SPEC CPU®2017 Floating Point Rate Result

Huawei 2288H V5 (Intel Xeon Gold 6248R)

**SPECrate®2017_fp_base = 292**

**SPECrate®2017_fp_peak = 292**

<table>
<thead>
<tr>
<th>Hardware</th>
<th>Software</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU Name: Intel Xeon Gold 6248R</td>
<td>OS: SUSE Linux Enterprise Server 12 SP4 (x86_64)</td>
</tr>
<tr>
<td>Nominal: 3000</td>
<td>Parallel: No</td>
</tr>
<tr>
<td>Orderable: 1,2 chips</td>
<td>File System: xfs</td>
</tr>
<tr>
<td>Cache L1: 32 KB I + 32 KB D on chip per core</td>
<td>System State: Run level 3 (multi-user)</td>
</tr>
<tr>
<td>L2: 1 MB I+D on chip per core</td>
<td>Base Pointers: 64-bit</td>
</tr>
<tr>
<td>L3: 35.75 MB I+D on chip per core</td>
<td>Peak Pointers: 64-bit</td>
</tr>
<tr>
<td>Other: None</td>
<td>Other: jemalloc memory allocator V5.0.1</td>
</tr>
<tr>
<td>Memory: 768 GB (24 x 32 GB 2Rx4 PC4-2933Y-R)</td>
<td>(Continued on next page)</td>
</tr>
<tr>
<td>Storage: 1 x 800 GB SAS SSD</td>
<td></td>
</tr>
<tr>
<td>Other: None</td>
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| Software Availability: Apr-2020 | Spec CPU®2017 License: 6177 |
| Test Sponsor: China Academy of Information and Communications Technology | Test Date: Jul-2020 |
| Hardware Availability: Mar-2020 | Technology |
| Tested by: China Academy of Information and Communications Technology | |

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## Huawei 2288H V5 (Intel Xeon Gold 6248R)

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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

SPEC has learned that this result, which used an evaluation compiler, was submitted contrary to the compiler license terms.

Intel has granted a one-time waiver for this result.

## 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.
Huawei 2288H V5 (Intel Xeon Gold 6248R)

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**CPU2017 License:** 6177  
**Test Sponsor:** China Academy of Information and Communications Technology  
**Tested by:** China Academy of Information and Communications Technology  
**Test Date:** Jul-2020  
**Hardware Availability:** Mar-2020  
**Software Availability:** Apr-2020

**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 = 
  - "/opt/intel/compilers_and_libraries_2020.1.217/linux/compiler/lib/intel64:/usr/local/jemalloc64-5.0.1"
- MALLOC_CONF = "retain:true"

**General Notes**

- 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.

**Platform Notes**

- BIOS configuration:
- Power Policy Set to Performance
- SNC Set to Enabled
- IMC Interleaving Set to 1-way Interleave
- XPT Prefetch Set to Enabled

- Sysinfo program /spec2017/bin/sysinfo
- Rev: r6365 of 2019-08-21 295195f888a3d7ed1e6e46a485a0011
  - running on linux-r48i Thu Jul 16 22:12:53 2020

- SUT (System Under Test) info as seen by some common utilities.
  - For more information on this section, see

(Continued on next page)
Huawei 2288H V5 (Intel Xeon Gold 6248R)

SPEC CPU®2017 Floating Point Rate Result

Copyright 2017-2020 Standard Performance Evaluation Corporation

Huawei

(Technology)

SPECrater®2017_fp_base = 292
SPECrater®2017_fp_peak = 292

Huawei 2288H V5 (Intel Xeon Gold 6248R)

CPU2017 License: 6177
Test Sponsor: China Academy of Information and Communications Technology
Test Date: Jul-2020
Hardware Availability: Mar-2020
Tested by: China Academy of Information and Communications Technology
Software Availability: Apr-2020

SPECrate®2017_fp_peak = 292

Platform Notes (Continued)

https://www.spec.org/cpu2017/Docs/config.html#sysinfo

From /proc/cpuinfo
- model name: Intel(R) Xeon(R) Gold 6248R CPU @ 3.00GHz
- 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
  - 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 6248R CPU @ 3.00GHz
- Stepping: 7
- CPU MHz: 3000.000
- CPU max MHz: 4000.0000
- CPU min MHz: 1200.0000
- BogoMIPS: 6000.00
- 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): 4-6,10-12,16-18,21-23,25-32,35-42,58-60,64-66,69-71
- 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 art arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid aperfmperf pni pclmulqdq dtes64 ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtpr pdcm

(Continued on next page)

