# SPEC CPU®2017 Integer Speed Result

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## Lenovo Global Technology

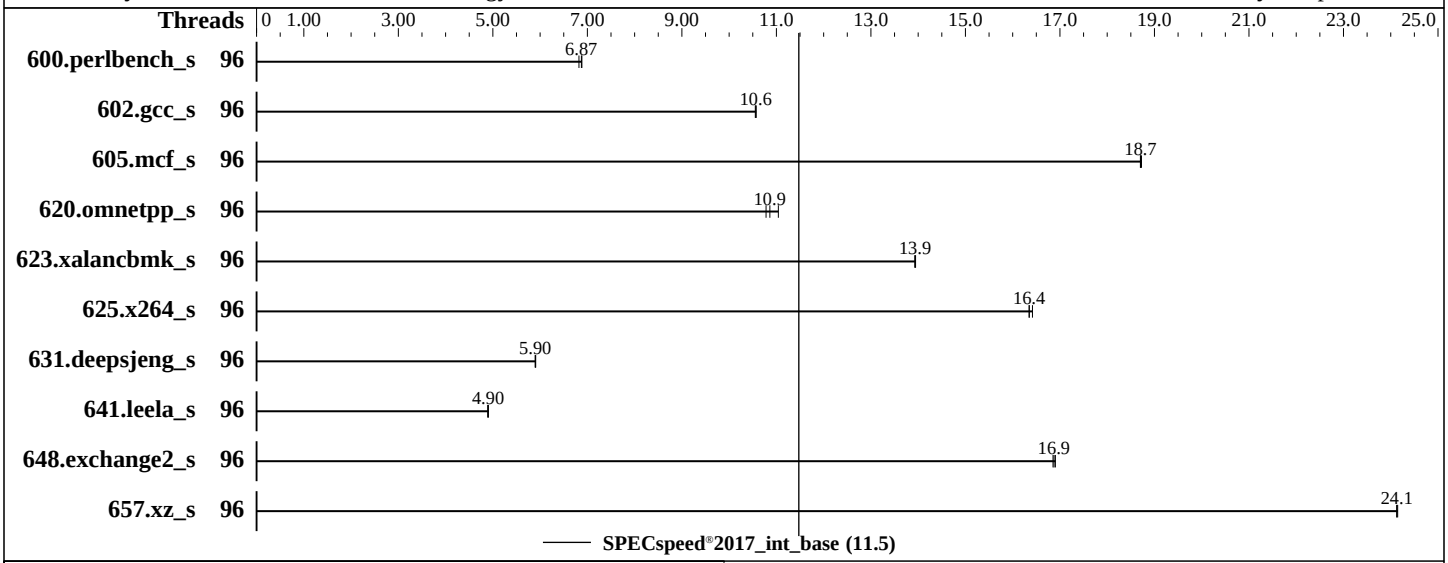
ThinkSystem SR650
(2.20 GHz, Intel Xeon Gold 5220R)

SPECspeed®2017_int_base = 11.5

SPECspeed®2017_int_peak = Not Run

**CPU2017 License:** 9017
**Test Sponsor:** Lenovo Global Technology
**Tested by:** Lenovo Global Technology

**Test Date:** Jun-2020
**Hardware Availability:** Mar-2020
**Software Availability:** Apr-2020




## Hardware

| | |
|---|---|
| CPU Name: | Intel Xeon Gold 5220R |
| Max MHz: | 4000 |
| Nominal: | 2200 |
| Enabled: | 48 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 PC4-2933Y-R, running at 2666) |
| Storage: | 1 x 800 GB SATA SSD |
| Other: | None |

## Software

| | |
|---|---|
| OS: | SUSE Linux Enterprise Server 15 SP1 (x86_64) Kernel 4.12.14-195-default |
| Compiler: | C/C++: Version 19.1.1.217 of Intel C/C++ Compiler for Linux; Fortran: Version 19.1.1.217 of Intel Fortran Compiler for Linux |
| Parallel: | Yes |
| Firmware: | Lenovo BIOS Version IVE155L 2.61 released May-2020 |
| File System: | xfs |
| System State: | Run level 3 (multi-user) |
| Base Pointers: | 64-bit |
| Peak Pointers: | Not Applicable |
| Other: | jemalloc memory allocator V5.0.1 |
| Power Management: | BIOS set to prefer performance at the cost of additional power usage |

