SPEC CPU®2017 Integer Speed Result

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Dell Inc.

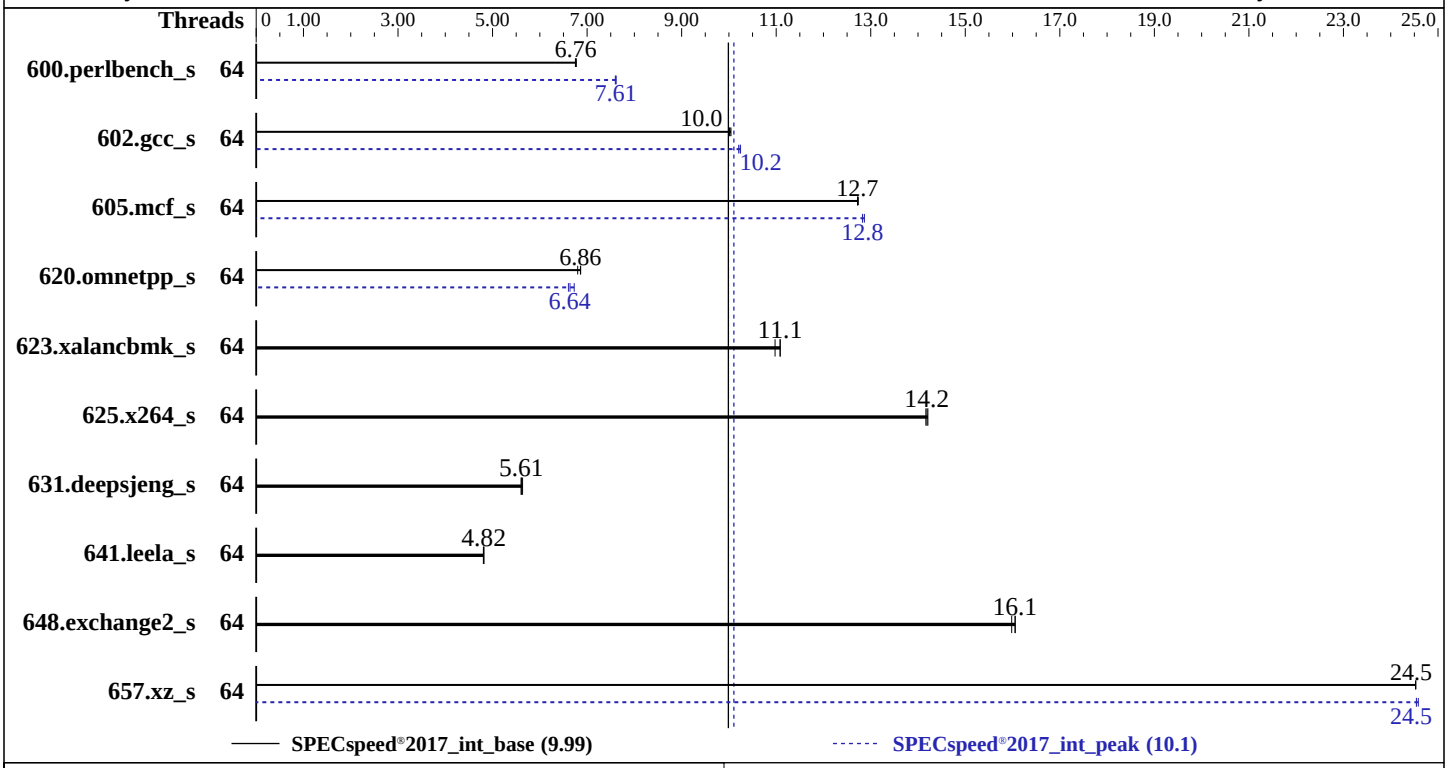
PowerEdge C6420 (Intel Xeon Gold 6246R, 3.40 GHz)

SPECspeed®2017_int_base = 9.99

SPECspeed®2017_int_peak = 10.1

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

Test Date: Apr-2020
Hardware Availability: Feb-2020
Software Availability: Feb-2020



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:	384 GB (12 x 32 GB 2Rx8 PC4-2933V-R, running at 2933)
Storage:	1 x 480 GB SATA SSD
Other:	None

Software

OS:	CentOS Linux 8.1.1911 kernel 4.18.0-147.5.1.el8_1.x86_64
Compiler:	C/C++: Version 19.0.5.281 of Intel C/C++ Compiler for Linux; Fortran: Version 19.0.5.281 of Intel Fortran Compiler for Linux
Parallel:	Yes
Firmware:	Version 2.7.3 released Mar-2020
File System:	tmpfs
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 set to prefer performance at the cost of additional power usage.

