# SPEC CPU®2017 Integer Rate Result

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## Cisco Systems

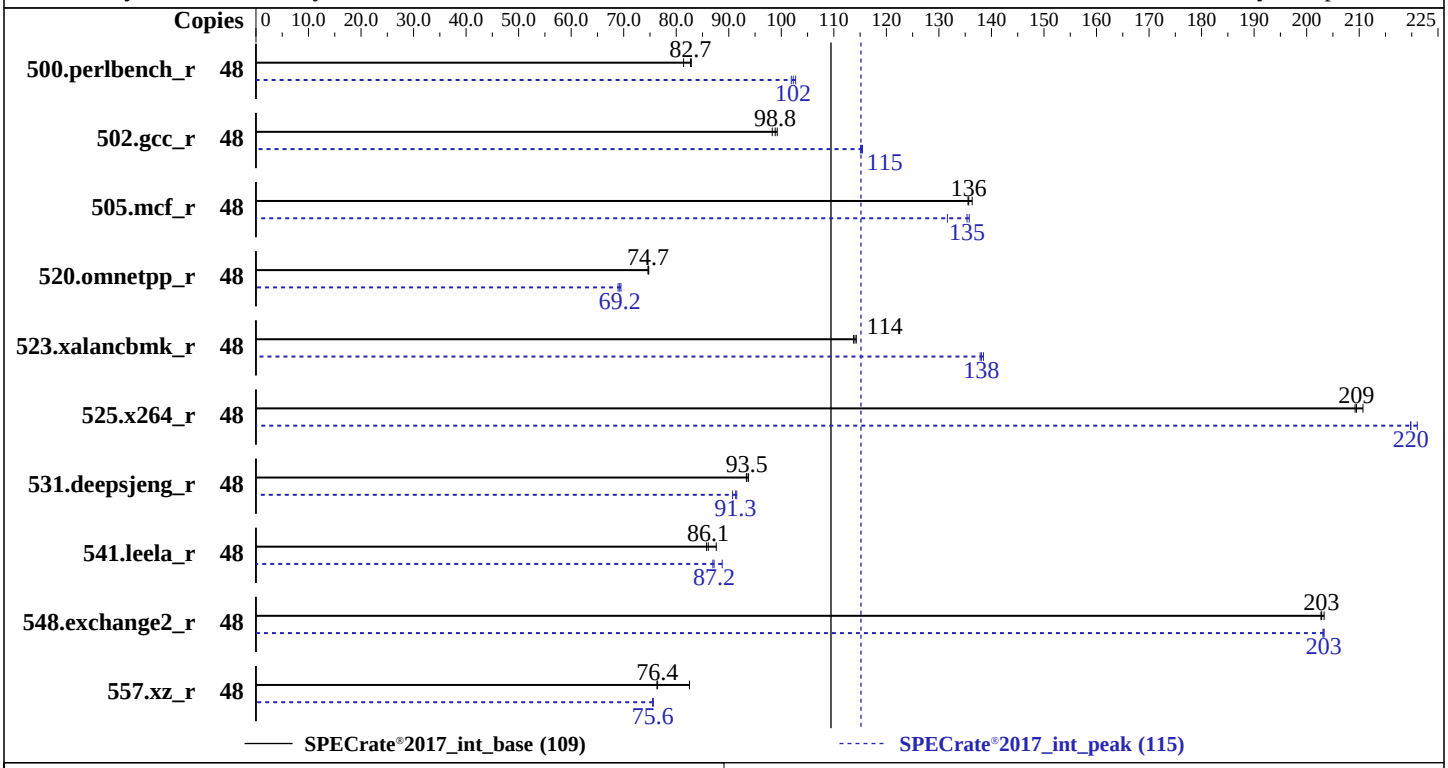
Cisco UCS C220 M5 (Intel Xeon Silver 4116, 2.10 GHz)

