# SPEC CPU®2017 Integer Speed Result

**Supermicro**  
A+ Server 2014CS-TR  
(H12SSW-AN6, AMD EPYC 7473X)

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**CPU2017 License:** 001176  
**Test Sponsor:** Supermicro  
**Tested by:** Supermicro

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**SPECspeed®2017_int_base = 12.8**  
**SPECspeed®2017_int_peak = 13.0**

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**Hardware**

- **CPU Name:** AMD EPYC 7473X  
- **Max MHz:** 3700  
- **Nominal:** 2800  
- **Enabled:** 24 cores, 1 chip, 2 threads/core  
- **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:** 768 MB I+D on chip per chip, 96 MB shared / 3 cores  
- **Other:** None  
- **Memory:** 512 GB (16 x 32 GB 2Rx4 PC4-3200AA-R, running at 2933)  
- **Storage:** 1 x 3 TB SATA III, 7200 RPM  
- **Other:** None

---

**Software**

- **OS:** Ubuntu 20.04.3 LTS  
- **Kernel:** 5.4.0-100-generic  
- **Compiler:** C/C++/Fortran: Version 3.2.0 of AOCC  
- **Parallel:** Yes  
- **Firmware:** Version 2.4 released Feb-2022  
- **File System:** ext4  
- **System State:** Run level 5 (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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**SPECspeed®2017_int_base = 12.8**

**SPECspeed®2017_int_peak = 13.0**

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#### Results Table

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**SPECspeed®2017_int_base = 12.8**

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Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

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### Compiler Notes

The AMD64 AOCC Compiler Suite is available at http://developer.amd.com/amd-aocc/

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### Submit Notes

The config file option 'submit' was used. 'numactl' was used to bind copies to the cores. See the configuration file for details.

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### 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>

To limit dirty cache to 8% of memory, 'sysctl -w vm.dirty_ratio=8' run as root.
To limit swap usage to minimum necessary, 'sysctl -w vm.swappiness=1' run as root.
To free node-local memory and avoid remote memory usage, 'sysctl -w vm.zone_reclaim_mode=1' run as root.
To clear filesystem caches, 'sync; sysctl -w vm.drop_caches=3' run as root.
To disable address space randomization (ASLR) to reduce run-to-run variability, 'sysctl -w kernel.randomize_va_space=0' run as root.

To enable Transparent Hugepages (THP) for all allocations,

(Continued on next page)
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Operating System Notes (Continued)
'echo always > /sys/kernel/mm/transparent_hugepage/enabled' and
'echo always > /sys/kernel/mm/transparent_hugepage/defrag' run as root.

Environment Variables Notes

Environment variables set by runcpu before the start of the run:
GOMP_CPU_AFFINITY = "0-47"
LD_LIBRARY_PATH =
    "/home/cpu2017/amd_speed_aocc320_milanx_A_lib/lib;/home/cpu2017/amd_speed_aocc320_milanx_A_lib/lib32:" LIBOMP_NUM_HIDDEN_HELPER_THREADS = "0"
MALLOCC_CONF = "retain:true"
OMP_DYNAMIC = "false"
OMP_SCHEDULE = "static"
OMP_STACKSIZE = "128M"
OMP_THREAD_LIMIT = "48"

Environment variables set by runcpu during the 602.gcc_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 648.exchange2_s peak run:
GOMP_CPU_AFFINITY = "0"

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
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Tested by: Supermicro

Platform Notes

BIOS Settings:
Determinism Control = Manual
Determinism Slider = Power
cTDP Control = Manual
cTDP = 280
Package Power Limit Control = Manual
Package Power Limit = 280
APBDIS = 1
NUMA Nodes Per Socket = NPS4

Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16aca64d4
running on h12ssw-an6-7473x Fri Feb 18 19:26:47 2022

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 7473X 24-Core Processor
 1 "physical id"s (chips)
48 "processors"
core(s), 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 2 4 5 6 8 9 10 12 13 14 16 17 18 20 21 22 24 25 26 28 29 30

From lscpu from util-linux 2.34:
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):                    48
On-line CPU(s) list:       0-47
Thread(s) per core:        2
Core(s) per socket:        24
Socket(s):                 1
NUMA node(s):              8
Vendor ID:                 AuthenticAMD
CPU family:                25
Model:                     1
Model name:                AMD EPYC 7473X 24-Core Processor
Stepping:                  2
Frequency boost:           enabled
CPU MHz:                   2728.955
CPU max MHz:               2800.0000

(Continued on next page)
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</table>

