### SPEC CPU®2017 Floating Point Speed Result

**Hewlett Packard Enterprise**  
(Test Sponsor: HPE)  
ProLiant DL385 Gen10  
(2.50 GHz, AMD EPYC 7502)

| Threads | 0 | 30.0 | 60.0 | 90.0 | 120 | 150 | 180 | 210 | 240 | 270 | 300 | 330 | 360 | 390 | 420 | 450 | 480 | 510 | 540 | 570 |
|---------|---|------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 603.bwaves_s | 64 | 261 |
| 607.cactuBSSN_s | 64 | 55.6 |
| 619.lbm_s | 64 | 128 |
| 621.wrf_s | 64 | 147 |
| 627.cam4_s | 64 | 53.8 |
| 628.pop2_s | 64 | 189 |
| 638.imagick_s | 64 | 86.5 |
| 644.nab_s | 64 | 305 |
| 649.fotonik3d_s | 64 | 230 |
| 654.roms_s | 64 | SPECspeed®2017_fp_base (157) |

#### Hardware

- **CPU Name:** AMD EPYC 7502  
- **Max MHz:** 3350  
- **Nominal:** 2500  
- **Enabled:** 64 cores, 2 chips  
- **Orderable:** 1, 2 chip(s)  
- **Cache L1:** 32 KB I + 32 KB D on chip per core  
- **Cache L2:** 512 KB I+D on chip per core  
- **Cache L3:** 128 MB I+D on chip per chip,  
  16 MB shared / 4 cores  
- **Other:** None  
- **Memory:** 1 TB (16 x 64 GB 4Rx4 PC4-2933Y-L)  
- **Storage:** 1 x 400 GB SAS SSD, RAID 0  
- **Other:** None

#### Software

- **OS:** SUSE Linux Enterprise Server 15 (x86_64) SP1  
  Kernel 4.12.14-195-default  
- **Compiler:** C/C++: Version 1.3.0 of AOCC  
  Fortran: Version 4.8.2 of GCC  
- **Parallel:** Yes  
- **Firmware:** HPE BIOS Version A40 07/20/2019 released Oct-2019  
- **File System:** xfs  
- **System State:** Run level 3 (multi-user)  
- **Base Pointers:** 64-bit  
- **Peak Pointers:** Not Applicable  
- **Other:** jemalloc: jemalloc memory allocator library v5.1.0;  
- **Power Management:** --
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(2.50 GHz, AMD EPYC 7502)

SPECspeed®2017_fp_base = 157
SPECspeed®2017_fp_peak = Not Run

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

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

Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>603.bwaves_s</td>
<td>64</td>
<td>104</td>
<td>565</td>
<td>105</td>
<td>560</td>
<td>105</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td>64</td>
<td>63.9</td>
<td>261</td>
<td>64.5</td>
<td>259</td>
<td>64.0</td>
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<tr>
<td>619.lbm_s</td>
<td>64</td>
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<td>55.8</td>
<td>94.1</td>
<td>55.6</td>
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<tr>
<td>621.wrf_s</td>
<td>64</td>
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<td>104</td>
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<tr>
<td>627.cam4_s</td>
<td>64</td>
<td>60.1</td>
<td>147</td>
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<td>147</td>
<td>60.1</td>
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<tr>
<td>628.pop2_s</td>
<td>64</td>
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<td>53.3</td>
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<td>53.8</td>
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<tr>
<td>638.imagick_s</td>
<td>64</td>
<td>76.2</td>
<td>189</td>
<td>76.4</td>
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<td>76.6</td>
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<tr>
<td>644.nab_s</td>
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<td>57.4</td>
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<tr>
<td>649.fotonik3d_s</td>
<td>64</td>
<td>105</td>
<td>86.7</td>
<td>106</td>
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<tr>
<td>654.roms_s</td>
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<td>71.5</td>
<td>220</td>
<td>71.5</td>
<td></td>
<td></td>
<td></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/
The AOCC Fortran Plugin version 1.3.0 was used to leverage AOCC optimizers with gfortran. It is available here: 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
runspec command invoked through numactl i.e.:
numactl --interleave=all runspec <etc>
Set dirty_ratio=8 to limit dirty cache to 8% of memory
Set swappiness=1 to swap only if necessary
Set zone_reclaim_mode=1 to free local node memory and avoid remote memory sync then drop_caches=3 to reset caches before invoking runcpu

