Supermicro
SuperStorage 6029P-E1CR24H
(X11DSC+, Intel Xeon Gold 5220R)

SPECrater®2017_fp_base = 239
SPECrater®2017_fp_peak = 254

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

SPECrater®2017_fp_base = 239
SPECrater®2017_fp_peak = 254

Hardware
CPU Name: Intel Xeon Gold 5220R
Max MHz: 4000
Nominal: 2200
Enabled: 48 cores, 2 chips, 2 threads/core
Orderable: 1,2 chips
Cache L1: 32 KB I + 32 KB D on chip per core
L2: 1 MB I+D on chip per core
L3: 35.75 MB I+D on chip per chip
Other: None
Memory: 384 GB (12 x 32 GB 2Rx4 PC4-2933Y-R)
Storage: 1 x 200 GB SATA III SSD
Other: None

Software
OS: Red Hat Enterprise Linux release 8.1
Compiler: C/C++; Version 19.1.1.217 of Intel C/C++ Compiler for Linux;
Fortran: Version 19.1.1.217 of Intel Fortran Compiler for Linux
Parallel: No
Firmware: Version 3.2 released Oct-2019
File System: xfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: 64-bit
Other: jemalloc memory allocator V5.0.1
Power Management: BIOS set to prefer performance at the cost of additional power usage.
## Results Table

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**Compiler Notes**

The inconsistent Compiler version information under Compiler Version section is due to a discrepancy in Intel Compiler. The correct version of C/C++ compiler is: Version 19.1.1.217 Build 20200306 Compiler for Linux. The correct version of Fortran compiler is: Version 19.1.1.217 Build 20200306 Compiler for Linux.

**Submit Notes**

The numactl mechanism was used to bind copies to processors. The config file option 'submit' was used to generate numactl commands to bind each copy to a specific processor. For details, please see the config file.

**Operating System Notes**

Stack size set to unlimited using "ulimit -s unlimited"

**Environment Variables Notes**

Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH = "/home/cpu2017/lib/intel64:/home/cpu2017/je5.0.1-64"
MALLOC_CONF = "retain:true"
## General Notes

Binaries compiled on a system with 1x Intel Core i9-7980XE CPU + 64GB RAM memory using Redhat Enterprise Linux 8.0
Transparency Huge Pages enabled by default
Prior to runcpu invocation
Filesystem page cache synced and cleared with:

```bash
sync; echo 3 > /proc/sys/vm/drop_caches
runcpu command invoked through numactl i.e.:
numactl --interleave=all runcpu <etc>
```

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.


## Platform Notes

BIOS Settings:
Power Technology = Custom
Power Performance Tuning = BIOS Controls EPB
ENERGY_PERF_BIAS_CFG mode = Maximum Performance
SNC = Enable
Stale AtoS = Disable
IMC Interleaving = 1-way Interleave
Patrol Scrub = Disable

Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7edbe6e46a485a001
running on RHEL81-01 Sat Aug 29 00:28:37 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 : Intel(R) Xeon(R) Gold 5220R CPU @ 2.20GHz
  2 "physical id"s (chips)
  96 "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 : 48

(Continued on next page)
Supermicro

SuperStorage 6029P-E1CR24H
(X11DSC+, Intel Xeon Gold 5220R)

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

SPEC CPU®2017 Floating Point Rate Result

SPECrate®2017_fp_base = 239
SPECrate®2017_fp_peak = 254

Platform Notes (Continued)

physical 0: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 16 17 18 19 20 21 25 26 27 28 29
physical 1: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 16 17 18 19 20 21 25 26 27 28 29

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 96
On-line CPU(s) list: 0-95
Thread(s) per core: 2
Core(s) per socket: 24
Socket(s): 2
NUMA node(s): 4
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Gold 5220R CPU @ 2.20GHz
Stepping: 7
CPU MHz: 1000.017
BogoMIPS: 4400.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 36608K
NUMA node0 CPU(s): 0-3,7-9,13-15,19,20,48-51,55-57,61-63,67,68
NUMA node1 CPU(s): 4-6,10-12,16-18,21-23,52-54,58-60,64-66,69-71
NUMA node2 CPU(s): 24-27,31-33,37-39,43,44,72-75,79-81,85-87,91,92
NUMA node3 CPU(s): 28-30,34-36,40-42,45-47,76-78,82-84,88-90,93-95
Flags: fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov
pat pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtscp
lm constant_tsc arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid
aperfmerf pni pclmulqdq dtes64 ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtpr pdcm
pcid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c
rdseed lahf_lm abm 3dnowprefetch cpuid_fault epb cat_l3 cdp_l3 invpcid_single
intel_pmm ssbd mba ibrs ibp bbr dpbt ibrs_enhanced tpr_shadow vmmi flexpriority ept
vpid fsgsbase tsc_adjust bm11 hle avx2 smep bmi2 erms invpcid rtm cqm mpx rdt_a
avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd avx512bw avx512vl
xsaveopt xsavec xsaveas cqm_llc cqm_occup_llc cqm_mbb_total cqm_mbb_local
dtherm ida arat pln pts hwp_epp pku ospke avx512_vnni md_clear flush_l1d
arch_capabilities

