



SPEC CPU®2017 Floating Point Speed Result

Copyright 2017-2020 Standard Performance Evaluation Corporation

Dell Inc.

SPECspeed®2017_fp_base = 152

PowerEdge R7525 (AMD EPYC 7F72, 3.20 GHz)

SPECspeed®2017_fp_peak = 153

CPU2017 License: 55

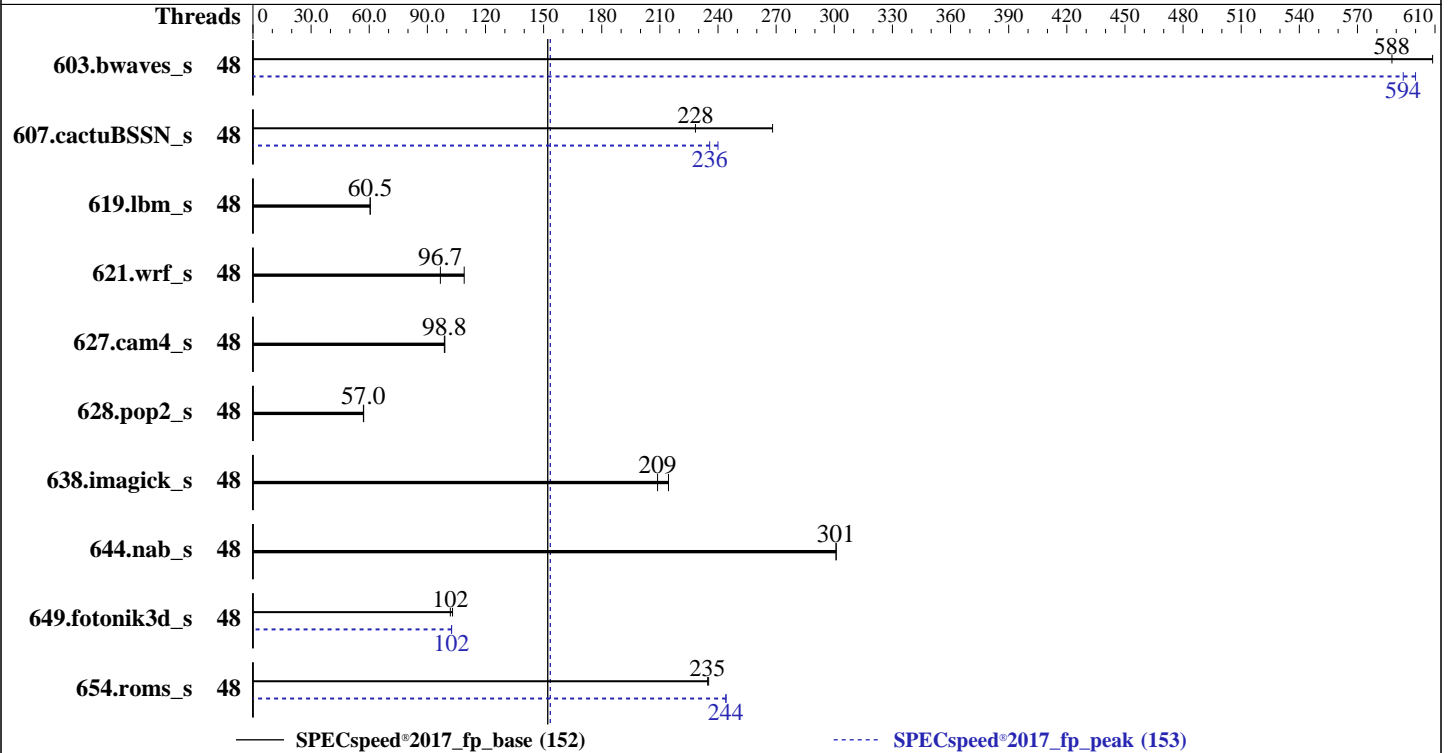
Test Date: Apr-2020

Test Sponsor: Dell Inc.

Hardware Availability: Jul-2020

Tested by: Dell Inc.

Software Availability: Aug-2019



Hardware

CPU Name: AMD EPYC 7F72
 Max MHz: 3700
 Nominal: 3200
 Enabled: 48 cores, 2 chips
 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: Yes
 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 v5.1.0
 Power Management: BIOS set to prefer performance at the cost of additional power usage.



