# SPEC CPU®2017 Floating Point Speed Result

## Dell Inc.

$SPECspeed®2017\_fp\_base = 153$

PowerEdge R6525 (AMD EPYC 7502, 2.50 GHz)

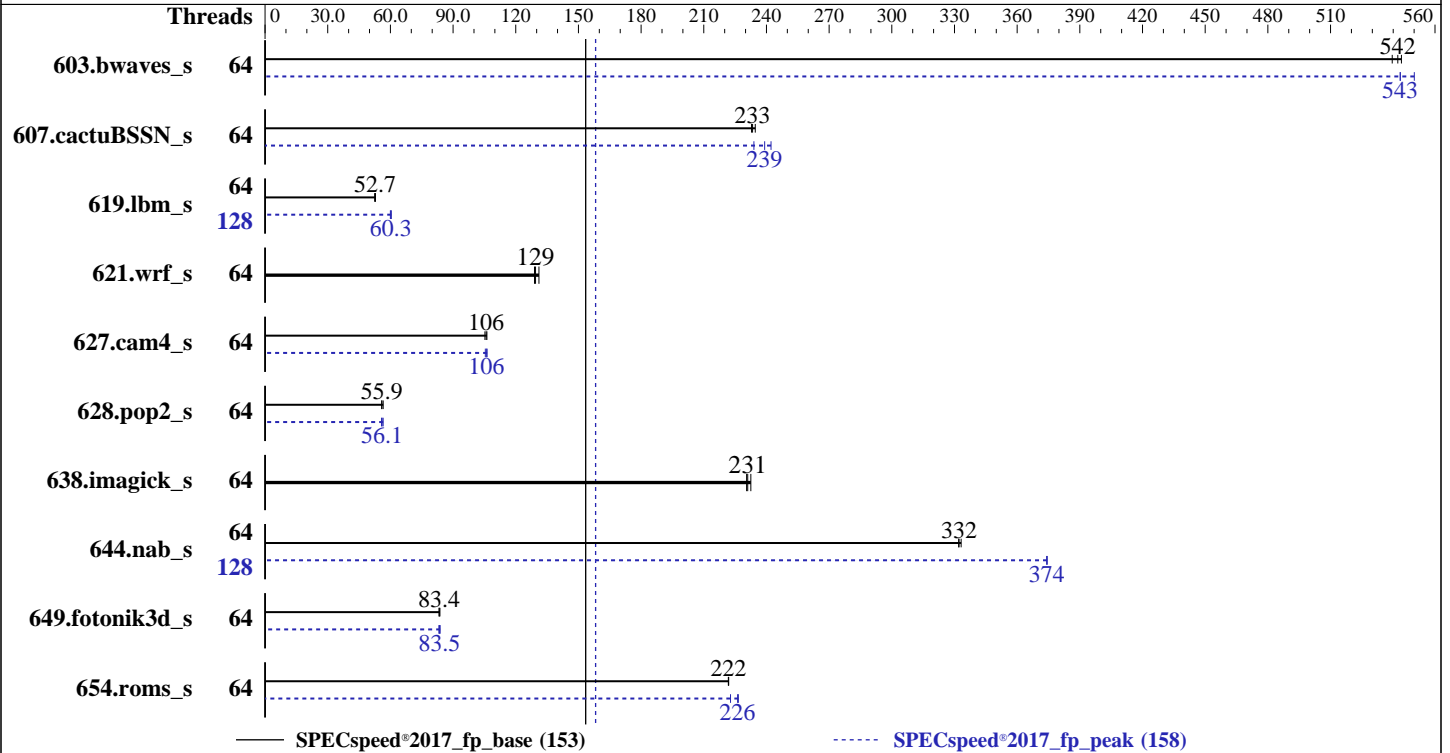$SPECspeed®2017\_fp\_peak = 158$

**CPU2017 License:** 55
**Test Sponsor:** Dell Inc.
**Tested by:** Dell Inc.

**Test Date:** Sep-2019
**Hardware Availability:** Oct-2019
**Software Availability:** Aug-2019



| | Threads | |
|---|---|---|
| 603.bwaves_s | 64 | 542 / 543 |
| 607.cactuBSSN_s | 64 | 233 / 239 |
| 619.lbm_s | 64 / 128 | 52.7 / 60.3 |
| 621.wrf_s | 64 | 129 |
| 627.cam4_s | 64 | 106 / 106 |
| 628.pop2_s | 64 | 55.9 / 56.1 |
| 638.imagick_s | 64 | 231 |
| 644.nab_s | 64 / 128 | 332 / 374 |
| 649.fotonik3d_s | 64 | 83.4 / 83.5 |
| 654.roms_s | 64 | 222 / 226 |

