SPEC CPU®2017 Floating Point Speed Result

Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL365 Gen10 Plus
(2.60 GHz, AMD EPYC 7513)

SPECspeed®2017_fp_base = 208
SPECspeed®2017_fp_peak = 215

Hardware

<table>
<thead>
<tr>
<th>Threads</th>
<th>SPECspeed®2017_fp_base (208)</th>
</tr>
</thead>
<tbody>
<tr>
<td>603.bwaves_s 64</td>
<td>128</td>
</tr>
<tr>
<td>607.cactuBSSN_s 64</td>
<td>123</td>
</tr>
<tr>
<td>619.ibm_s 64</td>
<td>182</td>
</tr>
<tr>
<td>621.wrf_s 64</td>
<td>155</td>
</tr>
<tr>
<td>627.cam4_s 64</td>
<td>63.9</td>
</tr>
<tr>
<td>628.pop2_s 64</td>
<td>298</td>
</tr>
<tr>
<td>638.imagick_s 64</td>
<td>415</td>
</tr>
<tr>
<td>644.nab_s 64</td>
<td>108</td>
</tr>
<tr>
<td>649.fotonik3d_s 64</td>
<td>221</td>
</tr>
<tr>
<td>654.roms_s 64</td>
<td>249</td>
</tr>
</tbody>
</table>

Software

- OS: Ubuntu 20.04.1 LTS (x86_64)
- Compiler: C/C++/Fortran: Version 3.0.0 of AOCC
- Parallel: Yes
- Firmware: HPE BIOS Version A42 v2.42 04/29/2021 released Apr-2021
- File System: ext4
- System State: Run level 5 (multi-user)
- Base Pointers: 64-bit
- Peak Pointers: 64-bit
- Power Management: BIOS set to prefer performance at the cost of additional power usage

CPU Name: AMD EPYC 7513
Max MHz: 3650
Nominal: 26000
Enabled: 64 cores, 2 chips, 2 threads/core
Orderable: 1.2 chip(s)
Cache L1: 32 KB I + 32 KB D on chip per core
L2: 512 KB I+D on chip per core
L3: 128 MB I+D on chip per chip, 32 MB shared / 8 cores
Other: None
Memory: 2 TB (16 x 128 GB 4Rx4 PC4-3200AA-L)
Storage: 1 x 196 GB SATA SSD, RAID 0
Other: None
Hewlett Packard Enterprise
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SPECspeed®2017_fp_base = 208
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Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<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>88.0</td>
<td>671</td>
<td>88.2</td>
<td>669</td>
<td>88.1</td>
<td>670</td>
<td>128</td>
<td>87.6</td>
<td>673</td>
<td>87.6</td>
<td>674</td>
<td>87.3</td>
</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td>64</td>
<td>49.3</td>
<td>338</td>
<td>49.3</td>
<td>338</td>
<td>49.3</td>
<td>338</td>
<td>64</td>
<td>49.4</td>
<td>337</td>
<td>49.1</td>
<td>339</td>
<td>49.3</td>
</tr>
<tr>
<td>619.lbm_s</td>
<td>64</td>
<td>43.1</td>
<td>122</td>
<td>42.0</td>
<td>125</td>
<td>42.5</td>
<td>123</td>
<td>64</td>
<td>43.1</td>
<td>122</td>
<td>42.0</td>
<td>125</td>
<td>42.5</td>
</tr>
<tr>
<td>621.wrf_s</td>
<td>64</td>
<td>71.5</td>
<td>185</td>
<td>73.4</td>
<td>180</td>
<td>72.6</td>
<td>182</td>
<td>64</td>
<td>71.5</td>
<td>185</td>
<td>73.4</td>
<td>180</td>
<td>72.6</td>
</tr>
<tr>
<td>627.cam4_s</td>
<td>64</td>
<td>57.0</td>
<td>155</td>
<td>56.6</td>
<td>157</td>
<td>57.1</td>
<td>155</td>
<td>64</td>
<td>57.0</td>
<td>155</td>
<td>56.6</td>
<td>157</td>
<td>57.1</td>
</tr>
<tr>
<td>628.pop2_s</td>
<td>64</td>
<td>192</td>
<td>61.8</td>
<td>172</td>
<td>69.1</td>
<td>186</td>
<td>63.9</td>
<td>64</td>
<td>192</td>
<td>61.8</td>
<td>172</td>
<td>69.1</td>
<td>186</td>
</tr>
<tr>
<td>638.imagick_s</td>
<td>64</td>
<td>48.5</td>
<td>298</td>
<td>48.4</td>
<td>298</td>
<td>48.5</td>
<td>298</td>
<td>64</td>
<td>48.5</td>
<td>298</td>
<td>48.4</td>
<td>298</td>
<td>48.5</td>
</tr>
<tr>
<td>644.nab_s</td>
<td>64</td>
<td>42.1</td>
<td>415</td>
<td>42.0</td>
<td>416</td>
<td>42.1</td>
<td>415</td>
<td>128</td>
<td>38.6</td>
<td>453</td>
<td>38.7</td>
<td>451</td>
<td>38.7</td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>64</td>
<td>85.4</td>
<td>107</td>
<td>84.4</td>
<td>108</td>
<td>83.9</td>
<td>109</td>
<td>64</td>
<td>85.4</td>
<td>107</td>
<td>84.4</td>
<td>108</td>
<td>83.9</td>
</tr>
<tr>
<td>654.roms_s</td>
<td>64</td>
<td>70.7</td>
<td>223</td>
<td>71.5</td>
<td>220</td>
<td>71.1</td>
<td>221</td>
<td>64</td>
<td>56.2</td>
<td>280</td>
<td>56.4</td>
<td>279</td>
<td>56.4</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
'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.
Operating System Notes (Continued)

