



SPEC® CPU2017 Integer Speed Result

Copyright 2017-2019 Standard Performance Evaluation Corporation

Dell Inc.

SPECspeed2017_int_base = 6.69

PowerEdge R7425 (AMD EPYC 7551, 2.00GHz)

SPECspeed2017_int_peak = 6.88

CPU2017 License: 55

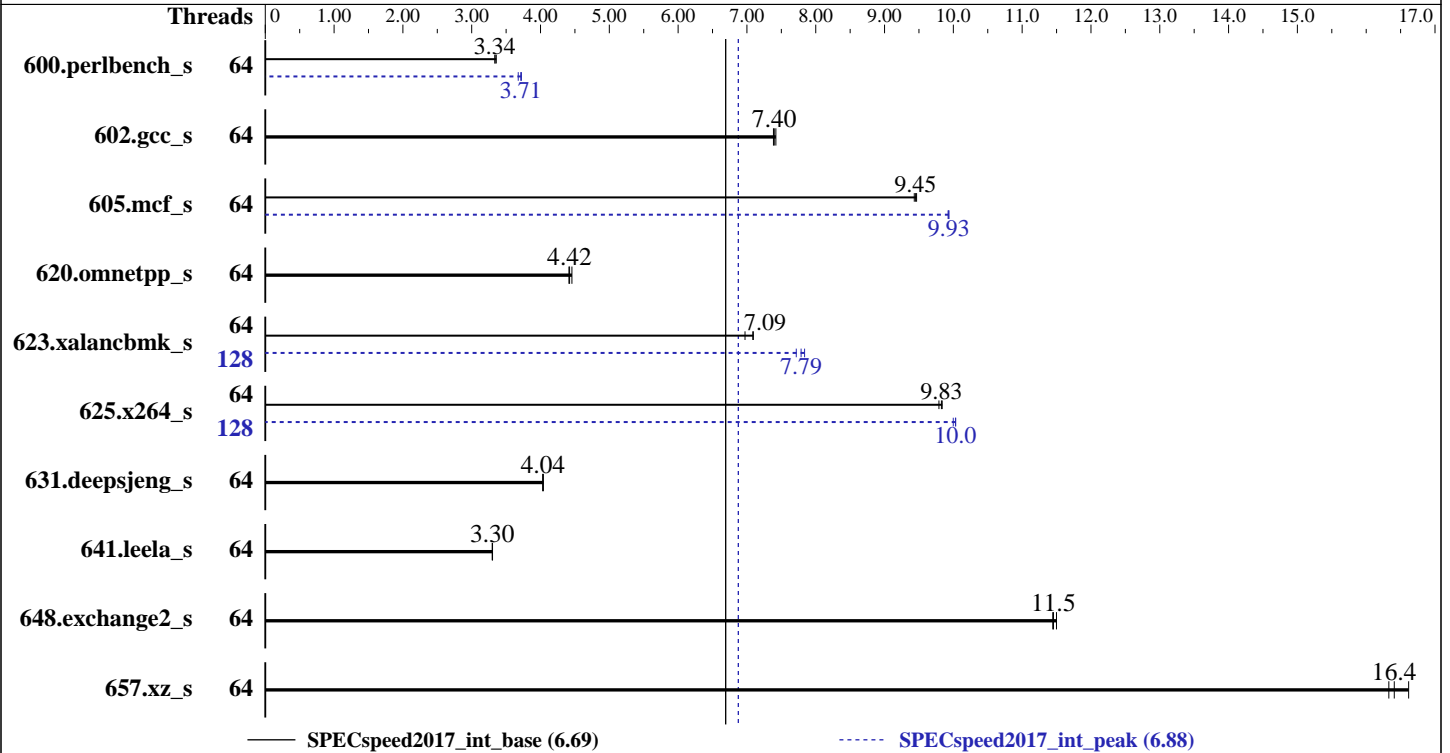
Test Date: Nov-2018

Test Sponsor: Dell Inc.

Hardware Availability: Dec-2018

Tested by: Dell Inc.