Page 4

Standard Performance Evaluation Corporation (info@spec.org) https://www.spec.org/
Huawei 2288H V5 (Intel Xeon Gold 6248R)

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CPU2017 License: 6177
Test Sponsor: China Academy of Information and Communications Technology
Tested by: China Academy of Information and Communications Technology

Platform Notes (Continued)

```
pcid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c
rdrand lahf_lm abm 3dnowprefetch cpuid_fault epb cat_13 cdp_13 invpcid_single ssbd
mba ibrs ibpb stibp tpr_shadow vnmi flexpriority ept vpid fsgsbase tsc_adjust bm1
hle avx2 smep bmi2 erms invpcid rtm cqmp mxp rdt_a avx512f avx512dq rdseed adx smap
cflushopt clwb intel_pt avx512cd avx512bw avx512vl xsaveopt xsaves xgetbv1 xsaves
cqmm_llc cqmm_occup_llc cqmm_mmb_total cqmm_mmb_local dtherm ida arat pln pts pkup ospke
avx512_vnni flush_l1d arch_capabilities
```

From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a physical chip.
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: 191973 MB
node 0 free: 191031 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: 193531 MB
node 1 free: 192466 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: 193502 MB
node 2 free: 192696 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: 193321 MB
node 3 free: 192509 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: 790864816 kB
HugePages_Total: 0
Hugepagesize: 2048 kB
```

From /etc/*release* /etc/*version*
SuSE-release:
SUSE Linux Enterprise Server 12 (x86_64)
VERSION = 12
PATCHLEVEL = 4
# This file is deprecated and will be removed in a future service pack or release.
# Please check /etc/os-release for details about this release.

(Continued on next page)
Huawei 2288H V5 (Intel Xeon Gold 6248R)

CPU2017 License: 6177
Test Sponsor: China Academy of Information and Communications Technology
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**SPEC CPU®2017 Floating Point Rate Result**

**SPECCrate®2017_fp_base = 292**  
**SPECCrate®2017_fp_peak = 292**

**Platform Notes (Continued)**

```plaintext
os-release:
NAME="SLES"
VERSION="12-SP4"
VERSION_ID="12.4"
PRETTY_NAME="SUSE Linux Enterprise Server 12 SP4"
ID="sles"
ANSI_COLOR="0;32"
CPE_NAME="cpe:/o:suse:sles:12:sp4"

uname -a:
x86_64 x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:

CVE-2018-3620 (L1 Terminal Fault): Not affected
Microarchitectural Data Sampling: No status reported
CVE-2017-5754 (Meltdown): Not affected
CVE-2018-3639 (Speculative Store Bypass): Mitigation: Speculative Store Bypass disabled via prctl and seccomp
CVE-2017-5734 (Speculative Store Bypass): Mitigation: Speculative Store Bypass disabled via prctl and seccomp
CVE-2017-5715 (Spectre variant 1): Mitigation: __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Indirect Branch Restricted Speculation, IBPB, IBRS_FW

run-level 3 Jul 16 12:21

SPEC is set to: /spec2017

Filesystem  Type  Size  Used Avail Use% Mounted on
/dev/sda3      xfs  730G  118G  612G  17% /

From /sys/devices/virtual/dmi/id
BIOS:    INSYDE Corp. 6.83 06/29/2019
Vendor:  Huawei
Product: 2288H V5
Product Family: Purley
Serial:  Huawei

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: 24x Samsung M393A4K40CB2-CVF 32 GB 2 rank 2933

(End of data from sysinfo program)
SPEC CPU®2017 Floating Point Rate Result

Huawei

Huawei 2288H V5 (Intel Xeon Gold 6248R)

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Hardware Availability: Mar-2020
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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
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
==============================================================================
C++, C | 511.povray_r(base, peak) 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, Fortran | 507.cactuBSSN_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.
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.
ifort: NOTE: The evaluation period for this product ends on 30-jul-2020 UTC.
-----------------------------------------------------------------------------
Fortran | 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak)

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

**Huawei**  
(Test Sponsor: China Academy of Information and Communications Technology)

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**Compiler Version Notes (Continued)**

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Huawei
(Hardware Sponsor: China Academy of Information and Communications Technology)

Huawei 2288H V5 (Intel Xeon Gold 6248R)

SPECrate®2017_fp_base = 292
SPECrate®2017_fp_peak = 292

CPU2017 License: 6177
Test Sponsor: China Academy of Information and Communications Technology
Tested by: China Academy of Information and Communications Technology

Test Date: Jul-2020
Hardware Availability: Mar-2020
Software Availability: Apr-2020

Compiler Version Notes (Continued)

Fortran, C      | 521.wrf_r (peak)

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 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.
icc: NOTE: The evaluation period for this product ends on 30-jul-2020 UTC.

