SPEC CPU®2017 Integer Speed Result

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Cisco Systems

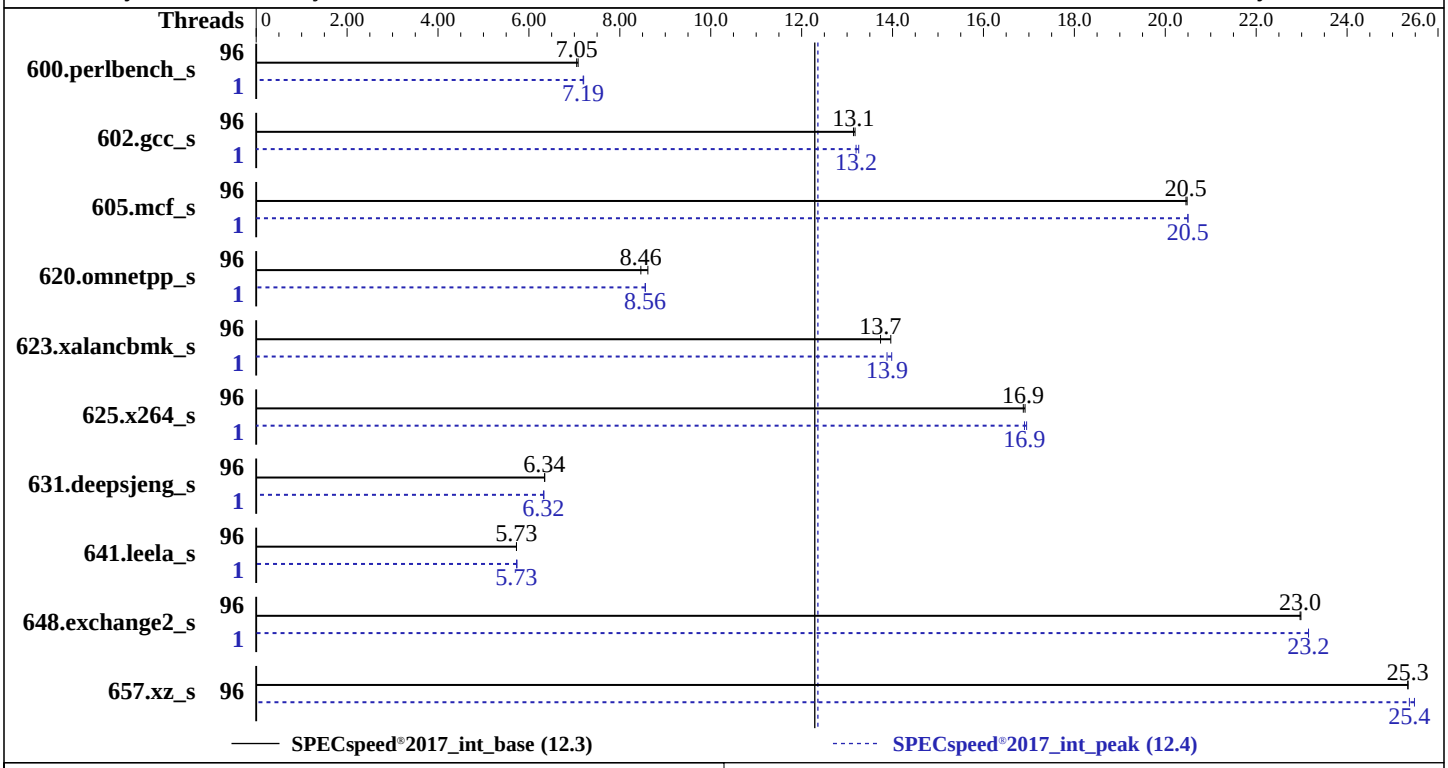
Cisco UCS C225 M6 (AMD EPYC 7643 48-Core Processor)

SPECspeed®2017_int_base = 12.3

SPECspeed®2017_int_peak = 12.4

CPU2017 License: 9019
Test Sponsor: Cisco Systems
Tested by: Cisco Systems

Test Date: Sep-2021
Hardware Availability: Jun-2021
Software Availability: Jun-2021



Hardware

CPU Name:	AMD EPYC 7643
Max MHz:	3600
Nominal:	2300
Enabled:	96 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:	256 MB I+D on chip per chip, 32 MB shared / 6 cores
Other:	None
Memory:	2 TB (16 x 128 GB 4Rx4 PC4-3200V-L)
Storage:	1 x 960 GB M.2 SSD SATA
Other:	None

