SPEC CPU®2017 Floating Point Rate Result

Copyright 2017-2020 Standard Performance Evaluation Corporation

Dell Inc.

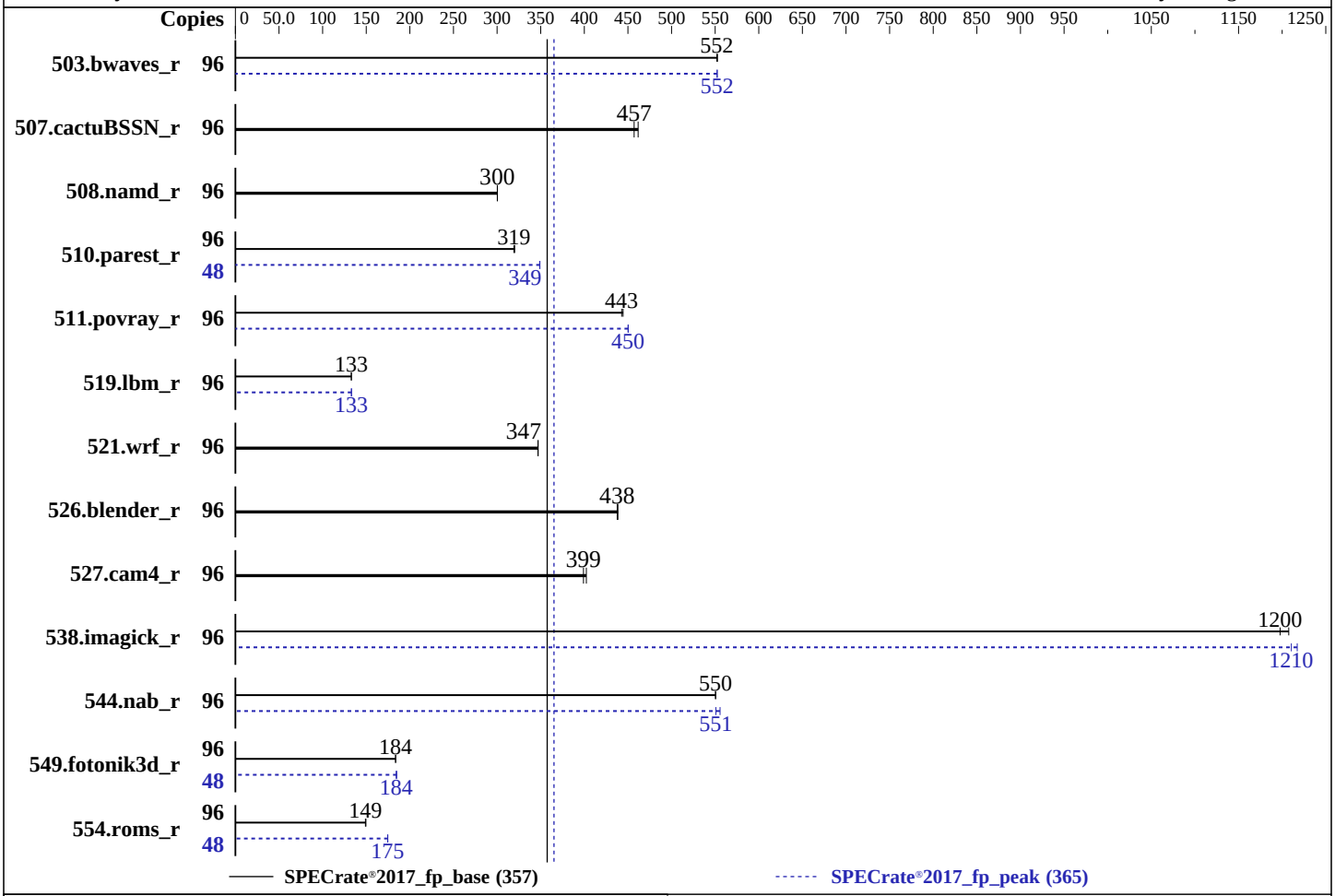
PowerEdge R7525 (AMD EPYC 7F72, 3.20 GHz)

SPECrate®2017_fp_base = 357

SPECrate®2017_fp_peak = 365

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

Test Date: Apr-2020
Hardware Availability: Jul-2020
Software Availability: Aug-2019