Software Availability: Oct-2018



Hardware

CPU Name: AMD EPYC 7551
 Max MHz.: 3000
 Nominal: 2000
 Enabled: 64 cores, 2 chips, 2 threads/core
 Orderable: 1,2 chips
 Cache L1: 64 KB I + 32 KB D on chip per core
 L2: 512 KB I+D on chip per core
 L3: 64 MB I+D on chip per chip, 8 MB shared / 4 cores
 Other: None
 Memory: 1 TB (16 x 64 GB 4DRx4 PC4-2667V-L)
 Storage: 1 x 120 GB SATA SSD
 Other: None

Software

OS: Ubuntu 18.04.1 LTS
 kernel 4.15.0-38
 Compiler: C/C++: Version 1.2.1 of AOCC
 Fortran: Version 4.8.2 of GCC
 Parallel: Yes
 Firmware: Version 1.6.7 released Oct-2018
 File System: ext4
 System State: Run level 3 (multi-user)
 Base Pointers: 64-bit
 Peak Pointers: 32/64-bit
 Other: jemalloc: jemalloc memory allocator library
 V4.5.0



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Results Table

Benchmark	Base							Peak						
	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
600.perlbench_s	64	532	3.34	532	3.34	529	3.36	64	478	3.71	477	3.72	483	3.68
602.gcc_s	64	538	7.40	539	7.39	537	7.42	64	538	7.40	539	7.39	537	7.42
605.mcf_s	64	500	9.45	501	9.43	499	9.47	64	476	9.92	475	9.93	475	9.93
620.omnetpp_s	64	366	4.46	369	4.42	370	4.41	64	366	4.46	369	4.42	370	4.41
623.xalancbmk_s	64	200	7.09	203	6.97	200	7.09	128	181	7.84	182	7.79	184	7.72
625.x264_s	64	179	9.84	180	9.79	180	9.83	128	176	10.0	176	10.0	176	10.0
631.deepsjeng_s	64	355	4.04	355	4.03	355	4.04	64	355	4.04	355	4.03	355	4.04
641.leela_s	64	517	3.30	517	3.30	517	3.30	64	517	3.30	517	3.30	517	3.30
648.exchange2_s	64	256	11.5	257	11.5	257	11.4	64	256	11.5	257	11.5	257	11.4
657.xz_s	64	372	16.6	379	16.3	377	16.4	64	372	16.6	379	16.3	377	16.4

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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/>

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

The AOCC Fortran Plugin version 1.2 was used to leverage AOCC optimizers with gfortran. It is available here: <http://developer.amd.com/amd-aocc/>

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

dirty_ratio, swappiness, zone_reclaim_mode and drop_caches were all set using privileged echo (e.g. echo 1 > /proc/sys/vm/swappiness).

Transparent huge pages were enabled for this run (OS default)



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General Notes

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

```
GOMP_CPU_AFFINITY = "0,8,16,24,32,40,48,56,2,10,18,26,34,42,50,58,4,12,20,28,36,44,52,60,6,14,22,30,38,46,54,62,1,9,17,25,33,41,49,57,3,11,19,27,35,43,51,59,5,13,21,29,37,45,53,61,7,15,23,31,39,47,55,63"
LD_LIBRARY_PATH = "/home/cpu2017-1.0.5/amd1806-speed-libs-revA/64:/home/cpu2017-1.0.5/amd1806-speed-libs-revA/32:"
OMP_PROC_BIND = "true"
OMP_STACKSIZE = "192M"
OMP_WAIT_POLICY = "active"
```

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

jemalloc: sources available from jemalloc.net or <https://github.com/jemalloc/jemalloc/releases>

jemalloc uses environment variable MALLOC_CONF with values narenas and lg_chunk:

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

lg_chunk: set the virtual memory chunk size (log base 2). For example, lg_chunk:21 sets the default chunk size to 2^21 = 2MiB.

