# SPEC® CPU2017 Integer Rate Result

## Huawei

**Huawei 2288H V5 (Intel Xeon Silver 4210)**

<table>
<thead>
<tr>
<th>SPECrate2017_int_base</th>
<th>110</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECrate2017_int_peak</td>
<td>115</td>
</tr>
</tbody>
</table>

**CPU2017 License**: 3175  
**Test Date**: Mar-2019  
**Hardware Availability**: Apr-2019  
**Software Availability**: Dec-2018

### Hardware

- **CPU Name**: Intel Xeon Silver 4210  
- **Max MHz.**: 3200  
- **Nominal**: 2200  
- **Enabled**: 20 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**: 13.75 MB I+D on chip per core  
- **Memory**: 384 GB (24 x 16 GB 2Rx8 PC4-2933Y-R, running at 2400)  
- **Storage**: 1 x 1200 GB SAS, 10000 RPM  
- **Other**: None  

### Software

- **OS**: SUSE Linux Enterprise Server 12 SP4 (x86_64)  
- **C/C++**: Version 19.0.1.144 of Intel C/C++ Compiler Build 20181018 for Linux;  
- **Fortran**: Version 19.0.1.144 of Intel Fortran Compiler Build 20181018 for Linux  
- **Parallel**: No  
- **Firmware**: Version 6.36 Released Feb-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

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<table>
<thead>
<tr>
<th>Benchmark</th>
<th>SPECrate2017_int_base</th>
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<tbody>
<tr>
<td>perlbench_r</td>
<td>84.9</td>
<td>97.2</td>
</tr>
<tr>
<td>gcc_r</td>
<td>93.0</td>
<td>104.0</td>
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<tr>
<td>mcf_r</td>
<td>75.9</td>
<td>153.0</td>
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<td>omnetpp_r</td>
<td>76.0</td>
<td>131.0</td>
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<tr>
<td>xalancbmk_r</td>
<td>140.0</td>
<td>208.0</td>
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<tr>
<td>x264_r</td>
<td>153.0</td>
<td>217.0</td>
</tr>
<tr>
<td>deepsjeng_r</td>
<td>91.7</td>
<td>192.0</td>
</tr>
<tr>
<td>leela_r</td>
<td>83.2</td>
<td>193.0</td>
</tr>
<tr>
<td>exchange2_r</td>
<td>73.5</td>
<td>84.9</td>
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<tr>
<td>xz_r</td>
<td>73.5</td>
<td>84.9</td>
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**Copies**

- SPECrate2017_int_base (110)
- SPECrate2017_int_peak (115)
### Huawei 2288H V5 (Intel Xeon Silver 4210)

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<td>587</td>
<td>73.5</td>
<td>588</td>
<td>73.5</td>
</tr>
</tbody>
</table>

**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"

### General Notes

Environment variables set by runcpu before the start of the run:

```
LD_LIBRARY_PATH = "/spec/lib/ia32/:/spec/lib/intel64/:/spec/je5.0.1-32/:/spec/je5.0.1-64"
```

Binaries compiled on a system with 1x Intel Core i9-7900X CPU + 32GB RAM

Memory using Redhat Enterprise Linux 7.5

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>
```

Yes: 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.
Huawei

Huawei 2288H V5 (Intel Xeon Silver 4210)

CPU2017 License: 3175
Test Sponsor: Huawei
Tested by: Huawei

SPECrate2017_int_base = 110
SPECrate2017_int_peak = 115

Test Date: Mar-2019
Hardware Availability: Apr-2019
Software Availability: Dec-2018

General Notes (Continued)

jemalloc, a general purpose malloc implementation
built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5

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 /spec/bin/sysinfo
Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
running on linux-7ejo Fri Mar 22 19:01:38 2019

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) Silver 4210 CPU @ 2.20GHz
    2 "physical id"s (chips)
    40 "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 : 10
    siblings : 20
      physical 0: cores 0 1 2 3 4 8 9 10 11 12
      physical 1: cores 0 1 2 3 4 8 9 10 11 12

From lscpu:
  Architecture: x86_64
  CPU op-mode(s): 32-bit, 64-bit
  Byte Order: Little Endian
  CPU(s): 40
  On-line CPU(s) list: 0-39
  Thread(s) per core: 2
  Core(s) per socket: 10
  Socket(s): 2
  NUMA node(s): 2
  Vendor ID: GenuineIntel
  CPU family: 6
  Model: 85
  Model name: Intel(R) Xeon(R) Silver 4210 CPU @ 2.20GHz
  Stepping: 6
  CPU MHz: 2200.000

(Continued on next page)
Huawei

Huawei 2288H V5 (Intel Xeon Silver 4210)

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CPU2017 License: 3175
Test Sponsor: Huawei
Tested by: Huawei

- **CPU max MHz:** 3200.0000
- **CPU min MHz:** 1000.0000
- **BogoMIPS:** 4400.00
- **Virtualization:** VT-x
- **L1d cache:** 32K
- **L1i cache:** 32K
- **L2 cache:** 1024K
- **L3 cache:** 14080K
- **NUMA node0 CPU(s):** 0-9,20-29
- **NUMA node1 CPU(s):** 10-19,30-39

Flags: fpu vme de pse tsc msr pae mce 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 aperfmperf pni pclmulqdq dtes64 msr dtes64e tm lmvpt msave ptnop M3140 mcmov 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 aperfmperf pni pclmulqdq dtes64 msr dtes64e tm lmvpt msave ptnop M3140 mcmov

/proc/cpuinfo cache data