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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	48	96.9	609	<u>100</u>	<u>588</u>			48	<u>99.4</u>	<u>594</u>	98.3	600		
607.cactuBSSN_s	48	62.2	268	<u>73.0</u>	<u>228</u>			48	<u>70.7</u>	<u>236</u>	69.5	240		
619.lbm_s	48	86.5	60.5	<u>86.6</u>	<u>60.5</u>			48	86.5	60.5	<u>86.6</u>	<u>60.5</u>		
621.wrf_s	48	<u>137</u>	<u>96.7</u>	121	109			48	<u>137</u>	<u>96.7</u>	121	109		
627.cam4_s	48	89.5	99.0	<u>89.7</u>	<u>98.8</u>			48	89.5	99.0	<u>89.7</u>	<u>98.8</u>		
628.pop2_s	48	<u>208</u>	<u>57.0</u>	208	57.1			48	<u>208</u>	<u>57.0</u>	208	57.1		
638.imagick_s	48	67.3	214	<u>69.1</u>	<u>209</u>			48	67.3	214	<u>69.1</u>	<u>209</u>		
644.nab_s	48	58.0	301	<u>58.1</u>	<u>301</u>			48	58.0	301	<u>58.1</u>	<u>301</u>		
649.fotonik3d_s	48	<u>89.5</u>	<u>102</u>	88.5	103			48	<u>88.9</u>	<u>102</u>	88.9	102		
654.roms_s	48	<u>67.1</u>	<u>235</u>	67.0	235			48	<u>64.5</u>	<u>244</u>	64.5	244		

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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/>

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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Environment Variables Notes

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

GOMP_CPU_AFFINITY = "0-47"

LD_LIBRARY_PATH =

"/mnt/ramdisk/cpu2017-1.1.0/amd_speed_aocc200_rome_C_lib/64;/mnt/ramdisk
/cpu2017-1.1.0/amd_speed_aocc200_rome_C_lib/32:"

MALLOC_CONF = "retain:true"

OMP_DYNAMIC = "false"

OMP_SCHEDULE = "static"

OMP_STACKSIZE = "128M"

OMP_THREAD_LIMIT = "48"

Environment variables set by runcpu during the 603.bwaves_s peak run:

GOMP_CPU_AFFINITY = "0-47"

Environment variables set by runcpu during the 607.cactuBSSN_s peak run:

GOMP_CPU_AFFINITY = "0-47"

Environment variables set by runcpu during the 649.fotonik3d_s peak run:

GOMP_CPU_AFFINITY = "0-47"

Environment variables set by runcpu during the 654.roms_s peak run:

GOMP_CPU_AFFINITY = "0-47"

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 5.1.0 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 2

CCX as NUMA Domain set to Enabled

System Profile set to Custom

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Platform Notes (Continued)

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
 Memory Interleaving set to Auto
 ApbDis set to Disabled
 DLWM set to Unforced
 Logical Processor Disabled

Sysinfo program /mnt/ramdisk/cpu2017-1.1.0/bin/sysinfo
 Rev: r6365 of 2019-08-21 295195f888a3d7edb1e6e46a485a0011
 running on linux-g3ob Thu Apr 23 13:33:24 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)
 48 "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 : 24
 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): 48
 On-line CPU(s) list: 0-47
 Thread(s) per core: 1
 Core(s) per socket: 24
 Socket(s): 2
 NUMA node(s): 24
 Vendor ID: AuthenticAMD
 CPU family: 23
 Model: 49

