# SPEC CPU®2017 Integer Speed Result

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## Dell Inc.

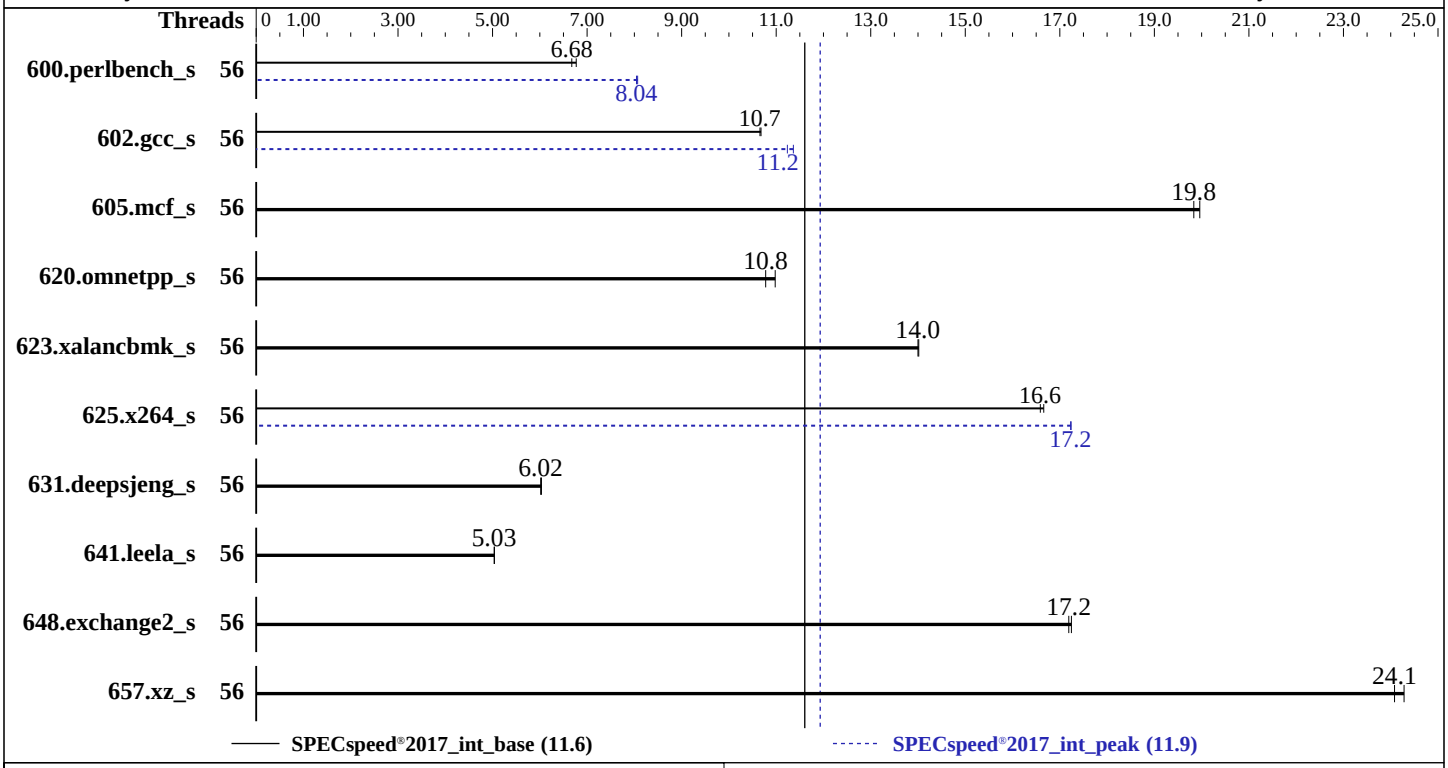
PowerEdge C6420 (Intel Xeon Gold 6238R, 2.20 GHz)