Software

OS:	SUSE Linux Enterprise Server 15 SP3 (x86_64) kernel version 5.3.18-57-default
Compiler:	C/C++/Fortran: Version 3.0.0 of AOCC
Parallel:	Yes
Firmware:	Version C225M6.4.2.1c released Sep-2021
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:	BIOS and OS 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
600.perlbench_s	96	251	7.08	**252**	**7.05**			1	246	7.20	**247**	**7.19**		
602.gcc_s	96	302	13.2	**303**	**13.1**			1	**302**	**13.2**	300	13.3		
605.mcf_s	96	231	20.5	**231**	**20.5**			1	230	20.5	**230**	**20.5**		
620.omnetpp_s	96	189	8.62	**193**	**8.46**			1	190	8.56	**191**	**8.56**		
623.xalancbmk_s	96	101	14.0	**103**	**13.7**			1	**102**	**13.9**	101	14.0		
625.x264_s	96	**105**	**16.9**	104	16.9			1	**104**	**16.9**	104	16.9		
631.deepsjeng_s	96	**226**	**6.34**	226	6.35			1	226	6.33	**227**	**6.32**		
641.leela_s	96	298	5.73	**298**	**5.73**			1	297	5.74	**298**	**5.73**		
648.exchange2_s	96	**128**	**23.0**	128	23.0			1	**127**	**23.2**	127	23.2		
657.xz_s	96	**244**	**25.3**	244	25.3			96	**244**	**25.4**	243	25.5		

SPECspeed®2017_int_base = 12.3

SPECspeed®2017_int_peak = 12.4

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 limit
'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>
'echo 8 > /proc/sys/vm/dirty_ratio' run as root to limit dirty cache to 8% of
memory.
'echo 1 > /proc/sys/vm/swappiness' run as root to limit swap usage to minimum
necessary.
'echo 1 > /proc/sys/vm/zone_reclaim_mode' run as root to free node-local memory
and avoid remote memory usage.
'sync; echo 3 > /proc/sys/vm/drop_caches' run as root to reset filesystem caches.
'sysctl -w kernel.randomize_va_space=0' run as root to disable address space layout
randomization (ASLR) to reduce run-to-run variability.
'echo always > /sys/kernel/mm/transparent_hugepage/enabled' and
'echo always > /sys/kernel/mm/transparent_hugepage/defrag' run as root for peak
```

(Continued on next page)

Operating System Notes (Continued)

integer runs and all FP runs to enable Transparent Hugepages (THP).
'cpupower' frequency-set -g performance' run as root to set the scaling governor to performance.

Environment Variables Notes

```
Environment variables set by runcpu before the start of the run:
GOMP_CPU_AFFINITY = "0-191"
LD_LIBRARY_PATH =
     "/home/cpu2017/amd_speed_aocc300_milan_B_lib/lib;/home/cpu2017/amd_speed
     _aocc300_milan_B_lib/lib32:"
MALLOC_CONF = "retain:true"
OMP_DYNAMIC = "false"
OMP_SCHEDULE = "static"
OMP_STACKSIZE = "128M"
OMP_THREAD_LIMIT = "192"

Environment variables set by runcpu during the 600.perlbench_s peak run:
GOMP_CPU_AFFINITY = "0"

Environment variables set by runcpu during the 602.gcc_s peak run:
GOMP_CPU_AFFINITY = "0"

Environment variables set by runcpu during the 605.mcf_s peak run:
GOMP_CPU_AFFINITY = "0"

Environment variables set by runcpu during the 620.omnetpp_s peak run:
GOMP_CPU_AFFINITY = "0"

Environment variables set by runcpu during the 623.xalancbmk_s peak run:
GOMP_CPU_AFFINITY = "0"

Environment variables set by runcpu during the 625.x264_s peak run:
GOMP_CPU_AFFINITY = "0"

Environment variables set by runcpu during the 631.deepsjeng_s peak run:
GOMP_CPU_AFFINITY = "0"

Environment variables set by runcpu during the 641.leela_s peak run:
GOMP_CPU_AFFINITY = "0"

Environment variables set by runcpu during the 648.exchange2_s peak run:
GOMP_CPU_AFFINITY = "0"

Environment variables set by runcpu during the 657.xz_s peak run:
GOMP_CPU_AFFINITY = "0-95"
```

General Notes

```
Binaries were compiled on a system with 2x AMD EPYC 7742 CPU + 1TiB Memory using OpenSUSE 15.2