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Platform Notes (Continued)

```

Model name:          AMD EPYC 7F72 24-Core Processor
Stepping:           0
CPU MHz:            3194.003
BogoMIPS:           6388.00
Virtualization:     AMD-V
L1d cache:          32K
L1i cache:          32K
L2 cache:           512K
L3 cache:           16384K
NUMA node0 CPU(s): 0,1
NUMA node1 CPU(s): 2,3
NUMA node2 CPU(s): 4,5
NUMA node3 CPU(s): 6,7
NUMA node4 CPU(s): 8,9
NUMA node5 CPU(s): 10,11
NUMA node6 CPU(s): 12,13
NUMA node7 CPU(s): 14,15
NUMA node8 CPU(s): 16,17
NUMA node9 CPU(s): 18,19
NUMA node10 CPU(s): 20,21
NUMA node11 CPU(s): 22,23
NUMA node12 CPU(s): 24,25
NUMA node13 CPU(s): 26,27
NUMA node14 CPU(s): 28,29
NUMA node15 CPU(s): 30,31
NUMA node16 CPU(s): 32,33
NUMA node17 CPU(s): 34,35
NUMA node18 CPU(s): 36,37
NUMA node19 CPU(s): 38,39
NUMA node20 CPU(s): 40,41
NUMA node21 CPU(s): 42,43
NUMA node22 CPU(s): 44,45
NUMA node23 CPU(s): 46,47
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

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Platform Notes (Continued)

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
node 0 size: 20922 MB
node 0 free: 20841 MB
node 1 cpus: 2 3
node 1 size: 21502 MB
node 1 free: 21473 MB
node 2 cpus: 4 5
node 2 size: 21504 MB
node 2 free: 21467 MB
node 3 cpus: 6 7
node 3 size: 21502 MB
node 3 free: 21452 MB
node 4 cpus: 8 9
node 4 size: 21502 MB
node 4 free: 21471 MB
node 5 cpus: 10 11
node 5 size: 21503 MB
node 5 free: 21459 MB
node 6 cpus: 12 13
node 6 size: 21502 MB
node 6 free: 21468 MB
node 7 cpus: 14 15
node 7 size: 21502 MB
node 7 free: 21475 MB
node 8 cpus: 16 17
node 8 size: 21504 MB
node 8 free: 21480 MB
node 9 cpus: 18 19
node 9 size: 21502 MB
node 9 free: 21475 MB
node 10 cpus: 20 21
node 10 size: 21473 MB
node 10 free: 21446 MB
node 11 cpus: 22 23
node 11 size: 21491 MB
node 11 free: 21458 MB
node 12 cpus: 24 25
node 12 size: 21502 MB
node 12 free: 21474 MB
node 13 cpus: 26 27
node 13 size: 21502 MB
node 13 free: 21453 MB

```

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Platform Notes (Continued)

```

node 14 cpus: 28 29
node 14 size: 21504 MB
node 14 free: 21469 MB
node 15 cpus: 30 31
node 15 size: 21502 MB
node 15 free: 21472 MB
node 16 cpus: 32 33
node 16 size: 21502 MB
node 16 free: 21473 MB
node 17 cpus: 34 35
node 17 size: 21503 MB
node 17 free: 21478 MB
node 18 cpus: 36 37
node 18 size: 21502 MB
node 18 free: 19525 MB
node 19 cpus: 38 39
node 19 size: 21502 MB
node 19 free: 21420 MB
node 20 cpus: 40 41
node 20 size: 21504 MB
node 20 free: 18179 MB
node 21 cpus: 42 43
node 21 size: 21502 MB
node 21 free: 21456 MB
node 22 cpus: 44 45
node 22 size: 21502 MB
node 22 free: 21412 MB
node 23 cpus: 46 47
node 23 size: 21502 MB
node 23 free: 21420 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

```

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Platform Notes (Continued)

```

7:  12  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  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  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  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  12  11  11  11  11  11  10  32  32  32  32  32  32  32  32
32  32  32  32
12: 32  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  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  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  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  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  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  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  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  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  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  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  32  12  12  12  12  12  12  11  11
11  11  11  10

```

```

From /proc/meminfo
MemTotal:      527825644 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"

```

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Platform Notes (Continued)

```
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-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: disabled, RSB
                                              filling
```

```
run-level 3 Apr 23 10:08 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)



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Compiler Version Notes

```

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

```

```

=====
AOCCLLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins
  AOCCLLVM.2.0.0.B191.2019_07_19) (based on LLVM AOCCLLVM.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)
=====

```

```

=====
AOCCLLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins
  AOCCLLVM.2.0.0.B191.2019_07_19) (based on LLVM AOCCLLVM.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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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)
=====

```

```

=====
AOCCLLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins
  AOCCLLVM.2.0.0.B191.2019_07_19) (based on LLVM AOCCLLVM.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)
=====

```

```

=====
AOCCLLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins
=====

```

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Dell Inc.

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PowerEdge R7525 (AMD EPYC 7F72, 3.20 GHz)

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CPU2017 License: 55

Test Sponsor: Dell Inc.

Tested by: Dell Inc.

Test Date: Apr-2020

Hardware Availability: Jul-2020

Software Availability: Aug-2019

Compiler Version Notes (Continued)

```

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
-----

```

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

```



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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
-freemap-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
-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 -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
-freemap-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 -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 -freemap-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 -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: basepeak = yes

638.imagick_s: basepeak = yes

644.nab_s: basepeak = yes

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Peak Optimization Flags (Continued)

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
-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
-fopenmp=libomp -lomp -lpthread -ldl -lmvec -lamdlibm
-ljemalloc -lflang
```

Benchmarks using both Fortran and C:

621.wrf_s: basepeak = yes

627.cam4_s: basepeak = yes

628.pop2_s: basepeak = yes

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 -fopenmp=libomp -lomp -lpthread -ldl -lmvec
-lamdlibm -ljemalloc -lflang
```



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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

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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