Platform Notes

BIOS settings:

- Memory Interleaving set to Channel Interleaving
- Virtualization Technology disabled
- System Profile set to Custom
- CPU Power Management set to Maximum Performance
- Memory Frequency set to Maximum Performance
- Turbo Boost enabled
- C States set to Autonomous
- Memory Patrol Scrub disabled
- Memory Refresh Rate set to 1x
- PCI ASPM L1 Link Power Management disabled
- Determinism Slider set to Power Determinism

Sysinfo program /home/cpu2017-1.0.5/bin/sysinfo
 Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
 running on user-PowerEdge-R7425 Fri Nov 23 09:11:54 2018

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Platform Notes (Continued)

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 7551 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 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 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

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): 8

Vendor ID: AuthenticAMD

CPU family: 23

Model: 1

Model name: AMD EPYC 7551 32-Core Processor

Stepping: 2

CPU MHz: 2426.379

BogoMIPS: 3992.30

Virtualization: AMD-V

L1d cache: 32K

L1i cache: 64K

L2 cache: 512K

L3 cache: 8192K

NUMA node0 CPU(s): 0,8,16,24,32,40,48,56,64,72,80,88,96,104,112,120

NUMA node1 CPU(s): 2,10,18,26,34,42,50,58,66,74,82,90,98,106,114,122

NUMA node2 CPU(s): 4,12,20,28,36,44,52,60,68,76,84,92,100,108,116,124

NUMA node3 CPU(s): 6,14,22,30,38,46,54,62,70,78,86,94,102,110,118,126

NUMA node4 CPU(s): 1,9,17,25,33,41,49,57,65,73,81,89,97,105,113,121

NUMA node5 CPU(s): 3,11,19,27,35,43,51,59,67,75,83,91,99,107,115,123

NUMA node6 CPU(s): 5,13,21,29,37,45,53,61,69,77,85,93,101,109,117,125

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Platform Notes (Continued)

```

NUMA node7 CPU(s): 7,15,23,31,39,47,55,63,71,79,87,95,103,111,119,127
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 pdpelgb rdtscp lm
constant_tsc rep_good nopl nonstop_tsc cpuid extd_apicid amd_dcm aperfmperf pni
pclmulqdq monitor ssse3 fma cx16 sse4_1 sse4_2 movbe popcnt aes xsave avx fl6c
rdrand lahf_lm cmp_legacy svm extapic cr8_legacy abm sse4a misalignsse 3dnowprefetch
osvw skinit wdt tce topoext perfctr_core perfctr_nb bpext perfctr_llc mwaitx cpb
hw_pstate sme ssbd ibpb vmmcall fsgsbase bmi1 avx2 smep bmi2 rdseed adx smap
clflushopt sha_ni xsaveopt xsavec xgetbv1 xsaves clzero irperf xsaveerptr arat npt
lbrv svm_lock nrip_save tsc_scale vmcb_clean flushbyasid decodeassists pausefilter
pfthreshold avic v_umsave_vmload vgif 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: 8 nodes (0-7)
node 0 cpus: 0 8 16 24 32 40 48 56 64 72 80 88 96 104 112 120
node 0 size: 128638 MB
node 0 free: 128334 MB
node 1 cpus: 2 10 18 26 34 42 50 58 66 74 82 90 98 106 114 122
node 1 size: 128999 MB
node 1 free: 128822 MB
node 2 cpus: 4 12 20 28 36 44 52 60 68 76 84 92 100 108 116 124
node 2 size: 129020 MB
node 2 free: 128831 MB
node 3 cpus: 6 14 22 30 38 46 54 62 70 78 86 94 102 110 118 126
node 3 size: 129020 MB
node 3 free: 128797 MB
node 4 cpus: 1 9 17 25 33 41 49 57 65 73 81 89 97 105 113 121
node 4 size: 129020 MB
node 4 free: 128754 MB
node 5 cpus: 3 11 19 27 35 43 51 59 67 75 83 91 99 107 115 123
node 5 size: 129020 MB
node 5 free: 128831 MB
node 6 cpus: 5 13 21 29 37 45 53 61 69 77 85 93 101 109 117 125
node 6 size: 129020 MB
node 6 free: 128804 MB
node 7 cpus: 7 15 23 31 39 47 55 63 71 79 87 95 103 111 119 127
node 7 size: 129018 MB
node 7 free: 128782 MB
node distances:
node 0 1 2 3 4 5 6 7
0: 10 16 16 16 28 28 22 28
1: 16 10 16 16 28 28 28 22
2: 16 16 10 16 22 28 28 28