To enable Transparent Hugepages (THP) for all allocations,  
'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/amd_speed_aocc300_milan_B_lib/64;/home/SPEC_CPU2017/  
amd_speed_aocc300_milan_B_lib/32:"
MALLOCPROF = "true"
OMP_DYNAMIC = "false"
OMP_SCHEDULE = "static"
OMP_STACKSIZE = "128M"
OMP_THREAD_LIMIT = "128"

Environment variables set by runcpu during the 603.bwaves_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 13 14 76 15 77 16 78 17 18 19 79 20 80 81 82 83 84 85 86 87 88 89  
90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111  
112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127"

Environment variables set by runcpu during the 607.cactuBSSN_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 13 14 76 15 77 16 78 17 18 19 79 20 80 81 82 83 84 85 86 87 88 89  
90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111  
112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127"

Environment variables set by runcpu during the 654.roms_s peak run:
GOMP_CPU_AFFINITY = "0-63"
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CPU2017 License: 3
Test Sponsor: HPE
Tested by: HPE

General Notes

Binaries were compiled on a system with 2x AMD EPYC 7742 CPU + 1TiB Memory using openSUSE 15.2
NA: The test sponsor attests, as of date of publication, that CVE-2017-5754 (Meltdown) is mitigated in the system as tested and documented.
Yes: The test sponsor attests, as of date of publication, that CVE-2017-5753 (Spectre variant 1) is mitigated in the system as tested and documented.
Yes: The test sponsor attests, as of date of publication, that CVE-2017-5715 (Spectre variant 2) is mitigated in the system as tested and documented.
jemalloc: configured and built with GCC v4.8.2 in RHEL 7.4 (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 Aug 16 13:17:56 EDT 2021
Submission: cpu2017-20210816-28732.sub

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
Infinity Fabric Power Management set to Disabled
Infinity Fabric Performance State set to P0
Workload Profile set to Custom
Power Regulator set to OS Control Mode

Sysinfo program /home/SPEC_CPU2017/bin/sysinfo
Rev: r6538 of 2020-09-24 e8664e66d2d7080afeaa89d4b38e2f1c
running on admin Wed Apr 1 21:21:10 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 7513 32-Core Processor
  2 "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.)

