## SPEC® CPU2017 Integer Rate Result

### Huawei 2288H V5 (Intel Xeon Silver 4208)

- **SPECrate2017_int_base** = 81.3
- **SPECrate2017_int_peak** = 84.3

### Hardware

<table>
<thead>
<tr>
<th>Test Date:</th>
<th>Mar-2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware Availability:</td>
<td>Apr-2019</td>
</tr>
<tr>
<td>Software Availability:</td>
<td>Dec-2018</td>
</tr>
</tbody>
</table>

#### CPU
- **Name**: Intel Xeon Silver 4208
- **Max MHz.**: 3200
- **Nominal**: 2100
- **Enabled**: 16 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**: 11 MB I+D on chip per chip
- **Memory**: 384 GB (24 x 16 GB 2Rx8 PC4-2933Y-R, running at 2400)
- **Storage**: 1 x 1200 GB SAS, 10000 RPM
- **Other**: None

#### OS
- **SUSE Linux Enterprise Server 12 SP4 (x86_64)**
- **Version**: 4.12.14-94.41-default

#### Compiler
- **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.

#### Firmware
- **Version**: 6.36 Released Feb-2019

#### System State
- **Run level 3 (multi-user)**

#### Other
- **jemalloc memory allocator V5.0.1**

### Software

### Hardware Copy Results

<table>
<thead>
<tr>
<th>Test Sponsor:</th>
<th>Huawei</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tested by:</td>
<td>Huawei</td>
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<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>SPECrate2017_int_base</th>
<th>SPECrate2017_int_peak</th>
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</thead>
<tbody>
<tr>
<td>perlbench_r</td>
<td>32</td>
<td>81.3</td>
<td>84.3</td>
</tr>
<tr>
<td>gcc_r</td>
<td>32</td>
<td>56.9</td>
<td>62.7</td>
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<tr>
<td>mcf_r</td>
<td>32</td>
<td>113</td>
<td>77.6</td>
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<tr>
<td>omnetpp_r</td>
<td>32</td>
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<td>xalancbmk_r</td>
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<td>deepsjeng_r</td>
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<tr>
<td>exchange2_r</td>
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<tr>
<td>xz_r</td>
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### Software

<table>
<thead>
<tr>
<th>Specification</th>
<th>Description</th>
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<tbody>
<tr>
<td>OS</td>
<td>SUSE Linux Enterprise Server 12 SP4 (x86_64)</td>
</tr>
<tr>
<td>Compiler</td>
<td>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</td>
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<tr>
<td>Parallel</td>
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<td>Firmware</td>
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<tr>
<td>File System</td>
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<tr>
<td>System State</td>
<td>Run level 3 (multi-user)</td>
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<tr>
<td>Base Pointers</td>
<td>64-bit</td>
</tr>
<tr>
<td>Peak Pointers</td>
<td>32/64-bit</td>
</tr>
<tr>
<td>Other</td>
<td>jemalloc memory allocator V5.0.1</td>
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</tbody>
</table>
 SPEC CPU2017 Integer Rate Result

Huawei
Huawei 2288H V5 (Intel Xeon Silver 4208)

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Base Copies</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Peak Copies</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
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<td>72.1</td>
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<td>548.exchange2_r</td>
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<td>143</td>
<td>32</td>
<td>588</td>
<td>143</td>
<td>587</td>
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<tr>
<td>557.xz_r</td>
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<td>629</td>
<td>54.9</td>
<td>630</td>
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<td>32</td>
<td>629</td>
<td>54.9</td>
<td>629</td>
<td>54.9</td>
</tr>
</tbody>
</table>

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

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.

