Dell Inc.

PowerEdge FC740 (Intel Xeon Gold 5220S, 2.70GHz)

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

Test Date: Mar-2019
Hardware Availability: Apr-2019
Software Availability: Mar-2019

---

**Threads**

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>perlbench_s</td>
<td>36</td>
<td>7.73</td>
</tr>
<tr>
<td>gcc_s</td>
<td>36</td>
<td>9.25</td>
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<tr>
<td>mcf_s</td>
<td>36</td>
<td>9.86</td>
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<tr>
<td>omnetpp_s</td>
<td>36</td>
<td>7.66</td>
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<tr>
<td>xalancbmk_s</td>
<td>36</td>
<td>7.74</td>
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<tr>
<td>x264_s</td>
<td>36</td>
<td>12.0</td>
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<td>xalancbmk_s</td>
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<td>12.4</td>
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<td>x264_s</td>
<td>36</td>
<td>12.5</td>
</tr>
<tr>
<td>deepsjeng_s</td>
<td>36</td>
<td>5.45</td>
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<tr>
<td>leela_s</td>
<td>36</td>
<td>4.77</td>
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<tr>
<td>exchange2_s</td>
<td>36</td>
<td>14.1</td>
</tr>
<tr>
<td>xz_s</td>
<td>36</td>
<td>20.5</td>
</tr>
</tbody>
</table>

---

**Hardware**

CPU Name: Intel Xeon Gold 5220S
Max MHz.: 3900
Nominal: 2700
Enabled: 36 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: 24.75 MB I+D on chip per chip
Other: None
Memory: 384 GB (12 x 32 GB 2Rx4 PC4-2933Y-R, running at 2666)
Storage: 1 x 480 GB SATA SSD
Other: None

**Software**

OS: Ubuntu 18.04.2 LTS
Compiler: C/C++: Version 19.0.1.144 of Intel C/C++
Compiler Build 20181018 for Linux;
Fortran: Version 19.0.1.144 of Intel Fortran
Compiler Build 20181018 for Linux
Parallel: Yes
Firmware: Version 2.1.6 released Mar-2019
File System: ext4
System State: Run level 5 (multi-user)
Base Pointers: 64-bit
Peak Pointers: 64-bit
Other: jemalloc memory allocator V5.0.1
SPEC CPU2017 Integer Speed Result

Dell Inc.
PowerEdge FC740 (Intel Xeon Gold 5220S, 2.70GHz)

SPECspeed2017_int_base = 9.71
SPECspeed2017_int_peak = 9.90

Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Base</td>
<td></td>
<td></td>
<td>Peak</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>600.perlbench_s</td>
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<td>417</td>
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<td>113</td>
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<td>12.4</td>
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<td>123</td>
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<td>14.3</td>
<td>123</td>
<td>14.3</td>
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<tr>
<td>631.deepsjeng_s</td>
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<td>263</td>
<td>5.44</td>
<td>263</td>
<td>5.45</td>
<td>263</td>
<td>5.46</td>
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<tr>
<td>641.leela_s</td>
<td>36</td>
<td>358</td>
<td>4.77</td>
<td>358</td>
<td>4.77</td>
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<td>4.77</td>
</tr>
<tr>
<td>648.exchange2_s</td>
<td>36</td>
<td>209</td>
<td>14.1</td>
<td>211</td>
<td>13.9</td>
<td>209</td>
<td>14.1</td>
</tr>
<tr>
<td>657.xz_s</td>
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<td>302</td>
<td>20.5</td>
<td>301</td>
<td>20.5</td>
<td>301</td>
<td>20.5</td>
</tr>
</tbody>
</table>

SPECspeed2017_int_base = 9.71
SPECspeed2017_int_peak = 9.90

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"

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 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.
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>

(Continued on next page)
**General Notes (Continued)**

jemalloc, a general purpose malloc implementation
built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5

**Platform Notes**

BIOS settings:
- ADDDC setting disabled
- Sub NUMA Cluster enabled
- Virtualization Technology disabled
- DCU Streamer Prefetcher enabled
- 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 disabled
- Logical Processor disabled
- CPU Interconnect Bus Link Power Management disabled
- PCI ASPM L1 Link Power Management disabled
- Sysinfo program /home/cpu2017/bin/sysinfo
- Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
- running on intel-sut Wed May 8 03:34:34 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 5220S CPU @ 2.70GHz
2 "physical id"s (chips)
36 "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 : 18
siblings : 18
physical 0: cores 0 1 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27
physical 1: cores 0 1 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27

From `lscpu`:

Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 36
On-line CPU(s) list: 0-35

(Continued on next page)
SPEC CPU2017 Integer Speed Result

Dell Inc. PowerEdge FC740 (Intel Xeon Gold 5220S, 2.70GHz)

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

Test Date: Mar-2019
Hardware Availability: Apr-2019
Software Availability: Mar-2019

Platform Notes (Continued)

