### SPEC CPU®2017 Integer Rate Result

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

<table>
<thead>
<tr>
<th>SPECrate®2017_int_base</th>
<th>286</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECrate®2017_int_peak</td>
<td>297</td>
</tr>
</tbody>
</table>

**CPU 2017 License:** 001176  
**Test Date:** Aug-2020  
**Test Sponsor:** Supermicro  
**Hardware Availability:** Feb-2020  
**Tested by:** Supermicro  
**Software Availability:** Apr-2020

**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  
- **Kernel:** 4.18.0-147.el8.x86_64  
- **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:** 32/64-bit  
- **Other:** jemalloc memory allocator V5.0.1  
- **Power Management:** BIOS set to prefer performance at the cost of additional power usage

### SPECrate®2017 Int Results

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>SPECrate®2017_int_base</th>
<th>SPECrate®2017_int_peak</th>
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<tr>
<td>perlbench_r</td>
<td>96</td>
<td>193</td>
<td>228</td>
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<td>gcc_r</td>
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<td>225</td>
<td>261</td>
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<tr>
<td>mcf_r</td>
<td>96</td>
<td>180</td>
<td>472</td>
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<td>omnetpp_r</td>
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<td></td>
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<tr>
<td>xalancbmk_r</td>
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<tr>
<td>x264_r</td>
<td>96</td>
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<td>586</td>
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<tr>
<td>deepsjeng_r</td>
<td>96</td>
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<tr>
<td>leela_r</td>
<td>96</td>
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<tr>
<td>exchange2_r</td>
<td>96</td>
<td></td>
<td>546</td>
</tr>
</tbody>
</table>
| xz_r              | 96     |                        | 172                    | **SPECrate®2017_int_base (286)**  
|                   |        |                        | 177                    | **SPECrate®2017_int_peak (297)**
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<td>541.leela_r</td>
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<tr>
<td>548.exchange2_r</td>
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<tr>
<td>557.xz_r</td>
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<td>177</td>
<td>587</td>
<td>177</td>
<td>585</td>
<td>177</td>
</tr>
</tbody>
</table>

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

**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/lib/ia32:/home/cpu2017/je5.0.1-32"
```

```
MALLOCONF = "retain:true"
```
SPEC CPU®2017 Integer Rate Result
Copyright 2017-2020 Standard Performance Evaluation Corporation

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

SPECrate®2017_int_base = 286
SPECrate®2017_int_peak = 297

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

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

General Notes

Binaries compiled on a system with 1x Intel Core i9-7980XE CPU + 64GB RAM
memory using Redhat Enterprise Linux 8.0
Transparent Huge Pages enabled by default
Prior to runcpu invocation
Filesystem page cache synced and cleared with:
 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.
jemalloc, a general purpose malloc implementation
built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5

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 295195f888a3d7edbl6e46a485a0011
running on RHEL81-01 Sat Aug 29 20:00:54 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)
SPEC CPU®2017 Integer Rate Result

Supermicro
SuperStorage 6029P-E1CR24H
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SPECrate®2017_int_base = 286
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CPU2017 License: 001176
Test Sponsor: Supermicro
Tested by: Supermicro

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: 999.994
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
aperfperf 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_ppn ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vnni flexpriority ept
vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 ireds invpcid rtm cqm mpx rdtd_a
avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd avx512bw avx512vl
xsavesopt xsaveopt xsavec xsaves 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

From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a physical chip.
### 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: 90547 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: 92213 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: 92411 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: 92495 MB
node distances:

node 0 1 2 3
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)
Supermicro
SuperStorage 6029P-E1CR24H
(X11DSC+, Intel Xeon Gold 5220R)

SPEC CPU®2017 Integer Rate Result

Copyright 2017-2020 Standard Performance Evaluation Corporation

SPECrate®2017_int_base = 286
SPECrate®2017_int_peak = 297

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

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

Platform Notes (Continued)

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: 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 28G 157G 15% /

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 | 502.gcc_r(peak) |
|----------------------------------------------|
Intel(R) C Compiler for applications running on IA-32, Version 2021.1 NextGen Build 20200304
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

==============================================================================
| C | 500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base, peak) |
|-----------------------------------------------|
| 525.x264_r(base, peak) 557.xz_r(base) |

Intel(R) C Compiler for applications running on Intel(R) 64, Version 2021.1 NextGen Build 20200304

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

### Supermicro

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

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

### Compiler Version Notes (Continued)

```plaintext
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

-----------------------------------------------
C    | 500.perlbench_r(peak) 557.xz_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.

-----------------------------------------------
C    | 502.gcc_r(peak)
-----------------------------------------------
Intel(R) C Compiler for applications running on IA-32, Version 2021.1 NextGen  
Build 20200304  
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

-----------------------------------------------
C    | 500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base, peak)  
| 525.x264_r(base, peak) 557.xz_r(base)
-----------------------------------------------
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    | 500.perlbench_r(peak) 557.xz_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.

