### SPEC CPU®2017 Floating Point Speed Result

**Supermicro**

A+ Server 1123US-TR4  
(H11DSU-iN, AMD EPYC 7282)

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**CPU2017 License:** 001176  
**Test Sponsor:** Supermicro  
**Tested by:** Supermicro  
**Test Date:** Mar-2020  
**Hardware Availability:** Aug-2019  
**Software Availability:** Aug-2019

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<table>
<thead>
<tr>
<th>Threads</th>
<th>SPECspeed®2017_fp_base = 105</th>
<th>SPECspeed®2017_fp_peak = 108</th>
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</thead>
<tbody>
<tr>
<td>603.bwaves_s 32</td>
<td>607.cactuBSSN_s 32</td>
<td>619.ibm_s 64</td>
</tr>
<tr>
<td>0</td>
<td>15.0</td>
<td>30.0</td>
</tr>
<tr>
<td>326</td>
<td>326</td>
<td>326</td>
</tr>
</tbody>
</table>

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### Hardware

**CPU Name:** AMD EPYC 7282  
**Max MHz:** 3200  
**Nominal:** 2800  
**Enabled:** 32 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:** 64 MB I+D on chip per chip, 16 MB shared / 4 cores  
**Other:** None  
**Memory:** 256 GB (16 x 16 GB 2Rx8 PC4-3200AA-R)  
**Storage:** 1 x 200 GB SATA III SSD  
**Other:** None

### Software

**OS:** Ubuntu 19.04  
**Compiler:** C/C++/Fortran: Version 2.0.0 of AOCC  
**Parallel:** Yes  
**Firmware:** Version 2.0b released Nov-2019  
**File System:** ext4  
**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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A+ Server 1123US-TR4 (H11DSU-iN, AMD EPYC 7282)

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Results Table

| Benchmark     | Threads | Seconds | Ratio | Seconds | Ratio | 1 | Seconds | Ratio | 1 | Seconds | Ratio |
|---------------|---------|---------|-------|---------|-------| 1 |         |       | 1 |         |       |
| 603.bwaves_s  | 32      | 181     | 326   | 181     | 326   |   | 32      | 181   | 326 | 181     | 326   |
| 607.cactuBSSN_s | 32     | 97.3    | 171   | 97.8    | 171   |   | 32      | 97.3  | 171 | 97.8    | 171   |
| 619.lbm_s     | 32      | 151     | 34.7  | 150     | 34.8  | 164 | 32      | 149   | 35.1 | 149     | 35.2  |
| 621.wrf_s     | 32      | 116     | 114   | 116     | 114   |   | 32      | 116   | 114 | 116     | 114   |
| 627.cam4_s    | 32      | 130     | 68.3  | 130     | 68.1  |   | 32      | 130   | 68.3 | 130     | 68.1  |
| 628.pop2_s    | 32      | 235     | 50.6  | 235     | 50.5  |   | 32      | 235   | 50.6 | 235     | 50.5  |
| 638.imagick_s | 32      | 105     | 138   | 105     | 137   |   | 32      | 105   | 138 | 105     | 138   |
| 644.nab_s     | 32      | 92.5    | 189   | 92.5    | 189   |   | 32      | 92.5  | 189 | 92.5    | 189   |
| 649.fotonik3d_s | 32   | 141     | 64.5  | 141     | 64.8  | 142 | 32      | 141   | 64.9 | 141     | 64.9  |
| 654.roms_s    | 32      | 122     | 129   | 123     | 128   |   | 32      | 120   | 131 | 119     | 132   |

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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SPECspeed®2017_fp_base = 105
SPECspeed®2017_fp_peak = 108

Environment Variables Notes

Environment variables set by runcpu before the start of the run:
GOMP_CPU_AFFINITY = "0-63"
LD_LIBRARY_PATH = "/home/cpu2017/amd_speed_aocc200_rome_C_lib/64;/home/cpu2017/amd_speed_aocc200_rome_C_lib/32;"
MALLOC_CONF = "retain:true"
OMP_DYNAMIC = "false"
OMP_SCHEDULE = "static"
OMP_STACKSIZE = "128M"
OMP_THREAD_LIMIT = "64"

Environment variables set by runcpu during the 603.bwaves_s peak run:
GOMP_CPU_AFFINITY = "0-31"

Environment variables set by runcpu during the 619.lbm_s peak run:
GOMP_CPU_AFFINITY = "0 32 1 33 2 34 3 35 4 36 5 37 6 38 7 39 8 40 9 41 10 42 11 43 12 44 13 45 14 46 15 47 16 48 17 49 18 50 19 51 20 52 21 53 22 54 23 55 24 56 25 57 26 58 27 59 28 60 29 61 30 62 31 63"

Environment variables set by runcpu during the 644.nab_s peak run:
GOMP_CPU_AFFINITY = "0 32 1 33 2 34 3 35 4 36 5 37 6 38 7 39 8 40 9 41 10 42 11 43 12 44 13 45 14 46 15 47 16 48 17 49 18 50 19 51 20 52 21 53 22 54 23 55 24 56 25 57 26 58 27 59 28 60 29 61 30 62 31 63"

Environment variables set by runcpu during the 649.fotonik3d_s peak run:
GOMP_CPU_AFFINITY = "0-31"

Environment variables set by runcpu during the 654.roms_s peak run:
GOMP_CPU_AFFINITY = "0-31"

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.

