## Hardware

<table>
<thead>
<tr>
<th>Component</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU Name</td>
<td>Intel Xeon Gold 6226</td>
</tr>
<tr>
<td>Max MHz</td>
<td>3700</td>
</tr>
<tr>
<td>Nominal</td>
<td>2700</td>
</tr>
<tr>
<td>Enabled</td>
<td>24 cores, 2 chips</td>
</tr>
<tr>
<td>Orderable</td>
<td>1.2 Chips</td>
</tr>
<tr>
<td>Cache L1</td>
<td>32 KB I + 32 KB D on chip per core</td>
</tr>
<tr>
<td>Cache L2</td>
<td>1 MB I+D on chip per core</td>
</tr>
<tr>
<td>Cache L3</td>
<td>19.25 MB I+D on chip per chip</td>
</tr>
<tr>
<td>Other</td>
<td>None</td>
</tr>
<tr>
<td>Memory</td>
<td>768 GB (24 x 32 GB 2Rx4 PC4-2933V-R)</td>
</tr>
<tr>
<td>Storage</td>
<td>1 x 1.9 TB SSD SAS</td>
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<tr>
<td>Other</td>
<td>None</td>
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## Software

<table>
<thead>
<tr>
<th>Component</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>OS</td>
<td>SUSE Linux Enterprise Server 15 (x86_64)</td>
</tr>
<tr>
<td>Compiler</td>
<td>C/C++: Version 19.0.4.227 of Intel C/C++</td>
</tr>
<tr>
<td>Compiler for Linux</td>
<td>Compiler for Linux; Fortran: Version 19.0.4.227 of Intel Fortran Compiler for Linux</td>
</tr>
<tr>
<td>Parallel</td>
<td>Yes</td>
</tr>
<tr>
<td>Firmware</td>
<td>Version 4.0.4g released Jul-2019</td>
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<tr>
<td>File System</td>
<td>xfs</td>
</tr>
<tr>
<td>System State</td>
<td>Run level 3 (multi-user)</td>
</tr>
<tr>
<td>Base Pointers</td>
<td>64-bit</td>
</tr>
<tr>
<td>Peak Pointers</td>
<td>64-bit</td>
</tr>
<tr>
<td>Other</td>
<td>jemalloc memory allocator V5.0.1</td>
</tr>
<tr>
<td>Power Management</td>
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### SPEC CPU 2017 Integer Speed Result

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<th>Benchmark</th>
<th>Threads</th>
<th>SPECspeed²017_int_base</th>
<th>SPECspeed²017_int_peak</th>
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<tbody>
<tr>
<td>600.perlbench_s</td>
<td>24</td>
<td>9.35</td>
<td>9.54</td>
</tr>
<tr>
<td>602.gcc_s</td>
<td>24</td>
<td>8.60</td>
<td>8.34</td>
</tr>
<tr>
<td>605.mcf_s</td>
<td>24</td>
<td>11.5</td>
<td>11.5</td>
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<tr>
<td>620.omnetpp_s</td>
<td>24</td>
<td>6.49</td>
<td>6.55</td>
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<tr>
<td>623.xalancbmk_s</td>
<td>24</td>
<td>11.8</td>
<td>11.7</td>
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<tr>
<td>625.x264_s</td>
<td>24</td>
<td>13.6</td>
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</tr>
<tr>
<td>631.deepsjeng_s</td>
<td>24</td>
<td>5.22</td>
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<tr>
<td>641.leela_s</td>
<td>24</td>
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<tr>
<td>648.exchange2_s</td>
<td>24</td>
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<td>15.9</td>
</tr>
<tr>
<td>657.xz_s</td>
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<td>21.1</td>
</tr>
</tbody>
</table>

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Cisco Systems
Cisco UCS C220 M5 (Intel Xeon Gold 6226, 2.70GHz)

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

Threads

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>SPECspeed²017_int_base</th>
<th>SPECspeed²017_int_peak</th>
</tr>
</thead>
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Cisco Systems
Cisco UCS C220 M5 (Intel Xeon Gold 6226, 2.70GHz)

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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<td>294</td>
<td>21.1</td>
<td>294</td>
<td>21.0</td>
</tr>
</tbody>
</table>

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

**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:
- KMP_AFFINITY = "granularity=fine,scatter"
- LD_LIBRARY_PATH = "/home/cpu2017/lib/intel64:/home/cpu2017/je5.0.1-64"
- OMP_STACKSIZE = "192M"

Binaries compiled on a system with 1x Intel Core i9-799X 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
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.
Cisco Systems
Cisco UCS C220 M5 (Intel Xeon Gold 6226, 2.70GHz)

