## SPEC CPU®2017 Floating Point Rate Result

**Hewlett Packard Enterprise**  
(Test Sponsor: HPE)  
ProLiant DL365 Gen10 Plus  
(2.80 GHz, AMD EPYC 7543)

### SPECrate®2017_fp_base = 529  
SPECrate®2017_fp_peak = 539

<table>
<thead>
<tr>
<th>CPU2017 License:</th>
<th>3</th>
<th>Test Date:</th>
<th>Mar-2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Sponsor:</td>
<td>HPE</td>
<td>Hardware Availability:</td>
<td>Apr-2021</td>
</tr>
<tr>
<td>Tested by:</td>
<td>HPE</td>
<td>Software Availability:</td>
<td>Mar-2021</td>
</tr>
</tbody>
</table>

### Hardware

- **CPU Name:** AMD EPYC 7543  
  - **Max MHZ:** 3700  
  - **Nominal:** 2800  
  - **Enabled:** 64 cores, 2 chips, 2 threads/core  
  - **Orderable:** 1, 2 chips  
  - **Cache L1:** 32 KB I + 32 KB D on chip per core  
  - **L2:** 512 KB I+D on chip per core  
  - **L3:** 256 MB I+D on chip per chip, 32 MB shared / 4 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

### Software

- **OS:** Ubuntu 20.04.1 LTS (x86_64)  
  - Kernel 5.4.0-56-generic  
- **Compiler:** C/C++/Fortran: Version 3.0.0 of AOCC  
- **Parallel:** No  
- **Firmware:** HPE BIOS Version A42 v2.40 02/23/2021 released Feb-2021  
- **File System:** ext4  
- **System State:** Run level 5 (multi-user)  
- **Base Pointers:** 64-bit  
- **Peak Pointers:** 64-bit  
- **Other:** jemalloc: jemalloc memory allocator library v5.1.0  
- **Power Management:** BIOS set to prefer performance at the cost of additional power usage

### Copies

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>SPECrate®2017_fp_base</th>
<th>SPECrate®2017_fp_peak</th>
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<tbody>
<tr>
<td>503.bwaves_r</td>
<td>128</td>
<td>680</td>
<td>790</td>
</tr>
<tr>
<td>507.caCTuBSSN_r</td>
<td>128</td>
<td>399</td>
<td>490</td>
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<td>508.namd_r</td>
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<td>510.parest_r</td>
<td>128</td>
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<td>623</td>
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<tr>
<td>527.cam4_r</td>
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<td>579</td>
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<tr>
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<tr>
<td>544.nab_r</td>
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<td>785</td>
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<td>549.fotonik3d_r</td>
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<tr>
<td>554.roms_r</td>
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</table>

**SPECrate®2017_fp_base (529) --- SPECrate®2017_fp_peak (539)**
## Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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<tr>
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<td>368</td>
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<td><strong>369</strong></td>
<td><strong>276</strong></td>
</tr>
</tbody>
</table>

**SPECrate®2017_fp_base = 529**

**SPECrate®2017_fp_peak = 539**

Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

## Compiler Notes

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

## Submit Notes

The config file option 'submit' was used.

'numactl' was used to bind copies to the cores.

See the configuration file for details.

## Operating System Notes

'ulimit -s unlimited' was used to set environment stack size limit

'ulimit -l 2097152' was used to set environment locked pages in memory limit

runcpu command invoked through numactl i.e.:

numactl --interleave=all runcpu <etc>

'echo 8 > /proc/sys/vm/dirty_ratio' run as root to limit dirty cache to 8% of memory.

'echo 1 > /proc/sys/vm/swappiness' run as root to limit swap usage to minimum necessary.

'echo 1 > /proc/sys/vm/zone_reclaim_mode' run as root to free node-local memory and avoid remote memory usage.

'sync; echo 3 > /proc/sys/vm/drop_caches' run as root to reset filesystem caches.

