



SPEC CPU®2017 Floating Point Speed Result

Copyright 2017-2019 Standard Performance Evaluation Corporation

Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant DL325 Gen10

(3.00 GHz, AMD EPYC 7302P)

SPECspeed®2017_fp_base = 71.8

SPECspeed®2017_fp_peak = Not Run

CPU2017 License: 3

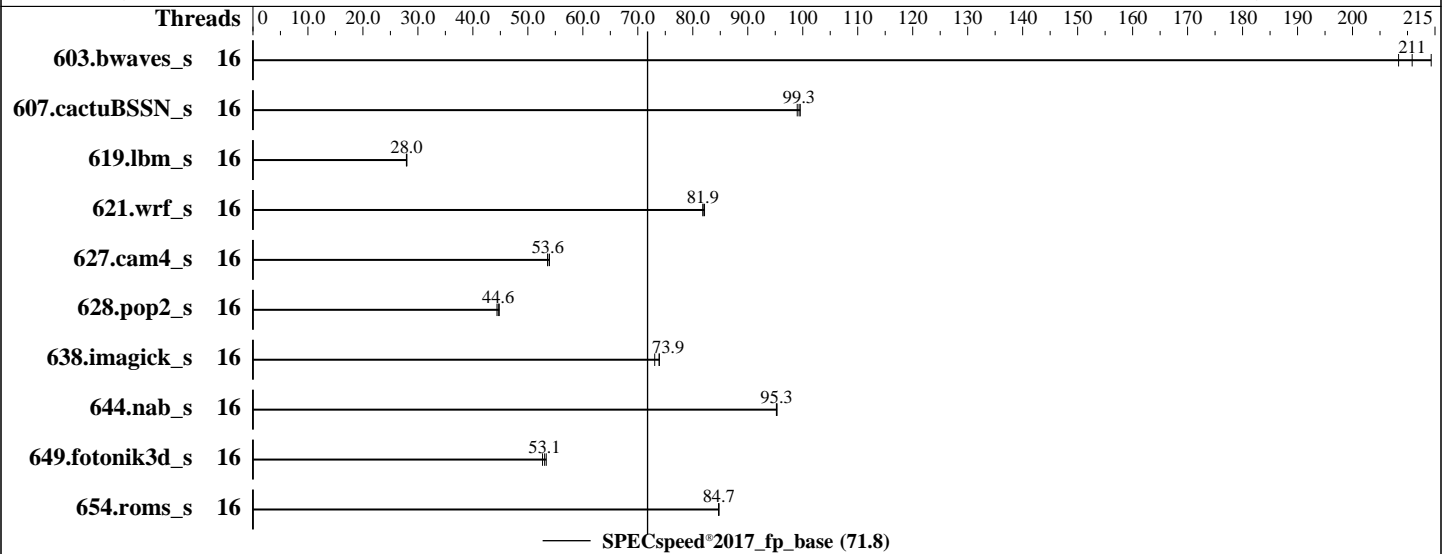
Test Sponsor: HPE

Tested by: HPE

Test Date: Aug-2019

Hardware Availability: Aug-2019

Software Availability: Jun-2019



Hardware

CPU Name: AMD EPYC 7302P
 Max MHz: 3300
 Nominal: 3000
 Enabled: 16 cores, 1 chip
 Orderable: 1 chip
 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,
 16 MB shared / 2 cores
 Other: None
 Memory: 256 GB (8 x 32 GB 2Rx4 PC4-2933Y-R)
 Storage: 1 x 400 GB NVMe 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 A41 07/20/2019 released Aug-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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Results Table

Benchmark	Base						Peak							
	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
603.bwaves_s	16	283	208	275	214	280	211							
607.cactuBSSN_s	16	168	99.0	167	99.6	168	99.3							
619.lbm_s	16	187	28.0	187	28.0	188	27.9							
621.wrf_s	16	161	82.1	162	81.8	162	81.9							
627.cam4_s	16	164	53.9	165	53.6	165	53.6							
628.pop2_s	16	265	44.8	266	44.6	267	44.4							
638.imagick_s	16	195	73.9	197	73.1	195	73.9							
644.nab_s	16	183	95.3	183	95.3	184	95.2							
649.fotonik3d_s	16	173	52.7	171	53.3	172	53.1							
654.roms_s	16	186	84.7	186	84.7	186	84.7							

