size: 193533 MB
node 2 free: 193193 MB
node 3 cpus: 8 9 10 11 12 13 14 15
node 3 size: 193533 MB
node 3 free: 193235 MB
node 4 cpus: 32 33 34 35 36 37 38 39
node 4 size: 193533 MB
node 4 free: 193042 MB
node 5 cpus: 48 49 50 51 52 53 54 55
node 5 size: 193500 MB
node 5 free: 193002 MB

(Continued on next page)
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Platform Notes (Continued)

node 6 cpus: 56 57 58 59 60 61 62 63
node 6 size: 193490 MB
node 6 free: 192812 MB
node 7 cpus: 40 41 42 43 44 45 46 47
node 7 size: 193533 MB
node 7 free: 193050 MB
node distances:

node 0 1 2 3 4 5 6 7
0: 10 11 11 11 32 32 32 32
1: 11 10 11 11 32 32 32 32
2: 11 11 10 11 32 32 32 32
3: 11 11 11 10 32 32 32 32
4: 32 32 32 32 10 11 11 11
5: 32 32 32 32 11 10 11 11
6: 32 32 32 32 11 11 10 11
7: 32 32 32 32 11 11 11 10

From /proc/meminfo

MemTotal: 1585032728 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

/sbin/tuned-adm active

Current active profile: throughput-performance

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

/usr/bin/lsb_release -d

Ubuntu 22.04.1 LTS

From /etc/*release* /etc/*version*

debian_version: bookworm/sid
os-release:

PRETTY_NAME="Ubuntu 22.04.1 LTS"
NAME="Ubuntu"
VERSION_ID="22.04"
VERSION="22.04.1 LTS (Jammy Jellyfish)"
VERSION_CODENAME=jammy
ID=ubuntu
ID_LIKE=debian
HOME_URL="https://www.ubuntu.com/

uname -a:

Linux admin1 5.15.0-43-generic #46-Ubuntu SMP Tue Jul 12 10:30:17 UTC 2022 x86_64
x86_64 x86_64 GNU/Linux

(Continued on next page)
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Platform Notes (Continued)

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
- mmio_stale_data: 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: Retpolines, IBPB: conditional, IBRS_FW, STIBP: disabled, RSB filling

- CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
- CVE-2019-11135 (TSX Asynchronous Abort): Not affected

run-level 5 Jun 28 00:00

SPEC is set to: /home/cpu2017

   Filesystem                      Type  Size  Used Avail Use% Mounted on
   /dev/mapper/ubuntu--vg-ubuntu--lv  ext4   98G  17G  77G  18%  /

From /sys/devices/virtual/dmi/id

   Vendor:       HPE
   Product:      ProLiant DL365 Gen11
   Product Family: ProLiant
   Serial:       DL365G11-003

Additional information from dmidecode 3.3 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:
   24x Hynix HMCG94AEBRA103N 64 GB 2 rank 4800

   BIOS:
   BIOS Vendor:     HPE
   BIOS Version:    1.12
   BIOS Date:       11/24/2022
   BIOS Revision:   1.12
   Firmware Revision: 1.10

(End of data from sysinfo program)
### Compiler Version Notes

<table>
<thead>
<tr>
<th>C</th>
<th>tests</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>619.lbm_s(base, peak)</td>
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AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin

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

**Hewlett Packard Enterprise**
(Test Sponsor: HPE)
ProLiant DL365 Gen11
(2.70 GHz, AMD EPYC 9334)

| SPECspeed®2017_fp_base = 321 |
| SPECspeed®2017_fp_peak = 326 |

**Compiler Version Notes (Continued)**

LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on
LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/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
654.roms_s: -DSPEC_LP64
SPEC CPU®2017 Floating Point Speed Result

Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL365 Gen11
(2.70 GHz, AMD EPYC 9334)

SPECspeed®2017_fp_base = 321
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CPU2017 License: 3
Test Sponsor: HPE
Tested by: HPE

Test Date: Dec-2022
Hardware Availability: Dec-2022
Software Availability: Nov-2022

Base Optimization Flags

C benchmarks:
-m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -fopenmp -flto -fstruct-layout=7
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-fremap-arrays -fstrip-mining -mllvm -reduce-array-computations=3
-DSPEC_OPENMP -zopt -fopenmp=libomp -lomp -lamdlibm -lamdalloc
-llflag

Fortran benchmarks:
-m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-enable-X86-prefetching -DSPEC_OPENMP -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -fopenmp -flto -Mrecursive
-funroll-loops -mllvm -lsr-in-nested-loop
-mllvm -reduce-array-computations=3 -zopt -fopenmp=libomp -lomp
-lamdlibm -lamdalloca -llflag

Benchmarks using both Fortran and C:
-m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-enable-X86-prefetching -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -fopenmp -flto -fstruct-layout=7
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-fremap-arrays -fstrip-mining -mllvm -reduce-array-computations=3
-DSPEC_OPENMP -zopt -Mrecursive -funroll-loops
-mllvm -lsr-in-nested-loop -fopenmp=libomp -lomp -lamdlibm -lamdalloc
-llflag