## Results Table

| Benchmark | Base | | | | | | | Peak | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Threads | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio | Threads | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio |
| 600.perlbench_s | 96 | 260 | 6.82 | **258** | **6.87** | 258 | 6.88 | | | | | | | |
| 602.gcc_s | 96 | 377 | 10.6 | 377 | 10.6 | **377** | **10.6** | | | | | | | |
| 605.mcf_s | 96 | 252 | 18.7 | 252 | 18.7 | **252** | **18.7** | | | | | | | |
| 620.omnetpp_s | 96 | 151 | 10.8 | **150** | **10.9** | 148 | 11.0 | | | | | | | |
| 623.xalancbmk_s | 96 | 102 | 13.9 | 102 | 13.9 | **102** | **13.9** | | | | | | | |
| 625.x264_s | 96 | 108 | 16.3 | **108** | **16.4** | 107 | 16.4 | | | | | | | |
| 631.deepsjeng_s | 96 | 243 | 5.91 | **243** | **5.90** | 243 | 5.90 | | | | | | | |
| 641.leela_s | 96 | 349 | 4.89 | 348 | 4.91 | **348** | **4.90** | | | | | | | |
| 648.exchange2_s | 96 | 174 | 16.9 | **174** | **16.9** | 174 | 16.9 | | | | | | | |
| 657.xz_s | 96 | 256 | 24.1 | **256** | **24.1** | 256 | 24.1 | | | | | | | |

**SPECspeed®2017_int_base = 11.5**

**SPECspeed®2017_int_peak = Not Run**

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

## Compiler Notes

```
The inconsistent Compiler version information under Compiler Version section is due to a discrepancy in Intel Compiler.
The correct version of C/C++ compiler is: Version 19.1.1.217 Build 20200306 Compiler for Linux
The correct version of Fortran compiler is: Version 19.1.1.217 Build 20200306 Compiler for Linux
```

## 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:
KMP_AFFINITY = "granularity=fine,scatter"
LD_LIBRARY_PATH =
     "/home/cpu2017-1.1.0-ic19.1.1/lib/intel64:/home/cpu2017-1.1.0-ic19.1.1/j
     e5.0.1-64"
MALLOC_CONF = "retain:true"
OMP_STACKSIZE = "192M"
```

## General Notes

```
Binaries compiled on a system with 1x Intel Core i9-7980XE CPU + 64GB RAM
memory using Redhat Enterprise Linux 8.0
Transparent Huge Pages enabled by default
Prior to runcpu invocation
Filesystem page cache synced and cleared with:
```

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## General Notes (Continued)

```
 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.
 jemalloc, a general purpose malloc implementation
 built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5
 sources available from jemalloc.net or https://github.com/jemalloc/jemalloc/releases
```

## Platform Notes

```
BIOS configuration:
Choose Operating Mode set to Maximum Performance and then set it to Custom Mode
C-States set to Legacy

 Sysinfo program /home/cpu2017-1.1.0-ic19.1.1/bin/sysinfo
 Rev: r6365 of 2019-08-21 295195f888a3d7edb1e6e46a485a0011
 running on linux-xpyz Wed Jun 17 20:03:08 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 5220R CPU @ 2.20GHz
       2  "physical id"s (chips)
       96 "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 : 24
       siblings  : 48
       physical 0: cores 0 1 2 3 4 5 6 9 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29
       physical 1: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 16 17 18 19 20 21 25 26 27 28 29

 From lscpu:
      Architecture:        x86_64
      CPU op-mode(s):      32-bit, 64-bit
      Byte Order:          Little Endian
      Address sizes:       46 bits physical, 48 bits virtual
      CPU(s):              96
      On-line CPU(s) list: 0-95
      Thread(s) per core:  2
      Core(s) per socket:  24
      Socket(s):           2
```

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## Platform Notes (Continued)

```
      NUMA node(s):        2
      Vendor ID:           GenuineIntel
      CPU family:          6
      Model:               85
      Model name:          Intel(R) Xeon(R) Gold 5220R CPU @ 2.20GHz
      Stepping:            7
      CPU MHz:             2200.000
      CPU max MHz:         4000.0000
      CPU min MHz:         1000.0000
      BogoMIPS:            4400.00
      Virtualization:      VT-x
      L1d cache:           32K
      L1i cache:           32K
      L2 cache:            1024K
      L3 cache:            36608K
      NUMA node0 CPU(s):   0-23,48-71
      NUMA node1 CPU(s):   24-47,72-95
      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 cpuid
      aperfmperf 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 cpuid_fault epb cat_l3 cdp_l3
      invpcid_single intel_ppin ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vnmi
      flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm
      cqm mpx rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd
      avx512bw avx512vl xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbm_total
      cqm_mbm_local dtherm ida arat pln pts pku ospke avx512_vnni md_clear flush_l1d
      arch_capabilities