/proc/cpuinfo cache data
cache size : 36608 KB

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

(Continued on next page)
## SPEC CPU®2017 Floating Point Rate Result

**Supermicro**  
SuperStorage 6029P-E1CR24H  
(X11DSC+, Intel Xeon Gold 5220R)

**SPECCrate®2017_fp_base = 239**  
**SPECCrate®2017_fp_peak = 254**

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<td>Hardware Availability:</td>
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<td>Software Availability:</td>
<td>Apr-2020</td>
</tr>
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</table>

---

**Platform Notes (Continued)**

available: 4 nodes (0-3)  
node 0 cpus: 0 1 2 3 7 8 9 13 14 15 19 20 48 49 50 51 55 56 57 61 62 63 67 68  
node 0 size: 95348 MB  
node 0 free: 9535 MB  
node 1 cpus: 4 5 6 10 11 12 16 17 18 21 22 23 52 53 54 58 59 60 64 65 66 69 70 71  
node 1 size: 96763 MB  
node 1 free: 96302 MB  
node 2 cpus: 24 25 26 27 31 32 33 37 38 39 43 44 72 73 74 75 79 80 81 85 86 87 91 92  
node 2 size: 96737 MB  
node 2 free: 96474 MB  
node 3 cpus: 28 29 30 34 35 36 40 41 42 45 46 47 76 77 78 82 83 84 88 89 90 93 94 95  
node 3 size: 96762 MB  
node 3 free: 96565 MB  
node distances:  
0: 10 11 21 21  
1: 11 10 21 21  
2: 21 21 10 11  
3: 21 21 11 10

---

From `/proc/meminfo`  
MemTotal: 394867300 kB  
HugePages_Total: 0  
Hugepagesize: 2048 kB

From `/etc/*release* /etc/*version*`  
`os-release:`  
NAME="Red Hat Enterprise Linux"  
VERSION="8.1 (Ootpa)"  
ID="rhel"  
ID_LIKE="fedora"  
VERSION_ID="8.1"  
PLATFORM_ID="platform:el8"  
PRETTY_NAME="Red Hat Enterprise Linux 8.1 (Ootpa)"  
ANSI_COLOR="0;31"  
redhat-release: Red Hat Enterprise Linux release 8.1 (Ootpa)  
system-release: Red Hat Enterprise Linux release 8.1 (Ootpa)  
system-release-cpe: cpe:/o:redhat:enterprise_linux:8.1:ga

`uname -a:`  
Linux RHEL81-01 4.18.0-147.el8.x86_64 #1 SMP Thu Sep 26 15:52:44 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

---

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

**CPU-2017-5754 (Meltdown):** Not affected  
**CPU-2018-3639 (Speculative Store Bypass):** Mitigation: Speculative Store Bypass disabled via prctl and seccomp  
**CPU-2017-5753 (Spectre variant 1):** Mitigation: usercopy/swapgs barriers and __user pointer sanitization  
**CPU-2017-5715 (Spectre variant 2):** Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling

---

**run-level 3 Aug 29 00:12**

SPEC is set to: /home/cpu2017

Filesystem Type Size Used Avail Use% Mounted on  
/dev/sda3 xfs 185G 13G 173G 7% /

From /sys/devices/virtual/dmi/id  
BIOS: American Megatrends Inc. 3.2 10/18/2019  
Vendor: pm_2019-10-08_18:11:34  
Product: ppm_2019-10-08_18:11:37  
Serial: ps_2019-10-08_18:11:38

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:  
12x NO DIMM NO DIMM  
12x Samsung M393A4K40CB2-CVF 32 GB 2 rank 2933

(End of data from sysinfo program)

---

**Compiler Version Notes**

```
==============================================
C     | 519.lbm_r(base, peak) 538.imagick_r(base, peak) 544.nab_r(base, peak)
==============================================
Intel(R) C Compiler for applications running on Intel(R) 64, Version 2021.1  
NextGen Build 20200304  
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

==============================================
C++   | 508.namd_r(base, peak) 510.parest_r(base, peak)
==============================================
Intel(R) C++ Compiler for applications running on Intel(R) 64, Version 2021.1  
NextGen Build 20200304
```

(Continued on next page)
Supermicro
SuperStorage 6029P-E1CR24H
(X11DSC+, Intel Xeon Gold 5220R)

Compiler Version Notes (Continued)