SPECspeed®2017_int_base = 11.6

SPECspeed®2017_int_peak = 11.9

**CPU2017 License:** 55
**Test Sponsor:** Dell Inc.
**Tested by:** Dell Inc.

**Test Date:** Nov-2021
**Hardware Availability:** Apr-2019
**Software Availability:** Dec-2020




## Hardware

| | |
|---|---|
| CPU Name: | Intel Xeon Gold 6238R |
| Max MHz: | 4000 |
| Nominal: | 2200 |
| Enabled: | 56 cores, 2 chips |
| 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: | 38.5 MB I+D on chip per chip |
| Other: | None |
| Memory: | 384 GB (12 x 32 GB 2Rx4 PC4-2933Y-R) |
| Storage: | 1 x 1.6 TB SATA SSD |
| Other: | None |

## Software

| | |
|---|---|
| OS: | Red Hat Enterprise Linux 8.3 (Ootpa)<br>4.18.0-240.el8.x86_64 |
| Compiler: | C/C++: Version 2021.1 of Intel oneAPI DPC++/C++ Compiler Build 20201113 for Linux;<br>Fortran: Version 2021.1 of Intel Fortran Compiler Classic Build 20201112 for Linux;<br>C/C++: Version 2021.1 of Intel C/C++ Compiler Classic Build 20201112 for Linux |
| Parallel: | Yes |
| Firmware: | Version 2.13.1 released Nov-2021 |
| File System: | xfs |
| System State: | Run level 3 (multi-user) |
| Base Pointers: | 64-bit |
| Peak Pointers: | 64-bit |
| Other: | jemalloc memory allocator V5.0.1 |
| Power Management: | BIOS and OS 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 | 56 | **266** | **6.68** | 262 | 6.77 | | | 56 | 220 | 8.07 | **221** | **8.04** | | |
| 602.gcc_s | 56 | **374** | **10.7** | 373 | 10.7 | | | 56 | **354** | **11.2** | 350 | 11.4 | | |
| 605.mcf_s | 56 | 237 | 20.0 | **238** | **19.8** | | | 56 | 237 | 20.0 | **238** | **19.8** | | |
| 620.omnetpp_s | 56 | 149 | 11.0 | **151** | **10.8** | | | 56 | 149 | 11.0 | **151** | **10.8** | | |
| 623.xalancbmk_s | 56 | **101** | **14.0** | 101 | 14.0 | | | 56 | **101** | **14.0** | 101 | 14.0 | | |
| 625.x264_s | 56 | 106 | 16.7 | **106** | **16.6** | | | 56 | 102 | 17.2 | **102** | **17.2** | | |
| 631.deepsjeng_s | 56 | **238** | **6.02** | 237 | 6.03 | | | 56 | **238** | **6.02** | 237 | 6.03 | | |
| 641.leela_s | 56 | **339** | **5.03** | 339 | 5.04 | | | 56 | **339** | **5.03** | 339 | 5.04 | | |
| 648.exchange2_s | 56 | **171** | **17.2** | 170 | 17.2 | | | 56 | **171** | **17.2** | 170 | 17.2 | | |
| 657.xz_s | 56 | 255 | 24.3 | **257** | **24.1** | | | 56 | 255 | 24.3 | **257** | **24.1** | | |

**SPECspeed®2017_int_base = 11.6**

**SPECspeed®2017_int_peak = 11.9**

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"
```

## Environment Variables Notes

```
Environment variables set by runcpu before the start of the run:
KMP_AFFINITY = "granularity=fine,scatter"
LD_LIBRARY_PATH =
     "/home/cpu2017-1.1.8-ic2021.1/lib/intel64:/home/cpu2017-1.1.8-ic2021.1/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:
sync; echo 3>       /proc/sys/vm/drop_caches
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

NA: The test sponsor attests, as of date of publication, that CVE-2017-5754 (Meltdown)
is mitigated in the system as tested and documented.
```

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## General Notes (Continued)

```
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:
             Logical Processor : Disabled
     Virtualization Technology : Disabled

                System Profile : Custom
          CPU Power Management : Maximum Performance
                           C1E : Disabled
                      C States : Autonomous
           Memory Patrol Scrub : Disabled
       Energy Efficiency Policy : Performance
   CPU Interconnect Bus Link
              Power Management : Disabled
            PCI ASPM L1 Link
              Power Management : Disabled

Sysinfo program /home/cpu2017-1.1.8-ic2021.1/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acafc64d
running on localhost.localdomain Wed Nov 10 12:16:22 2021