Hardware

CPU Name:	AMD EPYC 7F72
Max MHz:	3700
Nominal:	3200
Enabled:	48 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:	192 MB I+D on chip per chip, 16 MB shared / 2 cores
Other:	None
Memory:	512 GB (16 x 32 GB 2Rx4 PC4-3200AA-R, running at 3200)
Storage:	1 x 960 GB SATA 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:	No
Firmware:	Version 1.4.6 released Apr-2020
File System:	tmpfs
System State:	Run level 3 (multi-user)
Base Pointers:	64-bit
Peak Pointers:	64-bit
Other:	jemalloc: jemalloc memory allocator library v5.2.0
Power Management:	BIOS set to prefer performance at the cost of additional power usage.

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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	96	**1744**	**552**	1742	553			96	**1743**	**552**	1743	552		
507.cactuBSSN_r	96	263	462	**266**	**457**			96	263	462	**266**	**457**		
508.namd_r	96	**304**	**300**	304	300			96	**304**	**300**	304	300		
510.parest_r	96	**787**	**319**	784	320			48	360	349	**360**	**349**		
511.povray_r	96	**506**	**443**	504	444			96	498	450	**498**	**450**		
519.lbm_r	96	761	133	**761**	**133**			96	**761**	**133**	761	133		
521.wrf_r	96	**620**	**347**	620	347			96	**620**	**347**	620	347		
526.blender_r	96	333	439	**334**	**438**			96	333	439	**334**	**438**		
527.cam4_r	96	417	402	**421**	**399**			96	417	402	**421**	**399**		
538.imagick_r	96	**199**	**1200**	198	1210			96	196	1220	**197**	**1210**		
544.nab_r	96	**294**	**550**	293	551			96	**293**	**551**	291	556		
549.fotonik3d_r	96	**2038**	**184**	2036	184			48	**1015**	**184**	1011	185		
554.roms_r	96	**1023**	**149**	1020	150			48	437	175	**437**	**175**		

SPECrate®2017_fp_base = 357

SPECrate®2017_fp_peak = 365

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
```

(Continued on next page)

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)
```

Environment Variables Notes

```
Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH =
     "/mnt/ramdisk/cpu2017-1.1.0/amd_rate_aocc200_rome_C_lib/64;/mnt/ramdisk/
     cpu2017-1.1.0/amd_rate_aocc200_rome_C_lib/32:"
MALLOC_CONF = "retain:true"
```

General Notes

```
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.
Benchmark run from a 225 GB ramdisk created with the cmd; "mount -t tmpfs -o size=225G tmpfs /mnt/ramdisk".
jemalloc: configured and built with GCC v9.1.0 in Ubuntu 19.04 with -O3 -znver2 -flto
jemalloc 5.2.0 is available here:
https://github.com/jemalloc/jemalloc/releases/download/5.2.0/jemalloc-5.2.0.tar.bz2
```

Platform Notes

```
 BIOS settings:
  NUMA Nodes Per Socket set to 2
  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
```

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Platform Notes (Continued)

```
 Memory Interleaving set to Disabled
 ApbDis set to Disabled
 DLWM set to Unforced

Sysinfo program /mnt/ramdisk/cpu2017-1.1.0/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7edb1e6e46a485a0011
running on linux-g3ob Tue Apr 21 14:45:18 2020

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 7F72 24-Core Processor
      2  "physical id"s (chips)
      96 "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 : 24
      siblings  : 48
      physical 0: cores 0 1 4 5 8 9 12 13 16 17 20 21 24 25 28 29 32 33 36 37 40 41 44 45
      physical 1: cores 0 1 4 5 8 9 12 13 16 17 20 21 24 25 28 29 32 33 36 37 40 41 44 45

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):              96
     On-line CPU(s) list: 0-95
     Thread(s) per core:  2
     Core(s) per socket:  24
     Socket(s):           2
     NUMA node(s):        24
     Vendor ID:           AuthenticAMD
     CPU family:          23
     Model:               49
     Model name:          AMD EPYC 7F72 24-Core Processor
     Stepping:            0
     CPU MHz:             3193.913
     BogoMIPS:            6387.82
     Virtualization:      AMD-V
     L1d cache:           32K
     L1i cache:           32K
     L2 cache:            512K
     L3 cache:            16384K
     NUMA node0 CPU(s):   0,1,48,49
```