Base Compiler Invocation

C benchmarks:
iccc

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
507.cactuBSSN_r: -DSPEC_LP64
508.namd_r: -DSPEC_LP64
510.parest_r: -DSPEC_LP64
511.povray_r: -DSPEC_LP64

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

Huawei
[Test Sponsor: China Academy of Information and Communications Technology]

Huawei 2288H V5 (Intel Xeon Gold 6248R)

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Base Portability Flags (Continued)

519.lbm_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-AVX512 -Ofast -ffast-math -flto -mfpmath=sse
  -funroll-loops -qopt-mem-layout-trans=4 -L/usr/local/jemalloc64-5.0.1/ -ljemalloc

C++ benchmarks:
  -m64 -qnextgen -Wl,-plugin-opt=-x86-branches-within-32B-boundaries
  -Wl,-z,muldefs -fuse-ld=gold -xCORE-AVX512 -Ofast -ffast-math -flto
  -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
  -L/usr/local/jemalloc64-5.0.1/ -ljemalloc

Fortran benchmarks:
  -m64 -Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs
  -fuse-ld=gold -xCORE-AVX512 -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/ -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-AVX512 -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
  -L/usr/local/jemalloc64-5.0.1/ -ljemalloc

(Continued on next page)
SPEC CPU®2017 Floating Point Rate Result
Copyright 2017-2020 Standard Performance Evaluation Corporation

Huawei
(Hub: China Academy of Information and Communications Technology)

Huawei 2288H V5 (Intel Xeon Gold 6248R)

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CPU2017 License: 6177
Test Sponsor: China Academy of Information and Communications Technology
Test Date: Jul-2020
Hardware Availability: Mar-2020
Tested by: China Academy of Information and Communications Technology
Software Availability: Apr-2020

Base Optimization Flags (Continued)

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-AVX512 -Ofast -ffast-math -flto -mfpmath=sse
- funroll-loops -qopt-mem-layout-trans=4 -L/usr/local/jemalloc64-5.0.1/
- 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-AVX512 -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
- L/usr/local/jemalloc64-5.0.1/ -ljemalloc

Peak Compiler Invocation

C benchmarks:
iccc

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
## SPEC CPU®2017 Floating Point Rate Result

**Huawei 2288H V5 (Intel Xeon Gold 6248R)**

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**CPU2017 License:** 6177  
**Test Date:** Jul-2020  
**Hardware Availability:** Mar-2020  
**Test Sponsor:** China Academy of Information and Communications Technology  
**Tested by:** China Academy of Information and Communications Technology  

### 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 
  -W1,-plugin-opt=-x86-branches-within-32B-boundaries 
  -W1,-z,muldefs -fuse-ld=gold -xCORE-AVX512 -Ofast 
  -ffast-math -flto -mfpmath=sse -funroll-loops 
  -qopt-mem-layout-trans=4 -L/usr/local/jemalloc64-5.0.1/ 
  -ljemalloc

**Fortran benchmarks:**

- `503.bwaves_r`: -m64 -W1,-plugin-opt=-x86-branches-within-32B-boundaries 
  -W1,-z,muldefs -fuse-ld=gold -xCORE-AVX512 -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/ -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-AVX512 -O3 
  -ipo -no-prec-div -qopt-prefetch -ffinite-math-only 
  -qopt-multiple-gather-scatter-by-shuffles

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Huawei
(Test Sponsor: China Academy of Information and Communications Technology)

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Peak Optimization Flags (Continued)

521.wrf_r (continued):
-qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries
-nostandard-realloc-lhs -align array32byte -auto
-L/usr/local/jemalloc64-5.0.1/ -ljemalloc

527.cam4_r: basepeak = yes

Benchmarks using both C and C++:

511.povray_r: -m64 -qnextgen -std=c11
-WI,-plugin-opt=-x86-branches-within-32B-boundaries
-WI,-z,muldefs -fuse-ld=gold -flto -xCORE-AVX512 -Ofast
-qopt-mem-layout-trans=4 -L/usr/local/jemalloc64-5.0.1/
-ljemalloc

526.blender_r: basepeak = yes

Benchmarks using Fortran, C, and C++:

507.cactuBSSN_r: basepeak = yes

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/CAICT-Platform-Settings-CLX-V1.0.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/CAICT-Platform-Settings-CLX-V1.0.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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