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 v4.8.2 in RHEL 7.4 (No options specified)
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 Configuration
 SMT Mode set to Auto
 NUMA nodes per socket set to NPS1
 ACPI SRAT L3 Cache As NUMA Domain set to Enabled
 DRAM Scrub Time set to Disabled
 Determinism Slider set to Power
 L1 Stream HW Prefetcher set to Enabled
 APBDIS set to 1


 Sysinfo program /home/cpu2017/bin/sysinfo
 Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acafc64d
 running on localhost Tue Sep 21 19:43:24 2021

 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 7643 48-Core Processor
       2  "physical id"s (chips)
       192 "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 : 48
       siblings  : 96
       physical 0: cores 0 1 2 3 4 5 8 9 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29
       32 33 34 35 36 37 40 41 42 43 44 45 48 49 50 51 52 53 56 57 58 59 60 61
       physical 1: cores 0 1 2 3 4 5 8 9 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29
       32 33 34 35 36 37 40 41 42 43 44 45 48 49 50 51 52 53 56 57 58 59 60 61
```

(Continued on next page)

Platform Notes (Continued)

```
From lscpu from util-linux 2.36.2:
     Architecture:                    x86_64
     CPU op-mode(s):                  32-bit, 64-bit
     Byte Order:                      Little Endian
     Address sizes:                   48 bits physical, 48 bits virtual
     CPU(s):                          192
     On-line CPU(s) list:             0-191
     Thread(s) per core:              2
     Core(s) per socket:              48
     Socket(s):                       2
     NUMA node(s):                    16
     Vendor ID:                       AuthenticAMD
     CPU family:                      25
     Model:                           1
     Model name:                      AMD EPYC 7643 48-Core Processor
     Stepping:                        1
     Frequency boost:                 enabled
     CPU MHz:                         1716.658
     CPU max MHz:                     2300.0000
     CPU min MHz:                     1500.0000
     BogoMIPS:                        4591.25
     Virtualization:                  AMD-V
     L1d cache:                       3 MiB
     L1i cache:                       3 MiB
     L2 cache:                        48 MiB
     L3 cache:                        512 MiB
     NUMA node0 CPU(s):               0-5,96-101
     NUMA node1 CPU(s):               6-11,102-107
     NUMA node2 CPU(s):               12-17,108-113
     NUMA node3 CPU(s):               18-23,114-119
     NUMA node4 CPU(s):               24-29,120-125
     NUMA node5 CPU(s):               30-35,126-131
     NUMA node6 CPU(s):               36-41,132-137
     NUMA node7 CPU(s):               42-47,138-143
     NUMA node8 CPU(s):               48-53,144-149
     NUMA node9 CPU(s):               54-59,150-155
     NUMA node10 CPU(s):              60-65,156-161
     NUMA node11 CPU(s):              66-71,162-167
     NUMA node12 CPU(s):              72-77,168-173
     NUMA node13 CPU(s):              78-83,174-179
     NUMA node14 CPU(s):              84-89,180-185
     NUMA node15 CPU(s):              90-95,186-191
     Vulnerability Itlb multihit:     Not affected
     Vulnerability L1tf:              Not affected
     Vulnerability Mds:               Not affected
     Vulnerability Meltdown:          Not affected
     Vulnerability Spec store bypass: Mitigation; Speculative Store Bypass disabled via
```

(Continued on next page)

Platform Notes (Continued)

```
      prctl and seccomp
      Vulnerability Spectre v1:        Mitigation; usercopy/swapgs barriers and __user
      pointer sanitization
      Vulnerability Spectre v2:        Mitigation; Full AMD retpoline, IBPB conditional,
      IBRS_FW, STIBP always-on, RSB filling
      Vulnerability Srbds:             Not affected
      Vulnerability Tsx async abort:   Not affected
      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 nonstop_tsc cpuid extd_apicid
      aperfmperf pni pclmulqdq monitor ssse3 fma cx16 pcid 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_llc mwaitx cpb cat_l3 cdp_l3 invpcid_single hw_pstate ssbd mba ibrs
      ibpb stibp vmmcall fsgsbase bmi1 avx2 smep bmi2 erms invpcid 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 wbnoinvd amd_ppin arat npt lbrv
      svm_lock nrip_save tsc_scale vmcb_clean flushbyasid decodeassists pausefilter
      pfthreshold v_vmsave_vmload vgif umip pku ospke vaes vpclmulqdq rdpid overflow_recov
      succor smca fsrm