——— SPECspeed®2017_fp_base (153)        ┄┄┄┄ SPECspeed®2017_fp_peak (158)

## Hardware

CPU Name: AMD EPYC 7502
 Max MHz: 3350
 Nominal: 2500
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: 128 MB I+D on chip per chip, 16 MB shared / 4
 cores
 Other: None
Memory: 512 GB (16 x 32 GB 2Rx4 PC4-3200AA-R,
 running at 3200)
Storage: 1 x 960 GB SAS SSD
Other: None

## Software

OS: SUSE Linux Enterprise Server 15 SP1
 kernel 4.12.14-195-default
Compiler: C/C++/Fortran: Version 2.0.0 of AOCC
Parallel: Yes
Firmware: Version 0.4.11 released Sep-2019
File System: xfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: 64-bit
Other: jemalloc: jemalloc memory allocator library v5.1.0
Power Management: --

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$SPECspeed®2017\_fp\_peak = 158$

**CPU2017 License:** 55  
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## Results Table

| Benchmark | Base Threads | Base Seconds | Base Ratio | Base Seconds | Base Ratio | Base Seconds | Base Ratio | Peak Threads | Peak Seconds | Peak Ratio | Peak Seconds | Peak Ratio | Peak Seconds | Peak Ratio |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 603.bwaves_s | 64 | 108 | 544 | **109** | **542** | 109 | 540 | 64 | 107 | 550 | 109 | 543 | **109** | **543** |
| 607.cactuBSSN_s | 64 | **71.4** | **233** | 71.0 | 235 | 71.6 | 233 | 64 | **69.7** | **239** | 71.2 | 234 | 68.8 | 242 |
| 619.lbm_s | 64 | 99.8 | 52.5 | 99.1 | 52.8 | **99.4** | **52.7** | 128 | **86.9** | **60.3** | 87.3 | 60.0 | 86.7 | 60.4 |
| 621.wrf_s | 64 | 101 | 131 | **102** | **129** | 103 | 129 | 64 | 101 | 131 | **102** | **129** | 103 | 129 |
| 627.cam4_s | 64 | 83.5 | 106 | 84.2 | 105 | **83.8** | **106** | 64 | **83.7** | **106** | 83.4 | 106 | 84.1 | 105 |
| 628.pop2_s | 64 | 210 | 56.5 | 213 | 55.8 | **212** | **55.9** | 64 | 213 | 55.7 | 210 | 56.5 | **212** | **56.1** |
| 638.imagick_s | 64 | 62.6 | 230 | **62.4** | **231** | 62.0 | 233 | 64 | 62.6 | 230 | **62.4** | **231** | 62.0 | 233 |
| 644.nab_s | 64 | 52.6 | 332 | 52.4 | 333 | **52.6** | **332** | 128 | 46.7 | 374 | **46.7** | **374** | 46.7 | 374 |
| 649.fotonik3d_s | 64 | 109 | 83.7 | **109** | **83.4** | 109 | 83.3 | 64 | 110 | 83.2 | **109** | **83.5** | 109 | 83.8 |
| 654.roms_s | 64 | 71.0 | 222 | **71.0** | **222** | 71.0 | 222 | 64 | 70.7 | 223 | 69.5 | 227 | **69.6** | **226** |

| | |
|---|---|
| **SPECspeed®2017_fp_base =** | **153** |
| **SPECspeed®2017_fp_peak =** | **158** |

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
'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>

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

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)
```

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## General Notes

```
Environment variables set by runcpu before the start of the run:
GOMP_CPU_AFFINITY = "0-127"
LD_LIBRARY_PATH = "/root/cpu2017-1.0.5/amd_speed_aocc200_rome_B_lib/64;
/root/cpu2017-1.0.5/amd_speed_aocc200_rome_B_lib/32:"
MALLOC_CONF = "retain:true"
OMP_DYNAMIC = "false"
OMP_SCHEDULE = "static"
OMP_STACKSIZE = "128M"
OMP_THREAD_LIMIT = "128"


