### Hardware

- **CPU Name:** Intel Xeon Gold 5220
- **Max MHz.:** 3900
- **Nominal:** 2200
- **Enabled:** 36 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:** 24.75 MB I+D on chip per chip
- **Other:** None
- **Memory:** 768 GB (24 x 32 GB 2Rx4 PC4-2666V-R)
- **Storage:** 1 x 480 GB SATA SSD
- **Other:** None

### Software

- **OS:** Ubuntu 18.04.2 LTS
- **Kernel:** 4.15.0-45-generic
- **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:** No
- **Firmware:** Version 2.2.1 released Feb-2019
- **File System:** ext4
- **System State:** Run level 3 (multi-user)
- **Base Pointers:** 64-bit
- **Peak Pointers:** 32/64-bit
- **Other:** jemalloc memory allocator V5.0.1
Dell Inc.  

PowerEdge MX740C (Intel Xeon Gold 5220, 2.20GHz)  

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

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

Results Table

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<td>578</td>
</tr>
</tbody>
</table>

SPECrater2017_int_base = 200  
SPECrater2017_int_peak = 208

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.:
# SPEC CPU2017 Integer Rate Result

**Dell Inc.**

PowerEdge MX740C (Intel Xeon Gold 5220, 2.20GHz)

<table>
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<th>SPECrate2017_int_base</th>
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<tr>
<td>200</td>
<td>208</td>
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**CPU2017 License:** 55  
**Test Date:** Mar-2019  
**Test Sponsor:** Dell Inc.  
**Tested by:** Dell Inc.  
**Hardware Availability:** Apr-2019  
**Software Availability:** Feb-2019

### General Notes (Continued)

- 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  

### 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 enabled
  - 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 9bcd8f2999c33d61f64985e45859ea9
  - running on intel-sut Thu Apr 11 18:27:03 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 5220 CPU @ 2.20GHz
  - 2 "physical id"s (chips)
  - 72 "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: 36

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): 72

(Continued on next page)
SPEC CPU2017 Integer Rate Result

Dell Inc.

PowerEdge MX740C (Intel Xeon Gold 5220, 2.20GHz)

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

Platform Notes (Continued)

On-line CPU(s) list: 0-71
Thread(s) per core: 2
Core(s) per socket: 18
Socket(s): 2
NUMA node(s): 4
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Gold 5220 CPU @ 2.20GHz
Stepping: 6
CPU MHz: 2630.452
BogoMIPS: 4400.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 25344K
NUMA node0 CPU(s): 0,4,8,12,16,20,24,28,32,36,40,44,48,52,56,60,64,68
NUMA node1 CPU(s): 1,5,9,13,17,21,25,29,33,37,41,45,49,53,57,61,65,69
NUMA node2 CPU(s): 2,6,10,14,18,22,26,30,34,38,42,46,50,54,58,62,66,70
NUMA node3 CPU(s): 3,7,11,15,19,23,27,31,35,39,43,47,51,55,59,63,67,71
Flags: fpu vme de pse tsc msr pae mca cmov pat pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtscp lm constant_tsc 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 abm smep bmi2 erms invpcid_single ssbd mba ibrs ibpb ibrs enhanced tpr_shadow vni flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 64bit processor

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

/cache data

/cache size: 25344 KB
SPEC CPU2017 Integer Rate Result

Dell Inc.
PowerEdge MX740C (Intel Xeon Gold 5220, 2.20GHz)

SPECrate2017_int_base = 200
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CPU2017 License: 55
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Test Date: Mar-2019
Hardware Availability: Apr-2019
Software Availability: Feb-2019

Platform Notes (Continued)

node 2 free: 193251 MB
node 3 cpus: 3 7 11 15 19 23 27 31 35 39 43 47 51 55 59 63 67 71
node 3 size: 193509 MB
node 3 free: 193226 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:       791050440 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 4.15.0-46-generic #49-Ubuntu SMP Wed Feb 6 09:33:07 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 3 Apr 10 15:59

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

(Continued on next page)
SPEC CPU2017 Integer Rate Result

Dell Inc. PowerEdge MX740C (Intel Xeon Gold 5220, 2.20GHz)

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

Test Date: Mar-2019
Hardware Availability: Apr-2019
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Platform Notes (Continued)

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. 2.2.1 02/19/2019
Memory:
  5x 002C00B3002C 36ASF4G72PZ-2G6D1 32 GB 2 rank 2666
  8x 002C0632002C 36ASF4G72PZ-2G6D1 32 GB 2 rank 2666
  11x 00AD063200AD HMA84GR7AFR4N-VK 32 GB 2 rank 2666