SPECrate®2017_int_base = 109

SPECrate®2017_int_peak = 115

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

**Test Date:** Dec-2017
**Hardware Availability:** Aug-2017
**Software Availability:** Sep-2017




## Hardware

| | |
|---|---|
| CPU Name: | Intel Xeon Silver 4116 |
| Max MHz: | 3000 |
| Nominal: | 2100 |
| Enabled: | 24 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: | 16.5 MB I+D on chip per chip |
| Other: | None |
| Memory: | 384 GB (24 x 16 GB 2Rx4 PC4-2666V-R, running at 2400) |
| Storage: | 1 x 600 GB SAS HDD, 10K RPM |
| Other: | None |

## Software

| | |
|---|---|
| OS: | SUSE Linux Enterprise Server 12 SP2 (x86_64) 4.4.21-69-default |
| Compiler: | C/C++: Version 18.0.0.128 of Intel C/C++ Compiler for Linux; Fortran: Version 18.0.0.128 of Intel Fortran Compiler for Linux |
| Parallel: | No |
| Firmware: | Version 3.1.1d released Jun-2017 |
| File System: | xfs |
| System State: | Run level 3 (multi-user) |
| Base Pointers: | 64-bit |
| Peak Pointers: | 32/64-bit |
| Other: | jemalloc: jemalloc memory allocator library V5.0.1; jemalloc: configured and built at default for 32bit (i686) and 64bit (x86_64) targets; jemalloc: built with the RedHat Enterprise 7.4, and the system compiler gcc 4.8.5; jemalloc: sources avilable from jemalloc.net or releases |
| Power Management: | -- |

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## Results Table

| Benchmark | Base | | | | | | | Peak | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Copies | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio | Copies | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio |
| 500.perlbench_r | 48 | **924** | **82.7** | 939 | 81.4 | 922 | 82.9 | 48 | 744 | 103 | 750 | 102 | **747** | **102** |
| 502.gcc_r | 48 | **688** | **98.8** | 692 | 98.3 | 685 | 99.2 | 48 | 591 | 115 | **590** | **115** | 589 | 115 |
| 505.mcf_r | 48 | 569 | 136 | 572 | 136 | **572** | **136** | 48 | 571 | 136 | 589 | 132 | **573** | **135** |
| 520.omnetpp_r | 48 | 844 | 74.7 | **843** | **74.7** | 842 | 74.8 | 48 | 906 | 69.5 | 914 | 68.9 | **910** | **69.2** |
| 523.xalancbmk_r | 48 | 444 | 114 | **445** | **114** | 446 | 114 | 48 | 366 | 138 | **367** | **138** | 368 | 138 |
| 525.x264_r | 48 | 402 | 209 | 399 | 211 | **401** | **209** | 48 | **382** | **220** | 380 | 221 | 382 | 220 |
| 531.deepsjeng_r | 48 | 587 | 93.7 | **589** | **93.5** | 589 | 93.4 | 48 | 601 | 91.5 | **602** | **91.3** | 606 | 90.7 |
| 541.leela_r | 48 | 907 | 87.6 | **923** | **86.1** | 927 | 85.8 | 48 | 896 | 88.7 | **912** | **87.2** | 914 | 87.0 |
| 548.exchange2_r | 48 | 620 | 203 | 619 | 203 | **620** | **203** | 48 | 619 | 203 | 619 | 203 | **619** | **203** |
| 557.xz_r | 48 | 628 | 82.5 | 679 | 76.3 | **678** | **76.4** | 48 | **686** | **75.6** | 686 | 75.5 | 686 | 75.6 |

SPECrate®2017_int_base = **109**

SPECrate®2017_int_peak = **115**

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

## Submit Notes

```
The taskset mechanism was used to bind copies to processors. The config file option 'submit'
was used to generate taskset 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 = "/home/cpu2017/lib/ia32:/home/cpu2017/lib/intel64:/home/cpu2017/je5.0.1-32:/home/cpu2017/je5.0.1-64"

 Binaries compiled on a system with 1x Intel Core i7-4790 CPU + 32GB RAM
 memory using Redhat Enterprise Linux 7.4
 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
```

## Platform Notes

```
BIOS Settings:
Intel HyperThreading Technology set to Enabled
CPU performance set to Enterprise
Power Performance Tuning set to OS
```