Binaries were compiled on a system with 2x AMD EPYC 7601 CPU + 512GB Memory using Fedora 26

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 settings:
 NUMA Nodes Per Socket set to 4
 CCX as NUMA Domain set to Enabled
 System Profile set to Custom
 CPU Power Management set to Maximum Performance
 Memory Frequency set to Maximum Performance
 Turbo Boost Enabled
 Cstates set to Enabled
 Memory Patrol Scrub Disabled
 Memory Refresh Rate set to 1x
 PCI ASPM L1 Link Power Management Disabled
 Determinism Slider set to Power Determinism
 Efficiency Optimized Mode Disabled
 Sysinfo program /root/cpu2017-1.0.5/bin/sysinfo
 Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
 running on linux-g3ob Mon Sep  9 11:55:42 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
```

**(Continued on next page)**

Standard Performance Evaluation Corporation (info@spec.org) https://www.spec.org/

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## Dell Inc.

PowerEdge R6525 (AMD EPYC 7502, 2.50 GHz)

$SPECspeed^{®}2017\_fp\_base = 153$

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**CPU2017 License:** 55                  **Test Date:** Sep-2019
**Test Sponsor:** Dell Inc.              **Hardware Availability:** Oct-2019
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## Platform Notes (Continued)

```
From /proc/cpuinfo
   model name : AMD EPYC 7502 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:       43 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:          23
      Model:               49
      Model name:          AMD EPYC 7502 32-Core Processor
      Stepping:            0
      CPU MHz:             2495.471
      BogoMIPS:            4990.94
      Virtualization:      AMD-V
      L1d cache:           32K
      L1i cache:           32K
      L2 cache:            512K
      L3 cache:            16384K
      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
```

**(Continued on next page)**

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**Test Date:** Sep-2019
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## Platform Notes (Continued)

```
      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
      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
    cat_l3 cdp_l3 hw_pstate sme ssbd sev 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: 16 nodes (0-15)
   node 0 cpus: 0 1 2 3 64 65 66 67
   node 0 size: 31804 MB
   node 0 free: 31723 MB
   node 1 cpus: 4 5 6 7 68 69 70 71
   node 1 size: 32253 MB
   node 1 free: 32205 MB
   node 2 cpus: 8 9 10 11 72 73 74 75
   node 2 size: 32254 MB
   node 2 free: 32109 MB
   node 3 cpus: 12 13 14 15 76 77 78 79
   node 3 size: 32253 MB
   node 3 free: 32193 MB
   node 4 cpus: 16 17 18 19 80 81 82 83
   node 4 size: 32254 MB
   node 4 free: 32041 MB
   node 5 cpus: 20 21 22 23 84 85 86 87
   node 5 size: 32253 MB
   node 5 free: 32206 MB
   node 6 cpus: 24 25 26 27 88 89 90 91
   node 6 size: 32254 MB
   node 6 free: 32182 MB
   node 7 cpus: 28 29 30 31 92 93 94 95
   node 7 size: 32241 MB
```

**(Continued on next page)**

## Dell Inc.

PowerEdge R6525 (AMD EPYC 7502, 2.50 GHz)

SPECspeed®2017_fp_base = 153

SPECspeed®2017_fp_peak = 158

| | |
|---|---|
| **CPU2017 License:** 55 | **Test Date:** Sep-2019 |
| **Test Sponsor:** Dell Inc. | **Hardware Availability:** Oct-2019 |
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## Platform Notes (Continued)

```
   node 7 free: 32202 MB
   node 8 cpus: 32 33 34 35 96 97 98 99
   node 8 size: 32254 MB
   node 8 free: 32211 MB
   node 9 cpus: 36 37 38 39 100 101 102 103
   node 9 size: 32253 MB
   node 9 free: 32215 MB
   node 10 cpus: 40 41 42 43 104 105 106 107
   node 10 size: 32224 MB
   node 10 free: 32186 MB
   node 11 cpus: 44 45 46 47 108 109 110 111
   node 11 size: 32253 MB
   node 11 free: 32220 MB
   node 12 cpus: 48 49 50 51 112 113 114 115
   node 12 size: 32254 MB
   node 12 free: 32214 MB
   node 13 cpus: 52 53 54 55 116 117 118 119
   node 13 size: 32253 MB
   node 13 free: 32216 MB
   node 14 cpus: 56 57 58 59 120 121 122 123
   node 14 size: 32254 MB
   node 14 free: 32208 MB
   node 15 cpus: 60 61 62 63 124 125 126 127
   node 15 size: 32252 MB
   node 15 free: 32212 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  10  11  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  12  10  11  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  12  10  11  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  10  11  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  12  12  10  11
    15:  32  32  32  32  32  32  32  32  12  12  12  12  12  12  11  10