**SPEC CPU®2017 Integer Speed Result**

<table>
<thead>
<tr>
<th>Test Date:</th>
<th>Sep-2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU2017 License</td>
<td>9019</td>
</tr>
<tr>
<td>Test Sponsor:</td>
<td>Cisco Systems</td>
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<tr>
<td>Tested by:</td>
<td>Cisco Systems</td>
</tr>
<tr>
<td>Hardware Availability</td>
<td>Apr-2019</td>
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<tr>
<td>Software Availability</td>
<td>May-2019</td>
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</table>

**CPU2017** License: 9019

**Test Date:** Sep-2019

**Test Sponsor:** Cisco Systems

**Tested by:** Cisco Systems

**Hardware Availability:** Apr-2019

**Software Availability:** May-2019

---

**Platform Notes**

BIOS Settings:
Intel HyperThreading Technology set to Disabled
CPU performance set to Enterprise
Power Performance Tuning set to OS Controls
SNC set to Disabled
Patrol Scrub set to Disabled

Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
running on linux-ylia Sat Sep 14 04:17:16 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) Gold 6226 CPU @ 2.70GHz
  2 "physical id"s (chips)
  24 "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 : 12
siblings : 12
physical 0: cores 1 2 3 4 5 6 8 9 10 11 12 13
physical 1: cores 0 2 3 4 5 6 8 9 10 11 13 14

From lscpu:

Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 24
On-line CPU(s) list: 0-23
Thread(s) per core: 1
Core(s) per socket: 12
Socket(s): 2
NUMA node(s): 2
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Gold 6226 CPU @ 2.70GHz
Stepping: 7
CPU MHz: 2700.000
CPU max MHz: 3700.0000
CPU min MHz: 1200.0000
BogoMIPS: 5400.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K

(Continued on next page)

Page 3
Cisco Systems
Cisco UCS C220 M5 (Intel Xeon Gold 6226, 2.70GHz)

<table>
<thead>
<tr>
<th>SPECspeed®2017_int_peak</th>
<th>SPECspeed®2017_int_base</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.54</td>
<td>9.35</td>
</tr>
</tbody>
</table>

Platform Notes (Continued)

L2 cache: 1024K
L3 cache: 19712K
NUMA node0 CPU(s): 0-11
NUMA node1 CPU(s): 12-23
Flags: fpu vme de pse tsc msr pae 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
aperfmrperf tsc_known_freq pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3
sdbg fma cx16 xtrr pdcm pcid dca ssse4_1 ssse4_2 x2apic movbe popcnt
tsc_deadline_timer aes xsave avx f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault
ebf cat_13 cdp_13 invpcid_single intel_pcin mba tpr_shadow vnmi flexpriority ept
vpid fsgsbase tsc_adjust bmis hle avx2 smep bmi2 erms invpcid rtm cqm mpx rdt_a
avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd avx512bw avx512vl
xsaveopt xsaves xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local
ibpb ibrs stibp dtcrh ida arat pln pts hwp hwp_act_window hwp_epp hwp_pkg_req pu
oskpe avx512_vnni arch_capabilities ssbd

/proc/cpuinfo cache data
cache size : 19712 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 10 11
   node 0 size: 385636 MB
   node 0 free: 384908 MB
   node 1 cpus: 12 13 14 15 16 17 18 19 20 21 22 23
   node 1 size: 387028 MB
   node 1 free: 386683 MB
   node distances:
      node 0 1
      0: 10 21
      1: 21 10

From /proc/meminfo
MemTotal: 7912091104 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"

(Continued on next page)
## Platform Notes (Continued)

```plaintext
ANSI_COLOR="0;32"
CPE_NAME="cpe:/o:suse:sles:15"

uname -a:
Linux linux-ylla 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-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 Sep 14 04:11

SPEC is set to: /home/cpu2017
Filesystem Type Size Used Avail Use% Mounted on
/dev/sdb2 xfs 559G 55G 505G 10% /

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 Cisco Systems, Inc. C220M5.4.0.4g.0.0712190011 07/12/2019
Memory:
24x 0xCE00 M393A4K40CB2-CVF 32 GB 2 rank 2933, configured at 2934

(End of data from sysinfo program)
```

## Compiler Version Notes

<table>
<thead>
<tr>
<th>C</th>
<th>600.perlbench_s(base, peak) 602.gcc_s(base, peak) 605.mcf_s(base, peak) 625.x264_s(base, peak) 657.xz_s(base, peak)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intel(R) C</td>
<td>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.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>C++</th>
<th>620.omnetpp_s(base, peak) 623.xalancbmk_s(base, peak) 631.deepsjeng_s(base, peak) 641.leela_s(base, peak)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intel(R) C++</td>
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</tr>
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</table>

(Continued on next page)
Cisco Systems
Cisco UCS C220 M5 (Intel Xeon Gold 6226, 2.70GHz)

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

SPECSpeed®2017_int_base = 9.35
SPECSpeed®2017_int_peak = 9.54

Test Date: Sep-2019
Hardware Availability: Apr-2019
Software Availability: May-2019

Compiler Version Notes (Continued)

Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

------------------------------------------------------------------------------
Fortran | 648.exchange2_s(base, peak)
------------------------------------------------------------------------------
Intel(R) Fortran 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.