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
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Platform Notes

BIOS Settings:
Determinism Control = Manual
Determinism Slider = Power
cTDP Control = Manual
cTDP = 150
Package Power Limit Control = Manual
Package Power Limit = 150
APBDIS = 1

Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7edbbe6e46a485a0011
running on h11dsu-02 Thu Mar  5 23:04:15 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 7282 16-Core Processor
  2 "physical id"s (chips)
  64 "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 : 16
    siblings : 32
    physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
    physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

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): 64
  On-line CPU(s) list: 0-63
  Thread(s) per core: 2
  Core(s) per socket: 16
  Socket(s): 2
  NUMA node(s): 2
  Vendor ID: AuthenticAMD
  CPU family: 23
  Model: 49
  Model name: AMD EPYC 7282 16-Core Processor
  Stepping: 0
  CPU MHz: 2410.093
  CPU max MHz: 2800.0000
  CPU min MHz: 1500.0000

(Continued on next page)
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Platform Notes (Continued)

BogoMIPS: 5599.95
Virtualization: AMD-V
L1d cache: 32K
L1i cache: 32K
L2 cache: 512K
L3 cache: 16384K
NUMA node0 CPU(s): 0-15,32-47
NUMA node1 CPU(s): 16-31,48-63

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 nop1 xtoretry nonstop_tsc cpuid extd_apicid aperf
mpn pcrmulqdq monitor ssse3 fma cx16 sse4_1 sse4_2 movbe popcnt aes xsave avx f16c
rdrand lahf_lm cmp_legacy svm extapic cr8_legacy abm sse4a misalignsse 3dnowprefetch
osww ibs skinit wdt tce topoext perfctr_core perfctr_nb bpext perfctr_llc mwaitx cpb
cat_l3 cdp_l3 hw_pstate sbe ssbd mba sev ibrs ibpb stibp vmmcall bml1 axv2
smep bmi2 cqm rdt_a rdseed adx smap clflushopt clwb sha ni xsaveopt xsavex xgetbv1
xsaves cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local clzero irperf xsaveerptr
wbnoinvd ar arpt lbrv svm_lock nrp_save tsc_scale vmcb_clean flushbyasid
deodeassist pae pafe pfilter pfthreshold avic v_vmsave_vmload vgif umip rpdp
doerflow rcov 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: 2 nodes (0-1)
  node 0 cpus: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 32 33 34 35 36 37 38 39 40 41 42 43
  44 45 46 47
  node 0 size: 128850 MB
  node 0 free: 127765 MB
  node 1 cpus: 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 48 49 50 51 52 53 54 55 56
  57 58 59 60 61 62 63
  node 1 size: 128973 MB
  node 1 free: 127626 MB
  node distances:
  node 0 1
  0: 10 32
  1: 32 10

From /proc/meminfo
  MemTotal: 264011976 kB
  HugePages_Total: 0
  Hugepagesize: 2048 kB

From /etc/*release* /etc/*version*
  debian_version: buster/sid

(Continued on next page)
Platform Notes (Continued)

os-release:
- NAME="Ubuntu"
- VERSION="19.04 (Disco Dingo)"
- ID=ubuntu
- ID_LIKE=debian
- PRETTY_NAME="Ubuntu 19.04"
- VERSION_ID="19.04"
- HOME_URL="https://www.ubuntu.com/"
- SUPPORT_URL="https://help.ubuntu.com/"

uname -a:
- Linux h11dsu-02 5.0.0-25-generic #26-Ubuntu SMP Thu Aug 1 12:04:58 UTC 2019 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: usercopy/swapgs barriers and __user pointer sanitation
CVE-2017-5715 (Spectre variant 2): Mitigation: Full AMD retpoline, IBPB: conditional, IBRS_FW, STIBP: conditional, RSB filling

run-level 3 Mar 4 15:55

SPEC is set to: /home/cpu2017
- Filesystem Type Size Used Avail Use% Mounted on
- /dev/sda2 ext4 183G 20G 154G 12% /

From /sys/devices/virtual/dmi/id
- BIOS: American Megatrends Inc. 2.0b 11/15/2019
- Vendor: Supermicro
- Product: Super Server
- Serial: 0123456789