(Continued on next page)
### 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 Mon Mar 25 21:13:06 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 4208 CPU @ 2.10GHz
  2 "physical id"s (chips)
  32 "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 : 8
siblings : 16
physical 0: cores 0 1 2 3 4 5 6 7
physical 1: cores 0 1 2 3 4 5 6 7
```

From lscpu:

```
Architecture:       x86_64
CPU op-mode(s):     32-bit, 64-bit
Byte Order:         Little Endian
CPU(s):             32
On-line CPU(s) list: 0-31
Thread(s) per core:  2
Core(s) per socket:  8
Socket(s):          2
NUMA node(s):       2
Vendor ID:          GenuineIntel
CPU family:         6
Model:              85
Model name:         Intel(R) Xeon(R) Silver 4208 CPU @ 2.10GHz
Stepping:           6
CPU MHz:            2100.000
```
Huawei

Huawei 2288H V5 (Intel Xeon Silver 4208)

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

SPECrate2017_int_base = 81.3
SPECrate2017_int_peak = 84.3

CPU max MHz: 3200.0000
CPU min MHz: 800.0000
BogoMIPS: 4200.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 11264K
NUMA node0 CPU(s): 0-7, 16-23
NUMA node1 CPU(s): 8-15, 24-31

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
        aperfmperf 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
        rrand lahf_lm abm 3dnowprefetch cpuid_fault epb cat_l3 cdp_l3 invpcid_single ssbd
        mba ibrs ibsd bmi1 hle avx2 smep bmi2 irdq invpcid rtm cqm mpx rdts a xsave avx512f
        avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd avx512bw avx512vl
        xsaveopt xsavec xsaveprec xsave xsaveextended xsavefull xsavec full 3dnow
        fma4 xsaveopt xsavec xsaveprec xsave full 3dnow

/proc/cpuinfo cache data

Cache size: 11264 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 16 17 18 19 20 21 22 23
Node 0 size: 192877 MB
Node 0 free: 186515 MB
Node 1 cpus: 8 9 10 11 12 13 14 15 24 25 26 27 28 29 30 31
Node 1 size: 193251 MB
Node 1 free: 192661 MB

From /proc/meminfo
MemTotal: 39539576 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)
## Platform Notes (Continued)

```bash
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.

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-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 25 21:11
```

SPEC is set to: /spec

<table>
<thead>
<tr>
<th>Filesystem</th>
<th>Type</th>
<th>Size</th>
<th>Used</th>
<th>Avail</th>
<th>Use%</th>
<th>Mounted on</th>
</tr>
</thead>
<tbody>
<tr>
<td>/dev/sda3</td>
<td>xfs</td>
<td>734G</td>
<td>91G</td>
<td>643G</td>
<td>13%</td>
<td>/</td>
</tr>
</tbody>
</table>

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)
# SPEC CPU2017 Integer Rate Result

## Huawei

**Huawei 2288H V5 (Intel Xeon Silver 4208)**

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<tr>
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</table>

**CPU2017 License:** 3175  
**Test Date:** Mar-2019  
**Test Sponsor:** Huawei  
**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.

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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.

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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.

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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.

---

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.

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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 4208)

SPECrate2017_int_base = 81.3
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CPU2017 License: 3175
Test Sponsor: Huawei
Tested by: Huawei
Test Date: Mar-2019
Hardware Availability: Apr-2019
Software Availability: Dec-2018

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.xalanchbmk_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:
-W1,-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:
-W1,-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:
-W1,-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

Huawei 2288H V5 (Intel Xeon Silver 4208)

| SPECrate2017_int_base | 81.3 |
| SPECrate2017_int_peak | 84.3 |

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

Peak Compiler Invocation

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

$02.gcc_r:icc -m32 -std=c11 -L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/ia32_lin

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

$23.xalancbmk_r:icpc -m32 -L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/ia32_lin

Fortran benchmarks:
ifort -m64

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:-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:

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

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

505.mcf_r:basepeak = yes

(Continued on next page)
Huawei

SPEC CPU2017 Integer Rate Result

SPECrate2017_int_base = 81.3
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Huawei 2288H V5 (Intel Xeon Silver 4208)

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

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

Peak Optimization Flags (Continued)

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: -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:

520.omnetpp_r: basepeak = yes

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: -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

541.leela_r: Same as 531.deepsjeng_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

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