(Continued on next page)

Platform Notes (Continued)

```
      NUMA node1 CPU(s):   2,3,50,51
      NUMA node2 CPU(s):   4,5,52,53
      NUMA node3 CPU(s):   6,7,54,55
      NUMA node4 CPU(s):   8,9,56,57
      NUMA node5 CPU(s):   10,11,58,59
      NUMA node6 CPU(s):   12,13,60,61
      NUMA node7 CPU(s):   14,15,62,63
      NUMA node8 CPU(s):   16,17,64,65
      NUMA node9 CPU(s):   18,19,66,67
      NUMA node10 CPU(s):  20,21,68,69
      NUMA node11 CPU(s):  22,23,70,71
      NUMA node12 CPU(s):  24,25,72,73
      NUMA node13 CPU(s):  26,27,74,75
      NUMA node14 CPU(s):  28,29,76,77
      NUMA node15 CPU(s):  30,31,78,79
      NUMA node16 CPU(s):  32,33,80,81
      NUMA node17 CPU(s):  34,35,82,83
      NUMA node18 CPU(s):  36,37,84,85
      NUMA node19 CPU(s):  38,39,86,87
      NUMA node20 CPU(s):  40,41,88,89
      NUMA node21 CPU(s):  42,43,90,91
      NUMA node22 CPU(s):  44,45,92,93
      NUMA node23 CPU(s):  46,47,94,95
      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 x2apic 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: 24 nodes (0-23)
    node 0 cpus: 0 1 48 49
    node 0 size: 20922 MB
    node 0 free: 20729 MB
    node 1 cpus: 2 3 50 51
    node 1 size: 21502 MB
```

(Continued on next page)

Platform Notes (Continued)

```
node 1 free: 21317 MB
node 2 cpus: 4 5 52 53
node 2 size: 21503 MB
node 2 free: 21307 MB
node 3 cpus: 6 7 54 55
node 3 size: 21502 MB
node 3 free: 21315 MB
node 4 cpus: 8 9 56 57
node 4 size: 21502 MB
node 4 free: 21300 MB
node 5 cpus: 10 11 58 59
node 5 size: 21504 MB
node 5 free: 21354 MB
node 6 cpus: 12 13 60 61
node 6 size: 21502 MB
node 6 free: 21357 MB
node 7 cpus: 14 15 62 63
node 7 size: 21502 MB
node 7 free: 21354 MB
node 8 cpus: 16 17 64 65
node 8 size: 21503 MB
node 8 free: 21355 MB
node 9 cpus: 18 19 66 67
node 9 size: 21502 MB
node 9 free: 21347 MB
node 10 cpus: 20 21 68 69
node 10 size: 21502 MB
node 10 free: 21355 MB
node 11 cpus: 22 23 70 71
node 11 size: 21491 MB
node 11 free: 21338 MB
node 12 cpus: 24 25 72 73
node 12 size: 21502 MB
node 12 free: 21349 MB
node 13 cpus: 26 27 74 75
node 13 size: 21502 MB
node 13 free: 21356 MB
node 14 cpus: 28 29 76 77
node 14 size: 21503 MB
node 14 free: 21355 MB
node 15 cpus: 30 31 78 79
node 15 size: 21502 MB
node 15 free: 21354 MB
node 16 cpus: 32 33 80 81
node 16 size: 21473 MB
node 16 free: 21324 MB
node 17 cpus: 34 35 82 83
```

(Continued on next page)