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## Platform Notes (Continued)

```
SNC set to Enabled
IMC Interleaving set to 1-way Interleave
Patrol Scrub set to Disabled
 Sysinfo program /home/cpu2017/bin/sysinfo
 Rev: r5797 of 2017-06-14 96c45e4568ad54c135fd618bcc091c0f
 running on linux-3joc Thu Dec  7 19:36:44 2017

 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 4116 CPU @ 2.10GHz
       2  "physical id"s (chips)
       48 "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  : 24
       physical 0: cores 0 1 2 3 4 5 8 9 10 11 12 13
       physical 1: cores 0 1 2 3 4 5 8 9 10 11 12 13

 From lscpu:
      Architecture:          x86_64
      CPU op-mode(s):        32-bit, 64-bit
      Byte Order:            Little Endian
      CPU(s):                48
      On-line CPU(s) list:   0-47
      Thread(s) per core:    2
      Core(s) per socket:    12
      Socket(s):             2
      NUMA node(s):          4
      Vendor ID:             GenuineIntel
      CPU family:            6
      Model:                 85
      Model name:            Intel(R) Xeon(R) Silver 4116 CPU @ 2.10GHz
      Stepping:              4
      CPU MHz:               1260.252
      CPU max MHz:           3000.0000
      CPU min MHz:           800.0000
      BogoMIPS:              4190.13
      Virtualization:        VT-x
      L1d cache:             32K
      L1i cache:             32K
      L2 cache:              1024K
      L3 cache:              16896K
      NUMA node0 CPU(s):     0-2,6-8,24-26,30-32
```

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## Platform Notes (Continued)

```
      NUMA node1 CPU(s):     3-5,9-11,27-29,33-35
      NUMA node2 CPU(s):     12-14,18-20,36-38,42-44
      NUMA node3 CPU(s):     15-17,21-23,39-41,45-47
      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
      aperfmperf eagerfpu pni pclmulqdq dtes64 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 ida arat epb pln pts dtherm hwp
      hwp_act_window hwp_epp hwp_pkg_req intel_pt tpr_shadow vnmi flexpriority ept vpid
      fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm cqm mpx avx512f
      avx512dq rdseed adx smap clflushopt clwb avx512cd avx512bw avx512vl xsaveopt xsavec
      xgetbv1 cqm_llc cqm_occup_llc

  /proc/cpuinfo cache data
     cache size : 16896 KB

  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 6 7 8 24 25 26 30 31 32
    node 0 size: 95330 MB
    node 0 free: 92365 MB
    node 1 cpus: 3 4 5 9 10 11 27 28 29 33 34 35
    node 1 size: 96760 MB
    node 1 free: 94227 MB
    node 2 cpus: 12 13 14 18 19 20 36 37 38 42 43 44
    node 2 size: 96760 MB
    node 2 free: 93602 MB
    node 3 cpus: 15 16 17 21 22 23 39 40 41 45 46 47
    node 3 size: 96758 MB
    node 3 free: 92804 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:       394864160 kB
     HugePages_Total:       0
     Hugepagesize:       2048 kB

  /usr/bin/lsb_release -d
     SUSE Linux Enterprise Server 12 SP2
```


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## Platform Notes (Continued)

```
From /etc/*release* /etc/*version*
   SuSE-release:
      SUSE Linux Enterprise Server 12 (x86_64)
      VERSION = 12
      PATCHLEVEL = 2
      # 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-SP2"
      VERSION_ID="12.2"
      PRETTY_NAME="SUSE Linux Enterprise Server 12 SP2"
      ID="sles"
      ANSI_COLOR="0;32"
      CPE_NAME="cpe:/o:suse:sles:12:sp2"

uname -a:
   Linux linux-3joc 4.4.21-69-default #1 SMP Tue Oct 25 10:58:20 UTC 2016 (9464f67)
   x86_64 x86_64 x86_64 GNU/Linux

run-level 3 Dec 5 18:45

SPEC is set to: /home/cpu2017
   Filesystem     Type  Size  Used Avail Use% Mounted on
   /dev/sda3      xfs   516G  112G  404G  22% /home

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. C220M5.3.1.1d.0.0615170645 06/15/2017
  Memory:
   24x 0xCE00 M393A2G40EB2-CTD 16 GB 2 rank 2666, configured at 2400

(End of data from sysinfo program)
```