-----------------------------------------------
C    | 502.gcc_r(peak)
-----------------------------------------------
Intel(R) C Compiler for applications running on IA-32, Version 2021.1 NextGen  
Build 20200304  
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

-----------------------------------------------
C    | 500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base, peak)  
| 525.x264_r(base, peak) 557.xz_r(base)
```

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

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

Compiler Version Notes (Continued)

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       | 500.perlbench_r(peak) 557.xz_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.

C++     | 520.omnetpp_r(base, peak) 523.xalancbmk_r(base, peak)
  531.deepsjeng_r(base, peak) 541.leela_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.

Fortran | 548.exchange2_r(base, peak)

Intel(R) Fortran 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.

Base Compiler Invocation

C benchmarks:
  icc

C++ benchmarks:
  icpc

Fortran benchmarks:
  ifort
SPEC CPU®2017 Integer Rate Result

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

SPECrate®2017_int_base = 286
SPECrate®2017_int_peak = 297

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

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

Base Portability Flags

500.perlbench_r: -DSPEC_LP64 -DSPEC_LINUX_X64
502.gcc_r: -DSPEC_LP64
505.mcf_r: -DSPEC_LP64
520.omnetpp_r: -DSPEC_LP64
523.xalancbmk_r: -DSPEC_LP64 -DSPEC_LINUX
525.x264_r: -DSPEC_LP64
531.deepsjeng_r: -DSPEC_LP64
541.leea_r: -DSPEC_LP64
548.exchange2_r: -DSPEC_LP64
557.xz_r: -DSPEC_LP64

Base Optimization Flags

C benchmarks:
-m64 -qnextgen -std=c11
-Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs
-xCORE-AVX512 -O3 -ffast-math -flto -mfpmath=sse -funroll-loops
-fuse-ld=gold -qopt-mem-layout-trans=4
-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.1.217/linux/compiler/lib/intel64_lin
-lqkmalloc

C++ benchmarks:
-m64 -qnextgen -Wl,-plugin-opt=-x86-branches-within-32B-boundaries
-Wl,-z,muldefs -xCORE-AVX512 -O3 -ffast-math -flto -mfpmath=sse
-funroll-loops -fuse-ld=gold -qopt-mem-layout-trans=4
-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.1.217/linux/compiler/lib/intel64_lin
-lqkmalloc

Fortran benchmarks:
-m64 -Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs
-xCORE-AVX512 -O3 -ipo -no-prec-div -qopt-mem-layout-trans=4
-nostandard-realloc-lhs -align array32byte -auto
-mbranches-within-32B-boundaries
-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.1.217/linux/compiler/lib/intel64_lin
-lqkmalloc

Peak Compiler Invocation

C benchmarks:
icc

(Continued on next page)
### Peak Compiler Invocation (Continued)

C++ benchmarks:
- icpc

Fortran benchmarks:
- ifort

### Peak Portability Flags

- 500.perlbench_r: -DSPEC_LP64 -DSPEC_LINUX_X64
- 502.gcc_r: -D_FILE_OFFSET_BITS=64
- 505.mcf_r: -DSPEC_LP64
- 520.omnetpp_r: -DSPEC_LP64
- 523.xalancbmk_r: -DSPEC_LP64 -DSPEC_LINUX
- 525.x264_r: -DSPEC_LP64
- 531.deepsjeng_r: -DSPEC_LP64
- 541.leela_r: -DSPEC_LP64
- 548.exchange2_r: -DSPEC_LP64
- 557.xz_r: -DSPEC_LP64

### Peak Optimization Flags

C benchmarks:

- 500.perlbench_r: -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2)
- -xCORE-AVX512 -ipo -O3 -no-prec-div
- -qopt-mem-layout-trans=4 -fno-strict-overflow
- -mbranches-within-32B-boundaries
- -L/usr/local/IntelCompiler19 compilers_and_libraries_2020.1.217 linux compiler lib/intel64_lin
- -Lqkmalloc

- 502.gcc_r: -m32
- -L/usr/local/IntelCompiler19 compilers_and_libraries_2020.1.217 linux compiler lib/ia32_lin
- -std=gnu89
- -Wl,-plugin-opt=-x86-branches-within-32B-boundaries
- -Wl,-z,muldefs -fprofile-generate(pass 1)
- -fprofile-use=default.profdatal -xCORE-AVX512 -flto
- -Ofast(pass 1) -O3 -ffast-math -qnextgen -fuse-ld=gold
- -qopt-mem-layout-trans=4 -L/usr/local/jemalloc32-5.0.1/lib
- -ljemalloc

- 505.mcf_r: basepeak = yes

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

SPECrate®2017_int_base = 286
SPECrate®2017_int_peak = 297

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

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

Peak Optimization Flags (Continued)

525.x264_r: -m64 -qnextgen -std=clang
-W1,-plugin-opt=-x86-branches-within-32B-boundaries
-W1,-z,muldefs -xCORE-AVX512 -fto -O3 -ffast-math
-fuse-ld=gold -qopt-mem-layout-trans=4 -fno-alias
-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.1.217/linux/compiler/lib/intel64_lin
-lqkmalloc

557.xz_r: -W1,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries
-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.1.217/linux/compiler/lib/intel64_lin
-lqkmalloc

C++ benchmarks:

520.omnetpp_r: basepeak = yes
523.xalancbmk_r: basepeak = yes
531.deepsjeng_r: basepeak = yes
541.leela_r: basepeak = yes

Fortran benchmarks:

548.exchange2_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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