Platform Notes (Continued)

```
node 17 size: 21504 MB
node 17 free: 21338 MB
node 18 cpus: 36 37 84 85
node 18 size: 21502 MB
node 18 free: 19480 MB
node 19 cpus: 38 39 86 87
node 19 size: 21502 MB
node 19 free: 21340 MB
node 20 cpus: 40 41 88 89
node 20 size: 21503 MB
node 20 free: 21349 MB
node 21 cpus: 42 43 90 91
node 21 size: 21502 MB
node 21 free: 21351 MB
node 22 cpus: 44 45 92 93
node 22 size: 21502 MB
node 22 free: 21342 MB
node 23 cpus: 46 47 94 95
node 23 size: 21502 MB
node 23 free: 16884 MB
node distances:
node   0   1   2   3   4   5   6   7   8   9  10  11  12  13  14  15  16  17  18  19
20  21  22  23
  0:  10  11  11  11  11  11  12  12  12  12  12  12  32  32  32  32  32  32  32  32
  32  32  32  32
  1:  11  10  11  11  11  11  12  12  12  12  12  12  32  32  32  32  32  32  32  32
  32  32  32  32
  2:  11  11  10  11  11  11  12  12  12  12  12  12  32  32  32  32  32  32  32  32
  32  32  32  32
  3:  11  11  11  10  11  11  12  12  12  12  12  12  32  32  32  32  32  32  32  32
  32  32  32  32
  4:  11  11  11  11  10  11  12  12  12  12  12  12  32  32  32  32  32  32  32  32
  32  32  32  32
  5:  11  11  11  11  11  10  12  12  12  12  12  12  32  32  32  32  32  32  32  32
  32  32  32  32
  6:  12  12  12  12  12  12  10  11  11  11  11  11  32  32  32  32  32  32  32  32
  32  32  32  32
  7:  12  12  12  12  12  12  11  10  11  11  11  11  32  32  32  32  32  32  32  32
  32  32  32  32
  8:  12  12  12  12  12  12  11  11  10  11  11  11  32  32  32  32  32  32  32  32
  32  32  32  32
  9:  12  12  12  12  12  12  11  11  11  10  11  11  32  32  32  32  32  32  32  32
  32  32  32  32
 10:  12  12  12  12  12  12  11  11  11  11  10  11  32  32  32  32  32  32  32  32
 32  32  32  32
 11:  12  12  12  12  12  12  11  11  11  11  11  10  32  32  32  32  32  32  32  32
 32  32  32  32
```


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Platform Notes (Continued)

```
    12:  32  32  32  32  32  32  32  32  32  32  32  32  10  11  11  11  11  11  12  12
    12  12  12  12
    13:  32  32  32  32  32  32  32  32  32  32  32  32  11  10  11  11  11  11  12  12
    12  12  12  12
    14:  32  32  32  32  32  32  32  32  32  32  32  32  11  11  10  11  11  11  12  12
    12  12  12  12
    15:  32  32  32  32  32  32  32  32  32  32  32  32  11  11  11  10  11  11  12  12
    12  12  12  12
    16:  32  32  32  32  32  32  32  32  32  32  32  32  11  11  11  11  10  11  12  12
    12  12  12  12
    17:  32  32  32  32  32  32  32  32  32  32  32  32  11  11  11  11  11  10  12  12
    12  12  12  12
    18:  32  32  32  32  32  32  32  32  32  32  32  32  12  12  12  12  12  12  10  11
    11  11  11  11
    19:  32  32  32  32  32  32  32  32  32  32  32  32  12  12  12  12  12  12  11  10
    11  11  11  11
    20:  32  32  32  32  32  32  32  32  32  32  32  32  12  12  12  12  12  12  11  11
    10  11  11  11
    21:  32  32  32  32  32  32  32  32  32  32  32  32  12  12  12  12  12  12  11  11
    11  10  11  11
    22:  32  32  32  32  32  32  32  32  32  32  32  32  12  12  12  12  12  12  11  11
    11  11  10  11
    23:  32  32  32  32  32  32  32  32  32  32  32  32  12  12  12  12  12  12  11  11
    11  11  11  10

  From /proc/meminfo
     MemTotal:       527816060 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 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:
```