(Continued on next page)
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SPECspeed®2017_fp_base = 157
SPECspeed®2017_fp_peak = Not Run

Operating System Notes (Continued)

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

Transparent huge pages set to 'always' for this run (OS default)

General Notes

Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH = "/home/cpu2017/amd_speed_aocc130_naples_A_lib/64; /home/cpu2017/amd_speed_aocc130_naples_A_lib/32:"
OMP_DYNAMIC = "false"
OMP_PLACES = "cores"
OMP_PROC_BIND = "close"
OMP_SCHEDULE = "static"
OMP_STACKSIZE = "192M"
OMP_WAIT_POLICY = "active"

Binaries were compiled on a system with 2p AMD EPYC 7601 CPU + 512GB Memory using RHEL 7.6

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.
jemalloc: configured and built with GCC v9.1.0 in Ubuntu 19.04 with -O3 -znver2 -flto
jemalloc 5.1.0 is available here: https://github.com/jemalloc/jemalloc/releases/download/5.1.0/jemalloc-5.1.0.tar.bz2

Platform Notes

BIOS Configuration
 Thermal Configuration set to Maximum Cooling
 SMT Mode set to Disabled
 Determinism Control set to Manual
 Performance Determinism set to Power Deterministic
 Minimum Processor Idle Power core C-State set to C6 State
 Memory Patrol Scrubbing set to Disabled
 Workload Profile set to General Peak Frequency Compute
 NUMA memory domains per socket set to One memory domains per socket
 Sysinfo program /home/cpu2017/bin/sysinfo
 Rev: r5974 of 2018-05-19 9bcede8f2999c33d61f64985e45859ea9
 running on dl385gen10-rome-32c Thu Feb 14 12:35:31 2019

(Continued on next page)
Platform Notes (Continued)

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 7502 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

From lscpu:
  Architecture:        x86_64
  CPU op-mode(s):      32-bit, 64-bit
  Byte Order:          Little Endian
  Address sizes:       48 bits physical, 48 bits virtual
  CPU(s):              64
  On-line CPU(s) list: 0-63
  Thread(s) per core:  1
  Core(s) per socket:  32
  Socket(s):           2
  NUMA node(s):        2
  Vendor ID:           AuthenticAMD
  CPU family:          23
  Model:               49
  Model name:          AMD EPYC 7502 32-Core Processor
  Stepping:            0
  CPU MHz:             2500.000
  CPU max MHz:         2500.0000
  CPU min MHz:         1500.0000
  BogoMIPS:            4991.02
  Virtualization:      AMD-V
  L1d cache:           32K
  L1i cache:           32K
  L2 cache:            512K
  L3 cache:            16384K
  NUMA node0 CPU(s):   0-31
  NUMA node1 CPU(s):   32-63
  Flags:               fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov
  pat pse36 cklflush mmx fxsr sse sse2 ht syscall nx mmxext fxsr_opt pdpe1gb rdtscp lm
  constant_tsc rep_good nopl xtopology nonstop_tsc cpuid extd_apicid aperfmperf pni

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Test Date: Aug-2019
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Software Availability: Jun-2019