(Continued on next page)
## Operating System Notes (Continued)

'sysctl -w kernel.randomize_va_space=0' run as root to disable address space layout randomization (ASLR) to reduce run-to-run variability.

To enable Transparent Hugepages (THP) for all allocations,

'echo always > /sys/kernel/mm/transparent_hugepage/always' 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/always' 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/always' run as root.

## Environment Variables Notes

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

<table>
<thead>
<tr>
<th>Environment Variable</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>LD_LIBRARY_PATH</code></td>
<td>&quot;/home/cpu2017n/amd_rate_aocc300_milan_A_lib/64;/home/cpu2017n/amd_rate_aocc300_milan_A_lib/32:&quot;</td>
</tr>
<tr>
<td><code>MALLOC_CONF</code></td>
<td>&quot;retain:true&quot;</td>
</tr>
</tbody>
</table>

## General Notes

Binaries were compiled on a system with 2x AMD EPYC 7742 CPU + 512GiB Memory using OpenSUSE 15.2

NA: The test sponsor attests, as of date of publication, that CVE-2017-5754 (Meltdown) is mitigated in the system as tested and documented.

Yes: The test sponsor attests, as of date of publication, that CVE-2017-5753 (Spectre variant 1) is mitigated in the system as tested and documented.

Yes: The test sponsor attests, as of date of publication, that CVE-2017-5715 (Spectre variant 2) is mitigated in the system as tested and documented.

jemalloc: configured and built with GCC v4.8.2 in RHEL 7.4 (No options specified)

jemalloc 5.1.0 is available here:

https://github.com/jemalloc/jemalloc/releases/download/5.1.0/jemalloc-5.1.0.tar.bz2

## Platform Notes

**BIOS Configuration**

Workload Profile set to General Throughput Compute

Thermal Configuration set to Maximum Cooling

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 Four memory domains per socket

Data Fabric C-State Enable set to Force Enabled

Workload Profile set to Custom

(Continued on next page)
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ProLiant DL365 Gen10 Plus
(2.80 GHz, AMD EPYC 7543)

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

SPECrate®2017_fp_base = 529
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Test Date: Mar-2021
Hardware Availability: Apr-2021
Software Availability: Mar-2021

Platform Notes (Continued)

L1 HW Prefetcher set to Disabled

Sysinfo program /home/cpu2017n/bin/sysinfo
Rev: r6538 of 2020-09-24 e8664e66d2d7080afeaa89d4b38e2f1c
running on admin Wed Apr 1 17:27:08 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 7543 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.)
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): 16
Vendor ID: AuthenticAMD
CPU family: 25
Model: 1
Model name: AMD EPYC 7543 32-Core Processor
Stepping: 1
Frequency boost: enabled
CPU MHz: 1796.512
CPU max MHz: 2800.0000
CPU min MHz: 1500.0000
BogoMIPS: 5589.57
Virtualization: AMD-V
L1d cache: 2 MiB
L1i cache: 2 MiB

(Continued on next page)
Platform Notes (Continued)