```
cache size : 14080 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 20 21 22 23 24 25 26 27 28 29
node 0 size: 191903 MB
node 0 free: 185391 MB
node 1 cpus: 10 11 12 13 14 15 16 17 18 19 30 31 32 33 34 35 36 37 38 39
node 1 size: 193279 MB
node 1 free: 192798 MB
node distances:
  node 0: 10 21
  node 1: 10 21
```

From /proc/meminfo

```
MemTotal:       394427596 kB
HugePages_Total:       0
Hugepagesize:       2048 kB
```

From /etc/*release*/etc/*version*

```
SuSE-release: SUSE Linux Enterprise Server 12 (x86_64)
```

(Continued on next page)
### SPEC CPU2017 Integer Rate Result

**Huawei**

Huawei 2288H V5 (Intel Xeon Silver 4210)  

<table>
<thead>
<tr>
<th>CPU2017 License</th>
<th>Test Date</th>
<th>Hardware Availability</th>
<th>Tested by</th>
<th>Software Availability</th>
</tr>
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<td>Mar-2019</td>
<td>Apr-2019</td>
<td>Huawei</td>
<td>Dec-2018</td>
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</tbody>
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**SPECrate2017_int_base = 110**  
**SPECrate2017_int_peak = 115**

<table>
<thead>
<tr>
<th>Platform Notes (Continued)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VERSION = 12</td>
</tr>
<tr>
<td>PATCHLEVEL = 4</td>
</tr>
<tr>
<td># This file is deprecated and will be removed in a future service pack or release.</td>
</tr>
<tr>
<td># Please check /etc/os-release for details about this release.</td>
</tr>
<tr>
<td>os-release:</td>
</tr>
<tr>
<td>NAME=&quot;SLES&quot;</td>
</tr>
<tr>
<td>VERSION=&quot;12-SP4&quot;</td>
</tr>
<tr>
<td>VERSION_ID=&quot;12.4&quot;</td>
</tr>
<tr>
<td>PRETTY_NAME=&quot;SUSE Linux Enterprise Server 12 SP4&quot;</td>
</tr>
<tr>
<td>ID=&quot;sles&quot;</td>
</tr>
<tr>
<td>ANSI_COLOR=&quot;0;32&quot;</td>
</tr>
<tr>
<td>CPE_NAME=&quot;cpe:/o:suse:sles:12:sp4&quot;</td>
</tr>
</tbody>
</table>

```
uname -a:
x86_64 x86_64 x86_64 GNU/Linux
```

**Kernel self-reported vulnerability status:**

- CVE-2017-5754 (Meltdown): Not affected
- CVE-2017-5753 (Spectre variant 1): Mitigation: __user pointer sanitization
- CVE-2017-5715 (Spectre variant 2): Mitigation: Indirect Branch Restricted Speculation, IBPB, IBRS_FW

**run-level 3 Mar 22 19:00**

**SPEC is set to:** /spec  
Filesystem Type Size Used Avail Use% Mounted on  
/dev/sda3 xfs 734G 90G 645G 13% /

**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.**

**BIOS INSYDE Corp. 6.36 02/15/2019**

**Memory:**

- 24x Samsung M393A2K43CB2-CVF 16 GB 2 rank 2933, configured at 2400

(End of data from sysinfo program)

**Compiler Version Notes**

