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

Hewlett Packard Enterprise  
(Test Sponsor: HPE)  
ProLiant DL345 Gen10 Plus  
(2.00 GHz, AMD EPYC 7713)  

**SPECspeed®2017_fp_base = 163**  
**SPECspeed®2017_fp_peak = 166**

<table>
<thead>
<tr>
<th>Test Date: Mar-2021</th>
<th>Hardware Availability: Apr-2021</th>
<th>Software Availability: Mar-2021</th>
</tr>
</thead>
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<table>
<thead>
<tr>
<th>Threads</th>
<th>SPECspeed®2017_fp_base (163)</th>
<th>SPECspeed®2017_fp_peak (166)</th>
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<tbody>
<tr>
<td>603.bwaves_s</td>
<td>64</td>
<td>269</td>
</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td>64</td>
<td></td>
</tr>
<tr>
<td>619.ibm_s</td>
<td>64</td>
<td>74.2</td>
</tr>
<tr>
<td>621.wrf_s</td>
<td>64</td>
<td>74.7</td>
</tr>
<tr>
<td>627.cam4_s</td>
<td>64</td>
<td>109</td>
</tr>
<tr>
<td>628.pop2_s</td>
<td>64</td>
<td>80.0</td>
</tr>
<tr>
<td>638.imagick_s</td>
<td>64</td>
<td>250</td>
</tr>
<tr>
<td>644.nab_s</td>
<td>64</td>
<td>349</td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>64</td>
<td>75.1</td>
</tr>
<tr>
<td>654.roms_s</td>
<td>64</td>
<td>161</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hardware</th>
<th>Software</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU Name: AMD EPYC 7713</td>
<td>OS: Ubuntu 20.04.1 LTS (x86_64)</td>
</tr>
<tr>
<td>Max MHz: 3675</td>
<td>Kernel 5.4.0-56-generic</td>
</tr>
<tr>
<td>Nominal: 2000</td>
<td>Compiler: C/C++/Fortran: Version 3.0.0 of AOCC</td>
</tr>
<tr>
<td>Enabled: 64 cores, 1 chip, 2 threads/core</td>
<td>Parallel: Yes</td>
</tr>
<tr>
<td>Orderable: 1 chip</td>
<td>Firmware: HPE BIOS Version A43 v2.40 02/15/2021 released Feb-2021</td>
</tr>
<tr>
<td>Cache L1: 32 KB I + 32 KB D on chip per core</td>
<td>File System: ext4</td>
</tr>
<tr>
<td>L2: 512 KB I+D on chip per core</td>
<td>System State: Run level 5 (multi-user)</td>
</tr>
<tr>
<td>L3: 256 MB I+D on chip per chip, 32 MB shared / 8 cores</td>
<td>Base Pointers: 64-bit</td>
</tr>
<tr>
<td>Other: None</td>
<td>Peak Pointers: 64-bit</td>
</tr>
<tr>
<td>Memory: 1 TB (8 x 128 GB 4Rx4 PC4-3200AA-L)</td>
<td>Other: jemalloc: jemalloc memory allocator library v5.1.0</td>
</tr>
<tr>
<td>Storage: 4 x 480 GB SAS SSD, RAID 0</td>
<td>Power Management: BIOS set to prefer performance at the cost of additional power usage</td>
</tr>
<tr>
<td>Other: None</td>
<td></td>
</tr>
</tbody>
</table>

Copyright 2017-2021 Standard Performance Evaluation Corporation
## Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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<tr>
<td>607.cactuBSSN_s</td>
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<td>62.2</td>
<td>268</td>
<td>61.9</td>
<td>269</td>
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<td>62.2</td>
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<td>61.9</td>
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<td>70.5</td>
<td>74.3</td>
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<td>70.3</td>
<td>74.6</td>
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<tr>
<td>621.wrf_s</td>
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<td>69.5</td>
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<td>71.3</td>
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<td>64</td>
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<td>627.cam4_s</td>
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<td>81.5</td>
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<td>81.4</td>
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<td>81.4</td>
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<td>628.pop2_s</td>
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<td>79.8</td>
<td>64</td>
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<tr>
<td>638.imagick_s</td>
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<td>349</td>
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<td>349</td>
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<td>75.3</td>
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<td>97.7</td>
<td>161</td>
<td>64</td>
<td>89.5</td>
<td>176</td>
</tr>
</tbody>
</table>