Platform Notes (Continued)

pclmulqdq monitor sse3 fma cx16 sse4_1 sse4_2 movbe popcnt aes xsave avx f16c
rdrand lahf_lm cmp_legacy svm extapic cr8_legacy abm sse4a misalignsse 3dnowprefetch
osvw ibs skinit wdt tce topoext perfctr_core perfctr_nb bpext perfctr_l2 mwaitx cpb
cat_l3 cdp_l3 hw_pstate ssbd ibrs ibpb stibp vmmcall fsqgsbase bmi1 avx2 smep bmi2
cqm rdt_a rdseed adx smap clflushopt clwb sha_ni xsaveopt xsaves xgetbv1 xsaveas
cqm_llc cqm_occcp(llc cqm_mbm_total cqm_mbm_local clzero irperf xsaverptr arat npt
lbrv svm_lock nrip_save tsc_scale vmcb_clean flushbyasid decodeassists pausefilter
PFthreshold avic v_vmsave_vmload vgif umip rdpid overflow_recov succor smca

/proc/cpuinfo cache data
cache size : 512 KB

From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a
physical chip.
available: 2 nodes (0-1)
node 0 cpus: 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
node 0 size: 515755 MB
node 0 free: 515164 MB
node 1 cpus: 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
node 1 size: 515878 MB
node 1 free: 515567 MB
node distances:
node 0 1
 0: 10 32
 1: 32 10

From /proc/meminfo
MemTotal: 1056393464 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

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

uname -a:
  (8fba516) x86_64 x86_64 x86_64 GNU/Linux

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Platform Notes (Continued)

Kernel self-reported vulnerability status:
CVE-2017-5754 (Meltdown):          Not affected
CVE-2017-5753 (Spectre variant 1): Mitigation: __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Full AMD retpoline, IBPB: conditional,
IBRS_FW, STIBP: disabled, RSB filling

run-level 3 Feb 14 09:21
SPEC is set to: /home/cpu2017
Filesystem     Type   Size  Used Avail Use% Mounted on
/dev/sda2      btrfs  371G   59G  311G  16% /home

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.
BIOS HPE A40 07/20/2019
Memory:
16x HPE P03054-091 64 GB 4 rank 2933
16x UNKNOWN NOT AVAILABLE

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
C               | 619.lbm_s(base) 638.imagick_s(base) 644.nab_s(base)
------------------------------------------------------------------------------
AOCC.LLVM.1.3.0.B34.2018_10_22 clang version 7.0.0 (CLANG: Jenkins
    AOCC_1_3_0_Release-Build#34) (based on LLVM AOCC.LLVM.1.3.0.B34.2018_10_22)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /root/work/compilers/aocc1.3.0/AOCC-1.3.0-Compiler/bin
------------------------------------------------------------------------------

==============================================================================
C++, C, Fortran | 607.cactuBSSN_s(base)
------------------------------------------------------------------------------
AOCC.LLVM.1.3.0.B34.2018_10_22 clang version 7.0.0 (CLANG: Jenkins
    AOCC_1_3_0_Release-Build#34) (based on LLVM AOCC.LLVM.1.3.0.B34.2018_10_22)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /root/work/compilers/aocc1.3.0/AOCC-1.3.0-Compiler/bin
AOCC.LLVM.1.3.0.B34.2018_10_22 clang version 7.0.0 (CLANG: Jenkins

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Compiler Version Notes (Continued)

AOCC_1_3_0_Release-Build#34) (based on LLVM AOCC.LLVM.1.3.0.B34.2018_10_22)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /root/work/compilers/aocc1.3.0/AOCC-1.3.0-Compiler/bin
GNU Fortran (GCC) 4.8.2
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You may redistribute copies of GNU Fortran
under the terms of the GNU General Public License.
For more information about these matters, see the file named COPYING

----------------------------------------------------------------------------
Fortran         | 603.bwaves_s(base) 649.fotonik3d_s(base) 654.roms_s(base)
----------------------------------------------------------------------------
GNU Fortran (GCC) 4.8.2
Copyright (C) 2013 Free Software Foundation, Inc.
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----------------------------------------------------------------------------
Fortran, C      | 621.wrf_s(base) 627.cam4_s(base) 628.pop2_s(base)
----------------------------------------------------------------------------
GNU Fortran (GCC) 4.8.2
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AOCC.LLVM.1.3.0.B34.2018_10_22 clang version 7.0.0 (CLANG: Jenkins
AOCC_1_3_0_Release-Build#34) (based on LLVM AOCC.LLVM.1.3.0.B34.2018_10_22)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /root/work/compilers/aocc1.3.0/AOCC-1.3.0-Compiler/bin