L2 cache: 32 MiB
L3 cache: 512 MiB
NUMA node0 CPU(s): 0-3, 64-67
NUMA node1 CPU(s): 4-7, 68-71
NUMA node2 CPU(s): 8-11, 72-75
NUMA node3 CPU(s): 12-15, 76-79
NUMA node4 CPU(s): 16-19, 80-83
NUMA node5 CPU(s): 20-23, 84-87
NUMA node6 CPU(s): 24-27, 88-91
NUMA node7 CPU(s): 28-31, 92-95
NUMA node8 CPU(s): 32-35, 96-99
NUMA node9 CPU(s): 36-39, 100-103
NUMA node10 CPU(s): 40-43, 104-107
NUMA node11 CPU(s): 44-47, 108-111
NUMA node12 CPU(s): 48-51, 112-115
NUMA node13 CPU(s): 52-55, 116-119
NUMA node14 CPU(s): 56-59, 120-123
NUMA node15 CPU(s): 60-63, 124-127
Vulnerability Itlb multihit: Not affected
Vulnerability L1tf: Not affected
Vulnerability Mds: Not affected
Vulnerability Meltdown: Not affected
Vulnerability Spectre v1: Mitigation; usercopy/swapgs barriers and __user pointer sanitization
Vulnerability Spectre v2: Mitigation; Full AMD retpoline, IBPB conditional, IBRS_FW, STIBP always-on, RSB filling
Vulnerability Srbds: Not affected
Vulnerability Txs async abort: Not affected
Flags: fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36 clflush mmx fxsr sse sse2 ht syscall nx mmxext fxsr_opt pdpe1gb rdtsscp lm constant_tsc rep_good nopl nonstop_tsc cpuid extd_apicid aperfmperf pni pclmulqdq monitor ssse3 fma cx16 pcid sse3_1 sse4_1 movebe popcnt aes xsave avx f16c rdrand lahf_lm cmp_legacy svm extapic cr8_legacy abm sse4a misalignnes 3dnowprefetch osvw ibr skinit wdt tce topoext perfctr_core perfctr_nb bpret perfctr_llc mwaitx cpb cat_13 cdp_13 invpcid_single hw_pstate ssbd mba ibrs ibpb stibp vmcall fsqsgbase bni avx2 smep bni2 invpcid cqm rdt_a rseed adx smap clflushopt clwb sha_ni xsaveopt xsave xsavec xgetbv1 xsaves cqml lcc cqmmoccup_llc cqm_mbb_total cqm_mbb_local clzero irperf xsaveerpr wbnoinvd arat npt lbv svm_lock nrip_save tsc_scale vmcb_clean flushbyasid decodeassistss puseqfilter pffsetting v_vmsave_vmload vgif umip pkx ospke veas vpcm vmlqdq rdpid overflow_recov succor smca

From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a
Hewlett Packard Enterprise
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Platform Notes (Continued)

physical chip.
    available: 16 nodes (0-15)
    node 0 cpus: 0 1 2 3 64 65 66 67
    node 0 size: 128776 MB
    node 0 free: 128611 MB
    node 1 cpus: 4 5 6 7 68 69 70 71
    node 1 size: 129020 MB
    node 1 free: 128857 MB
    node 2 cpus: 8 9 10 11 72 73 74 75
    node 2 size: 129022 MB
    node 2 free: 128847 MB
    node 3 cpus: 12 13 14 15 76 77 78 79
    node 3 size: 129021 MB
    node 3 free: 128824 MB
    node 4 cpus: 16 17 18 19 80 81 82 83
    node 4 size: 129022 MB
    node 4 free: 128814 MB
    node 5 cpus: 20 21 22 23 84 85 86 87
    node 5 size: 129021 MB
    node 5 free: 128767 MB
    node 6 cpus: 24 25 26 27 88 89 90 91
    node 6 size: 128997 MB
    node 6 free: 128847 MB
    node 7 cpus: 28 29 30 31 92 93 94 95
    node 7 size: 129009 MB
    node 7 free: 128855 MB
    node 8 cpus: 32 33 34 35 96 97 98 99
    node 8 size: 129022 MB
    node 8 free: 128898 MB
    node 9 cpus: 36 37 38 39 100 101 102 103
    node 9 size: 129021 MB
    node 9 free: 128899 MB
    node 10 cpus: 40 41 42 43 104 105 106 107
    node 10 size: 129022 MB
    node 10 free: 128896 MB
    node 11 cpus: 44 45 46 47 108 109 110 111
    node 11 size: 129021 MB
    node 11 free: 128898 MB
    node 12 cpus: 48 49 50 51 112 113 114 115
    node 12 size: 129022 MB
    node 12 free: 128896 MB
    node 13 cpus: 52 53 54 55 116 117 118 119
    node 13 size: 129021 MB
    node 13 free: 128898 MB
    node 14 cpus: 56 57 58 59 120 121 122 123
    node 14 size: 129022 MB
    node 14 free: 128893 MB