**CPU2017 License:** 001176  
**Test Sponsor:** Supermicro  
**Tested by:** Supermicro

**CPU min MHz:** 1500.0000  
**BogoMIPS:** 5599.63  
**Virtualization:** AMD-V  
**L1d cache:** 768 KiB  
**L1i cache:** 768 KiB  
**L2 cache:** 12 MiB  
**L3 cache:** 768 MiB  
**NUMA node0 CPU(s):** 0-2, 24-26  
**NUMA node1 CPU(s):** 3-5, 27-29  
**NUMA node2 CPU(s):** 6-8, 30-32  
**NUMA node3 CPU(s):** 9-11, 33-35  
**NUMA node4 CPU(s):** 12-14, 36-38  
**NUMA node5 CPU(s):** 15-17, 39-41  
**NUMA node6 CPU(s):** 18-20, 42-44  
**NUMA node7 CPU(s):** 21-23, 45-47  
**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, STIBF always-on, RSB filling  
**Vulnerability Srbd:** Not affected  
**Vulnerability Txs 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 rdosp lm constant_tsc rep_good nopl nonstop_tsc cpuid extd_apicid aperfmperf pni pclmulqdq monitor ssse3 fma cx16 pcmid sse4_1 sse4_2 movbe popcnt aes xsave avx f16c rdrand lahf_lm cmp_legacy svm extapic cr8_legacy abm sse4a misalignsse 3nowprefetch osvw ibs k8it wdt tce topoext perfctr_core perfctr_nb bproperf perfctr_llc mwainx cpb cat_l3 cpuid 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_mbb_total cqm_mbb_local clzero irperf xsavesrptr wbenoivd arat npt lbv svm_lock nrip_save tsc_scale vmcb_clean flushbyasid decodeassist pfthreshold v_msave_vmload vgif umip pkup ospe vaes vpclmulqdq rdpid overflow_recover succor smca

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<tr>
<th>NAME</th>
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<td>768M</td>
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Test Sponsor: Supermicro
Tested by: Supermicro

Test Date: Feb-2022
Hardware Availability: Mar-2022
Software Availability: Feb-2022

Platform Notes (Continued)

/proccpuinfo 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 1 2 24 25 26
node 0 size: 64387 MB
node 0 free: 64056 MB
node 1 cpus: 3 4 5 27 28 29
node 1 size: 64508 MB
node 1 free: 64261 MB
node 2 cpus: 6 7 8 30 31 32
node 2 size: 64510 MB
node 2 free: 63977 MB
node 3 cpus: 9 10 11 33 34 35
node 3 size: 64509 MB
node 3 free: 64369 MB
node 4 cpus: 12 13 14 36 37 38
node 4 size: 64510 MB
node 4 free: 64242 MB
node 5 cpus: 15 16 17 39 40 41
node 5 size: 64480 MB
node 5 free: 64259 MB
node 6 cpus: 18 19 20 42 43 44
node 6 size: 64510 MB
node 6 free: 63020 MB
node 7 cpus: 21 22 23 45 46 47
node 7 size: 64496 MB
node 7 free: 64277 MB
node distances:
  node   0   1   2   3   4   5   6   7
 0: 10 11 12 12 12 12 12 12
 1: 11 10 12 12 12 12 12 12
 2: 12 12 10 11 12 12 12 12
 3: 12 12 11 10 12 12 12 12
 4: 12 12 12 10 11 12 12 12
 5: 12 12 12 12 11 10 12 12
 6: 12 12 12 12 12 12 10 11
 7: 12 12 12 12 12 12 11 10

From /proc/meminfo
  MemTotal: 528295992 kB
  HugePages_Total: 0
  Hugepagesize: 2048 kB

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

(Continued on next page)
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**Platform Notes (Continued)**

```
performance

/usr/bin/lsb_release -d
Ubuntu 20.04.3 LTS

From /etc/*release* /etc/*version*
debian_version: bullseye/sid
os-release:
  NAME="Ubuntu"
  VERSION="20.04.3 LTS (Focal Fossa)"
  ID=ubuntu
  ID_LIKE=debian
  PRETTY_NAME="Ubuntu 20.04.3 LTS"
  VERSION_ID="20.04"
  HOME_URL="https://www.ubuntu.com/"
  SUPPORT_URL="https://help.ubuntu.com/"

uname -a:
  Linux h12ssw-an6-7473x 5.4.0-100-generic #113-Ubuntu SMP Thu Feb 3 18:43:29 UTC 2022
  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/swaps 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

run-level 5 Feb 18 07:53

SPEC is set to: /home/cpu2017

Filesystem     Type  Size  Used Avail Use% Mounted on
/dev/sda2      ext4  2.7T  17G  2.6T  1% /

From /sys/devices/virtual/dmi/id
  Vendor: Supermicro
```

(Continued on next page)
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SPECspeed®2017_int_base = 12.8
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Platform Notes (Continued)

Product: Super Server
Serial: 0123456789

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 Micron Technology 36ASF4G72PZ-3G2J3 32 GB 2 rank 3200, configured at 2933

BIOS:
BIOS Vendor: American Megatrends Inc.
BIOS Version: 2.4
BIOS Date: 02/07/2022
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 13.0.0 (CLANG: AOCC_3.2.0-Build#128 2021_11_12) (based on LLVM Mirror.Version.13.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.2.0/bin