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Platform Notes (Continued)

```
 CVE-2018-3620 (L1 Terminal Fault):        Not affected
 Microarchitectural Data Sampling:         Not affected
 CVE-2017-5754 (Meltdown):                 Not affected
 CVE-2018-3639 (Speculative Store Bypass): Mitigation: Speculative Store Bypass disabled
                                           via prctl and seccomp
 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 Apr 21 05:07 last=5

 SPEC is set to: /mnt/ramdisk/cpu2017-1.1.0
    Filesystem     Type   Size  Used Avail Use% Mounted on
    tmpfs          tmpfs  225G  4.3G  221G   2% /mnt/ramdisk

 From /sys/devices/virtual/dmi/id
     BIOS:    Dell Inc. 1.4.6 04/10/2020
     Vendor:  Dell Inc.
     Product: PowerEdge R7525
     Product Family: PowerEdge
     Serial:  48LN333

 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.
   Memory:
     16x 802C80B3802C 36ASF4G72PZ-3G2E7 32 GB 2 rank 3200
     16x Not Specified Not Specified

 (End of data from sysinfo program)
```

Compiler Version Notes

```
==============================================================================
C               | 519.lbm_r(base, peak) 538.imagick_r(base, peak)
                | 544.nab_r(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
------------------------------------------------------------------------------
```

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Compiler Version Notes (Continued)

```
==============================================================================
C++             | 508.namd_r(base, peak) 510.parest_r(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
------------------------------------------------------------------------------

==============================================================================
C++, C          | 511.povray_r(base, peak) 526.blender_r(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
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 | 507.cactuBSSN_r(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
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
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  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         | 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak)
```

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Compiler Version Notes (Continued)

```
                | 554.roms_r(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      | 521.wrf_r(base, peak) 527.cam4_r(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)
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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
------------------------------------------------------------------------------
```

Base Compiler Invocation

C benchmarks:
`clang`

C++ benchmarks:
`clang++`

Fortran benchmarks:
`flang`

Benchmarks using both Fortran and C:
`flang clang`

Benchmarks using both C and C++:
`clang++ clang`

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

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 -Mbyteswapio -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,-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 -z muldefs -lmvec -lamdlibm -ljemalloc
-lflang

C++ benchmarks:
-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
-mllvm -loop-unswitch-threshold=200000 -mllvm -vector-library=LIBMVEC
-mllvm -unroll-threshold=100 -flv-function-specialization
-mllvm -enable-partial-unswitch -z muldefs -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 -lmvec -lamdlibm -ljemalloc -lflang

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Base Optimization Flags (Continued)

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 -lmvec -lamdlibm -ljemalloc -lflang

Benchmarks using both 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 -z muldefs
-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
-lmvec -lamdlibm -ljemalloc -lflang

Peak Compiler Invocation

C benchmarks:
clang

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Peak Compiler Invocation (Continued)

C++ benchmarks:
clang++

Fortran benchmarks:
flang

Benchmarks using both Fortran and C:
flang clang

Benchmarks using both C and C++:
clang++ clang

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

Peak Portability Flags

Same as Base Portability Flags

Peak 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 -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 -lmvec -lamdlibm -ljemalloc -lflang

C++ benchmarks:

508.namd_r: basepeak = yes

510.parest_r: -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 -Ofast -march=znver2
-flv-function-specialization -mllvm -unroll-threshold=100

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Peak Optimization Flags (Continued)

510.parest_r (continued):
-mllvm -enable-partial-unswitch
-mllvm -loop-unswitch-threshold=200000
-mllvm -vector-library=LIBMVEC
-mllvm -inline-threshold=1000 -lmvec -lamdlibm -ljemalloc
-lflang

Fortran benchmarks:

503.bwaves_r: -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 -lmvec -lamdlibm -ljemalloc
-lflang

549.fotonik3d_r: Same as 503.bwaves_r

554.roms_r: -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 -lmvec -lamdlibm -ljemalloc
-lflang

Benchmarks using both Fortran and C:

521.wrf_r: basepeak = yes

527.cam4_r: basepeak = yes

Benchmarks using both C and C++:

511.povray_r: -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,-x86-use-vzeroupper=false -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

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Peak Optimization Flags (Continued)

511.povray_r (continued):

```
-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 -lmvec -lamdlibm
-ljemalloc -lflang
```

526.blender_r: `basepeak = yes`

Benchmarks using Fortran, C, and C++:

507.cactuBSSN_r: `basepeak = yes`

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

`http://www.spec.org/cpu2017/flags/aocc200-flags-C4.html`
`http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge-revE9.html`

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

`http://www.spec.org/cpu2017/flags/aocc200-flags-C4.xml`
`http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge-revE9.xml`

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