From lscpu --cache:
      NAME ONE-SIZE ALL-SIZE WAYS TYPE        LEVEL  SETS PHY-LINE COHERENCY-SIZE
      L1d       32K       3M    8 Data            1    64        1             64
      L1i       32K       3M    8 Instruction     1    64        1             64
      L2       512K      48M    8 Unified         2  1024        1             64
      L3        32M     512M   16 Unified         3 32768        1             64

/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 4 5 96 97 98 99 100 101
  node 0 size: 128836 MB
  node 0 free: 128554 MB
  node 1 cpus: 6 7 8 9 10 11 102 103 104 105 106 107
  node 1 size: 129020 MB
  node 1 free: 128684 MB
  node 2 cpus: 12 13 14 15 16 17 108 109 110 111 112 113
  node 2 size: 129020 MB
  node 2 free: 128874 MB
  node 3 cpus: 18 19 20 21 22 23 114 115 116 117 118 119
  node 3 size: 129020 MB
  node 3 free: 128882 MB
  node 4 cpus: 24 25 26 27 28 29 120 121 122 123 124 125
```

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Platform Notes (Continued)

```
node 4 size: 129020 MB
node 4 free: 128770 MB
node 5 cpus: 30 31 32 33 34 35 126 127 128 129 130 131
node 5 size: 128986 MB
node 5 free: 128863 MB
node 6 cpus: 36 37 38 39 40 41 132 133 134 135 136 137
node 6 size: 129020 MB
node 6 free: 128878 MB
node 7 cpus: 42 43 44 45 46 47 138 139 140 141 142 143
node 7 size: 116908 MB
node 7 free: 116779 MB
node 8 cpus: 48 49 50 51 52 53 144 145 146 147 148 149
node 8 size: 129020 MB
node 8 free: 128597 MB
node 9 cpus: 54 55 56 57 58 59 150 151 152 153 154 155
node 9 size: 129020 MB
node 9 free: 128876 MB
node 10 cpus: 60 61 62 63 64 65 156 157 158 159 160 161
node 10 size: 129020 MB
node 10 free: 128869 MB
node 11 cpus: 66 67 68 69 70 71 162 163 164 165 166 167
node 11 size: 129020 MB
node 11 free: 128889 MB
node 12 cpus: 72 73 74 75 76 77 168 169 170 171 172 173
node 12 size: 129020 MB
node 12 free: 128896 MB
node 13 cpus: 78 79 80 81 82 83 174 175 176 177 178 179
node 13 size: 129020 MB
node 13 free: 128893 MB
node 14 cpus: 84 85 86 87 88 89 180 181 182 183 184 185
node 14 size: 129020 MB
node 14 free: 128896 MB
node 15 cpus: 90 91 92 93 94 95 186 187 188 189 190 191
node 15 size: 129015 MB
node 15 free: 128891 MB
node distances:
node   0   1   2   3   4   5   6   7   8   9  10  11  12  13  14  15
  0:  10  11  11  11  11  11  11  11  32  32  32  32  32  32  32  32
  1:  11  10  11  11  11  11  11  11  32  32  32  32  32  32  32  32
  2:  11  11  10  11  11  11  11  11  32  32  32  32  32  32  32  32
  3:  11  11  11  10  11  11  11  11  32  32  32  32  32  32  32  32
  4:  11  11  11  11  10  11  11  11  32  32  32  32  32  32  32  32
  5:  11  11  11  11  11  10  11  11  32  32  32  32  32  32  32  32
  6:  11  11  11  11  11  11  10  11  32  32  32  32  32  32  32  32
  7:  11  11  11  11  11  11  11  10  32  32  32  32  32  32  32  32
  8:  32  32  32  32  32  32  32  32  10  11  11  11  11  11  11  11
  9:  32  32  32  32  32  32  32  32  11  10  11  11  11  11  11  11
```

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Platform Notes (Continued)

```
    10:  32  32  32  32  32  32  32  32  11  11  10  11  11  11  11  11
    11:  32  32  32  32  32  32  32  32  11  11  11  10  11  11  11  11
    12:  32  32  32  32  32  32  32  32  11  11  11  11  10  11  11  11
    13:  32  32  32  32  32  32  32  32  11  11  11  11  11  10  11  11
    14:  32  32  32  32  32  32  32  32  11  11  11  11  11  11  10  11
    15:  32  32  32  32  32  32  32  32  11  11  11  11  11  11  11  10

  From /proc/meminfo
     MemTotal:       2101245552 kB
     HugePages_Total:       0
     Hugepagesize:       2048 kB

