Cisco Systems
Cisco UCS C220 M5 (Intel Xeon Gold 6246R, 3.40GHz)

<table>
<thead>
<tr>
<th>Software</th>
<th>SPECrate\textsuperscript{®}2017_fp_base = 231</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU2017 License:</td>
<td>9019</td>
</tr>
<tr>
<td>Test Sponsor:</td>
<td>Cisco Systems</td>
</tr>
<tr>
<td>Tested by:</td>
<td>Cisco Systems</td>
</tr>
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<td>May-2019</td>
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### Hardware

- **CPU Name:** Intel Xeon Gold 6246R
- **Max MHz:** 4100
- **Nominal:** 3400
- **Enabled:** 32 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:** 768 GB (24 x 32 GB 2Rx4 PC4-2933V-R)
- **Storage:** 1 x 960 GB SSD SAS
- **Other:** None

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### Software

- **OS:** SUSE Linux Enterprise Server 15 (x86_64) 4.12.14-23-default
- **Compiler:** C/C++: Version 19.0.4.227 of Intel C/C++ Compiler for Linux; Fortran: Version 19.0.4.227 of Intel Fortran Compiler for Linux
- **Parallel:** No
- **Firmware:** Version 4.0.4i released Aug-2019
- **File System:** btrfs
- **System State:** Run level 3 (multi-user)
- **Base Pointers:** 64-bit
- **Peak Pointers:** 64-bit
- **Power Management:** BIOS set to prefer performance at the cost of additional power usage

### Copies

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CPU2017 License: 9019
Test Sponsor: Cisco Systems
Tested by: Cisco Systems

Results Table

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</tbody>
</table>

SPECrater®2017_fp_base = 231
SPECrater®2017_fp_peak = 235

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"

Environment Variables Notes
Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH = "~/home/cpu2017/lib/intel64"

General Notes
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

(Continued on next page)
Cisco Systems
Cisco UCS C220 M5 (Intel Xeon Gold 6246R, 3.40GHz)

General Notes (Continued)

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:
Intel HyperThreading Technology set to Enabled
SNC set to Enabled
IMC Interleaving set to 1-way Interleave
Patrol Scrub set to Disabled

Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7ed1be6e46a485a0011
running on linux-cud8 Tue Feb 18 04:19:45 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 6246R CPU @ 3.40GHz
  2 "physical id"s (chips)
    64 "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 : 16
siblings : 32
physical 0: cores 0 1 2 3 5 6 9 12 16 18 19 20 21 24 27 29
physical 1: cores 0 1 2 3 4 5 6 12 16 17 18 19 21 24 28 29

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 64
On-line CPU(s) list: 0-63
Thread(s) per core: 2
Core(s) per socket: 16
Socket(s): 2
NUMA node(s): 4

(Continued on next page)
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SPECrates®2017_fp_base = 231  
SPECrates®2017_fp_peak = 235

**CPU2017 License:** 9019  
**Test Sponsor:** Cisco Systems  
**Tested by:** Cisco Systems  
**Test Date:** Feb-2020  
**Hardware Availability:** Feb-2020  
**Software Availability:** May-2019

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**Platform Notes (Continued)**

- **Vendor ID:** GenuineIntel  
- **CPU family:** 6  
- **Model:** 85  
- **Model name:** Intel(R) Xeon(R) Gold 6246R CPU @ 3.40GHz  
- **Stepping:** 7  
- **CPU MHz:** 3400.000  
- **CPU max MHz:** 4100.0000  
- **CPU min MHz:** 1200.0000  
- **BogoMIPS:** 6800.00  
- **Virtualization:** VT-x  
- **L1d cache:** 32K  
- **L1i cache:** 32K  
- **L2 cache:** 1024K  
- **L3 cache:** 36608K  

**NUMA node0 CPU(s):** 0-3, 6, 8, 9, 13, 32-35, 38, 40, 41, 45  
**NUMA node1 CPU(s):** 4, 5, 7, 10-12, 14, 15, 36, 37, 39, 42-44, 46, 47  
**NUMA node2 CPU(s):** 16-19, 24-26, 29, 48-51, 56-58, 59, 60, 62, 63  
**NUMA node3 CPU(s):** 20-23, 27, 28, 30, 31, 52-55, 59, 60, 62, 63  