 From /proc/meminfo
   MemTotal:       527946116 kB
   HugePages_Total:         0
```

**(Continued on next page)**

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$SPECspeed^{®}2017\_fp\_peak = 158$

**CPU2017 License:** 55
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## Platform Notes (Continued)

```
     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 linux-g3ob 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: conditional, RSB filling

 run-level 3 Sep 9 06:42

 SPEC is set to: /root/cpu2017-1.0.5
    Filesystem      Type  Size  Used Avail Use% Mounted on
    /dev/sda2       xfs   440G   19G  421G   5% /

 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 Dell Inc. 0.4.11 09/05/2019
    Memory:
     16x 802C869D802C 36ASF4G72PZ-3G2E2 32 GB 2 rank 3200
     16x Not Specified Not Specified

 (End of data from sysinfo program)
```

## Compiler Version Notes

```
==============================================================================
 C                  | 619.lbm_s(base, peak) 638.imagick_s(base, peak)
                    | 644.nab_s(base, peak)
```

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## Compiler Version Notes (Continued)

```
--------------------------------------------------------------------------
AOCC.LLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins
  AOCC_2_0_0-Build#191) (based on LLVM AOCC.LLVM.2.0.0.B191.2019_07_19)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin
--------------------------------------------------------------------------


==========================================================================
C++, C, Fortran | 607.cactuBSSN_s(base, peak)
--------------------------------------------------------------------------
AOCC.LLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins
  AOCC_2_0_0-Build#191) (based on LLVM AOCC.LLVM.2.0.0.B191.2019_07_19)
Target: x86_64-unknown-linux-gnu
Thread model: posix
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AOCC.LLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins
  AOCC_2_0_0-Build#191) (based on LLVM AOCC.LLVM.2.0.0.B191.2019_07_19)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin
AOCC.LLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins
  AOCC_2_0_0-Build#191) (based on LLVM AOCC.LLVM.2.0.0.B191.2019_07_19)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin
--------------------------------------------------------------------------


==========================================================================
Fortran         | 603.bwaves_s(base, peak) 649.fotonik3d_s(base, peak)
                | 654.roms_s(base, peak)
--------------------------------------------------------------------------
AOCC.LLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins
  AOCC_2_0_0-Build#191) (based on LLVM AOCC.LLVM.2.0.0.B191.2019_07_19)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin
--------------------------------------------------------------------------


==========================================================================
Fortran, C      | 621.wrf_s(base, peak) 627.cam4_s(base, peak)
                | 628.pop2_s(base, peak)
--------------------------------------------------------------------------
AOCC.LLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins
  AOCC_2_0_0-Build#191) (based on LLVM AOCC.LLVM.2.0.0.B191.2019_07_19)
Target: x86_64-unknown-linux-gnu
Thread model: posix
```

**(Continued on next page)**

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| | | | |
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| **CPU2017 License:** 55 | | **Test Date:** | Sep-2019 |
| **Test Sponsor:** | Dell Inc. | **Hardware Availability:** | Oct-2019 |
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## Compiler Version Notes (Continued)

```
InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin
AOCC.LLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins
  AOCC_2_0_0-Build#191) (based on LLVM AOCC.LLVM.2.0.0.B191.2019_07_19)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin
----------------------------------------------------------------------
```

## Base Compiler Invocation

C benchmarks:
```
clang
```

Fortran benchmarks:
```
flang
```

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

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

## Base Portability Flags