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Platform Notes (Continued)

node 15 cpus: 60 61 62 63 124 125 126 127
node 15 size: 129019 MB
node 15 free: 128890 MB
node distances:
node   0   1   2   3   4   5   6   7   8   9  10  11  12  13  14  15
0:  10  11  12  12  12  12  12  12  32  32  32  32  32  32  32  32
1:  11  10  12  12  12  12  12  12  32  32  32  32  32  32  32  32
2:  12  12  11  10  12  12  12  12  32  32  32  32  32  32  32  32
3:  12  12  11  10  12  12  12  12  32  32  32  32  32  32  32  32
4:  12  12  12  12  10  11  12  12  32  32  32  32  32  32  32  32
5:  12  12  12  12  11  10  12  12  32  32  32  32  32  32  32  32
6:  12  12  12  12  12  10  11  12  32  32  32  32  32  32  32  32
7:  12  12  12  12  12  12  11  10  32  32  32  32  32  32  32  32
8:  32  32  32  32  32  32  32  32  10  11  12  12  12  12  12  12
9:  32  32  32  32  32  32  32  32  11  10  12  12  12  12  12  12
10: 32  32  32  32  32  32  32  32  12  10  11  12  12  12  12  12
11: 32  32  32  32  32  32  32  32  12  12  11  10  12  12  12  12
12: 32  32  32  32  32  32  32  32  12  12  12  12  11  10  12  12
13: 32  32  32  32  32  32  32  32  12  12  12  12  11  10  12  12
14: 32  32  32  32  32  32  32  32  12  12  12  12  11  10  12  12
15: 32  32  32  32  32  32  32  32  12  12  12  12  11  10  12  12

From /proc/meminfo
MemTotal:       2113598740 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/"

(Continued on next page)
Platform Notes (Continued)

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

run-level 5 Apr 1 17:24
SPEC is set to: /home/cpu2017n

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

BIOS:
BIOS Vendor: HPE
BIOS Version: A42
BIOS Date: 02/23/2021

(Continued on next page)
Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL365 Gen10 Plus
(2.80 GHz, AMD EPYC 7543)

SPEC CPU®2017 Floating Point Rate Result

Copyright 2017-2021 Standard Performance Evaluation Corporation

SPECrater®2017_fp_base = 529
SPECrater®2017_fp_peak = 539

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

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

Platform Notes (Continued)

BIOS Revision: 2.40
Firmware Revision: 2.40

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
<p>| C               | 519.lbm_r(base, peak) 538.imagick_r(base, peak) 544.nab_r(base, peak) |
|----------------------------|
| AMD clang version 12.0.0 (CLANG: AOCC_3.0.0-Build#78 2020_12_10) (based on |
| LLVM Mirror.Version.12.0.0) |
| Target: x86_64-unknown-linux-gnu |
| Thread model: posix |</p>
<table>
<thead>
<tr>
<th>InstalledDir: /opt/AMD/aocc-compiler-3.0.0/bin</th>
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</thead>
<tbody>
<tr>
<td>C++</td>
</tr>
<tr>
<td>----------------------------------------------------------------------------</td>
</tr>
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<td>AMD clang version 12.0.0 (CLANG: AOCC_3.0.0-Build#78 2020_12_10) (based on</td>
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<td>InstalledDir: /opt/AMD/aocc-compiler-3.0.0/bin</td>
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<td>----------------------------------------------------------------------------</td>
</tr>
<tr>
<td>C++, C, Fortran</td>
</tr>
<tr>
<td>---------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>

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

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

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

Fortran         | 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak) 554.roms_r(base, peak)
==============================================================================
Fortran, C      | 521.wrf_r(base, peak) 527.cam4_r(base, peak)
==============================================================================

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

AMD clang version 12.0.0 (CLANG: AOCC_3.0.0-Build#78 2020_12_10) (based on LLVM Mirror.Version.12.0.0)
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Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL365 Gen10 Plus
(2.80 GHz, AMD EPYC 7543)