**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 aperf perfmon tsc_known_freq pni pclmulqdq dtельд4 monitor 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 rdrand lahf_lm abm 3dnowprefetch cpuid_fault ebx cat_13 cdp_13 invpcid_single intel_pmmi flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 ibrms invpcid rtm cqm mpx rdtr_a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd avx512bw avx512vl xsaveopt xsavec xsaves cqm_llc cqm_occup_llc cqm_mbb_total cqm_mbb_local ibpb ibrs stibp dtherm ida arat pln pts hwp hwp_act_window hwp_epp hwp_pkg_req pku ospke avx512_vnni arch_capabilities ssbd

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 6 8 9 13 32 33 34 35 38 40 41 45  
- **node 0 size:** 192103 MB  
- **node 0 free:** 181610 MB  
- **node 1 cpus:** 4 5 7 10 11 12 14 15 36 37 39 42 43 44 46 47  
- **node 1 size:** 193527 MB  
- **node 1 free:** 186382 MB  
- **node 2 cpus:** 16 17 18 19 24 25 26 29 48 49 50 51 56 57 58 61  
- **node 2 size:** 193527 MB  
- **node 2 free:** 186438 MB  
- **node 3 cpus:** 20 21 22 23 27 28 30 31 52 53 54 55 59 60 62 63
Cisco Systems
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Platform Notes (Continued)

node 3 size: 193497 MB
node 3 free: 186661 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: 791200060 kB
  HugePages_Total: 0
  Hugepagesize: 2048 kB

From /etc/*release* /etc/*version*
  os-release:
    NAME="SLES"
    VERSION="15"
    VERSION_ID="15"
    PRETTY_NAME="SUSE Linux Enterprise Server 15"
    ID="sles"
    ID_LIKE="suse"
    ANSI_COLOR="0;32"
    CPE_NAME="cpe:/o:suse:sles:15"

  uname -a:
    Linux linux-cud8 4.12.14-23-default #1 SMP Tue May 29 21:04:44 UTC 2018 (cd0437b)
x86_64 x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:

CVE-2018-3620 (L1 Terminal Fault): No status reported
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-2017-5753 (Spectre variant 1): Mitigation: __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Indirect Branch Restricted Speculation, IBPB, IBRS_FW

run-level 3 Feb 17 21:31

SPEC is set to: /home/cpu2017
  Filesystem Type Size Used Avail Use% Mounted on
  /dev/sda2 btrfs 224G 66G 158G 30% /home

From /sys/devices/virtual/dmi/id

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Platform Notes (Continued)

BIOS: Cisco Systems, Inc. C220M5.4.0.4i.0.0831191119 08/31/2019
Vendor: Cisco Systems Inc
Product: UCSC-C220-M5SX
Serial: WZP22380CRE

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 0xCE00 M393A4K40CB2-CVF 32 GB 2 rank 2933, configured at 2934

(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 Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------
C++             | 508.namd_r(base, peak) 510.parest_r(base, peak)
------------------------------------------------------------------------------
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------
C++, C          | 511.povray_r(base, peak) 526.blender_r(base, peak)
------------------------------------------------------------------------------
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
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C++, C, Fortran | 507.cactuBSSN_r(base, peak)

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Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
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Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.4.227 Build 20190416
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Fortran, C

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

Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R) 64,
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Base Compiler Invocation

C benchmarks:
icc -m64 -std=c11

C++ benchmarks:
icpc -m64

Fortran benchmarks:
ifort -m64

Benchmarks using both Fortran and C:
ifort -m64 icc -m64 -std=c11

(Continued on next page)
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Base Compiler Invocation (Continued)

Benchmarks using both C and C++:
icpc -m64 icc -m64 -std=c11

Benchmarks using Fortran, C, and C++:
icpc -m64 icc -m64 -std=c11 ifort -m64

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
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:
-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4

C++ benchmarks:
-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4

Fortran benchmarks:
-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -auto
-nostandard-realloc-lhs -align array32byte