```
603.bwaves_s: -DSPEC_LP64
607.cactuBSSN_s: -DSPEC_LP64
619.lbm_s: -DSPEC_LP64
621.wrf_s: -DSPEC_CASE_FLAG -Mbyteswapio -DSPEC_LP64
627.cam4_s: -DSPEC_CASE_FLAG -DSPEC_LP64
628.pop2_s: -DSPEC_CASE_FLAG -Mbyteswapio -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,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-vector-library=LIBMVEC
-Wl,-mllvm -Wl,-reduce-array-computations=3 -O3 -ffast-math
```

**(Continued on next page)**

# SPEC CPU®2017 Floating Point Speed Result
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## Dell Inc.

PowerEdge R6525 (AMD EPYC 7502, 2.50 GHz)

$SPECspeed^{®}2017\_fp\_base = 153$

$SPECspeed^{®}2017\_fp\_peak = 158$

**CPU2017 License:** 55
**Test Sponsor:** Dell Inc.
**Tested by:** Dell Inc.

**Test Date:** Sep-2019
**Hardware Availability:** Oct-2019
**Software Availability:** Aug-2019

# Base Optimization Flags (Continued)

C benchmarks (continued):
```
-march=znver2 -fstruct-layout=3 -mllvm -unroll-threshold=50
-fremap-arrays -mllvm -function-specialize -mllvm -enable-gvn-hoist
-mllvm -reduce-array-computations=3 -mllvm -global-vectorize-slp
-mllvm -vector-library=LIBMVEC -mllvm -inline-threshold=1000
-flv-function-specialization -z muldefs -DSPEC_OPENMP -fopenmp
-DUSE_OPENMP -fopenmp=libomp -lomp -lpthread -ldl -lmvec -lamdlibm
-ljemalloc -lflang
```

Fortran benchmarks:
```
-flto -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-vector-library=LIBMVEC
-Wl,-mllvm -Wl,-reduce-array-computations=3 -O3 -march=znver2
-funroll-loops -Mrecursive -mllvm -vector-library=LIBMVEC -z muldefs
-Kieee -fno-finite-math-only -DSPEC_OPENMP -fopenmp -DUSE_OPENMP
-fopenmp=libomp -lomp -lpthread -ldl -lmvec -lamdlibm -ljemalloc
-lflang
```

Benchmarks using both Fortran and C:
```
-flto -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-vector-library=LIBMVEC
-Wl,-mllvm -Wl,-reduce-array-computations=3 -O3 -ffast-math
-march=znver2 -fstruct-layout=3 -mllvm -unroll-threshold=50
-fremap-arrays -mllvm -function-specialize -mllvm -enable-gvn-hoist
-mllvm -reduce-array-computations=3 -mllvm -global-vectorize-slp
-mllvm -vector-library=LIBMVEC -mllvm -inline-threshold=1000
-flv-function-specialization -funroll-loops -Mrecursive -z muldefs
-Kieee -fno-finite-math-only -DSPEC_OPENMP -fopenmp -DUSE_OPENMP
-fopenmp=libomp -lomp -lpthread -ldl -lmvec -lamdlibm -ljemalloc
-lflang
```

Benchmarks using Fortran, C, and C++:
```
-std=c++98 -flto -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-vector-library=LIBMVEC
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-suppress-fmas -O3 -ffast-math -march=znver2
-fstruct-layout=3 -mllvm -unroll-threshold=50 -fremap-arrays
-mllvm -function-specialize -mllvm -enable-gvn-hoist
-mllvm -reduce-array-computations=3 -mllvm -global-vectorize-slp
-mllvm -vector-library=LIBMVEC -mllvm -inline-threshold=1000
-flv-function-specialization -mllvm -loop-unswitch-threshold=200000
-mllvm -unroll-threshold=100 -mllvm -enable-partial-unswitch
-funroll-loops -Mrecursive -z muldefs -Kieee -fno-finite-math-only
-DSPEC_OPENMP -fopenmp -DUSE_OPENMP -fopenmp=libomp -lomp -lpthread
-ldl -lmvec -lamdlibm -ljemalloc -lflang
```

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## 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
```

## Peak Compiler Invocation

C benchmarks:
```
clang
```

Fortran benchmarks:
```
flang
```

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

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

## Peak Portability Flags

```
Same as Base Portability Flags
```

## Peak Optimization Flags

C benchmarks:

```
619.lbm_s: -flto -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-region-vectorize
-Wl,-mllvm -Wl,-vector-library=LIBMVEC
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast
-march=znver2 -mno-sse4a -fstruct-layout=5
-mllvm -vectorize-memory-aggressively
```

