SPEC® CPU2017 Floating Point Speed Result

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Hewlett Packard Enterprise

(Test Sponsor: HPE)

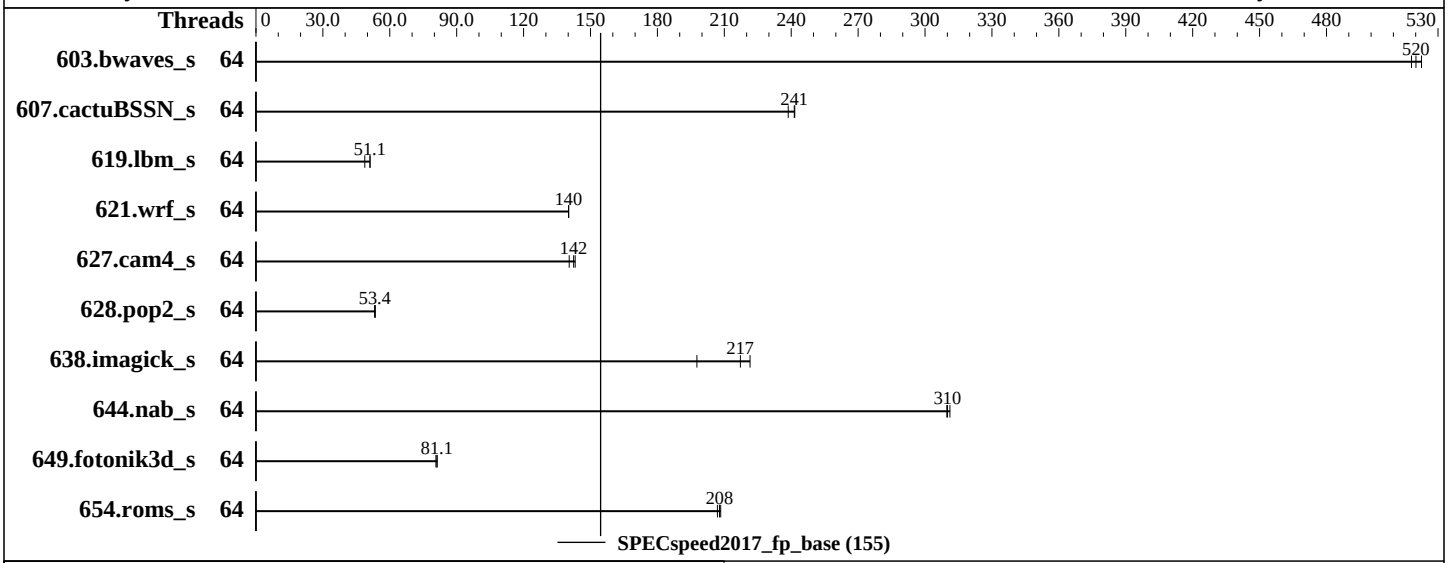
ProLiant DL385 Gen10
(2.35 GHz, AMD EPYC 7452)

SPECspeed2017_fp_base = 155

SPECspeed2017_fp_peak = Not Run

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

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



Hardware

CPU Name:	AMD EPYC 7452
Max MHz.:	3350
Nominal:	2350
Enabled:	64 cores, 2 chips
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, 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 07/11/2019 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;

Results Table

Benchmark	Base							Peak						
	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
603.bwaves_s	64	113	523	**113**	**520**	114	518							
607.cactuBSSN_s	64	69.0	242	**69.1**	**241**	69.8	239							
619.lbm_s	64	107	48.8	**102**	**51.1**	102	51.2							
621.wrf_s	64	94.4	140	94.3	140	**94.4**	**140**							
627.cam4_s	64	63.1	140	**62.2**	**142**	61.9	143							
628.pop2_s	64	222	53.5	223	53.2	**222**	**53.4**							
638.imagick_s	64	73.0	198	**66.4**	**217**	65.1	222							
644.nab_s	64	56.2	311	**56.3**	**310**	56.4	310							
649.fotonik3d_s	64	**112**	**81.1**	112	81.2	113	80.7							
654.roms_s	64	75.6	208	**75.8**	**208**	76.1	207							

SPECspeed2017_fp_base = 155

SPECspeed2017_fp_peak = Not Run

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_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 v4.8.5 in RHEL v7.2 under default conditions.
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
 AMD SMT Option 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 9bcde8f2999c33d61f64985e45859ea9
 running on dl385gen10-rome-32c Thu Jul 18 05:08:36 2019

 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
```

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Platform Notes (Continued)

```
From /proc/cpuinfo
   model name : AMD EPYC 7452 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 7452 32-Core Processor
     Stepping:            0
     CPU MHz:             2350.000
     CPU max MHz:         2350.0000
     CPU min MHz:         1500.0000
     BogoMIPS:            4691.36
     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 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
     pclmulqdq monitor ssse3 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
```

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Platform Notes (Continued)

```
      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: 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: 515122 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: 515542 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:
    Linux dl385gen10-rome-32c 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:
```

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Platform Notes (Continued)

```
 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 Jul 18 05:07

 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 07/11/2019
   Memory:
    16x HPE P03054-091 64 GB 4 rank 2933
    16x UNKNOWN NOT AVAILABLE

 (End of data from sysinfo program)
```

Compiler Version Notes

```
==============================================================================
 CC  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
------------------------------------------------------------------------------

==============================================================================
 FC  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
  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
```

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Compiler Version Notes (Continued)

```
InstalledDir: /root/work/compilers/aocc1.3.0/AOCC-1.3.0-Compiler/bin
GNU Fortran (GCC) 4.8.2
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under the terms of the GNU General Public License.
For more information about these matters, see the file named COPYING
------------------------------------------------------------------------------

==============================================================================
 FC  603.bwaves_s(base) 649.fotonik3d_s(base) 654.roms_s(base)
------------------------------------------------------------------------------
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
------------------------------------------------------------------------------

==============================================================================
 CC  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.
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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
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

Benchmarks using both Fortran and C:
clang gfortran

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Base Compiler Invocation (Continued)

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
-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
-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 -fopenmp -fopenmp=libomp -lomp -lpthread -ldl
-ljemalloc -lamdlibm -lgfortran

Benchmarks using both Fortran and C:
-flto -Wl,-plugin-opt=-merge-constant

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Base Optimization Flags (Continued)

Benchmarks using both Fortran and C (continued):
-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 -mavx -madx -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 -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
-fremap-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
-madx -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 -fopenmp=libomp -lomp -lpthread -ldl
-ljemalloc -lamdlibm

Base Other Flags

C benchmarks:
-Wno-return-type -DUSE_OPENMP

Fortran benchmarks:
-DUSE_OPENMP -Wno-return-type

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

Benchmarks using Fortran, C, and C++:
-Wno-return-type -DUSE_OPENMP

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

http://www.spec.org/cpu2017/flags/aocc130-flags-revA-I.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-revA-I.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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