```

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Platform Notes (Continued)

```

3: 16 16 16 10 28 22 28 28
4: 28 28 22 28 10 16 16 16
5: 28 28 28 22 16 10 16 16
6: 22 28 28 28 16 16 10 16
7: 28 22 28 28 16 16 16 10

```

From /proc/meminfo

```

MemTotal:      1056521116 kB
HugePages_Total:      0
Hugepagesize:    2048 kB

```

```

/usr/bin/lsb_release -d
Ubuntu 18.04.1 LTS

```

From /etc/*release* /etc/*version*

```

debian_version: buster/sid
os-release:
  NAME="Ubuntu"
  VERSION="18.04.1 LTS (Bionic Beaver)"
  ID=ubuntu
  ID_LIKE=debian
  PRETTY_NAME="Ubuntu 18.04.1 LTS"
  VERSION_ID="18.04"
  HOME_URL="https://www.ubuntu.com/"
  SUPPORT_URL="https://help.ubuntu.com/"

```

uname -a:

```

Linux user-PowerEdge-R7425 4.15.0-39-generic #42-Ubuntu SMP Tue Oct 23 15:48:01 UTC
2018 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

```

run-level 3 Nov 23 09:10 last=5

SPEC is set to: /home/cpu2017-1.0.5

```

Filesystem      Type      Size      Used      Avail      Use%      Mounted on
/dev/sda2       ext4      109G      14G       90G       13%      /

```

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. 1.6.7 10/29/2018

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Platform Notes (Continued)

Memory:

16x 80CE863280CE M386A8K40BM2-CTD 64 GB 4 rank 2666

16x Not Specified Not Specified

(End of data from sysinfo program)

Compiler Version Notes

=====
CXXC 623.xalancbmk_s(peak)
=====

AOCC.LLVM.1.2.1.B29.2018_05_14 clang version 6.0.0 (CLANG:
b6b3d31d6df08fb7da935a28842b39b7b3c2c55b) (llvm/cpu/llvm
18855c80ed252fc4ba4ac41e2086627ef2bddd04) (based on LLVM
AOCC.LLVM.1.2.1.B29.2018_05_14)

Target: i386-unknown-linux-gnu

Thread model: posix

InstalledDir: /root/work/compilers/aoccl.2.1/AOCC-1.2.1-Compiler/bin

=====
CC 600.perlbench_s(base) 602.gcc_s(base, peak) 605.mcf_s(base, peak)
625.x264_s(base) 657.xz_s(base, peak)
=====

AOCC.LLVM.1.2.1.B29.2018_05_14 clang version 6.0.0 (CLANG:
b6b3d31d6df08fb7da935a28842b39b7b3c2c55b) (llvm/cpu/llvm
18855c80ed252fc4ba4ac41e2086627ef2bddd04) (based on LLVM
AOCC.LLVM.1.2.1.B29.2018_05_14)

Target: x86_64-unknown-linux-gnu

Thread model: posix

InstalledDir: /root/work/compilers/aoccl.2.1/AOCC-1.2.1-Compiler/bin

=====
CXXC 620.omnetpp_s(base, peak) 623.xalancbmk_s(base) 631.deepsjeng_s(base,
peak) 641.leela_s(base)
=====

AOCC.LLVM.1.2.1.B29.2018_05_14 clang version 6.0.0 (CLANG:
b6b3d31d6df08fb7da935a28842b39b7b3c2c55b) (llvm/cpu/llvm
18855c80ed252fc4ba4ac41e2086627ef2bddd04) (based on LLVM
AOCC.LLVM.1.2.1.B29.2018_05_14)

Target: x86_64-unknown-linux-gnu

Thread model: posix

InstalledDir: /root/work/compilers/aoccl.2.1/AOCC-1.2.1-Compiler/bin

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Compiler Version Notes (Continued)

=====
CC 600.perlbench_s(peak) 625.x264_s(peak)
=====

AOCC.LLVM.1.2.1.B29.2018_05_14 clang version 6.0.0 (CLANG:
b6b3d31d6df08fb7da935a28842b39b7b3c2c55b) (llvm/cpu/llvm
18855c80ed252fc4ba4ac41e2086627ef2bddd04) (based on LLVM
AOCC.LLVM.1.2.1.B29.2018_05_14)

