



SPEC® CPU2017 Floating Point Rate Result

Copyright 2017-2019 Standard Performance Evaluation Corporation

Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant DL325 Gen10

(2.50 GHz, AMD EPYC 7261)

SPECrate2017_fp_base = 53.8

SPECrate2017_fp_peak = Not Run

CPU2017 License: 3

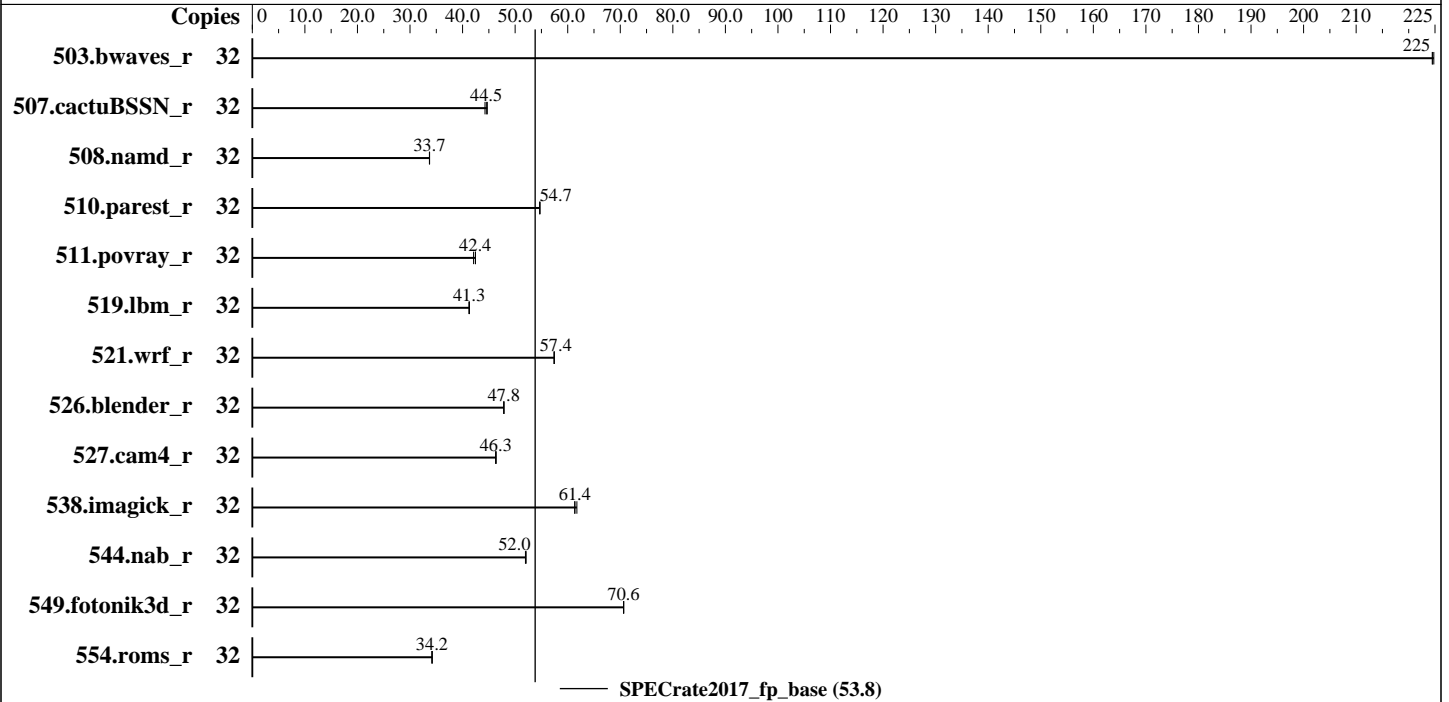
Test Sponsor: HPE

Tested by: HPE

Test Date: Jun-2018

Hardware Availability: Apr-2018

Software Availability: May-2018



Hardware

CPU Name: AMD EPYC 7261
 Max MHz.: 2900
 Nominal: 2500
 Enabled: 8 cores, 1 chip, 2 threads/core
 Orderable: 1 chip
 Cache L1: 64 KB I + 32 KB D on chip per core
 L2: 512 KB I+D on chip per core
 L3: 64 MB I+D on chip per chip
 Other: None
 Memory: 512 GB (8 x 64 GB 4Rx4 PC4-2666V-L, running at 2400)
 Storage: 1 x 900 GB SATA SSD, RAID 0
 Other: None

Software

OS: SUSE Linux Enterprise Server 12 (x86_64) SP3
 Kernel 4.4.131-94.25-default
 Compiler: C/C++: Version 1.0.0 of AOCC
 Fortran: Version 4.8.2 of GCC
 Parallel: No
 Firmware: HPE BIOS Version A41 04/06/2018 released Jul-2018
 File System: xfs
 System State: Run level 3 (multi-user)
 Base Pointers: 64-bit
 Peak Pointers: Not Applicable
 Other: jemalloc general purpose malloc implementation v4.5.0;