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

SPECrater®2017_fp_base = 529
SPECrater®2017_fp_peak = 539

CPU2017 License: 3
Test Sponsor: HPE
Test Date: Mar-2021
Tested by: HPE
Hardware Availability: Apr-2021
Software Availability: Mar-2021
Hewlett Packard Enterprise
ProLiant DL365 Gen10 Plus
(2.80 GHz, AMD EPYC 7543)

SPEC CPU®2017 Floating Point Rate Result

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SPECrate®2017_fp_base = 529
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Base Compiler Invocation

C benchmarks:
clang

C++ benchmarks:
clang++

Fortran benchmarks:
flang

Benchmarks using both Fortran and C:
flang clang

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

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

Base Portability Flags

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

Base Optimization Flags

C benchmarks:
-m64 -flto -Wl,-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 -ffast-math
-march=znver3 -fveclib=AMDLIBM -fstruct-layout=5

(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

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SPECrate®2017_fp_base = 529
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Test Date: Mar-2021
Hardware Availability: Apr-2021
Software Availability: Mar-2021

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

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

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

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

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

Benchmarks using both Fortran and C (continued):
-mlir -extra-vectorizer-passes -mlir -lsr-in-nested-loop -z muldefs
-landlibm -ljemalloc -lflang -lflangrti

Benchmarks using both C and C++:
-m64 -std=c++98 -mno-adx -mno-sse4a
-Wl,-mlir -Wl,-x86-use-vzeroupper=false -flto
-Wl,-mlir -Wl,-region-vectorize -Wl,-mlir -Wl,-function-specialize
-Wl,-mlir -Wl,-align-nofallthru-blocks=6
-Wl,-mlir -Wl,-reduce-array-computations=3 -O3 -ffast-math
-march=znver3 -fveclib=AMDLIBM -fstruct-layout=5
-mlir -unroll-threshold=50 -mlir -inline-threshold=1000
-freemap-arrays -mlir -function-specialize -fiv-function-specialization
-mlir -enable-gvn-hoist -mlir -global-vectorize-slp=true
-mlir -enable-licm-vrp -mlir -reduce-array-computations=3
-mlir -enable-partial-unswitch -mlir -unroll-threshold=100
-finline-aggressive -mlir -loop-unswitch-threshold=200000
-mlir -reroil-loops -mlir -aggressive-loop-unswitch
-mlir -extra-vectorizer-passes -mlir -convert-pow-exp-to-int=false
-z muldefs -landlibm -ljemalloc -lflang -lflangrti

Benchmarks using Fortran, C, and C++:
-m64 -std=c++98 -mno-adx -mno-sse4a
-Wl,-mlir -Wl,-x86-use-vzeroupper=false -flto
-Wl,-mlir -Wl,-region-vectorize -Wl,-mlir -Wl,-function-specialize
-Wl,-mlir -Wl,-align-nofallthru-blocks=6
-Wl,-mlir -Wl,-reduce-array-computations=3 -O3 -ffast-math
-march=znver3 -fveclib=AMDLIBM -fstruct-layout=5
-mlir -unroll-threshold=50 -mlir -inline-threshold=1000
-freemap-arrays -mlir -function-specialize -fiv-function-specialization
-mlir -enable-gvn-hoist -mlir -global-vectorize-slp=true
-mlir -enable-licm-vrp -mlir -reduce-array-computations=3
-mlir -enable-partial-unswitch -mlir -unroll-threshold=100
-finline-aggressive -mlir -loop-unswitch-threshold=200000
-mlir -reroil-loops -mlir -aggressive-loop-unswitch
-mlir -extra-vectorizer-passes -mlir -convert-pow-exp-to-int=false
-z muldefs -landlibm -ljemalloc -lflang -lflangrti

Base Other Flags

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

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

Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL365 Gen10 Plus
(2.80 GHz, AMD EPYC 7543)

