SPEC CPU®2017 Integer Speed Result

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Hewlett Packard Enterprise

(Test Sponsor: HPE)

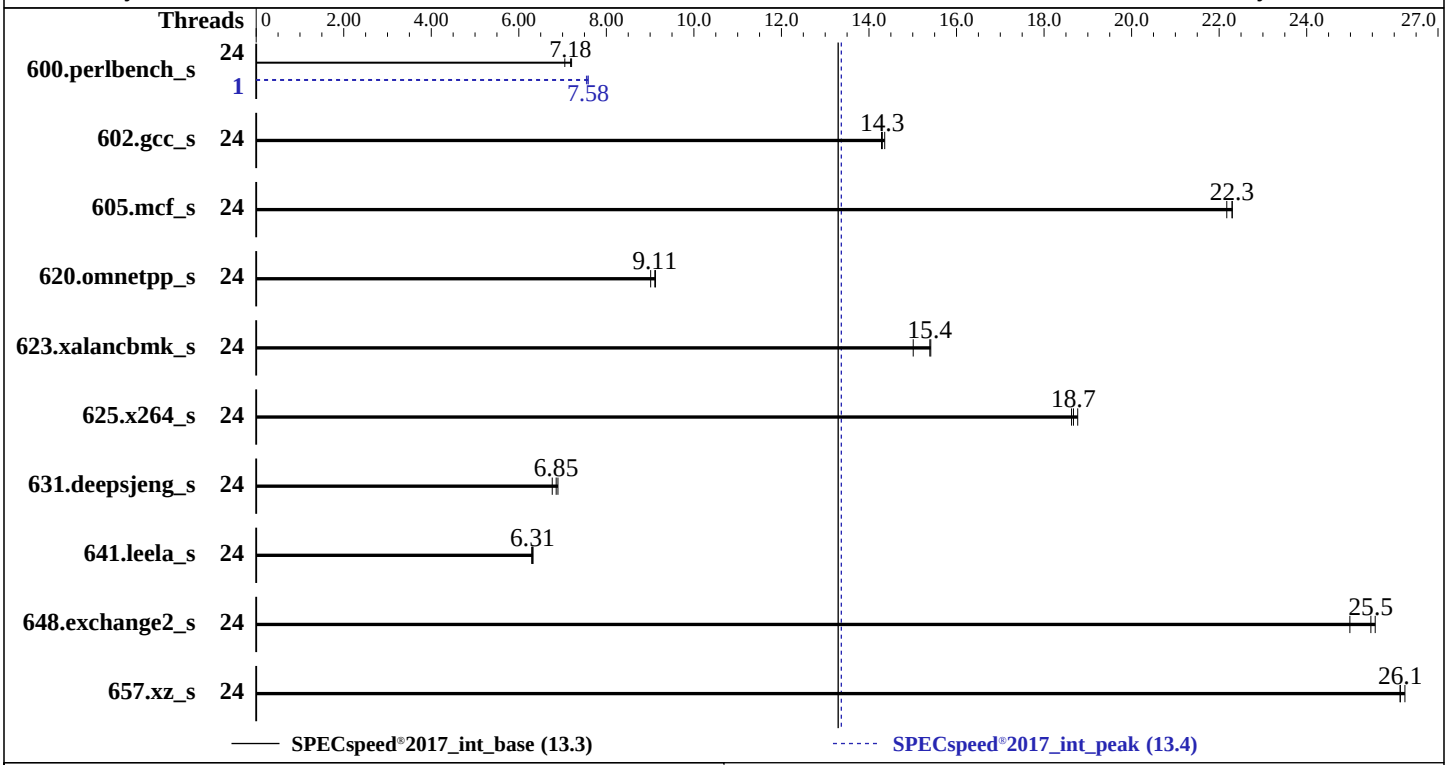
ProLiant DL325 Gen10 Plus v2
(3.20 GHz, AMD EPYC 74F3)

SPECspeed®2017_int_base = 13.3

SPECspeed®2017_int_peak = 13.4

CPU2017 License: 3
Test Sponsor: HPE
Tested by: HPE

Test Date: Apr-2021
Hardware Availability: Jun-2021
Software Availability: Mar-2021



Hardware

CPU Name:	AMD EPYC 74F3
Max MHz:	4000
Nominal:	3200
Enabled:	24 cores, 1 chip
Orderable:	1 chip
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 / 3 cores
Other:	None
Memory:	1 TB (8 x 128 GB 4Rx4 PC4-3200AA-L)
Storage:	1 x 800 GB SAS SSD, RAID 0
Other:	None