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
CC   502.gcc_r(peak)
Intel(R) C Intel(R) 64 Compiler for applications running on IA-32, Version
  19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
==============================================================================

==============================================================================
CC  500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base, peak)
  557.xz_r(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 523.xalancbmk_r(peak)
Intel(R) C++ Intel(R) 64 Compiler for applications running on IA-32, Version
  19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
==============================================================================

(Continued on next page)
### Compiler Version Notes (Continued)

```
CXXC 520.omnetpp_r(base, peak) 523.xalancbmk_r(base) 531.deepsjeng_r(base, peak) 541.leela_r(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.
```

```
FC 548.exchange2_r(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
```

**C++ benchmarks:**
```
icpc -m64
```

**Fortran benchmarks:**
```
ifort -m64
```

### 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
```
## SPEC CPU2017 Integer Rate Result

### Dell Inc.

PowerEdge MX740C (Intel Xeon Gold 5220, 2.20GHz)

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| Test Date: | Mar-2019 |
| Hardware Availability: | Apr-2019 |
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### SPECrate2017_int_base = 200

### SPECrate2017_int_peak = 208

**Update: Dell Inc.**

**Dell Inc.**

**PowerEdge MX740C (Intel Xeon Gold 5220, 2.20GHz)**

**SPECrate2017_int_base = 200**

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**Test Date:** Mar-2019

**Hardware Availability:** Apr-2019

**Software Availability:** Feb-2019

### Base Optimization Flags

C benchmarks:
- `-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`

C++ benchmarks:
- `-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`

Fortran benchmarks:
- `-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div`
- `-qopt-mem-layout-trans=4 -nostandard-realloc-lhs -align array32byte`
- `-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/intel64`
- `-lqkmalloc`

### Peak Compiler Invocation

**C benchmarks (except as noted below):**
- `icc -m64 -std=c11`
- `gcc_r: icc -m32 -std=c11 -L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/ia32_lin`

**C++ benchmarks (except as noted below):**
- `icpc -m64`
- `xalancbmk_r: icpc -m32 -L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/ia32_lin`

**Fortran benchmarks:**
- `ifort -m64`

### Peak Portability Flags

- `perlbench_r: -DSPEC_LP64 -DSPEC_LINUX_X64`
- `gcc_r: -D_FILE_OFFSET_BITS=64`
- `mcf_r: -DSPEC_LP64`
- `omnetpp_r: -DSPEC_LP64`
- `xalancbmk_r: -D_FILE_OFFSET_BITS=64 -DSPEC_LINUX`
- `x264_r: -DSPEC_LP64`

(Continued on next page)
Dell Inc. PowerEdge MX740C (Intel Xeon Gold 5220, 2.20GHz)

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**SPEC CPU2017 Integer Rate Result**

- **SPECrate2017_int_base = 200**
- **SPECrate2017_int_peak = 208**

---

### Peak Portability Flags (Continued)

- 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=4
  -fno-strict-overflow
  -L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/intel64
  -lqkmalloc`

- 502.gcc_r: `-Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo
  -xCORE-AVX512 -O3 -no-prec-div -qopt-mem-layout-trans=4
  -L/usr/local/jre5.0.1-32/lib -ljemalloc`

- 505.mcf_r: `-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`

- 525.x264_r: `-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
  -qopt-mem-layout-trans=4 -fno-alias
  -L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/intel64
  -lqkmalloc`

- 557.xz_r: Same as 505.mcf_r

**C++ benchmarks:**

- 520.omnetpp_r: `-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`

- 523.xalancbmk_r: `-Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo
  -xCORE-AVX512 -O3 -no-prec-div -qopt-mem-layout-trans=4
  -L/usr/local/jre5.0.1-32/lib -ljemalloc`

- 531.deepsjeng_r: Same as 520.omnetpp_r

(Continued on next page)
Dell Inc.
PowerEdge MX740C (Intel Xeon Gold 5220, 2.20GHz)

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Hardware Availability: Apr-2019
Software Availability: Feb-2019

Peak Optimization Flags (Continued)

541.leela_r: Same as 520.omnetpp_r

Fortran benchmarks:
-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4 -nostandard-realloc-lhs -align array32byte
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/intel64
-qlkmalloc

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 2019-04-11 14:27:02-0400.
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