(Continued on next page)
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Platform Notes (Continued)

cpu cores : 32
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
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

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): 128
On-line CPU(s) list: 0-127
Thread(s) per core: 2
Core(s) per socket: 32
Socket(s): 2
NUMA node(s): 8
Vendor ID: AuthenticAMD
CPU family: 25
Model: 1
Model name: AMD EPYC 7513 32-Core Processor
Stepping: 1
Frequency boost: enabled
CPU MHz: 1847.141
CPU max MHz: 2600.0000
CPU min MHz: 1500.0000
BogoMIPS: 5190.44
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

(Continued on next page)
Platform Notes (Continued)

Vulnerability Spectre v1: Mitigation; usercopy/swapgs barriers and __user pointer sanitization
Vulnerability Spectre v2: Mitigation; Full AMD retpoline, IBF 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 pdelgib rdtscp lm constant_tsc rep_good nopl nonstop_tsc cpuid extd_apicid aperfmperf pni pclmulqdq monitor ssse3 fma cx16 pcid sse4_1 sse4_2 movbe popcnt aes xsave avx f16c rdrand lahf_lm cmp_legacy svm extatic cr8_legacy abm sse4a misalignsse 3nowprefetch osuw ibs skinit wdt tce topoext perfctr_core perfctr_nb b Apex perfctr_llc mwaitx cpb cat_l3 cd p_l3 invpcid_single hw_pstate ssbd mba ibrs ibpb stibp vmmcall fsgsbase bm11 avx2 smep bmi2 invpcid cq q rd_t_a rdseed adx smap clflushopt clwb sha_x saveopt xsavvec xgetbvl xsavec q cm q_mmb_total q_mmb_local clzero iperf xsaverptr wboinvd arat npt lbv svm lock nrip_sav e tsc_scale vmbc_clean flushbyasid decodeassists pausefilter pthreshold v_vmsave_vmload vglif umip pk u ospke va p vclmulqdq rdfpid overflow_recover succor smca

/proc/cpuinfo cache data

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: 257797 MB
node 0 free: 257492 MB
node 1 cpus: 8 9 10 11 12 13 14 15 72 73 74 75 76 77 78 79
node 1 size: 258044 MB
node 1 free: 257823 MB
node 2 cpus: 16 17 18 19 20 21 22 23 80 81 82 83 84 85 86 87
node 2 size: 258020 MB
node 2 free: 257772 MB
node 3 cpus: 24 25 26 27 28 29 30 31 88 89 90 91 92 93 94 95
node 3 size: 245933 MB
node 3 free: 245503 MB
node 4 cpus: 32 33 34 35 36 37 38 39 96 97 98 99 100 101 102 103
node 4 size: 258044 MB
node 4 free: 257683 MB
node 5 cpus: 40 41 42 43 44 45 46 47 104 105 106 107 108 109 110 111
node 5 size: 258044 MB
node 5 free: 257832 MB
node 6 cpus: 48 49 50 51 52 53 54 55 112 113 114 115 116 117 118 119
node 6 size: 258044 MB
node 6 free: 257840 MB
node 7 cpus: 56 57 58 59 60 61 62 63 120 121 122 123 124 125 126 127
node 7 size: 258044 MB
node 7 free: 257840 MB
Hewlett Packard Enterprise
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SPECspeed®2017_fp_base = 208
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CPU2017 License: 3
Test Sponsor: HPE
Tested by: HPE
Test Date: Jun-2021
Hardware Availability: Mar-2021
Software Availability: Mar-2021

Platform Notes (Continued)

node 7 size: 258041 MB
node 7 free: 257834 MB
node distances:
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:       2101216624 kB
HugePages_Total:       0
Hugepagesize:       2048 kB
/sbin/tuned-adm active
Current active profile: balanced
/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

(Continued on next page)
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Platform Notes (Continued)

Microarchitectural Data Sampling:
CVE-2017-5754 (Meltdown):
CVE-2018-3639 (Speculative Store Bypass):
CVE-2017-5753 (Spectre variant 1):
CVE-2017-5715 (Spectre variant 2):
CVE-2020-0543 (Special Register Buffer Data Sampling):
CVE-2019-11135 (TSX Asynchronous Abort):