Base Compiler Invocation

C benchmarks:
clang

Fortran benchmarks:
clang gfortran

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Base Compiler Invocation (Continued)

Benchmarks using both Fortran and C:
clang gfortran

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

Base Portability Flags

603.bwaves_s: -DSPEC_LP64
607.cactuBSSN_s: -DSPEC_LP64
619.lbm_s: -DSPEC_LP64
621.wrf_s: -DSPEC_CASE_FLAG -fconvert=big-endian -DSPEC_LP64
627.cam4_s: -DSPEC_CASE_FLAG -DSPEC_LP64
628.pop2_s: -DSPEC_CASE_FLAG -fconvert=big-endian -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:
-ffto -Wl,-plugin-opt=-merge-constant
-ffast-math

Fortran benchmarks:
-ffto -Wl,-plugin-opt=-merge-constant
-ffast-math

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

Fortran benchmarks (continued):
-ldl -ljemalloc -lamdlibm -lgfortran

Benchmarks using both Fortran and C:
-fflto -ffast-math
-Ll, -lplugin-opt=--merge-constant
-Ll, -lplugin-opt=--lsr-in-nested-loop
-Ll, -lplugin-opt=--enable-vectorize-compares=false -O3 -ffast-math
-march=znver1 -mno-avx2 -fstruct-layout=3 -mlllvm -unroll-threshold=50
-fremap-arrays -mlllvm -inline-threshold=1000
-flv-function-specialization -mlllvm -enable-gvn-hoist
-mlllvm -function-specialize -mavx -madx -funroll-loops -z muldefs
-fplugin=dragonegg.so -fplugin-arg-dragonegg-llvm-option=--merge-constant
-fplugin=dragonegg-llvm-option=--enable-vectorize-compares=false
-DSPEC_OPENMP -DUSE_OPENMP -fopenmp -fopenmp=libomp -lomp -lpthread
-ldl -ljemalloc -lamdlibm -lgfortran

Benchmarks using Fortran, C, and C++:
-std=c++98 -fflto -flto -Ll, -lplugin-opt=--merge-constant
-Ll, -lplugin-opt=--lsr-in-nested-loop
-Ll, -lplugin-opt=--enable-vectorize-compares=false -O3 -ffast-math
-march=znver1 -mno-avx2 -fstruct-layout=3 -mlllvm -unroll-threshold=50
-fremap-arrays -mlllvm -inline-threshold=1000
-flv-function-specialization -mlllvm -enable-gvn-hoist
-mlllvm -function-specialize -mavx -mllvm -unroll-threshold=100
-flv-function-specialization -mlllvm -enable-gvn-hoist
-mlllvm -function-specialize -mavx -mllvm -unroll-threshold=100
-finline-aggressive -mlllvm -enable-vectorize-compares=false -mavx
-madx -funroll-loops -z muldefs -fplugin=dragonegg.so
-fplugin=dragonegg-llvm-option=--merge-constant
-fplugin=dragonegg-llvm-option=--enable-vectorize-compares=false
-DSPEC_OPENMP -fopenmp -DUSE_OPENMP -fopenmp=libomp -lomp -lpthread
-ldl -ljemalloc -lamdlibm

## Base Other Flags

C benchmarks:
-Wno-return-type

Fortran benchmarks:
-Wno-return-type

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

Benchmarks using Fortran, C, and C++:
-Wno-return-type
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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-revE.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/aocc130-flags-revA2-HPE.xml
http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-AMD-V1.2-EPYC-revE.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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