Benchmarks using both Fortran and C:
-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -auto
-nostandard-realloc-lhs -align array32byte

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Cisco Systems
Cisco UCS C220 M5 (Intel Xeon Gold 6246R, 3.40GHz)

SPECrate®2017_fp_base = 231
SPECrate®2017_fp_peak = 235

CPU2017 License: 9019
Test Sponsor: Cisco Systems
Tested by: Cisco Systems

Test Date: Feb-2020
Hardware Availability: Feb-2020
Software Availability: May-2019

Base Optimization Flags (Continued)

Benchmarks using both C and C++:
-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4

Benchmarks using Fortran, C, and C++:
-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -auto
-nostandard-realloc-lhs -align array32byte

Peak Compiler Invocation

C benchmarks:
icc -m64 -std=c11

C++ benchmarks:
icpc -m64

Fortran benchmarks:
ifort -m64

Benchmarks using both Fortran and C:
ifort -m64 icc -m64 -std=c11

Benchmarks using both C and C++:
icpc -m64 icc -m64 -std=c11

Benchmarks using Fortran, C, and C++:
icpc -m64 icc -m64 -std=c11 ifort -m64

Peak Portability Flags

Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:
519.lbm_r: -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX512
-O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4

(Continued on next page)
Cisco Systems
Cisco UCS C220 M5 (Intel Xeon Gold 6246R, 3.40GHz)  

SPEC CPU®2017 Floating Point Rate Result

| SPECrate®2017_fp_base = 231 |
| SPECrate®2017_fp_peak = 235 |

CPU2017 License: 9019
Test Sponsor: Cisco Systems
Tested by: Cisco Systems

Test Date: Feb-2020
Hardware Availability: Feb-2020
Software Availability: May-2019

Peak Optimization Flags (Continued)

538.imagick_r: -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch 
-ffinite-math-only -qopt-mem-layout-trans=4

544.nab_r: Same as 538.imagick_r

C++ benchmarks:

508.namd_r: -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX512 
-O3 -no-prec-div -qopt-prefetch -ffinite-math-only 
-qopt-mem-layout-trans=4

510.parest_r: -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch 
-ffinite-math-only -qopt-mem-layout-trans=4

Fortran benchmarks:

503.bwaves_r: -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch 
-ffinite-math-only -qopt-mem-layout-trans=4 -auto 
-nostandard-realloc-lhs -align array32byte

549.fotonik3d_r: Same as 503.bwaves_r

554.roms_r: -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX512 
-O3 -no-prec-div -qopt-prefetch -ffinite-math-only 
-qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs 
-align array32byte

Benchmarks using both Fortran and C:

-prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX512 -O3 
-no-prec-div -qopt-prefetch -ffinite-math-only 
-qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs 
-align array32byte

Benchmarks using both C and C++:

511.povray_r: -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX512 
-O3 -no-prec-div -qopt-prefetch -ffinite-math-only 
-qopt-mem-layout-trans=4

526.blender_r: -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch 
-ffinite-math-only -qopt-mem-layout-trans=4

Benchmarks using Fortran, C, and C++:

-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch

(Continued on next page)
Cisco Systems
Cisco UCS C220 M5 (Intel Xeon Gold 6246R, 3.40GHz)  

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<tbody>
<tr>
<td>SPECrate®2017_fp_peak</td>
<td>235</td>
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</tbody>
</table>

Cisco Systems  
3.40GHz)  

CPU2017 License: 9019  
Test Sponsor: Cisco Systems  
Tested by: Cisco Systems  
Test Date: Feb-2020  
Hardware Availability: Feb-2020  
Software Availability: May-2019

Peak Optimization Flags (Continued)
Benchmarks using Fortran, C, and C++ (continued):
-ffinite-math-only -qopt-mem-layout-trans=4 -auto
-nostandard-realloc-lhs -align array32byte

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/Cisco-Platform-Settings-V1.2-revJ.xml

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

Tested with SPEC CPU®2017 v1.1.0 on 2020-02-18 07:19:45-0500.
Report generated on 2020-03-17 16:23:52 by CPU2017 PDF formatter v6255.
Originally published on 2020-03-17.