Target: x86_64-unknown-linux-gnu

Thread model: posix

InstalledDir: /root/work/compilers/aoccl.2.1/AOCC-1.2.1-Compiler/bin
=====

=====
CXXC 641.leela_s(peak)
=====

AOCC.LLVM.1.2.1.B29.2018_05_14 clang version 6.0.0 (CLANG:
b6b3d31d6df08fb7da935a28842b39b7b3c2c55b) (llvm/cpu/llvm
18855c80ed252fc4ba4ac41e2086627ef2bddd04) (based on LLVM
AOCC.LLVM.1.2.1.B29.2018_05_14)

Target: x86_64-unknown-linux-gnu

Thread model: posix

InstalledDir: /root/work/compilers/aoccl.2.1/AOCC-1.2.1-Compiler/bin
=====

=====
FC 648.exchange2_s(base, peak)
=====

GNU Fortran (GCC) 4.8.2

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=====

Base Compiler Invocation

C benchmarks:

clang

C++ benchmarks:

clang++

Fortran benchmarks:

clang gfortran



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Base Portability Flags

```
600.perlbench_s: -DSPEC_LINUX_X64 -DSPEC_LP64
602.gcc_s: -DSPEC_LP64
605.mcf_s: -DSPEC_LP64
620.omnetpp_s: -DSPEC_LP64
623.xalancbmk_s: -DSPEC_LINUX -DSPEC_LP64
625.x264_s: -DSPEC_LP64
631.deepsjeng_s: -DSPEC_LP64
641.leela_s: -DSPEC_LP64
648.exchange2_s: -DSPEC_LP64
657.xz_s: -DSPEC_LP64
```

Base Optimization Flags

C benchmarks:

```
-flto -fuse-ld=lld -Wl,-mllvm -Wl,-function-specialize -O3
-ffast-math -march=znver1 -fstruct-layout=3
-mllvm -unroll-threshold=50 -fremap-arrays -mno-avx2
-mllvm -inline-threshold=1000 -flv-function-specialization
-mllvm -enable-gvn-hoist -mllvm -function-specialize -z muldefs
-lamdlibm -DSPEC_OPENMP -fopenmp -fopenmp=libomp -lomp -ljemalloc
```

C++ benchmarks:

```
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -flto -fuse-ld=lld
-Wl,-mllvm -Wl,-function-specialize -O3 -march=znver1 -ffast-math
-mllvm -unroll-threshold=100 -flv-function-specialization
-mllvm -enable-partial-unswitch -fremap-arrays
-mllvm -inline-threshold=1000 -z muldefs -lamdlibm -DSPEC_OPENMP
-fopenmp -fopenmp=libomp -lomp -ljemalloc
```

Fortran benchmarks:

```
-Wl,-mllvm -Wl,-inline-recursion=4 -Wl,-mllvm -Wl,-lsr-in-nested-loop
-Wl,-mllvm -Wl,-enable-iv-split -Wl,-mllvm -Wl,-merge-constant
-Wl,-mllvm -Wl,-unroll-aggressive -Wl,-mllvm -Wl,-unroll-threshold=150
-flto -fuse-ld=lld -Wl,-mllvm -Wl,-function-specialize -O3
-funroll-loops -ffast-math -z muldefs -lamdlibm -fplugin=dragonegg.so
-specs=integrated-as.specs
-fplugin-arg-dragonegg-llvm-option=-disable-indvar-simplify
-fplugin-arg-dragonegg-llvm-option=-unroll-aggressive
-fplugin-arg-dragonegg-llvm-option=-unroll-threshold:150 -DSPEC_OPENMP
-fopenmp -fopenmp=libomp -lomp -ljemalloc -lgfortran
```



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Base Other Flags

C benchmarks:

-Wno-return-type -DUSE_OPENMP

C++ benchmarks:

-Wno-return-type -DUSE_OPENMP

Fortran benchmarks:

-DUSE_OPENMP -Wno-return-type

Peak Compiler Invocation

C benchmarks:

clang

C++ benchmarks:

clang++

Fortran benchmarks:

clang gfortran

Peak Portability Flags

600.perlbench_s: -DSPEC_LINUX_X64 -DSPEC_LP64
602.gcc_s: -DSPEC_LP64
605.mcf_s: -DSPEC_LP64
620.omnetpp_s: -DSPEC_LP64
623.xalancbmk_s: -DSPEC_LINUX -D_FILE_OFFSET_BITS=64
625.x264_s: -DSPEC_LP64
631.deepsjeng_s: -DSPEC_LP64
641.leela_s: -DSPEC_LP64
648.exchange2_s: -DSPEC_LP64
657.xz_s: -DSPEC_LP64

Peak Optimization Flags

C benchmarks:

600.perlbench_s: -flto -fuse-ld=lld -Wl,-mllvm -Wl,-function-specialize
-fprofile-instr-generate(pass 1)
-fprofile-instr-use(pass 2) -Ofast -march=znver1

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Peak Optimization Flags (Continued)

600.perlbench_s (continued):

```
-mno-sse4a -fstruct-layout=5
-mllvm -vectorize-memory-aggressively -mno-avx2
-mllvm -unroll-threshold=50 -fremap-arrays
-mllvm -inline-threshold=1000 -mllvm -enable-gvn-hoist
-flv-function-specialization
-mllvm -enable-vectorize-compares -z muldefs -lamdlibm
-DSPEC_OPENMP -fopenmp -fopenmp=libomp -lomp -ljemalloc
```

602.gcc_s: basepeak = yes

605.mcf_s: -flto -fuse-ld=lld -Wl,-mllvm -Wl,-function-specialize

```
-Ofast -march=znver1 -mno-sse4a -fstruct-layout=5
-mllvm -vectorize-memory-aggressively -mno-avx2
-mllvm -unroll-threshold=50 -fremap-arrays
-mllvm -inline-threshold=1000 -mllvm -enable-gvn-hoist
-flv-function-specialization
-mllvm -enable-vectorize-compares -z muldefs -lamdlibm
-DSPEC_OPENMP -fopenmp -fopenmp=libomp -lomp -ljemalloc
```

625.x264_s: Same as 600.perlbench_s

657.xz_s: basepeak = yes

C++ benchmarks:

620.omnetpp_s: basepeak = yes

```
623.xalancbmk_s: -m32 -fuse-ld=lld -Wl,-mllvm -Wl,-x86-use-vzeroupper=false
-flto -Wl,-mllvm -Wl,-function-specialize -Ofast
-march=znver1 -flv-function-specialization
-mllvm -unroll-threshold=100 -fremap-arrays
-mllvm -inline-threshold=1000 -z muldefs -DSPEC_OPENMP
-fopenmp -fopenmp=libomp -lomp -libs-revA/32 -ljemalloc
```

631.deepsjeng_s: basepeak = yes

641.leela_s: basepeak = yes

Fortran benchmarks:

648.exchange2_s: basepeak = yes



SPEC CPU2017 Integer Speed Result

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Dell Inc.

SPECspeed2017_int_base = 6.69

PowerEdge R7425 (AMD EPYC 7551, 2.00GHz)

SPECspeed2017_int_peak = 6.88

CPU2017 License: 55

Test Sponsor: Dell Inc.

Tested by: Dell Inc.

Test Date: Nov-2018

Hardware Availability: Dec-2018

Software Availability: Oct-2018

Peak Other Flags

C benchmarks:

-Wno-return-type -DUSE_OPENMP

C++ benchmarks (except as noted below):

-Wno-return-type -DUSE_OPENMP

623.xalancbmk_s: -Wno-return-type -DUSE_OPENMP

-L/root/work/cpu2017/v105/amd1806-speed

Fortran benchmarks:

-DUSE_OPENMP -Wno-return-type

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

<http://www.spec.org/cpu2017/flags/aocc100-flags-revC-I.2018-11-13.html>

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

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

<http://www.spec.org/cpu2017/flags/aocc100-flags-revC-I.2018-11-13.xml>

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