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Results Table

Benchmark	Base							Peak						
	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
600.perlbench_s	64	**263**	**6.76**	262	6.77	263	6.75	64	**233**	**7.61**	233	7.61	234	7.60
602.gcc_s	64	398	10.0	**397**	**10.0**	396	10.0	64	**389**	**10.2**	389	10.2	390	10.2
605.mcf_s	64	371	12.7	**371**	**12.7**	371	12.7	64	367	12.9	368	12.8	**368**	**12.8**
620.omnetpp_s	64	240	6.80	238	6.86	**238**	**6.86**	64	**246**	**6.64**	242	6.73	247	6.60
623.xalancbmk_s	64	128	11.1	129	11.0	**128**	**11.1**	64	128	11.1	129	11.0	**128**	**11.1**
625.x264_s	64	125	14.2	**124**	**14.2**	124	14.2	64	125	14.2	**124**	**14.2**	124	14.2
631.deepsjeng_s	64	254	5.63	**255**	**5.61**	256	5.60	64	254	5.63	**255**	**5.61**	256	5.60
641.leela_s	64	355	4.81	354	4.82	**354**	**4.82**	64	355	4.81	354	4.82	**354**	**4.82**
648.exchange2_s	64	183	16.1	**183**	**16.1**	184	16.0	64	183	16.1	**183**	**16.1**	184	16.0
657.xz_s	64	252	24.5	**252**	**24.5**	252	24.5	64	**252**	**24.5**	251	24.6	252	24.5

SPECspeed®2017_int_base = 9.99

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

General Notes

```
Binaries compiled on a system with 1x Intel Core i9-7900X CPU + 32GB RAM
memory using Redhat Enterprise Linux 7.5
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.
```

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General Notes (Continued)

```
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
runcpu command invoked through numactl i.e.:
numactl --interleave=all runcpu <etc>
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 settings:
Sub NUMA Cluster enabled
Virtualization Technology disabled
System Profile set to Custom
CPU Performance set to Maximum Performance
C States set to Autonomous
C1E disabled
Uncore Frequency set to Dynamic
Energy Efficiency Policy set to Performance
Memory Patrol Scrub set to standard
Logical Processor enabled
CPU Interconnect Bus Link Power Management disabled
PCI ASPM L1 Link Power Management disabled
UPI Prefetch enabled
LLC Prefetch disabled
Dead Line LLC Alloc enabled
Directory AtoS disabled

Sysinfo program /dev/shm/cpu2017/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7edb1e6e46a485a0011
running on localhost.localdomain Wed Apr 29 11:56:42 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
```

(Continued on next page)

Platform Notes (Continued)

```
       physical 0: cores 0 1 2 6 12 13 16 17 18 19 21 25 26 27 28 29
       physical 1: cores 0 1 2 3 4 5 6 13 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
      Vendor ID:           GenuineIntel
      CPU family:          6
      Model:               85
      Model name:          Intel(R) Xeon(R) Gold 6246R CPU @ 3.40GHz
      Stepping:            7
      CPU MHz:             3780.927
      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):   0,4,6,12,16,20,24,28,32,36,38,44,48,52,56,60
      NUMA node1 CPU(s):   1,5,9,13,17,21,25,29,33,37,41,45,49,53,57,61
      NUMA node2 CPU(s):   2,8,10,14,18,22,26,30,34,40,42,46,50,54,58,62
      NUMA node3 CPU(s):   3,7,11,15,19,23,27,31,35,39,43,47,51,55,59,63
      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 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
```