SPECrater®2017_fp_base = 529
SPECrater®2017_fp_peak = 539

<table>
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<tr>
<th>CPU2017 License: 3</th>
<th>Test Date: Mar-2021</th>
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<tr>
<td>Test Sponsor: HPE</td>
<td>Hardware Availability: Apr-2021</td>
</tr>
<tr>
<td>Tested by: HPE</td>
<td>Software Availability: Mar-2021</td>
</tr>
</tbody>
</table>

---

**Base Other Flags (Continued)**

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

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

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

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

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

---

**Peak Compiler Invocation**

C benchmarks:
- `clang`

C++ benchmarks:
- `clang++`

Fortran benchmarks:
- `flang`

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

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

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

---

**Peak Portability Flags**

Same as Base Portability Flags
Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL365 Gen10 Plus
(2.80 GHz, AMD EPYC 7543)

SPECrate®2017_fp_base = 529
SPECrate®2017_fp_peak = 539

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

Peak Optimization Flags

C benchmarks:
519.lbm_r: -m64 -flto -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast
-march=znver3 -fveclib=AMDLIBM -fstruct-layout=7
-mllvm -unroll-threshold=50 -fremap-arrays
-flv-function-specialization -mllvm -inline-threshold=1000
-mllvm -enable-gvn- hoist -mllvm -global-vectorize-slp=true
-mllvm -function-specialize -mllvm -enable-licm-vrp
-mllvm -reduce-array-computations=3 -lamdlibm -ljemalloc

538.imagick_r: Same as 519.lbm_r

544.nab_r: -m64 -flto -Wl,-mllvm -Wl,-function-specialize -Ofast -march=znver3
-fveclib=AMDLIBM -fstruct-layout=7
-mllvm -unroll-threshold=50 -fremap-arrays
-flv-function-specialization -mllvm -inline-threshold=1000
-mllvm -enable-gvn- hoist -mllvm -global-vectorize-slp=true
-mllvm -function-specialize -mllvm -enable-licm-vrp
-mllvm -reduce-array-computations=3 -lamdlibm -ljemalloc

C++ benchmarks:
508.namd_r: basepeak = yes
510.parest_r: basepeak = yes

Fortran benchmarks:
503.bwaves_r: -m64 -Wl,-mllvm -Wl,-enable-X86-prefetching
-Wl,-mllvm -Wl,-enable-licm-vrp -flto
-Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast
-march=znver3 -fveclib=AMDLIBM -Mrecursive
-mllvm -reduce-array-computations=3
-mllvm -global-vectorize-slp=true -mllvm -enable-licm-vrp
-lamdlibm -ljemalloc -lflang -lflangrti

549.fotonik3d_r: Same as 503.bwaves_r

554.roms_r: -m64 -Wl,-mllvm -Wl,-enable-X86-prefetching
-Wl,-mllvm -Wl,-enable-licm-vrp -flto
-Wl,-mllvm -Wl,-function-specialize

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

554.roms_r (continued):
-     -Wl,-mllvm -Wl, -align-all-nofallthru-blocks=6
-     -Wl,-mllvm -Wl, -reduce-array-computations=3 -Ofast
-     -march=znver3 -fveclib=AMDLIBM -Kieee -Mrecursive
-     -mllvm -reduce-array-computations=3
-     -mllvm -global-vectorize-slp=true -mllvm -enable-licm-vrp
-     -Hz,i,0x1 -mllvm -fuse-tile-inner-loop -lamlbmlm
-     -ljemalloc -lflang -lflangrti

Benchmarks using both Fortran and C:

521.wrf_r: -m64 -Wl,-mllvm -Wl, -enable-X86-prefetching
-     -Wl,-mllvm -Wl, -enable-licm-vrp -flto
-     -Wl,-mllvm -Wl, -function-specialize
-     -Wl,-mllvm -Wl, -align-all-nofallthru-blocks=6
-     -Wl,-mllvm -Wl, -reduce-array-computations=3 -Ofast
-     -march=znver3 -fveclib=AMDLIBM -fstruct-layout=7
-     -mllvm -unroll-threshold=50 -fremap-arrays
-     -flv-function-specialization -mllvm -inline-threshold=1000
-     -mllvm -enable-gvn-hoist -mllvm -global-vectorize-slp=true
-     -mllvm -function-specialize -mllvm -enable-licm-vrp
-     -mllvm -reduce-array-computations=3 -Kieee -Mrecursive
-     -lamlbmlm -ljemalloc -lflang -lflangrti