```
(CC) 502.gcc_r(peak)
```

Intel(R) C Intel(R) 64 Compiler for applications running on IA-32, Version

(Continued on next page)
Huawei
Huawei 2288H V5 (Intel Xeon Silver 4210)

SPEC CPU2017 Integer Rate Result

SPECrater2017_int_base = 110
SPECrater2017_int_peak = 115

CPU2017 License: 3175
Test Sponsor: Huawei
Test Date: Mar-2019
Tested by: Huawei
Hardware Availability: Apr-2019
Software Availability: Dec-2018

Compiler Version Notes (Continued)

19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.

==============================================================================
CC  500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base, peak)
   525.x264_r(base, peak) 557.xz_r(base, peak)
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.

==============================================================================
CC   500.perlbench_r(peak)
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.

==============================================================================
CXXC 523.xalancbmk_r(peak)
Intel(R) C++ Intel(R) 64 Compiler for applications running on IA-32, Version
19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.

==============================================================================
CXXC 520.omnetpp_r(base, peak) 523.xalancbmk_r(base) 531.deepsjeng_r(base,
   peak) 541.leela_r(base, peak)
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.

==============================================================================
FC  548.exchange2_r(base, peak)
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
64, Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
Huawei
Huawei 2288H V5 (Intel Xeon Silver 4210)

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CPU2017 License: 3175
Test Sponsor: Huawei
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Base Compiler Invocation

C benchmarks:
  icc -m64 -std=c11

C++ benchmarks:
  icpc -m64

Fortran benchmarks:
  ifort -m64

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.leela_r: -DSPEC_LP64
548.exchange2_r: -DSPEC_LP64
557.xz_r: -DSPEC_LP64

Base Optimization Flags

C benchmarks:
  -Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
  -qopt-mem-layout-trans=4
  -L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/intel64
  -lqkmalloc

C++ benchmarks:
  -Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
  -qopt-mem-layout-trans=4
  -L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/intel64
  -lqkmalloc

Fortran benchmarks:
  -Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
  -qopt-mem-layout-trans=4 -nostandard-realloc-lhs -align array32byte
  -L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/intel64
  -lqkmalloc
Huawei 2288H V5 (Intel Xeon Silver 4210)

| SPECrate2017_int_base | 110 |
| SPECrate2017_int_peak | 115 |

CPU2017 License: 3175

Test Sponsor: Huawei

Tested by: Huawei

Peak Compiler Invocation

C benchmarks (except as noted below):
```plaintext
icc -m64 -std=c11
```

```plaintext
```

C++ benchmarks (except as noted below):
```plaintext
icpc -m64
```

```plaintext
523.xalancbmk_r:icpc -m32 -L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/ia32_lin
```

Fortran benchmarks:
```plaintext
ifort -m64
```

Peak Portability Flags

```plaintext
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:-D_FILE_OFFSET_BITS=64 -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:
```plaintext
500.perlbench_r:-Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo
-xCORE-AVX512 -O3 -no-prec-div -qopt-mem-layout-trans=4
-fno-strict-overflow
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/intel64
-lqkmalloc
```

```plaintext
502.gcc_r:-Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo
-xCORE-AVX512 -O3 -no-prec-div -qopt-mem-layout-trans=4
-L/usr/local/je5.0.1-32/lib -ljemalloc
```

```plaintext
505.mcf_r:-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4
```

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

505.mcf_r (continued):
- L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/intel64
  -lqkmalloc

525.x264_r -Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4 -fno-alias
- L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/intel64
  -lqkmalloc

557.xz_r: Same as 505.mcf_r

C++ benchmarks:

520.omnetpp_r -Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4
- L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/intel64
  -lqkmalloc

523.xalancbmk_r -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo
-xCORE-AVX512 -O3 -no-prec-div -qopt-mem-layout-trans=4
- L/usr/local/je5.0.1-32/lib -ljemalloc

531.deepsjeng_r: Same as 520.omnetpp_r

541.leela_r: Same as 520.omnetpp_r

Fortran benchmarks:

-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4 -nostandard-realloc-lhs -align array32byte
- L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/intel64
  -lqkmalloc

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/Huawei-Platform-Settings-SKL-V1.9-revC.xml
Huawei

Huawei 2288H V5 (Intel Xeon Silver 4210)

SPECrate2017_int_base = 110
SPECrate2017_int_peak = 115

CPU2017 License: 3175
Test Sponsor: Huawei
Tested by: Huawei

Test Date: Mar-2019
Hardware Availability: Apr-2019
Software Availability: Dec-2018

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For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

Tested with SPEC CPU2017 v1.0.5 on 2019-03-22 07:01:37-0400.