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==============================================================================
C++, C          | 511.povray_r(base) 526.blender_r(base, peak)
Intel(R) C++ Compiler for applications running on Intel(R) 64, Version 2021.1
NextGen Build 20200304
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
Intel(R) C Compiler for applications running on Intel(R) 64, Version 2021.1
NextGen Build 20200304
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

==============================================================================
C++, C          | 511.povray_r(peak)
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.1.1.217 Build 20200306
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.1.1.217 Build 20200306
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

==============================================================================
C++, C          | 511.povray_r(base) 526.blender_r(base, peak)
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Supermicro
SuperStorage 6029P-E1CR24H
(X11DSC+, Intel Xeon Gold 5220R)

**SPECrater®2017_fp_base = 239**
**SPECrater®2017_fp_peak = 254**

---

**Compiler Version Notes (Continued)**

---

**C++, C, Fortran | 507.cactuBSSN_r(base, peak)**

Intel(R) C++ Compiler for applications running on Intel(R) 64, Version 2021.1
NextGen Build 20200304
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Intel(R) C Compiler for applications running on Intel(R) 64, Version 2021.1
NextGen Build 20200304
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Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 19.1.1.217 Build 20200306
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

---

**Fortran | 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak) 554.roms_r(base, peak)**

Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 19.1.1.217 Build 20200306
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

---

**Fortran, C | 521.wrf_r(base) 527.cam4_r(base, peak)**

Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 19.1.1.217 Build 20200306
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

Intel(R) C Compiler for applications running on Intel(R) 64, Version 2021.1
NextGen Build 20200304
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

---

**Fortran, C | 521.wrf_r(peak)**

Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 19.1.1.217 Build 20200306
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

---

**Fortran, C | 521.wrf_r(base) 527.cam4_r(base, peak)**

(Continued on next page)
## SPEC CPU®2017 Floating Point Rate Result

### Supermicro
SuperStorage 6029P-E1CR24H  
(X11DSC+, Intel Xeon Gold 5220R)

<table>
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#### Compiler Version Notes (Continued)

Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.1.1.217 Build 20200306  
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Intel(R) C Compiler for applications running on Intel(R) 64, Version 2021.1 NextGen Build 20200304  
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

---

### Base Compiler Invocation

- **C benchmarks:**
  - icc

- **C++ benchmarks:**
  - icpc

- **Fortran benchmarks:**
  - ifort

- **Benchmarks using both Fortran and C:**
  - ifort icc

- **Benchmarks using both C and C++:**
  - icpc icc

- **Benchmarks using Fortran, C, and C++:**
  - icpc icc ifort

### Base Portability Flags

503.bwaves_r: -DSPEC_LP64

(Continued on next page)
Supermicro
SuperStorage 6029P-E1CR24H
(X11DSC+, Intel Xeon Gold 5220R)

| SPECrate®2017_fp_base = 239 |
| SPECrate®2017_fp_peak = 254 |

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

| Test Date: Aug-2020 |
| Hardware Availability: Feb-2020 |
| Software Availability: Apr-2020 |

### Base Portability Flags (Continued)

- 507.cactuBSSN_r: -DSPEC_LP64
- 508.namd_r: -DSPEC_LP64
- 510.parest_r: -DSPEC_LP64
- 511.povray_r: -DSPEC_LP64
- 519.libm_r: -DSPEC_LP64
- 521.wrf_r: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
- 526.blender_r: -DSPEC_LP64 -DSPEC_LINUX -funsigned-char
- 527.cam4_r: -DSPEC_LP64 -DSPEC_CASE_FLAG
- 538.imagick_r: -DSPEC_LP64
- 544.nab_r: -DSPEC_LP64
- 549.fotonik3d_r: -DSPEC_LP64
- 554.roms_r: -DSPEC_LP64

### Base Optimization Flags

#### C benchmarks:
- -m64 -qnextgen -std=c11
- -Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs
- -fuse-ld=gold -xCORE-AVX2 -Ofast -ffast-math -flto -mfpmath=sse
- -funroll-loops -qopt-mem-layout-trans=4
- -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

#### C++ benchmarks:
- -m64 -qnextgen -Wl,-plugin-opt=-x86-branches-within-32B-boundaries
- -Wl,-z,muldefs -fuse-ld=gold -xCORE-AVX2 -Ofast -ffast-math -flto
- -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
- -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

#### Fortran benchmarks:
- -m64 -Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs
- -fuse-ld=gold -xCORE-AVX2 -O3 -ipo -no-prec-div -qopt-prefetch
- -ffinite-math-only -qopt-multiple-gather-scatter-by-shuffles
- -qopt-mem-layout-trans=4 -nostandard-realloc-lhs -align array32byte
- -auto -mbranches-within-32B-boundaries
- -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