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Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
503.bwaves_r	32	<u>1429</u>	<u>225</u>	1428	225	1430	224							
507.cactuBSSN_r	32	915	44.3	906	44.7	<u>910</u>	<u>44.5</u>							
508.namd_r	32	902	33.7	<u>902</u>	<u>33.7</u>	901	33.7							
510.parest_r	32	1530	54.7	<u>1531</u>	<u>54.7</u>	1531	54.7							
511.povray_r	32	1761	42.4	<u>1761</u>	<u>42.4</u>	1775	42.1							
519.lbm_r	32	817	41.3	818	41.2	<u>818</u>	<u>41.3</u>							
521.wrf_r	32	1248	57.4	1248	57.4	<u>1248</u>	<u>57.4</u>							
526.blender_r	32	1019	47.8	1018	47.9	<u>1019</u>	<u>47.8</u>							
527.cam4_r	32	1209	46.3	<u>1208</u>	<u>46.3</u>	1207	46.4							
538.imagick_r	32	1298	61.3	<u>1297</u>	<u>61.4</u>	1289	61.7							
544.nab_r	32	1036	52.0	1034	52.1	<u>1035</u>	<u>52.0</u>							
549.fotonik3d_r	32	<u>1765</u>	<u>70.6</u>	1766	70.6	1765	70.7							
554.roms_r	32	1488	34.2	1486	34.2	<u>1487</u>	<u>34.2</u>							

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

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
Linux governor set to performance with cpupower "cpupower frequency-set -r -g performance"
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 were enabled for this run (OS default)
Huge pages were not configured for this run.
IRQ balance service stopped using "systemctl stop irqbalance.service"
Tuned profile set with "tuned-adm profile throughput-performance"

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Operating System Notes (Continued)

Speculative Store Bypass (CVE-2018-3639) mitigation was disabled system-wide via kernel boot parameter "spec_store_bypass_disable=off"

Benchmark was conducted on a pre-release kernel (Kernel 4.4.131-94.25-default) which has the same performance as the release version (Kernel 4.4.131-94.29-default)

General Notes

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

LD_LIBRARY_PATH = "/home/cpu2017/amd1704-rate-libs-revC/64;/home/cpu2017/amd1704-rate-libs-revC/32:"

MALLOC_CONF = "lg_chunk:28"

The AMD64 AOCC Compiler Suite is available at

<http://developer.amd.com/amd-aocc/>

Binaries were compiled on a system with 2x AMD EPYC 7601 CPU + 512GB Memory using RHEL 7.4

The AOCC Gold Linker plugin was installed and used for the link stage.

The AOCC Fortran Plugin version 1.0 was used to leverage AOCC optimizers

with gfortran. It is available here:

<http://developer.amd.com/amd-aocc/>

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, a general purpose malloc implementation, was obtained at

<https://github.com/jemalloc/jemalloc/releases/download/4.5.0/jemalloc-4.5.0.tar.bz2>

jemalloc was built with GCC v4.8.5 in RHEL v7.2 under default conditions.

jemalloc uses environment variable MALLOC_CONF with values narenas and lg_chunk:

narenas: sets the maximum number of arenas to use for automatic multiplexing of threads and arenas.

lg_chunk: set the virtual memory chunk size (log base 2). For example,

lg_chunk:21 sets the default chunk size to $2^{21} = 2\text{MiB}$.

Platform Notes

BIOS Configuration:

Thermal Configuration set to Maximum Cooling

Memory Patrol Scrubbing set to Disabled

Performance Determinism set to Power Deterministic

Processor Power and Utilization Monitoring set to Disabled

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Platform Notes (Continued)

Workload Profile set to General Throughput Compute
Minimum Processor Idle Power Core C-State set to C6 State
Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r5797 of 2017-06-14 96c45e4568ad54c135fd618bcc091c0f
running on dl325-gen10 Wed Jun 13 10:21:04 2018

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 7261 8-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 : 8
siblings  : 16
physical 0: cores 0 4 8 12 16 20 24 28
```

From lscpu:

```
Architecture:          x86_64
CPU op-mode(s):        32-bit, 64-bit
Byte Order:            Little Endian
CPU(s):                16
On-line CPU(s) list:   0-15
Thread(s) per core:    2
Core(s) per socket:    8
Socket(s):             1
NUMA node(s):         4
Vendor ID:             AuthenticAMD
CPU family:            23
Model:                1
Model name:            AMD EPYC 7261 8-Core Processor
Stepping:              2
CPU MHz:               2500.000
CPU max MHz:           2500.0000
CPU min MHz:           1200.0000
BogoMIPS:              4990.50
Virtualization:        AMD-V
L1d cache:             32K
L1i cache:             64K
L2 cache:              512K
L3 cache:              8192K
NUMA node0 CPU(s):    0,1,8,9
NUMA node1 CPU(s):    2,3,10,11
NUMA node2 CPU(s):    4,5,12,13
```

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Platform Notes (Continued)

```

NUMA node3 CPU(s):      6,7,14,15
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 pdpelgb rdtscp lm
constant_tsc rep_good nopl nonstop_tsc extd_apicid amd_dcm aperfmperf eagerfpu pni
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 skinit wdt tce topoext perfctr_core perfctr_nb bpext perfctr_l2 mwaitx arat
hw_pstate rds retpoline retpoline_amd npt lbrv svm_lock nrip_save tsc_scale
vmcb_clean flushbyasid decodeassists pausefilter pfthreshold vmmcall avic fsgsbase
bmi1 avx2 smep bmi2 rdseed adx smap clflushopt sha_ni xsaveopt xsavec xgetbv1 clzero
irperf ibpb 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 8 9
node 0 size: 128770 MB
node 0 free: 128618 MB
node 1 cpus: 2 3 10 11
node 1 size: 129022 MB
node 1 free: 128866 MB
node 2 cpus: 4 5 12 13
node 2 size: 129022 MB
node 2 free: 128866 MB
node 3 cpus: 6 7 14 15
node 3 size: 128869 MB
node 3 free: 128711 MB
node distances:
node  0  1  2  3
0:  10  16  16  16
1:  16  10  16  16
2:  16  16  10  16
3:  16  16  16  10

```

```

From /proc/meminfo
MemTotal:      528062344 kB
HugePages_Total:      0
Hugepagesize:    2048 kB

```

```

/usr/bin/lsb_release -d
SUSE Linux Enterprise Server 12 SP3

```

```

From /etc/*release* /etc/*version*
SuSE-release:

```

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Platform Notes (Continued)

SUSE Linux Enterprise Server 12 (x86_64)

VERSION = 12

PATCHLEVEL = 3

This file is deprecated and will be removed in a future service pack or release.

Please check /etc/os-release for details about this release.

os-release:

NAME="SLES"

VERSION="12-SP3"

VERSION_ID="12.3"

PRETTY_NAME="SUSE Linux Enterprise Server 12 SP3"

ID="sles"

ANSI_COLOR="0;32"

CPE_NAME="cpe:/o:suse:sles:12:sp3"

uname -a:

Linux dl325-gen10 4.4.131-94.25-default #1 SMP Mon May 7 11:22:19 UTC 2018 (9700bac)
x86_64 x86_64 x86_64 GNU/Linux

run-level 3 Jan 2 07:06

SPEC is set to: /home/cpu2017

```
Filesystem      Type      Size      Used Avail Use% Mounted on
/dev/sda4       xfs       852G      6.0G  846G    1% /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 04/06/2018

Memory:

8x UNKNOWN NOT AVAILABLE

8x UNKNOWN NOT AVAILABLE 64 GB 4 rank 2666

(End of data from sysinfo program)

Compiler Version Notes

=====
CC 519.lbm_r(base) 538.imagick_r(base) 544.nab_r(base)
=====

AOCC.LLVM.4.0.0.B35.2017_04_26 clang version 4.0.0 (CLANG:) (based on LLVM

AOCC.LLVM.4.0.0.B35.2017_04_26)

Target: x86_64-unknown-linux-gnu

Thread model: posix

InstalledDir: /root/work/compilers/AOCC-1.0-Compiler/bin
=====

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Compiler Version Notes (Continued)

=====
CXXC 508.namd_r(base) 510.parest_r(base)
=====

AOCC.LLVM.4.0.0.B35.2017_04_26 clang version 4.0.0 (CLANG:) (based on LLVM
AOCC.LLVM.4.0.0.B35.2017_04_26)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /root/work/compilers/AOCC-1.0-Compiler/bin
=====

=====
CC 511.povray_r(base) 526.blender_r(base)
=====

AOCC.LLVM.4.0.0.B35.2017_04_26 clang version 4.0.0 (CLANG:) (based on LLVM
AOCC.LLVM.4.0.0.B35.2017_04_26)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /root/work/compilers/AOCC-1.0-Compiler/bin
AOCC.LLVM.4.0.0.B35.2017_04_26 clang version 4.0.0 (CLANG:) (based on LLVM
AOCC.LLVM.4.0.0.B35.2017_04_26)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /root/work/compilers/AOCC-1.0-Compiler/bin
=====