**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,
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**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 = "0-127"
LD_LIBRARY_PATH =
"/home/SPEC_CPU2017/cpu2017/amd_speed_aocc300_milan_B_lib/64;/home/SPEC_CPU2017/cpu2017/amd_speed_aocc300_milan_B_lib/32:" MALLOC_CONF = "retain:true"
OMP_DYNAMIC = "false"
OMP_SCHEDULE = "static"
OMP_STACKSIZE = "128M"
OMP_THREAD_LIMIT = "128"

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 644.nab_s peak run:
GOMP_CPU_AFFINITY = "0 64 1 65 2 66 3 67 4 68 5 69 6 70 7 71 8 72 9 73 10 74 11 75 12 76 13 77 14 78 15 79 16 80 17 81 18 82 19 83 20 84 21 85 22 86 23 87 24 88 25 89 26 90 27 91 28 92 29 93 30 94 31 95 32 96 33 97 34 98 35 99 36 100 37 101 38 102 39 103 40 104 41 105 42 106 43 107 44 108 45 109 46 110 47 111 48 112 49 113 50 114 51 115 52 116 53 117 54 118 55 119 56 120 57 121 58 122 59 123 60 124 61 125 62 126 63 127"

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 7742 CPU + 1TiB Memory using openSUSE 15.2

(Continued on next page)
Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL345 Gen10 Plus
(2.00 GHz, AMD EPYC 7713)

SPECspeed®2017_fp_base = 163
SPECspeed®2017_fp_peak = 166

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

General Notes (Continued)

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

Platform Notes

BIOS Configuration
Workload Profile set to General Peak Frequency Compute
Determinism Control set to Manual
Performance Determinism set to Power Deterministic
Last-Level Cache (LLC) as NUMA Node set to Enabled
NUMA memory domains per socket set to One memory domain per socket
Thermal Configuration set to Maximum Cooling
Workload Profile set to Custom
Infinity Fabric Power Management set to Disabled
Infinity Fabric Performance State set to P0
Power Regulator set to OS Control Mode

Sysinfo program /home/SPEC_CPU2017/cpu2017/bin/sysinfo
Rev: r6538 of 2020-09-24 e8664e66d2d7080afeaa89d4b38e2f1c
running on admin Thu Apr 2 02:12:17 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 7713 64-Core Processor
  1 "physical id"s (chips)
  128 "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 : 128
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:

(Continued on next page)
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### Hewlett Packard Enterprise

**ProLiant DL345 Gen10 Plus**

(2.00 GHz, AMD EPYC 7713)

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<td>Apr-2021</td>
</tr>
<tr>
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<td>Mar-2021</td>
</tr>
</tbody>
</table>

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### Platform Notes (Continued)

- **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):** 128
- **On-line CPU(s) list:** 0–127
- **Thread(s) per core:** 2
- **Core(s) per socket:** 64
- **Socket(s):** 1
- **NUMA node(s):** 8
- **Vendor ID:** AuthenticAMD
- **CPU family:** 25
- **Model:** 1
- **Model name:** AMD EPYC 7713 64-Core Processor
- **Stepping:** 1
- **Frequency boost:** enabled
- **CPU MHz:** 1895.938
- **CPU max MHz:** 2000.0000
- **CPU min MHz:** 1500.0000
- **BogoMIPS:** 3992.55
- **Virtualization:** AMD-V
- **L1d cache:** 2 MiB
- **L1i cache:** 2 MiB
- **L2 cache:** 32 MiB
- **L3 cache:** 256 MiB
- **NUMA node0 CPU(s):** 0–7, 64–71
- **NUMA node1 CPU(s):** 8–15, 72–79
- **NUMA node2 CPU(s):** 16–23, 80–87
- **NUMA node3 CPU(s):** 24–31, 88–95
- **NUMA node4 CPU(s):** 32–39, 96–103
- **NUMA node5 CPU(s):** 40–47, 104–111
- **NUMA node6 CPU(s):** 48–55, 112–119
- **NUMA node7 CPU(s):** 56–63, 120–127
- **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, IBFB conditional, IBRS_FW, STIBP always-on, RSB filling
- **Vulnerability Srbds:** 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