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 6238R CPU @ 2.20GHz
      2  "physical id"s (chips)
      56 "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 : 28
      siblings  : 28
      physical 0: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27
      28 29 30
      physical 1: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27
      28 29 30

From lscpu from util-linux 2.32.1:
     Architecture:        x86_64
```

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## Platform Notes (Continued)

```
      CPU op-mode(s):      32-bit, 64-bit
      Byte Order:          Little Endian
      CPU(s):              56
      On-line CPU(s) list: 0-55
      Thread(s) per core:  1
      Core(s) per socket:  28
      Socket(s):           2
      NUMA node(s):        2
      Vendor ID:           GenuineIntel
      CPU family:          6
      Model:               85
      Model name:          Intel(R) Xeon(R) Gold 6238R CPU @ 2.20GHz
      Stepping:            7
      CPU MHz:             1025.675
      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:            39424K
      NUMA node0 CPU(s):
      0,2,4,6,8,10,12,14,16,18,20,22,24,26,28,30,32,34,36,38,40,42,44,46,48,50,52,54
      NUMA node1 CPU(s):
      1,3,5,7,9,11,13,15,17,19,21,23,25,27,29,31,33,35,37,39,41,43,45,47,49,51,53,55
      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 fsgsbase tsc_adjust
      bmi1 hle avx2 smep bmi2 erms invpcid 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 : 39424 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 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42 44 46 48 50
    52 54
    node 0 size: 181012 MB
```

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## Platform Notes (Continued)

```
   node 0 free: 191381 MB
   node 1 cpus: 1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31 33 35 37 39 41 43 45 47 49 51
   53 55
   node 1 size: 184469 MB
   node 1 free: 183796 MB
   node distances:
   node   0   1
     0:  10  21
     1:  21  10

 From /proc/meminfo
    MemTotal:       394815752 kB
    HugePages_Total:       0
    Hugepagesize:       2048 kB

 /sbin/tuned-adm active
     Current active profile: throughput-performance

 /sys/devices/system/cpu/cpu*/cpufreq/scaling_governor has
    performance

 From /etc/*release* /etc/*version*
    os-release:
       NAME="Red Hat Enterprise Linux"
       VERSION="8.3 (Ootpa)"
       ID="rhel"
       ID_LIKE="fedora"
       VERSION_ID="8.3"
       PLATFORM_ID="platform:el8"
       PRETTY_NAME="Red Hat Enterprise Linux 8.3 (Ootpa)"
       ANSI_COLOR="0;31"
    redhat-release: Red Hat Enterprise Linux release 8.3 (Ootpa)
    system-release: Red Hat Enterprise Linux release 8.3 (Ootpa)
    system-release-cpe: cpe:/o:redhat:enterprise_linux:8.3:ga

 uname -a:
    Linux localhost.localdomain 4.18.0-240.el8.x86_64 #1 SMP Wed Sep 23 05:13:10 EDT 2020
    x86_64 x86_64 x86_64 GNU/Linux

 Kernel self-reported vulnerability status:

 CVE-2018-12207 (iTLB Multihit):                 KVM: Mitigation: Split huge pages
 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
```

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## Platform Notes (Continued)

```
                                                    seccomp
 CVE-2017-5753 (Spectre variant 1):                 Mitigation: usercopy/swapgs
                                                    barriers and __user pointer
                                                    sanitization
 CVE-2017-5715 (Spectre variant 2):                 Mitigation: Enhanced IBRS, IBPB:
                                                    conditional, RSB filling
 CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
 CVE-2019-11135 (TSX Asynchronous Abort):           Mitigation: TSX disabled

 run-level 3 Nov 10 12:11

 SPEC is set to: /home/cpu2017-1.1.8-ic2021.1
    Filesystem            Type  Size  Used Avail Use% Mounted on
    /dev/mapper/rhel-home xfs   390G  9.3G  381G   3% /home

 From /sys/devices/virtual/dmi/id
     Vendor:         Dell Inc.
     Product:        PowerEdge C6420
     Product Family: PowerEdge