527.cam4_r: -m64 -Wl,-mllvm -Wl, -enable-X86-prefetching
-     -Wl,-mllvm -Wl, -enable-licm-vrp -flto
-     -Wl,-mllvm -Wl, -function-specialize
-     -Wl,-mllvm -Wl, -force-vector-interleave=1 -Ofast
-     -march=znver3 -fveclib=AMDLIBM -fstruct-layout=7
-     -mllvm -unroll-threshold=50 -fremap-arrays
-     -flv-function-specialization -mllvm -inline-threshold=1000
-     -mllvm -enable-gvn-hoist -mllvm -global-vectorize-slp=true
-     -mllvm -function-specialize -mllvm -enable-licm-vrp
-     -mllvm -reduce-array-computations=3 -Ofast -ffast-math
-     -funroll-loops -mllvm -extra-vectorizer-passes
-     -mllvm -lsr-in-nested-loop -Mrecursive -lamlbmlm
-     -ljemalloc -lflang -lflangrti

Benchmarks using both C and C++:

511.povray_r: -m64 -std=c++98 -mno-adx -mno-sse4a
-     -Wl,-mllvm -Wl, -x86-use-vzeroupper=false
-     -Wl,-mllvm -Wl, -enable-licm-vrp -flto
-     -Wl,-mllvm -Wl, -function-specialize
-     -Wl,-mllvm -Wl, -align-all-nofallthru-blocks=6
-     -Wl,-mllvm -Wl, -reduce-array-computations=3 -Ofast

(Continued on next page)
Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL365 Gen10 Plus
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SPECrate®2017_fp_base = 529
SPECrate®2017_fp_peak = 539
CPU2017 License: 3
Test Sponsor: HPE
Tested by: HPE

Peak Optimization Flags (Continued)

511.povray_r (continued):
-march=znver3 -fveclib=AMDLIBM -fstruct-layout=7
-mlirvm -unroll-threshold=50 -fremap-arrays
-flv-function-specialization -mlirvm -inline-threshold=1000
-mlirvm -enable-gvn-hoist -mlirvm -global-vectorize-slp=true
-mlirvm -function-specialize -mlirvm -enable-licm-vrp
-mlirvm -reduce-array-computations=3 -finline-aggressive
-mlirvm -unroll-threshold=100 -mlirvm -reroll-loops
-mlirvm -aggressive-loop-unswitch -lamdlibm -ljemalloc

526.blender_r: basepeak = yes

Benchmarks using Fortran, C, and C++:
-std=c++98 -mno-adx -mno-sse4a
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -Wl,-mllvm -Wl,-enable-licm-vrp
-llto -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast -march=znver3
-fveclib=AMDLIBM -fstruct-layout=7 -mlirvm -unroll-threshold=50
-fremap-arrays -flv-function-specialization
-mlirvm -inline-threshold=1000 -mlirvm -enable-gvn-hoist
-mlirvm -global-vectorize-slp=true -mlirvm -function-specialize
-mlirvm -enable-licm-vrp -mlirvm -reduce-array-computations=3
-mlirvm -unroll-threshold=100 -mlirvm -loop-unswitch-threshold=20000
-finline-aggressive -mlirvm -reroll-loops
-mlirvm -aggressive-loop-unswitch -mlirvm -extra-vectorizer-passes

Peak Other Flags

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

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

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

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

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

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

Peak Other Flags (Continued)

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

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

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

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-AMD-V1.2-EPYC-revP.xml

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For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

Tested with SPEC CPU®2017 v1.1.5 on 2020-04-01 13:27:08-0400.
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