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

Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL345 Gen10 Plus
(2.00 GHz, AMD EPYC 7713)

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

SPECspeed®2017_fp_base = 163
SPECspeed®2017_fp_peak = 166

Test Date: Mar-2021
Hardware Availability: Apr-2021
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Platform Notes (Continued)

pdpe1gb rdtscp lm constant_tsc rep_good nop1 nonstop_tsc cpuid extd_apicid
aperfmpref perfctr_core perfctr_nb
bpxext perfctr_llc mwaitx cpb cat_13 cdp_13 invpcid_single hw_pstate ssbd mba ibrs
ibpb stibp vmcall fsgsbase bmi1 avx2 smep bmi2 invpcid cqm rdt_a rdseed adx smap
clfushopt clwb sha ni xsaveopt xsaves xgetbv1 xsaves cqm_llc cqm_occup_llc
cq_mmb_total cqm_mmb_local clzero irperf xsaveerptr wbnoinvd arat npt lbv svm_lock
nrip_save tsc_scale vmcb_clean flushbyasid decodeassist pfthreshold
v_vmsave_vmload vgif umip pku ospe 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 1 2 3 4 5 6 7 64 65 66 67 68 69 70 71
  node 0 size: 128750 MB
  node 0 free: 128304 MB
  node 1 cpus: 8 9 10 11 12 13 14 15 72 73 74 75 76 77 78 79
  node 1 size: 129020 MB
  node 1 free: 128520 MB
  node 2 cpus: 16 17 18 19 20 21 22 23 80 81 82 83 84 85 86 87
  node 2 size: 129020 MB
  node 2 free: 128816 MB
  node 3 cpus: 24 25 26 27 28 29 30 31 88 89 90 91 92 93 94 95
  node 3 size: 129020 MB
  node 3 free: 128774 MB
  node 4 cpus: 32 33 34 35 36 37 38 39 96 97 98 99 100 101 102 103
  node 4 size: 129020 MB
  node 4 free: 128840 MB
  node 5 cpus: 40 41 42 43 44 45 46 47 104 105 106 107 108 109 110 111
  node 5 size: 129020 MB
  node 5 free: 128804 MB
  node 6 cpus: 48 49 50 51 52 53 54 55 112 113 114 115 116 117 118 119
  node 6 size: 129020 MB
  node 6 free: 128832 MB
  node 7 cpus: 56 57 58 59 60 61 62 63 120 121 122 123 124 125 126 127
  node 7 size: 116906 MB
  node 7 free: 116746 MB
  node distances:
    node 0 1 2 3 4 5 6 7
    0: 10 11 11 11 11 11 11 11
    1: 11 10 11 11 11 11 11 11
    2: 11 11 10 11 11 11 11 11
    3: 11 11 11 10 11 11 11 11

(Continued on next page)
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Platform Notes (Continued)

4: 11 11 11 11 10 11 11 11
5: 11 11 11 11 11 10 11 11
7: 11 11 11 11 11 11 11 10

From /proc/meminfo
MemTotal: 1044253840 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

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

/usr/bin/lsb_release -d
Ubuntu 20.04.1 LTS

From /etc/*release* /etc/*version*
debian_version: bullseye/sid
os-release:
  NAME="Ubuntu"
  VERSION="20.04.1 LTS (Focal Fossa)"
  ID=ubuntu
  ID_LIKE=debian
  PRETTY_NAME="Ubuntu 20.04.1 LTS"
  VERSION_ID="20.04"
  HOME_URL="https://www.ubuntu.com/"
  SUPPORT_URL="https://help.ubuntu.com/"