=====
FC 507.cactuBSSN_r(base)
=====

AOCC.LLVM.4.0.0.B35.2017_04_26 clang version 4.0.0 (CLANG:) (based on LLVM
AOCC.LLVM.4.0.0.B35.2017_04_26)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /root/work/compilers/AOCC-1.0-Compiler/bin
AOCC.LLVM.4.0.0.B35.2017_04_26 clang version 4.0.0 (CLANG:) (based on LLVM
AOCC.LLVM.4.0.0.B35.2017_04_26)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /root/work/compilers/AOCC-1.0-Compiler/bin
GNU Fortran (GCC) 4.8.2
Copyright (C) 2013 Free Software Foundation, Inc.
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Compiler Version Notes (Continued)

=====
FC 503.bwaves_r(base) 549.fotonik3d_r(base) 554.roms_r(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.
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=====
CC 521.wrf_r(base) 527.cam4_r(base)

GNU Fortran (GCC) 4.8.2
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You may redistribute copies of GNU Fortran
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For more information about these matters, see the file named COPYING
AOCC.LLVM.4.0.0.B35.2017_04_26 clang version 4.0.0 (CLANG:) (based on LLVM
AOCC.LLVM.4.0.0.B35.2017_04_26)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /root/work/compilers/AOCC-1.0-Compiler/bin

Base Compiler Invocation

C benchmarks:

clang

C++ benchmarks:

clang++

Fortran benchmarks:

clang gfortran

Benchmarks using both Fortran and C:

clang gfortran

Benchmarks using both C and C++:

clang++ clang

Benchmarks using Fortran, C, and C++:

clang++ clang gfortran



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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 -fconvert=big-endian -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:

```

-flto -Wl, -plugin-opt= -merge-constant -lsr-in-nested-loop
-disable-vect-cmp -O3 -ffast-math -march=znver1 -fstruct-layout=2
-mllvm -unroll-threshold=100 -fremap-arrays -mno-avx2
-inline-threshold=1000 -z muldefs -ljemalloc

```

C++ benchmarks:

```

-flto -Wl, -plugin-opt= -merge-constant -lsr-in-nested-loop
-disable-vect-cmp -O3 -march=znver1 -mllvm -unroll-threshold=100
-finline-aggressive -fremap-arrays -inline-threshold=1000 -z muldefs
-ljemalloc

```

Fortran benchmarks:

```

-flto -Wl, -plugin-opt= -merge-constant -lsr-in-nested-loop
-disable-vect-cmp -O3 -mavx -madx -funroll-loops -ffast-math
-z muldefs -fplugin=dragonegg.so -fplugin-arg-dragonegg-llvm-option="
-disable-vect-cmp" -ljemalloc -lgfortran -lamdlibm

```

Benchmarks using both Fortran and C:

```

-flto -Wl, -plugin-opt= -merge-constant -lsr-in-nested-loop
-disable-vect-cmp -O3 -ffast-math -march=znver1 -fstruct-layout=2
-mllvm -unroll-threshold=100 -fremap-arrays -mno-avx2
-inline-threshold=1000 -mavx -madx -funroll-loops -z muldefs
-fplugin=dragonegg.so -fplugin-arg-dragonegg-llvm-option="
-disable-vect-cmp" -ljemalloc -lgfortran -lamdlibm

```

Benchmarks using both C and C++:

```

-flto -Wl, -plugin-opt= -merge-constant -lsr-in-nested-loop

```

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Base Optimization Flags (Continued)

Benchmarks using both C and C++ (continued):

```
-disable-vect-cmp -O3 -ffast-math -march=znver1 -fstruct-layout=2  
-mllvm -unroll-threshold=100 -fremap-arrays -mno-avx2  
-inline-threshold=1000 -finline-aggressive -z muldefs -ljemalloc
```

Benchmarks using Fortran, C, and C++:

```
-flto -Wl, -plugin-opt= -merge-constant -lsr-in-nested-loop  
-disable-vect-cmp -O3 -ffast-math -march=znver1 -fstruct-layout=2  
-mllvm -unroll-threshold=100 -fremap-arrays -mno-avx2  
-inline-threshold=1000 -finline-aggressive -mavx -madox -funroll-loops  
-z muldefs -fplugin=dragonegg.so -fplugin-arg-dragonegg-llvm-option="  
-disable-vect-cmp" -ljemalloc
```

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-revD.html>

<http://www.spec.org/cpu2017/flags/aocc100-flags-revC-I.2018-02-16.html>

<http://www.spec.org/cpu2017/flags/gcc.2018-02-16.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-revD.xml>

<http://www.spec.org/cpu2017/flags/aocc100-flags-revC-I.2018-02-16.xml>

<http://www.spec.org/cpu2017/flags/gcc.2018-02-16.xml>

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