Not affected
Not affected
Mitigation: Speculative Store Bypass disabled via prctl and seccomp
Mitigation: usercopy/swaps barrier and __user pointer sanitation
Mitigation: Full AMD retpoline, IBPB: conditional, IBRS_FW, STIBP: always-on, RSB filling
Not affected

run-level 5 Apr 1 17:24

SPEC is set to: /home/SPEC_CPU2017
Filesystem                        Type  Size  Used Avail Use% Mounted on
/dev/mapper/ubuntu--vg-ubuntu--lv ext4  196G   42G  145G  23% /

From /sys/devices/virtual/dmi/id
Vendor:         HPE
Product:        ProLiant DL365 Gen10 Plus
Product Family: ProLiant
Serial:         CN70430NKR

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:
16x Samsung M386AAG40AM3-CWE 128 GB 4 rank 3200
16x UNKNOWN NOT AVAILABLE

BIOS:
BIOS Vendor:     HPE
BIOS Version:    A42
BIOS Date:       04/29/2021
BIOS Revision:   2.42
Firmware Revision: 2.42

(End of data from sysinfo program)
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SPECspeed®2017_fp_base = 208

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

---

**Compiler Version Notes**

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C

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

---

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

---

C++, C, Fortran

| 607.cactuBSSN_s(base, peak) |

---

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

---

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

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

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

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 Gen10 Plus
(2.60 GHz, AMD EPYC 7513)

SPECspeed®2017_fp_base = 208
SPECspeed®2017_fp_peak = 215

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

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

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=znver3
- 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-lcm-vrp -mllvm -reduce-array-computations=3 -z muldefs
- DSPEC_OPENMP -fopenmp -fopenmp=libomp -lomp -lamdlibm -ljemalloc
- lflang -lflangr1t

Fortran benchmarks:
- m64 -mno-adx -mno-sse4a -Wl,-mllvm -Wl,-enable-X86-prefetching
- Wl,-mllvm -Wl,-enable-lcm-vrp -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 -Hz,1,0x1 -O3
- march=znver3 -fveclib=AMDLIBM -ffast-math -Mrecursive
- mllvm -fuse-tile-inner-loop -funroll-loops
- mllvm -extra-vectorizer-passes -mllvm -lsr-in-nested-loop
- mllvm -enable-lcm-vrp -mllvm -reduce-array-computations=3
- mllvm -global-vectorize-slp=true -z muldefs -DSPEC_OPENMP -fopenmp
- fopenmp=libomp -lomp -lamdlibm -ljemalloc -lflang -lflangrt1

Benchmarks using both Fortran and C:
- m64 -mno-adx -mno-sse4a -Wl,-mllvm -Wl,-enable-X86-prefetching
- Wl,-mllvm -Wl,-enable-lcm-vrp -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=znver3
- fveclib=AMDLIBM -ffast-math -flto -fstruct-layout=5
- mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
- freemap-arrays -mllvm -function-specialize -flv-function-specialization
- mllvm -enable-gvn-hoist -mllvm -global-vectorize-slp=true
- mllvm -enable-lcm-vrp -mllvm -reduce-array-computations=3 -Hz,1,0x1
- Mrecursive -mllvm -fuse-tile-inner-loop -funroll-loops
- mllvm -extra-vectorizer-passes -mllvm -lsr-in-nested-loop -z muldefs
- DSPEC_OPENMP -fopenmp -fopenmp=libomp -lomp -lamdlibm -ljemalloc
- lflang -lflangrt1

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

(Continued on next page)
Hewlett Packard Enterprise  
ProLiant DL365 Gen10 Plus  
(2.60 GHz, AMD EPYC 7513)

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

**Base Optimization Flags (Continued):**

Benchmarks using Fortran, C, and C++ (continued):