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/swaps barriers and __user pointer sanitization
CVE-2017-5753 (Spectre variant 1): Mitigation: Full AMD retpoline, IBPB: conditional, IBRS_FW, STIBP: always-on, RSB filling
CVE-2017-5715 (Spectre variant 2):
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Platform Notes (Continued)

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

run-level 5 Apr 1 17:23

SPEC is set to: /home/SPEC_CPU2017/cpu2017
Filesystem Type Size Used Avail Use% Mounted on
/dev/mapper/ubuntu--vg-ubuntu--lv ext4 196G 81G 106G 44% /

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

Additional information from dmidecode follows. WARNING: Use caution when you interpret this section. The 'dmidecode' program reads system data which is "intended to allow hardware to be accurately determined", but the intent may not be met, as there are frequent changes to hardware, firmware, and the "DMTF SMBIOS" standard.
Memory:
8x UNKNOWN M386AAG40AM3-CWE 128 GB 4 rank 3200
8x UNKNOWN NOT AVAILABLE

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

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
<table>
<thead>
<tr>
<th>C</th>
<th>619.lbm_s(base, peak) 638.imagick_s(base, peak) 644.nab_s(base, peak)</th>
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<tr>
<td>AMD clang version 12.0.0 (CLANG: AOCC_3.0.0-Build#78 2020_12_10) (based on LLVM Mirror.Version.12.0.0)</td>
<td></td>
</tr>
<tr>
<td>Target: x86_64-unknown-linux-gnu</td>
<td>Thread model: posix</td>
</tr>
<tr>
<td>InstalledDir: /opt/AMD/aocc-compiler-3.0.0/bin</td>
<td></td>
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Compiler Version Notes (Continued)

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)
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

Fortran | 603.bwaves_s(base, peak) 649.fotonik3d_s(base, peak) 654.roms_s(base, peak)

AMD clang version 12.0.0 (CLANG: AOCC_3.0.0-Build#78 2020_12_10) (based on LLVM Mirror.Version.12.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.0.0/bin

Fortran, C | 621.wrf_s(base, peak) 627.cam4_s(base, peak) 628.pop2_s(base, peak)

AMD clang version 12.0.0 (CLANG: AOCC_3.0.0-Build#78 2020_12_10) (based on LLVM Mirror.Version.12.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.0.0/bin
AMD clang version 12.0.0 (CLANG: AOCC_3.0.0-Build#78 2020_12_10) (based on LLVM Mirror.Version.12.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.0.0/bin
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
(2.00 GHz, AMD EPYC 7713)

SPECspeed®2017_fp_base = 163
SPECspeed®2017_fp_peak = 166

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

Base Optimization Flags

C benchmarks:
-m64 -mno-adx -mno-sse4a -Wl,-mllvm -Wl,-region-vectorize
-Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -O3 -march=zni
-fvecclib=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 -lamdlibm -ljemalloc
-lflang -lflangrti

Fortran benchmarks:
-m64 -mno-adx -mno-sse4a -Wl,-mllvm -Wl,-enable-X86-prefetching

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

Fortran benchmarks (continued):
- W1,-mllvm -Wl,-enable-licm-vrp -Wl,-mllvm -Wl,-region-vectorize
- W1,-mllvm -Wl,-function-specialize
- W1,-mllvm -Wl,-align-all-nofallback-blocks=6
- W1,-mllvm -Wl,-reduce-array-computations=3 -Hz,1,0x1 -O3
- march=znver3 -fveclib=AMDLIBM -ffast-math -Mrecursive
- mllvm -fFuse-tile-inner-loop -funroll-loops
- mllvm -extra-vectorizer-passes -mllvm -lsr-in-nested-loop
- mllvm -global-vectorize-slp=true -z muldefs -DSPEC_OPENMP -fopenmp
-fopenmp=libomp -lomp -laml librml -ljemalloc -lflang -lflangrti