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Platform Notes (Continued)

```
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 4 6 12 16 20 24 28 32 36 38 44 48 52 56 60
  node 0 size: 95305 MB
  node 0 free: 95097 MB
  node 1 cpus: 1 5 9 13 17 21 25 29 33 37 41 45 49 53 57 61
  node 1 size: 96764 MB
  node 1 free: 96027 MB
  node 2 cpus: 2 8 10 14 18 22 26 30 34 40 42 46 50 54 58 62
  node 2 size: 96764 MB
  node 2 free: 80713 MB
  node 3 cpus: 3 7 11 15 19 23 27 31 35 39 43 47 51 55 59 63
  node 3 size: 96738 MB
  node 3 free: 96415 MB
  node distances:
  node   0   1   2   3
    0:  10  21  11  21
    1:  21  10  21  11
    2:  11  21  10  21
    3:  21  11  21  10

From /proc/meminfo
   MemTotal:       394827724 kB
   HugePages_Total:       0
   Hugepagesize:       2048 kB

From /etc/*release* /etc/*version*
   centos-release: CentOS Linux release 8.1.1911 (Core)
   centos-release-upstream: Derived from Red Hat Enterprise Linux 8.1 (Source)
   os-release:
      NAME="CentOS Linux"
      VERSION="8 (Core)"
      ID="centos"
      ID_LIKE="rhel fedora"
      VERSION_ID="8"
      PLATFORM_ID="platform:el8"
      PRETTY_NAME="CentOS Linux 8 (Core)"
      ANSI_COLOR="0;31"
   redhat-release: CentOS Linux release 8.1.1911 (Core)
   system-release: CentOS Linux release 8.1.1911 (Core)
   system-release-cpe: cpe:/o:centos:centos:8

uname -a:
   Linux localhost.localdomain 4.18.0-147.5.1.el8_1.x86_64 #1 SMP Wed Feb 5 02:00:39 UTC
   2020 x86_64 x86_64 x86_64 GNU/Linux
```

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Platform Notes (Continued)

```
 Kernel self-reported vulnerability status:

 itlb_multihit:                                  Processor vulnerable
 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: usercopy/swapgs barriers and __user
                                                  pointer sanitization
 CVE-2017-5715 (Spectre variant 2):              Mitigation: Enhanced IBRS, IBPB: conditional,
                                                  RSB filling
 tsx_async_abort:                                Mitigation: Clear CPU buffers; SMT vulnerable

 run-level 3 Apr 27 17:02

 SPEC is set to: /dev/shm/cpu2017
    Filesystem     Type   Size  Used Avail Use% Mounted on
    tmpfs          tmpfs  189G  7.6G  181G   5% /dev/shm

 From /sys/devices/virtual/dmi/id
     BIOS:    Dell Inc. 2.7.3 03/25/2020
     Vendor:  Dell Inc.
     Product: PowerEdge C6420
     Product Family: PowerEdge
     Serial:  1234567

 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:
     8x 00AD00B300AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933
     1x 00AD063200AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933
     3x 00AD069D00AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933
     4x Not Specified Not Specified

 (End of data from sysinfo program)
```

Compiler Version Notes

```
==============================================================================
C       | 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)
------------------------------------------------------------------------------
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
```


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Compiler Version Notes (Continued)

```
  Version 19.0.5.281 Build 20190815
Copyright (C) 1985-2019 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) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.5.281 Build 20190815
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 19.0.5.281 Build 20190815
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------
```

Base Compiler Invocation

C benchmarks:
icc

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

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Base Portability Flags (Continued)

657.xz_s: -DSPEC_LP64

Base Optimization Flags

C benchmarks:
-m64 -std=c11 -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

C++ benchmarks:
-m64 -Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.5.281/linux/compiler/lib/intel64_lin
-lqkmalloc

Fortran benchmarks:
-m64 -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-mem-layout-trans=4
-nostandard-realloc-lhs

Peak Compiler Invocation

C benchmarks:
icc

C++ benchmarks:
icpc

Fortran benchmarks:
ifort

Peak Portability Flags

Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:

600.perlbench_s: `-m64 -std=c11 -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: `-m64 -std=c11 -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 -L/usr/local/je5.0.1-64/lib`
`-ljemalloc`

605.mcf_s: `-m64 -std=c11 -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: `basepeak = yes`

657.xz_s: `-m64 -std=c11 -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: `-m64 -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_2019.5.281/linux/compiler/lib/intel64_lin`
`-lqkmalloc`

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-ic19.0u5-official-linux64_revD.html
http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge-revE9.html

You can also download the XML flags sources by saving the following links:

http://www.spec.org/cpu2017/flags/Intel-ic19.0u5-official-linux64_revD.xml
http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge-revE9.xml

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

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