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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

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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_aoccl30_naples_A_lib/64;
/home/cpu2017/amd_speed_aoccl30_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 Four memory domains per socket

Sysinfo program /home/cpu2017/bin/sysinfo

Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9

running on linux-20xx Thu Feb 14 12:54:12 2019

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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 7302P 16-Core Processor

1 "physical id"s (chips)

16 "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 : 16

siblings : 16

physical 0: cores 0 1 4 5 8 9 12 13 16 17 20 21 24 25 28 29

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): 16

On-line CPU(s) list: 0-15

Thread(s) per core: 1

Core(s) per socket: 16

Socket(s): 1

NUMA node(s): 4

Vendor ID: AuthenticAMD

CPU family: 23

Model: 49

Model name: AMD EPYC 7302P 16-Core Processor

Stepping: 0

CPU MHz: 3000.000

CPU max MHz: 3000.0000

CPU min MHz: 1500.0000

BogoMIPS: 5988.83

Virtualization: AMD-V

L1d cache: 32K

L1i cache: 32K

L2 cache: 512K

L3 cache: 16384K

NUMA node0 CPU(s): 0-3

NUMA node1 CPU(s): 4-7

NUMA node2 CPU(s): 8-11

NUMA node3 CPU(s): 12-15

Flags: fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov

pat pse36 clflush mmx fxsr sse sse2 ht syscall nx mmxext fxsr_opt pdpe1gb rdtscp lm

constant_tsc rep_good nopl xtopology nonstop_tsc cpuid extd_apicid aperfmperf pni

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Platform Notes (Continued)

```
pclmulqdq monitor ssse3 fma cx16 sse4_1 sse4_2 movbe popcnt aes xsave avx fl6c
rdrand lahf_lm cmp_legacy svm extapic cr8_legacy abm sse4a misalignsse 3dnowprefetch
osvw ibs skinit wdt tce topoext perfctr_core perfctr_nb bpeext perfctr_l2 mwaitx cpb
cat_l3 cdp_l3 hw_pstate ssbd ibrs ibpb stibp vmmcall fsgsbase bmi1 avx2 smep bmi2
cqm rdt_a rdseed adx smap clflushopt clwb sha_ni xsaveopt xsavec xgetbv1 xsaves
cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local clzero irperf xsaveerptr 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: 4 nodes (0-3)
node 0 cpus: 0 1 2 3
node 0 size: 64293 MB
node 0 free: 64148 MB
node 1 cpus: 4 5 6 7
node 1 size: 64481 MB
node 1 free: 64348 MB
node 2 cpus: 8 9 10 11
node 2 size: 64510 MB
node 2 free: 64266 MB
node 3 cpus: 12 13 14 15
node 3 size: 64498 MB
node 3 free: 64399 MB
node distances:
node  0  1  2  3
  0:  10  12  12  12
  1:  12  10  12  12
  2:  12  12  10  12
  3:  12  12  12  10
```

```
From /proc/meminfo
MemTotal:      263969732 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"
```

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Platform Notes (Continued)

ANSI_COLOR="0;32"

CPE_NAME="cpe:/o:suse:sles:15:sp1"

uname -a:

Linux linux-20xx 4.12.14-195-default #1 SMP Tue May 7 10:55:11 UTC 2019 (8fba516)
x86_64 x86_64 x86_64 GNU/Linux

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 08:21

SPEC is set to: /home/cpu2017

Filesystem	Type	Size	Used	Avail	Use%	Mounted on
/dev/nvme0n1p1	btrfs	373G	34G	338G	9%	/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 A41 07/20/2019

Memory:

8x UNKNOWN NOT AVAILABLE

8x UNKNOWN NOT AVAILABLE 32 GB 2 rank 2933

(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/aoccl.3.0/AOCC-1.3.0-Compiler/bin
=====