Benchmarks using both Fortran and C:
- m64 -mno-adx -mno-sse4a -Wl,-mllvm -Wl,-enable-X86-prefetching
- W1,-mllvm -Wl,-enable-licm-vrp -Wl,-mllvm -Wl,-region-vectorize
- W1,-mllvm -Wl,-function-specialize
- W1,-mllvm -Wl,-align-all-nofallback-blocks=6
- W1,-mllvm -Wl,-reduce-array-computations=3 -O3 -march=znver3
- fveclib=AMDLIBM -ffast-math -flto -fstruct-layout=5
- mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
- fremap-arrays -mllvm -function-specialize -flv-function-specialization
- mllvm -enable-gvn-hoist -mllvm -global-vectorize-slp=true
- mllvm -enable-licm-vrp -mllvm -reduce-array-computations=3 -Hz,1,0x1
- Mrecursive -mllvm -fFuse-tile-inner-loop -funroll-loops
- mllvm -extra-vectorizer-passes -mllvm -lsr-in-nested-loop -z muldefs
- DSPEC_OpenMP -fopenmp -fopenmp=libomp -lomp -laml librml -ljemalloc
- lflang -lflangrti

Benchmarks using Fortran, C, and C++:
- m64 -mno-adx -mno-sse4a -std=c++98
- Wl,-mllvm -Wl,-x86-use-vzeroupper=false
- Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-function-specialize
- Wl,-mllvm -Wl,-align-all-nofallback-blocks=6
- Wl,-mllvm -Wl,-reduce-array-computations=3 -O3 -march=znver3
- fveclib=AMDLIBM -ffast-math -flto -fstruct-layout=5
- mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
- fremap-arrays -mllvm -function-specialize -flv-function-specialization
- mllvm -enable-gvn-hoist -mllvm -global-vectorize-slp=true
- mllvm -enable-licm-vrp -mllvm -reduce-array-computations=3
- mllvm -enable-partial-unswitch -mllvm -unroll-threshold=100
- finline-aggressive -mllvm -loop-unswitch-threshold=200000
- mllvm -reroll-loops -mllvm -aggressive-loop-unswitch
- mllvm -extra-vectorizer-passes -mllvm -convert-pow-exp-to-int=false
- Hz,1,0x1 -Mrecursive -mllvm -fFuse-tile-inner-loop -funroll-loops
- mllvm -lsr-in-nested-loop -z muldefs -DSPEC_OPENMP -fopenmp
-fopenmp=libomp -lomp -laml librml -ljemalloc -lflang -lflangrti
Hewlett Packard Enterprise  
ProLiant DL345 Gen10 Plus  
(2.00 GHz, AMD EPYC 7713)  

| SPECspeed®2017_fp_base = 163 |
| SPECspeed®2017_fp_peak = 166 |

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

- `619.lbm_s: -m64 -mno-adx -mno-sse4a`
- `-Wl,-mllvm -Wl,-function-specialize`
- `-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6`
- `-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast`
- `-march=znver3 -fveclib=AMDLIBM -ffast-math -flto`
- `-fstruct-layout=5 -mllvm -unroll-threshold=50`

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Peak Optimization Flags (Continued)

619.lbm_s (continued):
-ffreemap-arrays -flv-function-specialization
-mlir -inline-threshold=1000 -mlir -enable-gvn-hoist
-mlir -global-vectorize-slp=true
-mlir -function-specialize -mlir -enable-licm-vrp
-mlir -reduce-array-computations=3 -DSPEC_OPENMP -fopenmp
-fopenmp=libomp -lomp -lamdlibm -ljemalloc -lfflang