C++
620.omnetpp_s(base, peak) 623.xalancbmk_s(base, peak)
631.deepsjeng_s(base, peak) 641.leea_s(base, peak)

AMD clang version 13.0.0 (CLANG: AOCC_3.2.0-Build#128 2021_11_12) (based on LLVM Mirror.Version.13.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.2.0/bin

Fortran
648.exchange2_s(base, peak)

AMD clang version 13.0.0 (CLANG: AOCC_3.2.0-Build#128 2021_11_12) (based on
SPEC CPU®2017 Integer Speed Result
Copyright 2017-2022 Standard Performance Evaluation Corporation

Supermicro
A+ Server 2014CS-TR
(H12SSW-AN6, AMD EPYC 7473X)

SPECspeed®2017_int_base = 12.8
SPECspeed®2017_int_peak = 13.0

CPU2017 License: 001176
Test Sponsor: Supermicro
Tested by: Supermicro

Test Date: Feb-2022
Hardware Availability: Mar-2022
Software Availability: Feb-2022

Compiler Version Notes (Continued)

LLVM Mirror.Version.13.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.2.0/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 -Wl,-allow-multiple-definition -W1, -mllvm -Wl, -enable-licm-vrp
-W1, -mllvm -Wl, -region-vectorize -W1, -mllvm -Wl, -function-specialize
-W1, -mllvm -Wl, -align-all-nofallthru-blocks=6
-W1, -mllvm -Wl, -reduce-array-computations=3 -03 -march=znver3
-fveclib=AMDLIBM -ffast-math -fopenmp -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

(Continued on next page)
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Base Optimization Flags (Continued)

C benchmarks (continued):
-mlir -enable-licm-vrp -mlir -reduce-array-computations=3 -z muldefs
-DSPEC_OPENMP -fopenmp=libomp -lomp -ldl -ljemalloc -lflang

C++ benchmarks:
-m64 -Wl,-mlir -Wl,-region-vectorize
-Wl,-mlir -Wl,-function-specialize
-Wl,-mlir -Wl,-align-all-nofallthru-blocks=6
-Wl,-mlir -Wl,-reduce-array-computations=3 -O3 -march=znver3
-fveclib=AMDLIBM -ffast-math -openmp -flto
-mlir -enable-partial-unswitch -mlir -unroll-threshold=100
-finline-aggressive -flv-function-specialization

Fortran benchmarks:
-m64 -Wl,-mlir -Wl,-inline-recursion=4
-Wl,-mlir -Wl,-lsr-in-nested-loop -Wl,-mlir -Wl,-enable-iv-split
-Wl,-mlir -Wl,-region-vectorize -Wl,-mlir -Wl,-function-specialize
-Wl,-mlir -Wl,-align-all-nofallthru-blocks=6
-Wl,-mlir -Wl,-reduce-array-computations=3 -O3 -march=znver3
-fveclib=AMDLIBM -ffast-math -openmp -flto -z muldefs
-mlir -unroll-aggressive -mlir -unroll-threshold=150 -DSPEC_OPENMP
-fopenmp=libomp -lomp -ldl -ljemalloc -lflang

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: basepeak = yes

602.gcc_s: -m64 -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 -fopenmp
-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=libomp -lomp -lmdlibm -ljemalloc -lflang

605.mcf_s: basepeak = yes

625.x264_s: basepeak = yes

657.xz_s: basepeak = yes

C++ benchmarks:

(Continued on next page)
SPEC CPU®2017 Integer Speed Result

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SPECspeed®2017_int_base = 12.8
SPECspeed®2017_int_peak = 13.0

Peak Optimization Flags (Continued)

620.omnetpp_s: -m64 -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 -fopenmp
       -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
       -fvirtual-function-elimination -fvisibility=hidden
       -DSPEC_OPENMP -fopenmp=libomp -lomp -lamdlibm -ljemalloc
       -lflang

623.xalancbk_s: -m64 -Wl,-mllvm -Wl,-function-specialize
       -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
       -Wl,-mllvm -Wl,-reduce-array-computations=3
       -march=znver3 -fveclib=AMDLIBM -ffast-math -fopenmp
       -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=libomp -lomp -lamdlibm -ljemalloc
       -lflang

631.deepsjeng_s: basepeak = yes

641.leela_s: basepeak = yes

Fortran benchmarks:
       -m64 -Wl,-mllvm -Wl,-inline-recursion=4
       -Wl,-mllvm -Wl,-lslr-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 -fopenmp -flto -mllvm -unroll-aggressive
       -mllvm -unroll-threshold=150 -DSPEC_OPENMP -fopenmp=libomp -lomp
       -lamdlibm -ljemalloc -lflang
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Hardware Availability: Mar-2022
Software Availability: Feb-2022

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

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

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Tested with SPEC CPU®2017 v1.1.8 on 2022-02-18 14:26:47-0500.
Originally published on 2022-03-22.