=====
C++, C, Fortran | 607.cactuBSSN_s(base)
=====

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Compiler Version Notes (Continued)

```
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/aoccl.3.0/AOCC-1.3.0-Compiler/bin
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/aoccl.3.0/AOCC-1.3.0-Compiler/bin
GNU Fortran (GCC) 4.8.2
Copyright (C) 2013 Free Software Foundation, Inc.
GNU Fortran comes with NO WARRANTY, to the extent permitted by law.
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.
GNU Fortran comes with NO WARRANTY, to the extent permitted by law.
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, C       | 621.wrf_s(base) 627.cam4_s(base) 628.pop2_s(base)
=====
```

```
GNU Fortran (GCC) 4.8.2
Copyright (C) 2013 Free Software Foundation, Inc.
GNU Fortran comes with NO WARRANTY, to the extent permitted by law.
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
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/aoccl.3.0/AOCC-1.3.0-Compiler/bin
=====
```



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Base Compiler Invocation

C benchmarks:

clang

Fortran benchmarks:

clang gfortran

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:

-flto -Wl,-plugin-opt=-merge-constant

-Wl,-plugin-opt=-lsr-in-nested-loop

-Wl,-plugin-opt=-enable-vectorize-compares=false -O3 -ffast-math

-march=znver1 -mno-avx2 -fstruct-layout=3 -mllvm -unroll-threshold=50

-fremap-arrays -mllvm -inline-threshold=1000

-flv-function-specialization -mllvm -enable-gvn-hoist

-mllvm -function-specialize -z muldefs -DSPEC_OPENMP -fopenmp

-DUSE_OPENMP -fopenmp=libomp -lomp -lpthread -ldl -ljemalloc

-lamdlibm

Fortran benchmarks:

-flto -Wl,-plugin-opt=-merge-constant

-Wl,-plugin-opt=-lsr-in-nested-loop

-Wl,-plugin-opt=-enable-vectorize-compares=false -O3 -mavx -madx

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Base Optimization Flags (Continued)

Fortran benchmarks (continued):

```
-funroll-loops -ffast-math -z muldefs -fplugin=dragonegg.so
-fplugin-arg-dragonegg-llvm-option=-merge-constant
-fplugin-arg-dragonegg-llvm-option=-enable-vectorize-compares:false
-DSPEC_OPENMP -DUSE_OPENMP -fopenmp -fopenmp=libomp -lomp -lpthread
-ldl -ljemalloc -lamdlibm -lgfortran
```

Benchmarks using both Fortran and C:

```
-flto -Wl,-plugin-opt=-merge-constant
-Wl,-plugin-opt=-lsr-in-nested-loop
-Wl,-plugin-opt=-enable-vectorize-compares=false -O3 -ffast-math
-march=znver1 -mno-avx2 -fstruct-layout=3 -mllvm -unroll-threshold=50
-freemap-arrays -mllvm -inline-threshold=1000
-flv-function-specialization -mllvm -enable-gvn-hoist
-mllvm -function-specialize -mavx -madox -funroll-loops -z muldefs
-fplugin=dragonegg.so -fplugin-arg-dragonegg-llvm-option=-merge-constant
-fplugin-arg-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 -flto -Wl,-plugin-opt=-merge-constant
-Wl,-plugin-opt=-lsr-in-nested-loop
-Wl,-plugin-opt=-enable-vectorize-compares=false -O3 -ffast-math
-march=znver1 -mno-avx2 -fstruct-layout=3 -mllvm -unroll-threshold=50
-freemap-arrays -mllvm -inline-threshold=1000
-flv-function-specialization -mllvm -enable-gvn-hoist
-mllvm -function-specialize -mllvm -unroll-threshold=100
-finline-aggressive -mllvm -enable-vectorize-compares=false -mavx
-madox -funroll-loops -z muldefs -fplugin=dragonegg.so
-fplugin-arg-dragonegg-llvm-option=-merge-constant
-fplugin-arg-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
```

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Base Other Flags (Continued)

Benchmarks using both Fortran and C:

-Wno-return-type

Benchmarks using Fortran, C, and C++:

-Wno-return-type

The flags files that were used to format this result can be browsed at

<http://www.spec.org/cpu2017/flags/aocc130-flags-revA2-HPE.html>

<http://www.spec.org/cpu2017/flags/gcc.2017-11-20.html>

<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/gcc.2017-11-20.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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