638.imagick_s: basepeak = yes

644.nab_s: -m64 -mno-adx -mno-sse4a -Wl,-mlir -Wl,-region-vectorize
-Wl,-mlir -Wl,-function-specialize -Ofast -march=zner3
-fveclib=AMDLIBM -ffast-math -flto -fstruct-layout=5
-mlir -unroll-threshold=50 -fremap-arrays
-flv-function-specialization -mlir -inline-threshold=1000
-mlir -enable-gvn-hoist -mlir -global-vectorize-slp=true
-mlir -function-specialize -mlir -enable-licm-vrp
-mlir -reduce-array-computations=3 -DSPEC_OPENMP -fopenmp
-fopenmp=libomp -lomp -lamdlibm -ljemalloc -lfflang

Fortran benchmarks:

603.bwaves_s: basepeak = yes

649.fotonik3d_s: basepeak = yes

654.roms_s: -m64 -mno-adx -mno-sse4a
-Wl,-mlir -Wl,-enable-X86-prefetching
-Wl,-mlir -Wl,-enable-licm-vrp
-Wl,-mlir -Wl,-function-specialize
-Wl,-mlir -Wl,-align-all-nofallthru-blocks=6
-Wl,-mlir -Wl,-reduce-array-computations=3 -Ofast
-march=zner3 -fveclib=AMDLIBM -ffast-math -Mrecursive
-mlir -reduce-array-computations=3
-mlir -global-vectorize-slp=true -mlir -enable-licm-vrp
-DSPEC_OPENMP -fopenmp -fopenmp=libomp -lomp -lamdlibm
-ljemalloc -lfflang

Benchmarks using both Fortran and C:

621.wrf_s: -m64 -mno-adx -mno-sse4a
-Wl,-mlir -Wl,-enable-X86-prefetching
-Wl,-mlir -Wl,-enable-licm-vrp
-Wl,-mlir -Wl,-function-specialize
-Wl,-mlir -Wl,-align-all-nofallthru-blocks=6
-Wl,-mlir -Wl,-reduce-array-computations=3 -Ofast

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Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL345 Gen10 Plus
(2.00 GHz, AMD EPYC 7713)

SPECspeed®2017_fp_base = 163
SPECspeed®2017_fp_peak = 166

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

Peak Optimization Flags (Continued)

621.wrf_s (continued):
-march=znver3 -fveclib=AMDLIBM -ffast-math -flto
-fstruct-layout=5 -mllvm -unroll-threshold=50
-fremap-arrays -flv-function-specialization
-mllvm -inline-threshold=1000 -mllvm -enable-gvn-hoist
-mllvm -global-vectorize-slp=true
-mllvm -function-specialize -mllvm -enable-licm-vrp
-mllvm -reduce-array-computations=3 -Hz,1,0x1 -O3
-Mrecursive -mllvm -fuse-tile-inner-loop -funroll-loops
-mllvm -extra-vectorizer-passes -mllvm -lsr-in-nested-loop
-DSPEC_OPENMP -fopenmp -fopenmp=libomp -lomp -lamdlibm
-ljemalloc -lflang

627.cam4_s: -m64 -mno-adx -mno-sse4a
-Wl,-mllvm -Wl, -enable-X86-prefetching
-Wl,-mllvm -Wl, -enable-licm-vrp
-Wl,-mllvm -Wl, -function-specialize
-Wl,-mllvm -Wl, -align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl, -reduce-array-computations=3 -Ofast
-march=znver3 -fveclib=AMDLIBM -ffast-math -flto
-fstruct-layout=5 -mllvm -unroll-threshold=50
-fremap-arrays -flv-function-specialization
-mllvm -inline-threshold=1000 -mllvm -enable-gvn-hoist
-mllvm -global-vectorize-slp=true
-mllvm -function-specialize -mllvm -enable-licm-vrp
-mllvm -reduce-array-computations=3 -Mrecursive
-DSPEC_OPENMP -fopenmp -fopenmp=libomp -lomp -lamdlibm
-ljemalloc -lflang

628.pop2_s: basepeak = yes

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

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Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL345 Gen10 Plus
(2.00 GHz, AMD EPYC 7713)

SPECspeed®2017_fp_base = 163
SPECspeed®2017_fp_peak = 166

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

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

Peak Other Flags (Continued)

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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