Software

OS:	Ubuntu 20.04.1 LTS (x86_64) Kernel 5.4.0-54-generic
Compiler:	C/C++/Fortran: Version 3.0.0 of AOCC
Parallel:	Yes
Firmware:	HPE BIOS Version A43 v2.42 04/15/2021 released Apr-2021
File System:	ext4
System State:	Run level 5 (multi-user, GUI disabled)
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	24	252	7.05	**247**	**7.18**	246	7.21	1	**234**	**7.58**	234	7.58	235	7.55
602.gcc_s	24	**278**	**14.3**	279	14.3	277	14.4	24	**278**	**14.3**	279	14.3	277	14.4
605.mcf_s	24	213	22.2	**212**	**22.3**	212	22.3	24	213	22.2	**212**	**22.3**	212	22.3
620.omnetpp_s	24	**179**	**9.11**	179	9.12	181	9.01	24	**179**	**9.11**	179	9.12	181	9.01
623.xalancbmk_s	24	91.9	15.4	**92.1**	**15.4**	94.4	15.0	24	91.9	15.4	**92.1**	**15.4**	94.4	15.0
625.x264_s	24	**94.5**	**18.7**	94.0	18.8	94.7	18.6	24	**94.5**	**18.7**	94.0	18.8	94.7	18.6
631.deepsjeng_s	24	212	6.76	208	6.89	**209**	**6.85**	24	212	6.76	208	6.89	**209**	**6.85**
641.leela_s	24	**270**	**6.31**	271	6.29	270	6.32	24	**270**	**6.31**	271	6.29	270	6.32
648.exchange2_s	24	118	25.0	115	25.6	**115**	**25.5**	24	118	25.0	115	25.6	**115**	**25.5**
657.xz_s	24	236	26.2	237	26.1	**236**	**26.1**	24	236	26.2	237	26.1	**236**	**26.1**

SPECspeed®2017_int_base = **13.3**

SPECspeed®2017_int_peak = **13.4**

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.

The real test date is Apr-2021. The clock was mistakenly set to 2020 before the benchmark was run.
```

(Continued on next page)

Operating System Notes (Continued)

```
To enable Transparent Hugepages (THP) for all allocations,
'echo always > /sys/kernel/mm/transparent_hugepage/enabled' and
'echo always > /sys/kernel/mm/transparent_hugepage/defrag' run as root.
To enable THP only on request for peak runs of 628.pop2_s, and 638.imagick_s,
'echo madvise > /sys/kernel/mm/transparent_hugepage/enabled' run as root.
To disable THP for peak runs of 627.cam4_s, 644.nab_s, 649.fotonik3d_s, and 654.roms_s,
'echo never > /sys/kernel/mm/transparent_hugepage/enabled' run as root.
```

Environment Variables Notes

```
Environment variables set by runcpu before the start of the run:
GOMP_CPU_AFFINITY = "0-23"
LD_LIBRARY_PATH =
      "/cpu2017/amd_speed_aocc300_milan_B_lib/64;/cpu2017/amd_speed_aocc300_mi
      lan_B_lib/32:"
MALLOC_CONF = "retain:true"
OMP_DYNAMIC = "false"
OMP_SCHEDULE = "static"
OMP_STACKSIZE = "128M"
OMP_THREAD_LIMIT = "24"

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

General Notes

```
Binaries were compiled on a system with 2x AMD EPYC 7742 CPU + 512GiB 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
 Workload Profile set to General Throughput Compute
```

(Continued on next page)

Platform Notes (Continued)

```
AMD SMT Option set to Disabled
Determinism Control set to Manual
 Performance Determinism set to Power Deterministic
Last-Level Cache (LLC) as NUMA Node set to Enabled
Memory PStates set to Disabled
Data Fabric C-State Enable set to Force Enabled
Thermal Configuration set to Maximum Cooling
Workload Profile set to Custom
 Infinity Fabric Power Management set to Disabled
  Infinity Fabric Performance State set to P0
L1 HW Prefetcher set to Disabled

Sysinfo program /cpu2017/bin/sysinfo
Rev: r6538 of 2020-09-24 e8664e66d2d7080afeaa89d4b38e2f1c
running on dl325gen10plus Mon Apr 26 17:14:29 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 74F3 24-Core Processor
      1  "physical id"s (chips)
      24 "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 2 4 5 6 8 9 10 12 13 14 16 17 18 20 21 22 24 25 26 28 29 30

From lscpu:
     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):                          24
     On-line CPU(s) list:             0-23
     Thread(s) per core:              1
     Core(s) per socket:              24
     Socket(s):                       1
     NUMA node(s):                    8
     Vendor ID:                       AuthenticAMD
     CPU family:                      25
     Model:                           1
     Model name:                      AMD EPYC 74F3 24-Core Processor
     Stepping:                        1
     Frequency boost:                 enabled
```

(Continued on next page)