 Additional information from dmidecode 3.2 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:
     7x 00AD00B300AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933
     2x 00AD063200AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933
     3x 00AD069D00AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933
     4x Not Specified Not Specified

 BIOS:
    BIOS Vendor:       Dell Inc.
    BIOS Version:      2.13.1
    BIOS Date:         11/03/2021
    BIOS Revision:     2.13

 (End of data from sysinfo program)
```

## Compiler Version Notes

```
==============================================================================
C       | 600.perlbench_s(peak)
------------------------------------------------------------------------------
Intel(R) C Intel(R) 64 Compiler Classic for applications running on Intel(R)
  64, Version 2021.1 Build 20201112_000000
Copyright (C) 1985-2020 Intel Corporation.  All rights reserved.
```

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## Compiler Version Notes (Continued)

```
------------------------------------------------------------------------------

==============================================================================
C       | 600.perlbench_s(base) 602.gcc_s(base, peak) 605.mcf_s(base, peak)
        | 625.x264_s(base, peak) 657.xz_s(base, peak)
------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
  Version 2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------

==============================================================================
C       | 600.perlbench_s(peak)
------------------------------------------------------------------------------
Intel(R) C Intel(R) 64 Compiler Classic for applications running on Intel(R)
  64, Version 2021.1 Build 20201112_000000
Copyright (C) 1985-2020 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------

==============================================================================
C       | 600.perlbench_s(base) 602.gcc_s(base, peak) 605.mcf_s(base, peak)
        | 625.x264_s(base, peak) 657.xz_s(base, peak)
------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
  Version 2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------

==============================================================================
C++     | 620.omnetpp_s(base, peak) 623.xalancbmk_s(base, peak)
        | 631.deepsjeng_s(base, peak) 641.leela_s(base, peak)
------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
  Version 2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------

==============================================================================
Fortran | 648.exchange2_s(base, peak)
------------------------------------------------------------------------------
Intel(R) Fortran Intel(R) 64 Compiler Classic for applications running on
  Intel(R) 64, Version 2021.1 Build 20201112_000000
Copyright (C) 1985-2020 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------
```

## Base Compiler Invocation

C benchmarks:
icx

C++ benchmarks:
icpx

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:
-DSPEC_OPENMP -std=c11 -m64 -fiopenmp -Wl,-z,muldefs -xCORE-AVX512
-O3 -ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

C++ benchmarks:
-DSPEC_OPENMP -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-mbranches-within-32B-boundaries
-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin/
-lqkmalloc

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

## Peak Compiler Invocation

C benchmarks (except as noted below):
icx

600.perlbench_s: icc

C++ benchmarks:
icpx

Fortran benchmarks:
ifort

## 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)
-xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4 -fno-strict-overflow
-mbranches-within-32B-boundaries
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

602.gcc_s: -m64 -std=c11 -Wl,-z,muldefs -fprofile-generate(pass 1)
-fprofile-use=default.profdata(pass 2) -xCORE-AVX512 -flto
-Ofast(pass 1) -O3 -ffast-math -qopt-mem-layout-trans=4
-mbranches-within-32B-boundaries
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

605.mcf_s: basepeak = yes

625.x264_s: -DSPEC_OPENMP -fiopenmp -std=c11 -m64 -Wl,-z,muldefs
-xCORE-AVX512 -flto -O3 -ffast-math
-qopt-mem-layout-trans=4 -fno-alias
-mbranches-within-32B-boundaries
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

657.xz_s: basepeak = yes

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## Peak Optimization Flags (Continued)

C++ benchmarks:

620.omnetpp_s: `basepeak = yes`

623.xalancbmk_s: `basepeak = yes`

631.deepsjeng_s: `basepeak = yes`

641.leela_s: `basepeak = yes`

Fortran benchmarks:

648.exchange2_s: `basepeak = yes`

The flags files that were used to format this result can be browsed at
`http://www.spec.org/cpu2017/flags/Intel-ic2021-official-linux64_revA.html`
`http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge-Intel-ICX-rev1.4.html`

You can also download the XML flags sources by saving the following links:
`http://www.spec.org/cpu2017/flags/Intel-ic2021-official-linux64_revA.xml`
`http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge-Intel-ICX-rev1.4.xml`


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