  /proc/cpuinfo cache data
     cache size : 36608 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 12 13 14 15 16 17 18 19 20 21 22 23 48 49 50 51
    52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71
    node 0 size: 386681 MB
    node 0 free: 385696 MB
    node 1 cpus: 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 72
    73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95
    node 1 size: 387031 MB
    node 1 free: 386563 MB
    node distances:
    node   0   1
      0:  10  21
```

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## Platform Notes (Continued)

```
     1:  21  10

  From /proc/meminfo
     MemTotal:       792283064 kB
     HugePages_Total:       0
     Hugepagesize:       2048 kB

  From /etc/*release* /etc/*version*
     os-release:
        NAME="SLES"
        VERSION="15-SP1"
        VERSION_ID="15.1"
        PRETTY_NAME="SUSE Linux Enterprise Server 15 SP1"
        ID="sles"
        ID_LIKE="suse"
        ANSI_COLOR="0;32"
        CPE_NAME="cpe:/o:suse:sles:15:sp1"

  uname -a:
     Linux linux-xpyz 4.12.14-195-default #1 SMP Tue May 7 10:55:11 UTC 2019 (8fba516)
     x86_64 x86_64 x86_64 GNU/Linux

  Kernel self-reported vulnerability status:

  CVE-2018-3620 (L1 Terminal Fault):        Not affected
  Microarchitectural Data Sampling:         Not affected
  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: Enhanced IBRS, IBPB: conditional,
                                            RSB filling

  run-level 3 Jun 17 20:00

  SPEC is set to: /home/cpu2017-1.1.0-ic19.1.1
     Filesystem     Type  Size  Used Avail Use% Mounted on
     /dev/sda3      xfs   737G   63G  675G   9% /

  From /sys/devices/virtual/dmi/id
      BIOS:    Lenovo -[IVE155L-2.61]- 05/20/2020
      Vendor:  Lenovo
      Product: ThinkSystem SR650 -[7X05RCZ000]-
      Product Family: ThinkSystem
      Serial:  1234567890

  Additional information from dmidecode follows.  WARNING: Use caution when you interpret
```

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## Platform Notes (Continued)

```
 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 Samsung M393A4K40CB2-CVF 32 GB 2 rank 2933

 (End of data from sysinfo program)
This system support 12 DIMMs per processor, total 24 DIMMs.
24 DIMM slots installed with 32 GB DIMM for this run,
and running at 2666 due to CPU limitation.
```

## Compiler Version Notes

```
==============================================================================
C       | 600.perlbench_s(base) 602.gcc_s(base) 605.mcf_s(base)
        | 625.x264_s(base) 657.xz_s(base)
------------------------------------------------------------------------------
Intel(R) C Compiler for applications running on Intel(R) 64, Version 2021.1
  NextGen Build 20200304
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------

==============================================================================
C++     | 620.omnetpp_s(base) 623.xalancbmk_s(base) 631.deepsjeng_s(base)
        | 641.leela_s(base)
------------------------------------------------------------------------------
Intel(R) C++ Compiler for applications running on Intel(R) 64, Version 2021.1
  NextGen Build 20200304
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------

==============================================================================
Fortran | 648.exchange2_s(base)
------------------------------------------------------------------------------
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
  64, Version 19.1.1.217 Build 20200306
Copyright (C) 1985-2020 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------
```

## Base Compiler Invocation

C benchmarks:
icc

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## Base Compiler Invocation (Continued)

C++ benchmarks:
icpc

Fortran benchmarks:
ifort

## 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:
-m64 -qnextgen -std=c11
-Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs
-xCORE-AVX512 -O3 -ffast-math -flto -mfpmath=sse -funroll-loops
-fuse-ld=gold -qopt-mem-layout-trans=4 -fopenmp -DSPEC_OPENMP
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

C++ benchmarks:
-m64 -qnextgen -Wl,-plugin-opt=-x86-branches-within-32B-boundaries
-Wl,-z,muldefs -xCORE-AVX512 -O3 -ffast-math -flto -mfpmath=sse
-funroll-loops -fuse-ld=gold -qopt-mem-layout-trans=4
-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.1.217/linux/compiler/lib/intel64_lin
-lqkmalloc

Fortran benchmarks:
-m64 -Wl,-plugin-opt=-x86-branches-within-32B-boundaries -xCORE-AVX512
-O3 -ipo -no-prec-div -qopt-mem-layout-trans=4
-nostandard-realloc-lhs -align array32byte
-mbranches-within-32B-boundaries

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/Intel-ic19.1u1-official-linux64_revA.html
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-CLX-I.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/Intel-ic19.1u1-official-linux64_revA.xml
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-CLX-I.xml


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