Platform Notes (Continued)

```
      CPU MHz:                         3541.539
      CPU max MHz:                     3200.0000
      CPU min MHz:                     1500.0000
      BogoMIPS:                        6387.70
      Virtualization:                  AMD-V
      L1d cache:                       768 KiB
      L1i cache:                       768 KiB
      L2 cache:                        12 MiB
      L3 cache:                        256 MiB
      NUMA node0 CPU(s):               0-2
      NUMA node1 CPU(s):               3-5
      NUMA node2 CPU(s):               6-8
      NUMA node3 CPU(s):               9-11
      NUMA node4 CPU(s):               12-14
      NUMA node5 CPU(s):               15-17
      NUMA node6 CPU(s):               18-20
      NUMA node7 CPU(s):               21-23
      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
      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 disabled, 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 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 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

  /proc/cpuinfo cache data
     cache size : 512 KB

  From numactl --hardware  WARNING: a numactl 'node' might or might not correspond to a
  physical chip.
```

(Continued on next page)

Platform Notes (Continued)

```
   available: 8 nodes (0-7)
   node 0 cpus: 0 1 2
   node 0 size: 128776 MB
   node 0 free: 128648 MB
   node 1 cpus: 3 4 5
   node 1 size: 128998 MB
   node 1 free: 128892 MB
   node 2 cpus: 6 7 8
   node 2 size: 129023 MB
   node 2 free: 128919 MB
   node 3 cpus: 9 10 11
   node 3 size: 129023 MB
   node 3 free: 128912 MB
   node 4 cpus: 12 13 14
   node 4 size: 129023 MB
   node 4 free: 128792 MB
   node 5 cpus: 15 16 17
   node 5 size: 129023 MB
   node 5 free: 128840 MB
   node 6 cpus: 18 19 20
   node 6 size: 129023 MB
   node 6 free: 128891 MB
   node 7 cpus: 21 22 23
   node 7 size: 116910 MB
   node 7 free: 116708 MB
   node distances:
   node   0   1   2   3   4   5   6   7
     0:  10  11  11  11  11  11  11  11
     1:  11  10  11  11  11  11  11  11
     2:  11  11  10  11  11  11  11  11
     3:  11  11  11  10  11  11  11  11
     4:  11  11  11  11  10  11  11  11
     5:  11  11  11  11  11  10  11  11
     6:  11  11  11  11  11  11  10  11
     7:  11  11  11  11  11  11  11  10

 From /proc/meminfo
    MemTotal:       1044276464 kB
    HugePages_Total:       0
    Hugepagesize:       2048 kB

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

 /usr/bin/lsb_release -d
    Ubuntu 20.04.1 LTS
```

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Platform Notes (Continued)

```
From /etc/*release* /etc/*version*
   debian_version: bullseye/sid
   os-release:
      NAME="Ubuntu"
      VERSION="20.04.1 LTS (Focal Fossa)"
      ID=ubuntu
      ID_LIKE=debian
      PRETTY_NAME="Ubuntu 20.04.1 LTS"
      VERSION_ID="20.04"
      HOME_URL="https://www.ubuntu.com/"
      SUPPORT_URL="https://help.ubuntu.com/"

uname -a:
   Linux dl325gen10plus 5.4.0-54-generic #60-Ubuntu SMP Fri Nov 6 10:37:59 UTC 2020
   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:
                                                       disabled, RSB filling
CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
CVE-2019-11135 (TSX Asynchronous Abort):               Not affected

run-level 5 Apr 26 17:11

SPEC is set to: /cpu2017
   Filesystem     Type  Size  Used Avail Use% Mounted on
   /dev/sdb2      ext4  733G   24G  672G   4% /

From /sys/devices/virtual/dmi/id
    Vendor:         HPE
    Product:        ProLiant DL325 Gen10 Plus
    Product Family: ProLiant
    Serial:         CN79290FKQ

Additional information from dmidecode follows.  WARNING: Use caution when you interpret
```

(Continued on next page)

Platform Notes (Continued)

```
 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:
     8x Samsung M386AAG40AM3-CWE 128 GB 4 rank 3200
     8x UNKNOWN NOT AVAILABLE

 BIOS:
    BIOS Vendor:       HPE
    BIOS Version:      A43
    BIOS Date:         04/15/2021
    BIOS Revision:     2.42
    Firmware Revision: 2.40

 (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)
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
```

(Continued on next page)

Compiler Version Notes (Continued)

```
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

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Base Optimization Flags (Continued)

C benchmarks (continued):
-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:

600.perlbench_s: -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

602.gcc_s: basepeak = yes

605.mcf_s: basepeak = yes

625.x264_s: basepeak = yes

657.xz_s: basepeak = yes

C++ benchmarks:

(Continued on next page)

Peak Optimization Flags (Continued)

620.omnetpp_s: `basepeak = yes`

623.xalancbmk_s: `basepeak = yes`

631.deepsjeng_s: `basepeak = yes`

641.leela_s: `basepeak = yes`

Fortran benchmarks:

648.exchange2_s: `basepeak = yes`

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-A1.html`
`http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-AMD-V1.2-EPYC-revP.html`

You can also download the XML flags sources by saving the following links:
`http://www.spec.org/cpu2017/flags/aocc300-flags-A1.xml`
`http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-AMD-V1.2-EPYC-revP.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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