## Compiler Version Notes

```
==============================================================================
C       | 500.perlbench_r(base, peak) 502.gcc_r(base, peak) 505.mcf_r(base,
        | peak) 525.x264_r(base, peak) 557.xz_r(base, peak)
------------------------------------------------------------------------------
icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------
```

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## Compiler Version Notes (Continued)

```
==============================================================================
C++      | 520.omnetpp_r(base, peak) 523.xalancbmk_r(base, peak)
         | 531.deepsjeng_r(base, peak) 541.leela_r(base, peak)
------------------------------------------------------------------------------
icpc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------

==============================================================================
Fortran | 548.exchange2_r(base, peak)
------------------------------------------------------------------------------
ifort (IFORT) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------
```

## Base Compiler Invocation

C benchmarks:
icc

C++ benchmarks:
icpc

Fortran benchmarks:
ifort

## 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=3 -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=3 -L/usr/local/je5.0.1-64/lib -ljemalloc`

Fortran benchmarks:
`-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-mem-layout-trans=3 -nostandard-realloc-lhs -align array32byte -L/usr/local/je5.0.1-64/lib -ljemalloc`

## Base Other Flags

C benchmarks:
`-m64 -std=c11`

C++ benchmarks:
`-m64`

Fortran benchmarks:
`-m64`

## Peak Compiler Invocation

C benchmarks:
`icc`

C++ benchmarks:
`icpc`

Fortran benchmarks:
`ifort`

## Peak Portability Flags

500.perlbench_r: `-DSPEC_LP64 -DSPEC_LINUX_X64`
502.gcc_r: `-D_FILE_OFFSET_BITS=64`

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## Peak Portability Flags (Continued)

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=3
-fno-strict-overflow -L/usr/local/je5.0.1-64/lib
-ljemalloc

502.gcc_r: -L/opt/intel/compilers_and_libraries_2018/linux/lib/ia32
-Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo
-xCORE-AVX512 -O3 -no-prec-div -qopt-mem-layout-trans=3
-L/usr/local/je5.0.1-32/lib -ljemalloc

505.mcf_r: -Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=3 -L/usr/local/je5.0.1-64/lib
-ljemalloc

525.x264_r: -Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=3 -fno-alias
-L/usr/local/je5.0.1-64/lib -ljemalloc

557.xz_r: Same as 505.mcf_r

C++ benchmarks:

520.omnetpp_r: -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo
-xCORE-AVX512 -O3 -no-prec-div -qopt-mem-layout-trans=3
-L/usr/local/je5.0.1-64/lib -ljemalloc

523.xalancbmk_r: -L/opt/intel/compilers_and_libraries_2018/linux/lib/ia32
-Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo
-xCORE-AVX512 -O3 -no-prec-div -qopt-mem-layout-trans=3
-L/usr/local/je5.0.1-32/lib -ljemalloc

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## Peak Optimization Flags (Continued)

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=3 -nostandard-realloc-lhs -align array32byte -L/usr/local/je5.0.1-64/lib -ljemalloc`

## Peak Other Flags

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

502.gcc_r: `-m32 -std=c11`

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

523.xalancbmk_r: `-m32`

Fortran benchmarks:
`-m64`

The flags files that were used to format this result can be browsed at
`http://www.spec.org/cpu2017/flags/Intel-ic18.0-official-linux64.html`
`http://www.spec.org/cpu2017/flags/Cisco-Platform-Settings-V1.2-revH.html`

You can also download the XML flags sources by saving the following links:
`http://www.spec.org/cpu2017/flags/Intel-ic18.0-official-linux64.xml`
`http://www.spec.org/cpu2017/flags/Cisco-Platform-Settings-V1.2-revH.xml`


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