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# Peak Optimization Flags (Continued)

619.lbm_s (continued):
```
-mllvm -function-specialize -mllvm -enable-gvn-hoist
-mllvm -unroll-threshold=50 -fremap-arrays
-mllvm -vector-library=LIBMVEC
-mllvm -reduce-array-computations=3
-mllvm -global-vectorize-slp -mllvm -inline-threshold=1000
-flv-function-specialization -DSPEC_OPENMP -fopenmp
-DUSE_OPENMP -lmvec -lamdlibm -fopenmp=libomp -lomp
-lpthread -ldl -ljemalloc -lflang
```

638.imagick_s: basepeak = yes

644.nab_s: Same as 619.lbm_s

Fortran benchmarks:

603.bwaves_s:
```
-flto -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-region-vectorize
-Wl,-mllvm -Wl,-vector-library=LIBMVEC
-Wl,-mllvm -Wl,-reduce-array-computations=3 -O3
-march=znver2 -funroll-loops -Mrecursive
-mllvm -vector-library=LIBMVEC -Kieee
-fno-finite-math-only -DSPEC_OPENMP -fopenmp -DUSE_OPENMP
-fopenmp=libomp -lomp -lpthread -ldl -lmvec -lamdlibm
-ljemalloc -lflang
```

649.fotonik3d_s: Same as 603.bwaves_s

654.roms_s:
```
-flto -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-region-vectorize
-Wl,-mllvm -Wl,-vector-library=LIBMVEC
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-enable-X86-prefetching -O3 -march=znver2
-funroll-loops -Mrecursive -mllvm -vector-library=LIBMVEC
-Kieee -fno-finite-math-only -DSPEC_OPENMP -fopenmp
-DUSE_OPENMP -fopenmp=libomp -lomp -lpthread -ldl
-lmvec -lamdlibm -ljemalloc -lflang
```

Benchmarks using both Fortran and C:

621.wrf_s: basepeak = yes

627.cam4_s:
```
-flto -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-region-vectorize
-Wl,-mllvm -Wl,-vector-library=LIBMVEC
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast
```

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# Peak Optimization Flags (Continued)

627.cam4_s (continued):

```
-march=znver2 -mno-sse4a -fstruct-layout=5
-mllvm -vectorize-memory-aggressively
-mllvm -function-specialize -mllvm -enable-gvn-hoist
-mllvm -unroll-threshold=50 -fremap-arrays
-mllvm -vector-library=LIBMVEC
-mllvm -reduce-array-computations=3
-mllvm -global-vectorize-slp -mllvm -inline-threshold=1000
-flv-function-specialization -O3 -funroll-loops
-Mrecursive -Kieee -fno-finite-math-only -DSPEC_OPENMP
-fopenmp -DUSE_OPENMP -fopenmp=libomp -lomp -lpthread
-ldl -lmvec -lamdlibm -ljemalloc -lflang
```

628.pop2_s: Same as 627.cam4_s

Benchmarks using Fortran, C, and C++:

```
-std=c++98 -flto -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-vector-library=LIBMVEC
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast -march=znver2
-mno-sse4a -fstruct-layout=5 -mllvm -vectorize-memory-aggressively
-mllvm -function-specialize -mllvm -enable-gvn-hoist
-mllvm -unroll-threshold=50 -fremap-arrays
-mllvm -vector-library=LIBMVEC -mllvm -reduce-array-computations=3
-mllvm -global-vectorize-slp -mllvm -inline-threshold=1000
-flv-function-specialization -mllvm -unroll-threshold=100
-mllvm -enable-partial-unswitch -mllvm -loop-unswitch-threshold=200000
-O3 -funroll-loops -Mrecursive -Kieee -fno-finite-math-only
-DSPEC_OPENMP -fopenmp -DUSE_OPENMP -fopenmp=libomp -lomp -lpthread
-ldl -lmvec -lamdlibm -ljemalloc -lflang
```

# Peak 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/aocc200-flags-B1-speed-Dell.html
http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge-revE4.2019-10-15.html

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You can also download the XML flags sources by saving the following links:

http://www.spec.org/cpu2017/flags/aocc200-flags-B1-speed-Dell.xml
http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge-revE4.2019-10-15.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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