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 NO DIMM Unknown
- 16x SK Hynix HMA82GR7DJR8N-XN 16 kB 2 rank 3200

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<th>001176</th>
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<tr>
<td>Test Sponsor:</td>
<td>Supermicro</td>
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<tr>
<td>Tested by:</td>
<td>Supermicro</td>
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<td>Test Date:</td>
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**Platform Notes (Continued)**

(End of data from sysinfo program)

#### Compiler Version Notes

<table>
<thead>
<tr>
<th>Language</th>
<th>Programs</th>
</tr>
</thead>
<tbody>
<tr>
<td>C</td>
<td>619.libm_s (base, peak) 638.imagick_s (base, peak) 644.nab_s (base, peak)</td>
</tr>
<tr>
<td></td>
<td>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)</td>
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<tr>
<td></td>
<td>Target: x86_64-unknown-linux-gnu</td>
</tr>
<tr>
<td></td>
<td>Thread model: posix</td>
</tr>
<tr>
<td></td>
<td>InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin</td>
</tr>
<tr>
<td>C++, C, Fortran</td>
<td>607.cactuBSSN_s (base, peak)</td>
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**Compiler Version Notes (Continued)**

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<th>621.wrf_s(base, peak) 627.cam4_s(base, peak) 628.pop2_s(base, peak)</th>
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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

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**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
- -fremap-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
- -fllvm-function-specialization -z muldefs -DSPEC_OPENMP -fopenmp
- -fopenmp=libomp -lomp -lpthread -ldl -lmvec -ladl -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 -ladl -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
- -fremap-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
- -fllvm-function-specialization -funroll-loops -Mrecursive -z muldefs
- -Kieee -fno-finite-math-only -DSPEC_OPENMP -fopenmp -fopenmp=libomp
- -lomp -lpthread -ldl -lmvec -ladl -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 -fremap-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
- -fllvm-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
- -ladl -ljemalloc -lflang
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### Base Other Flags

C benchmarks:  
- `-Wno-return-type -DUSE_OPENMP`

Fortran benchmarks:  
- `-DUSE_OPENMP -Wno-return-type`

Benmarks using both Fortran and C:  
- `-DUSE_OPENMP -Wno-return-type`

### Peak Compiler Invocation

C benchmarks:  
- `clang`

Fortran benchmarks:  
- `flang`

Benmarks using both Fortran and C:  
- `flang clang`

Benmarks using Fortran, C, and C++:  
- `clang++ clang flang`

### Peak Portability Flags

Same as Base Portability Flags

### Peak Optimization Flags

C benchmarks:  

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

619.lbm_s (continued):
-mlvm -function-specialize -mlvm -enable-gvn-hoist
-mlvm -unroll-threshold=50 -fremap-arrays
-mlvm -vector-library=LIBMVEC
-mlvm -reduce-array-computations=3
-mlvm -global-vectorize-slp -mlvm -inline-threshold=1000
-flv-function-specialization -DSPEC_OPENMP -fopenmp
-1mvec -lamdlibm -fopenmp=libomp -lomp -lpthread -ldl
-ljemalloc -lflang

638.imagick_s: basepeak = yes

644.nab_s: Same as 619.lbm_s

Fortran benchmarks:

603.bwaves_s: -flto -Wl,-mlvm -Wl,-function-specialize
-mlvm -Wl,-mlvm -Wl,-region-vectorize
-mlvm -Wl,-library=LIBMVEC
-mlvm -Wl,-reduce-array-computations=3 -O3
-march=znver2 -funroll-loops -Mrecursive
-mlvm -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,-mlvm -Wl,-function-specialize
-mlvm -Wl,-mlvm -Wl,-region-vectorize
-mlvm -Wl,-library=LIBMVEC
-mlvm -Wl,-reduce-array-computations=3
-mlvm -Wl,-enable-X86-prefetching -O3 -march=znver2
-funroll-loops -Mrecursive -mlvm -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
Supermicro
A+ Server 1123US-TR4
(H11DSU-iN , AMD EPYC 7282)

SPECspeed®2017_fp_base = 105
SPECspeed®2017_fp_peak = 108

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

Test Date: Mar-2020
Hardware Availability: Aug-2019
Software Availability: Aug-2019

Peak Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++:

607.cactuBSSN_s: basepeak = yes

Peak Other Flags

C benchmarks:
-Wno-return-type -DUSE_OPENMP

Fortran benchmarks:
-DUSE_OPENMP -Wno-return-type

Benchmarks using both Fortran and C:
-DUSE_OPENMP -Wno-return-type

Benchmarks using Fortran, C, and C++:
-Wno-return-type -DUSE_OPENMP

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:
http://www.spec.org/cpu2017/flags/Supermicro-Platform-Settings-V1.2-Rome-revB.xml

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