#### Benchmarks using both Fortran and C:
- -m64 -qnextgen -std=c11
- -Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs
- -fuse-ld=gold -xCORE-AVX2 -Ofast -ffast-math -flto -mfpmath=sse
- -funroll-loops -qopt-mem-layout-trans=4 -O3 -ipo -no-prec-div
- -qopt-prefetch -ffinite-math-only
- -qopt-multiple-gather-scatter-by-shuffles -nostandard-realloc-lhs
- -align array32byte -auto -mbranches-within-32B-boundaries

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**SPEC CPU®2017 Floating Point Rate Result**

**Supermicro**
SuperStorage 6029P-E1CR24H  
(X11DSC+, Intel Xeon Gold 5220R)

<table>
<thead>
<tr>
<th>SPECrate®2017_fp_base</th>
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<tr>
<td>SPECrate®2017_fp_peak</td>
<td>254</td>
</tr>
</tbody>
</table>

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

<table>
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<th>Test Date</th>
<th>Aug-2020</th>
</tr>
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<tbody>
<tr>
<td>Hardware Availability</td>
<td>Feb-2020</td>
</tr>
<tr>
<td>Software Availability</td>
<td>Apr-2020</td>
</tr>
</tbody>
</table>

**Base Optimization Flags (Continued)**

Benchmarks using both Fortran and C (continued):
- `-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc`

Benchmarks using both C and C++:
- `-m64 -qnextgen -std=c11`
- `-Wl, -plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs`
- `-fuse-ld=gold -xCORE-AVX2 -Ofast -ffast-math -flto -mfpmath=sse`
- `-funroll-loops -qopt-mem-layout-trans=4`
- `-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc`

Benchmarks using Fortran, C, and C++:
- `-m64 -qnextgen -std=c11`
- `-Wl, -plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs`
- `-fuse-ld=gold -xCORE-AVX2 -Ofast -ffast-math -flto -mfpmath=sse`

**Peak Compiler Invocation**

C benchmarks:
- `icc`

C++ benchmarks:
- `icpc`

Fortran benchmarks:
- `ifort`

Benchmarks using both Fortran and C:
- `ifort icc`

Benchmarks using both C and C++:
- `icpc icc`

Benchmarks using Fortran, C, and C++:
- `icpc icc ifort`
Supermicro
SuperStorage 6029P-E1CR24H (X11DSC+, Intel Xeon Gold 5220R)

SPECrate®2017_fp_base = 239
SPECrate®2017_fp_peak = 254

CPU2017 License: 001176
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Tested by: Supermicro

Hardware Availability: Feb-2020
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Peak Portability Flags
Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:
519.lbm_r: basepeak = yes
538.imagick_r: basepeak = yes
544.nab_r: basepeak = yes

C++ benchmarks:
508.namd_r: basepeak = yes
510.parest_r: -m64 -qnextgen
   -Wl,-plugin-opt=-x86-branches-within-32B-boundaries
   -Wl,-z,muldefs -fuse-ld=gold -xCORE-AVX2 -Ofast
   -ffast-math -flto -mfpmath=sse -funroll-loops
   -qopt-mem-layout-trans=4 -L/usr/local/jemalloc64-5.0.1/lib
   -ljemalloc

Fortran benchmarks:
503.bwaves_r: -m64 -Wl,-plugin-opt=-x86-branches-within-32B-boundaries
   -Wl,-z,muldefs -fuse-ld=gold -xCORE-AVX2 -O3 -ipo
   -no-prec-div -qopt-prefetch -ffinite-math-only
   -qopt-multiple-gather-scatter-by-shuffles
   -qopt-mem-layout-trans=4 -nostandard-realloc-lhs
   -align array32byte -auto -mbranches-within-32B-boundaries
   -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

549.fotonik3d_r: basepeak = yes
554.roms_r: Same as 503.bwaves_r

Benchmarks using both Fortran and C:
521.wrf_r: -prof-gen(pass 1) -prof-use(pass 2) -xCORE-AVX2 -O3 -ipo
   -no-prec-div -qopt-prefetch -ffinite-math-only
   -qopt-multiple-gather-scatter-by-shuffles
   -qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries
   -nostandard-realloc-lhs -align array32byte -auto

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Supermicro
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Peak Optimization Flags (Continued)

521.wrf_r (continued):
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

527.cam4_r: basepeak = yes

Benchmarks using both C and C++:

511.povray_r: -prof-gen(pass 1) -prof-use(pass 2) -xCORE-AVX2 -O3 -ipo
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-multiple-gather-scatter-by-shuffles
-qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

526.blender_r: basepeak = yes

Benchmarks using Fortran, C, and C++:

507.cactusBSSN_r: basepeak = yes

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/Supermicro-Platform-Settings-V1.2-CLX-revG.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/Intel-ic19.1u1-official-linux64_revA.xml
http://www.spec.org/cpu2017/flags/Supermicro-Platform-Settings-V1.2-CLX-revG.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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