------------------------------------------------------------------------------

Base Compiler Invocation

C benchmarks:
icc -m64 -std=c11

C++ benchmarks:
icpc -m64

Fortran benchmarks:
ifort -m64

Base Portability Flags

600.perlbench_s: -DSPEC_LP64 -DSPEC_LINUX_X64
602.gcc_s: -DSPEC_LP64
605.mcf_s: -DSPEC_LP64
620.omnetpp_s: -DSPEC_LP64
623.xalancbmk_s: -DSPEC_LP64 -DSPEC_LINUX
625.x264_s: -DSPEC_LP64
631.deepsjeng_s: -DSPEC_LP64
641.leela_s: -DSPEC_LP64
648.exchange2_s: -DSPEC_LP64
657.xz_s: -DSPEC_LP64

Base Optimization Flags

C benchmarks:
-W1, -z, muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP

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

C benchmarks (continued):
- `-L/usr/local/je5.0.1-64/lib -ljemalloc`

C++ benchmarks:
- `-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div`
- `-qopt-mem-layout-trans=4`
- `-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64 -lqkmalloc`

Fortran benchmarks:
- `-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-mem-layout-trans=4`
- `-nostandard-realloc-lhs`

## Peak Compiler Invocation

C benchmarks:
- `icc -m64 -std=c11`

C++ benchmarks:
- `icpc -m64`

Fortran benchmarks:
- `ifort -m64`

## Peak Portability Flags

Same as Base Portability Flags

## Peak Optimization Flags

C benchmarks:
- `600.perlbench_s: -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -O2`
- `-xCORE-AVX512 -qopt-mem-layout-trans=4 -ipo -O3`
- `-no-prec-div -DSPEC_SUPPRESS_OPENMP -qopenmp`
- `-DSPEC_OPENMP -fno-strict-overflow`
- `-L/usr/local/je5.0.1-64/lib -ljemalloc`

- `602.gcc_s: -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -O2`
- `-xCORE-AVX512 -qopt-mem-layout-trans=4 -ipo -O3`

(Continued on next page)
Cisco Systems
Cisco UCS C220 M5 (Intel Xeon Gold 6226, 2.70GHz)

Peak Optimization Flags (Continued)

602.gcc_s (continued):
- no-prec-div -DSPEC_SUPPRESS_OPENMP
- L/usr/local/je5.0.1-64/lib -ljemalloc

605.mcf_s: -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo
- xCORE-AVX512 -O3 -no-prec-div -qopt-mem-layout-trans=4
- DSPEC_SUPPRESS_OPENMP -qopenmp -DSPEC_OPENMP
- L/usr/local/je5.0.1-64/lib -ljemalloc

625.x264_s: -Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
- qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
- L/usr/local/je5.0.1-64/lib -ljemalloc

657.xz_s: -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -O2
- xCORE-AVX512 -qopt-mem-layout-trans=4 -ipo -O3
- no-prec-div -DSPEC_SUPPRESS_OPENMP -qopenmp
- DSPEC_OPENMP -L/usr/local/je5.0.1-64/lib -ljemalloc

C++ benchmarks:

620.omnetpp_s: -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo
- xCORE-AVX512 -O3 -no-prec-div -qopt-mem-layout-trans=4
- DSPEC_SUPPRESS_OPENMP
- L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64 -lqkmalloc

623.xalancbmk_s: -Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
- qopt-mem-layout-trans=4
- L/usr/local/IntelCompiler19/compilers_and_libraries_2019.4.227/linux/compiler/lib/intel64 -lqkmalloc

631.deepsjeng_s: Same as 623.xalancbmk_s

641.leela_s: Same as 623.xalancbmk_s

Fortran benchmarks:

-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-mem-layout-trans=4
- nostandard-realloc-lhs

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:
Cisco Systems  
Cisco UCS C220 M5 (Intel Xeon Gold 6226, 2.70GHz)  

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</tbody>
</table>

| CPU2017 License:          | 9019  |
| Test Sponsor:             | Cisco Systems |
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| Test Date:                | Sep-2019 |
| Hardware Availability:    | Apr-2019 |
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