- `-Wl,-mlllvm -Wl,-align-all-nofallthru-blocks=6`
- `-Wl,-mlllvm -Wl,-reduce-array-computations=3 -O3 -march=znver3`
- `-fveclib=AMDLIBM -ffast-math -flto -fstruct-layout=5`
- `-mlllvm -unroll-threshold=50 -mlllvm -inline-threshold=1000`
- `-fremap-arrays -mlllvm -function-specialize -flv-function-specialization`
- `-mlllvm -enable-gvn-hoist -mlllvm -global-vectorize-slp=true`
- `-mlllvm -enable-licm-vrp -mlllvm -reduce-array-computations=3`
- `-mlllvm -enable-partial-unswitch -mlllvm -unroll-threshold=100`
- `-finline-aggressive -mlllvm -loop-unswitch-threshold=200000`
- `-mlllvm -reroll-loops -mlllvm -aggressive-loop-unswitch`
- `-mlllvm -extra-vectorizer-passes -mlllvm -convert-pow-exp-to-int=false`
- `-Hz,1,0x1 -Mrecursive -mlllvm -fuse-tile-inner-loop -funroll-loops`
- `-mlllvm -lsr-in-nested-loop -z muldefs -DSPEC_OPENMP -fopenmp`
- `-fopenmp=libomp -lomp -lamdlibm -ljemalloc -lflang -lflangrti`

**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`

(Continued on next page)
Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL365 Gen10 Plus
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CPU2017 License: 3
Test Sponsor: HPE
Tested by: HPE

Peak Compiler Invocation (Continued)

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
638.imagick_s: basepeak = yes
644.nab_s: -m64 -mno-adx -mno-sse4a -Wl,-ml1vm -Wl,-region-vectorize
-W1,-ml1vm -Wl,-function-specialize -Ofast -march=znver3
-fveclib=AMDLIBM -ffast-math -flto -fstruct-layout=5
-ml1vm -unroll-threshold=50 -fremap-arrays
-flv-function-specialization -ml1vm -inline-threshold=1000
-ml1vm -enable-gvn-hoist -ml1vm -global-vectorize-slp=true
-ml1vm -function-specialize -ml1vm -enable-licm-vrp
-ml1vm -reduce-array-computations=3 -DSPEC_OPENMP -fopenmp
-fopenmp=libomp -lomp -ldl -ljemalloc -lflang

Fortran benchmarks:
603.bwaves_s: -m64 -mno-adx -mno-sse4a
-W1,-ml1vm -Wl,-enable-X86-prefetching
-W1,-ml1vm -Wl,-enable-licm-vrp
-W1,-ml1vm -Wl,-function-specialize
-W1,-ml1vm -Wl,-align-all-nofallthru-blocks=6
-W1,-ml1vm -Wl,-reduce-array-computations=3 -Ofast
-march=znver3 -fveclib=AMDLIBM -ffast-math -Mrecursive
-ml1vm -reduce-array-computations=3
-ml1vm -global-vectorize-slp=true -ml1vm -enable-licm-vrp
-DSPEC_OPENMP -fopenmp -fopenmp=libomp -lomp -ldl -ljemalloc -lflang
649.fotonik3d_s: basepeak = yes

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

654.roms_s: Same as 603.bwaves_s

Benchmarks using both Fortran and C:

621.wrf_s: basepeak = yes
627.cam4_s: basepeak = yes
628.pop2_s: basepeak = yes

Benchmarks using Fortran, C, and C++:

- -m64 -mno-adx -mno-sse4a -std=c++98
- -Wl,-mllvm -Wl,-x86-use-vzeroupper=false -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
- -Wl, -mveclib=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
- -finline-aggressive -mllvm -unroll-threshold=100 -mllvm -reroll-loops
- -mllvm -aggressive-loop-unswitch -Mrecursive -DSPEC_OPENMP -fopenmp
- -fopenmp=libomp -lomp -lamlibm -ljemalloc -lflang

Peak Other Flags

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

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

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

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

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-AMD-V1.2-EPYC-revQ.html
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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-revQ.xml](http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-AMD-V1.2-EPYC-revQ.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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