  /sys/devices/system/cpu/cpu*/cpufreq/scaling_governor has
     performance

  From /etc/*release* /etc/*version*
     os-release:
        NAME="SLES"
        VERSION="15-SP3"
        VERSION_ID="15.3"
        PRETTY_NAME="SUSE Linux Enterprise Server 15 SP3"
        ID="sles"
        ID_LIKE="suse"
        ANSI_COLOR="0;32"
        CPE_NAME="cpe:/o:suse:sles:15:sp3"

  uname -a:
     Linux localhost 5.3.18-57-default #1 SMP Wed Apr 28 10:54:41 UTC 2021 (ba3c2e9) x86_64
     x86_64 x86_64 GNU/Linux

  Kernel self-reported vulnerability status:

  CVE-2018-12207 (iTLB Multihit):                          Not affected
  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: usercopy/swapgs
                                                           barriers and __user pointer
                                                           sanitization
  CVE-2017-5715 (Spectre variant 2):                       Mitigation: Full AMD retpoline,
                                                          IBPB: conditional, IBRS_FW, STIBP:
                                                           always-on, RSB filling
  CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
  CVE-2019-11135 (TSX Asynchronous Abort):                 Not affected
```

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Platform Notes (Continued)

```
 run-level 3 Sep 21 15:06

 SPEC is set to: /home/cpu2017
    Filesystem     Type  Size  Used Avail Use% Mounted on
    /dev/sdc3      xfs   557G   11G  546G   2% /

 From /sys/devices/virtual/dmi/id
     Vendor:         Cisco Systems Inc
     Product:        UCSC-C225-M6S
     Serial:         WZP252309U3

 Additional information from dmidecode 3.2 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 0xCE00 M386AAG40AM3-CWE 128 GB 4 rank 3200

 BIOS:
    BIOS Vendor:       Cisco Systems, Inc.
    BIOS Version:      C225M6.4.2.1c.0.0806211349
    BIOS Date:         08/06/2021
    BIOS Revision:     5.22

 (End of data from sysinfo program)
```

Compiler Version Notes

```
==============================================================================
C       | 600.perlbench_s(base, peak) 602.gcc_s(base, peak) 605.mcf_s(base,
        | peak) 625.x264_s(base, peak) 657.xz_s(base, peak)
------------------------------------------------------------------------------
AMD clang version 12.0.0 (CLANG: AOCC_3.0.0-Build#78 2020_12_10) (based on
  LLVM Mirror.Version.12.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.0.0/bin
------------------------------------------------------------------------------

==============================================================================
C++     | 620.omnetpp_s(base, peak) 623.xalancbmk_s(base, peak)
        | 631.deepsjeng_s(base, peak) 641.leela_s(base, peak)
------------------------------------------------------------------------------
AMD clang version 12.0.0 (CLANG: AOCC_3.0.0-Build#78 2020_12_10) (based on
  LLVM Mirror.Version.12.0.0)
```

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Compiler Version Notes (Continued)

```
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.0.0/bin
------------------------------------------------------------------------------

==============================================================================
Fortran | 648.exchange2_s(base, peak)
------------------------------------------------------------------------------
AMD clang version 12.0.0 (CLANG: AOCC_3.0.0-Build#78 2020_12_10) (based on
  LLVM Mirror.Version.12.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.0.0/bin
------------------------------------------------------------------------------
```

Base Compiler Invocation

C benchmarks:
`clang`

C++ benchmarks:
`clang++`

Fortran benchmarks:
`flang`

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:

```
-m64 -mno-adx -mno-sse4a -Wl,-allow-multiple-definition
-Wl,-mllvm -Wl,-enable-licm-vrp -Wl,-mllvm -Wl,-region-vectorize
-Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -O3 -march=znver3
-fveclib=AMDLIBM -ffast-math -flto -fstruct-layout=5
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-fremap-arrays -mllvm -function-specialize -flv-function-specialization
-mllvm -enable-gvn-hoist -mllvm -global-vectorize-slp=true
-mllvm -enable-licm-vrp -mllvm -reduce-array-computations=3 -z muldefs
-DSPEC_OPENMP -fopenmp -fopenmp=libomp -lomp -lamdlibm -ljemalloc
-lflang -lflangrti
```

C++ benchmarks:

```
-m64 -std=c++98 -mno-adx -mno-sse4a
-Wl,-mllvm -Wl,-do-block-reorder=aggressive
-Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -O3 -march=znver3
-fveclib=AMDLIBM -ffast-math -flto -mllvm -enable-partial-unswitch
-mllvm -unroll-threshold=100 -finline-aggressive
-flv-function-specialization -mllvm -loop-unswitch-threshold=200000
-mllvm -reroll-loops -mllvm -aggressive-loop-unswitch
-mllvm -extra-vectorizer-passes -mllvm -reduce-array-computations=3
-mllvm -global-vectorize-slp=true -mllvm -convert-pow-exp-to-int=false
-z muldefs -mllvm -do-block-reorder=aggressive
-fvirtual-function-elimination -fvisibility=hidden -DSPEC_OPENMP
-fopenmp -fopenmp=libomp -lomp -lamdlibm -ljemalloc -lflang
-lflangrti
```

Fortran benchmarks:

```
-m64 -mno-adx -mno-sse4a -Wl,-mllvm -Wl,-inline-recursion=4
-Wl,-mllvm -Wl,-lsr-in-nested-loop -Wl,-mllvm -Wl,-enable-iv-split
-Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -O3 -march=znver3
-fveclib=AMDLIBM -ffast-math -flto -z muldefs
-mllvm -unroll-aggressive -mllvm -unroll-threshold=150 -DSPEC_OPENMP
-fopenmp -fopenmp=libomp -lomp -lamdlibm -ljemalloc -lflang
-lflangrti
```

Base Other Flags

C benchmarks:
-Wno-unused-command-line-argument -Wno-return-type

C++ benchmarks:
-Wno-unused-command-line-argument -Wno-return-type

Fortran benchmarks:
-Wno-return-type

Peak Compiler Invocation

C benchmarks:
clang

C++ benchmarks:
clang++

Fortran benchmarks:
flang

Peak Portability Flags

Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:
-m64 -mno-adx -mno-sse4a -Wl,-allow-multiple-definition
-Wl,-mllvm -Wl,-enable-licm-vrp -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast -march=znver3
-fveclib=AMDLIBM -ffast-math -flto -fstruct-layout=5
-mllvm -unroll-threshold=50 -fremap-arrays -flv-function-specialization
-mllvm -inline-threshold=1000 -mllvm -enable-gvn-hoist
-mllvm -global-vectorize-slp=true -mllvm -function-specialize
-mllvm -enable-licm-vrp -mllvm -reduce-array-computations=3
-DSPEC_OPENMP -fopenmp -fopenmp=libomp -lomp -lamdlibm -ljemalloc
-lflang

(Continued on next page)

Peak Optimization Flags (Continued)

C++ benchmarks:

```
-m64 -std=c++98 -mno-adx -mno-sse4a
-Wl,-mllvm -Wl,-do-block-reorder=aggressive
-Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast -march=znver3
-fveclib=AMDLIBM -ffast-math -flto -finline-aggressive
-mllvm -unroll-threshold=100 -flv-function-specialization
-mllvm -enable-licm-vrp -mllvm -reroll-loops
-mllvm -aggressive-loop-unswitch -mllvm -reduce-array-computations=3
-mllvm -global-vectorize-slp=true -mllvm -do-block-reorder=aggressive
-fvirtual-function-elimination -fvisibility=hidden -DSPEC_OPENMP
-fopenmp -fopenmp=libomp -lomp -lamdlibm -ljemalloc -lflang
```

Fortran benchmarks:

```
-m64 -mno-adx -mno-sse4a -Wl,-mllvm -Wl,-inline-recursion=4
-Wl,-mllvm -Wl,-lsr-in-nested-loop -Wl,-mllvm -Wl,-enable-iv-split
-Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -O3 -march=znver3
-fveclib=AMDLIBM -ffast-math -flto -mllvm -unroll-aggressive
-mllvm -unroll-threshold=150 -DSPEC_OPENMP -fopenmp -fopenmp=libomp
-lomp -lamdlibm -ljemalloc -lflang
```

Peak Other Flags

C benchmarks:

```
-Wno-unused-command-line-argument -Wno-return-type
```

C++ benchmarks:

```
-Wno-unused-command-line-argument -Wno-return-type
```

Fortran benchmarks:

```
-Wno-return-type
```

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

http://www.spec.org/cpu2017/flags/aocc300-flags-B2.html
http://www.spec.org/cpu2017/flags/Cisco-Platform-Settings-AMD-v2-revD.html

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

http://www.spec.org/cpu2017/flags/aocc300-flags-B2.xml
http://www.spec.org/cpu2017/flags/Cisco-Platform-Settings-AMD-v2-revD.xml

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