Benchmarks using Fortran, C, and C++:
-m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -fopenmp -flto -fstruct-layout=7
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-fremap-arrays -fstrip-mining -mllvm -reduce-array-computations=3
-DSPEC_OPENMP -zopt -mllvm -unroll-threshold=100 -finline-aggressive
-mllvm -loop-unswitch-threshold=200000 -Mrecursive -funroll-loops
-mllvm -lsr-in-nested-loop -fopenmp=libomp -lomp -lamdlibm -lamdalloc
-llflag
## Hewlett Packard Enterprise

*ProLiant DL365 Gen11 (2.70 GHz, AMD EPYC 9334)*

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### Base Other Flags

**C benchmarks:**
- `-Wno-return-type`
- `-Wno-unused-command-line-argument`

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

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

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

### 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:**

```plaintext
```

*(Continued on next page)*
Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL365 Gen11
(2.70 GHz, AMD EPYC 9334)

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Peak Optimization Flags (Continued)

619.lbm_s (continued):
-mlvm -reduce-array-computations=3 -DSPEC_OPENMP -zopt
-fopenmp=libomp -lomp -lamdlibm -lamdalloc -lflang

638.imagick_s: Same as 619.lbm_s
644.nab_s: basepeak = yes

Fortran benchmarks:

603.bwaves_s: -m64 -Wl,-mllvvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvvm -Wl,-reduce-array-computations=3
-Wl,-mllvvm -Wl,-enable-X86-prefetching -DSPEC_OPENMP
-Ofast -march=znver4 -fveclib=AMDLIBM -ffast-math
-fopenmp -flto -Mrecursive
-mllvvm -reduce-array-computations=3 -zopt -fopenmp=libomp
-lomp -lamdlibm -lamdalloc -lflang

649.fotonik3d_s: -m64 -Wl,-mllvvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvvm -Wl,-reduce-array-computations=3
-Wl,-mllvvm -Wl,-enable-X86-prefetching -DSPEC_OPENMP
-Ofast -march=znver4 -fveclib=AMDLIBM -ffast-math
-fopenmp -flto -Mrecursive
-mllvvm -reduce-array-computations=3 -zopt -fopenmp=libomp
-lomp -lamdlibm -lamdalloc -lflang

654.roms_s: basepeak = yes

Benchmarks using both Fortran and C:

621.wrf_s: -m64 -Wl,-mllvvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvvm -Wl,-reduce-array-computations=3
-Wl,-mllvvm -Wl,-enable-X86-prefetching -Ofast
-march=znver4 -fveclib=AMDLIBM -ffast-math -fopenmp
-flto -fstruct-layout=9 -mllvvm -unroll-threshold=50
-fremap-arrays -fstrip-mining
-mllvvm -inline-threshold=1000
-mllvvm -reduce-array-computations=3 -DSPEC_OPENMP -zopt
-O3 -Mrecursive -funroll-loops -mllvvm -lsr-in-nested-loop
-fopenmp=libomp -lomp -lamdlibm -lamdalloc -lflang

627.cam4_s: -m64 -Wl,-mllvvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvvm -Wl,-reduce-array-computations=3
-Wl,-mllvvm -Wl,-enable-X86-prefetching -Ofast
-march=znver4 -fveclib=AMDLIBM -ffast-math -fopenmp
-flto -fstruct-layout=9 -mllvvm -unroll-threshold=50

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

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Peak Optimization Flags (Continued)

627.cam4_s (continued):
-fremap-arrays -fstrip-mining
-mlllvm -inlinethreshold=1000
-mlllvm -reduce-array-computations=3 -DSPEC_OPENMP -zopt
-Mrecursive -fopenmp=libomp -lomp -lamdlibm -lamdalloc
-1flang

628.pop2_s_m64 -Wl,-mlllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mlllvm -Wl,-reduce-array-computations=3
-Wl,-mlllvm -Wl,-enable-X86-prefetching -Ofast
-march=znver4 -fveclib=AMDLIBM -ffast-math -fopenmp
-flto -fstruct-layout=9 -mlllvm -unroll-threshold=50
-fremap-arrays -fstrip-mining
-mlllvm -inlinethreshold=1000
-mlllvm -reduce-array-computations=3 -DSPEC_OPENMP -zopt
-Mrecursive -fvec-transform -fscalar-transform
-fopenmp=libomp -lomp -lamdlibm -lamdalloc -1flang

Benchmarks using Fortran, C, and C++:

607.cactuBSSN_s: basepeak = yes

Peak Other Flags

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

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

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

Benchmarks using Fortran, C, and C++:
-Wno-return-type -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-Genoa-rev2.1.html
http://www.spec.org/cpu2017/flags/aocc400-flags.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-AMD-Genoa-rev2.1.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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