- Thread(s) per core: 1
- Core(s) per socket: 18
- Socket(s): 2
- NUMA node(s): 2
- Vendor ID: GenuineIntel
- CPU family: 6
- Model: 85
- Model name: Intel(R) Xeon(R) Gold 5220S CPU @ 2.70GHz
- Stepping: 7
- CPU MHz: 2833.740
- BogoMIPS: 5400.00
- Virtualization: VT-x
- L1d cache: 32K
- L1i cache: 32K
- L2 cache: 1024K
- L3 cache: 25344K
- NUMA node0 CPU(s): 0,2,4,6,8,10,12,14,16,18,20,22,24,26,28,30,32,34
- NUMA node1 CPU(s): 1,3,5,7,9,11,13,15,17,19,21,23,25,27,29,31,33,35
- 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 xtpre pdcm pclid dca sse4_1 sse4_2 x2apic movbe popcnt aes xsave avx f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault epb cat13 cdp13 invpcid_single ssbd mba ibrs ibpb stibp ibrs enhanced tpr_shadow vmmi lexibility ept vpid fsgsbase tsc_adjust bm1 hle avx2 smep bmi2 ertms invpcid rtm cmx mpzx rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb interpt avx512cd avx512bw avx512vl xsaveopt xsavec xsavec xgetbv1 xsaves cmq_llc cmq_occurs llc cmq_mbm_total cmq_mbm_local dtherm ida arat pln pts pku ospke avx512_vnni flush_l1d arch_capabilities

From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a physical chip.

```
make info
cache data
```

(Continued on next page)
Dell Inc.
PowerEdge FC740 (Intel Xeon Gold 5220S, 2.70GHz)

SPECspped2017_int_peak = 9.90
SPECspped2017_int_base = 9.71

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Platform Notes (Continued)

From /proc/meminfo
    MemTotal: 394697320 kB
    HugePages_Total: 0
    Hugepagesize: 2048 kB

/usr/bin/lsb_release -d
    Ubuntu 18.04.2 LTS

From /etc/*release* /etc/*version*
    debian_version: buster/sid
    os-release:
        NAME="Ubuntu"
        VERSION="18.04.2 LTS (Bionic Beaver)"
        ID=ubuntu
        ID_LIKE=debian
        PRETTY_NAME="Ubuntu 18.04.2 LTS"
        VERSION_ID="18.04"
        HOME_URL="https://www.ubuntu.com/
        SUPPORT_URL="https://help.ubuntu.com/"

uname -a:
    Linux intel-sut 4.15.0-47-generic #50-Ubuntu SMP Wed Mar 13 10:44:52 UTC 2019 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: Enhanced IBRS, IBPB

run-level 5 May 8 03:29

SPEC is set to: /home/cpu2017
    Filesystem Type Size Used Avail Use% Mounted on
    /dev/sda2 ext4 439G 20G 398G 5% /

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 Dell Inc. 2.1.6 03/04/2019
    Memory:
        4x 00AD00B300AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933, configured at 2666
        8x 00AD069D00AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933, configured at 2666
        4x Not Specified Not Specified

(End of data from sysinfo program)
**SPEC CPU2017 Integer Speed Result**

**Dell Inc.**

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**Compiler Version Notes**

```
==============================================================================
CC  600.perlbench_s(base) 602.gcc_s(base) 605.mcf_s(base) 625.x264_s(base, peak) 657.xz_s(base)
------------------------------------------------------------------------------
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,        
  Version 19.0.1.144 Build 20181018                                        
Copyright (C) 1985-2018 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------

==============================================================================
CC   600.perlbench_s(peak) 602.gcc_s(peak) 605.mcf_s(peak) 657.xz_s(peak)
------------------------------------------------------------------------------
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,        
  Version 19.0.1.144 Build 20181018                                        
Copyright (C) 1985-2018 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------

==============================================================================
CXXC 620.omnetpp_s(base) 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 19.0.1.144 Build 20181018                                        
Copyright (C) 1985-2018 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------

==============================================================================
CXXC 620.omnetpp_s(peak)
------------------------------------------------------------------------------
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,      
  Version 19.0.1.144 Build 20181018                                        
Copyright (C) 1985-2018 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------

==============================================================================
FC  648.exchange2_s(base, peak)
------------------------------------------------------------------------------
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R) 64, 
  Version 19.0.1.144 Build 20181018                                        
Copyright (C) 1985-2018 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------
```

**Base Compiler Invocation**

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

(Continued on next page)
Dell Inc. PowerEdge FC740 (Intel Xeon Gold 5220S, 2.70GHz)

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### Base Compiler Invocation (Continued)

- **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 -gopenmp -DSPEC_OPENMP
  - -L/usr/local/je5.0.1-64/lib -ljemalloc

- **C++ benchmarks:**
  - -W1,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
  - -qopt-mem-layout-trans=4
  - -L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/intel64
  - -lqkmalloc

- **Fortran benchmarks:**
  - -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-mem-layout-trans=4
  - -nostandard-realloc-lhs
SPEC CPU2017 Integer Speed Result

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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: -W1,-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: -W1,-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: -W1,-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 -gopenmp -DSPEC_OPENMP
-L/usr/local/je5.0.1-64/lib -ljemalloc

625.x264_s: -W1,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4 -gopenmp -DSPEC_OPENMP
-L/usr/local/je5.0.1-64/lib -ljemalloc

657.xz_s: -W1,-z,muldefs -xCORE-AVX512 -qopt-mem-layout-trans=4 -ipo -O3
-no-prec-div -DSPEC_SUPPRESS_OPENMP -gopenmp
-DSPEC_OPENMP -L/usr/local/je5.0.1-64/lib -ljemalloc

(Continued on next page)
# SPEC CPU2017 Integer Speed Result

## Dell Inc.

**PowerEdge FC740 (Intel Xeon Gold 5220S, 2.70GHz)**

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## Peak Optimization Flags (Continued)

### 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_2019.1.144/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_2019.1.144/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:


---

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

Tested with SPEC CPU2017 v1.0.5 on 2019-05-07 23:34:34-0400.  
Originally published on 2019-07-23.