## Dell Inc.

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

<table>
<thead>
<tr>
<th>SPECspeed®2017_fp_base</th>
<th>138</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECspeed®2017_fp_peak</td>
<td>139</td>
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</table>

### CPU2017 License:
- 55

### Test Sponsor:
- Dell Inc.

### Tested by:
- Dell Inc.

### Test Date:
- May-2020

### Hardware Availability:
- Feb-2020

### Software Availability:
- Apr-2020

### Threads

<table>
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<tr>
<th>Benchmark</th>
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<td>96</td>
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</tr>
<tr>
<td>638.imagick_s</td>
<td>96</td>
<td>266</td>
<td>266</td>
</tr>
<tr>
<td>644.nab_s</td>
<td>96</td>
<td>82.5</td>
<td>82.5</td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>96</td>
<td>81.8</td>
<td>81.8</td>
</tr>
<tr>
<td>654.roms_s</td>
<td>96</td>
<td>143</td>
<td>143</td>
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</table>

### 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
- **Memory:** 768 GB (24 x 32 GB 2Rx8 PC4-2933V-R, running at 2666)
- **Storage:** 1 x 960 GB SATA SSD
- **Other:** None

### Software

- **OS:** Red Hat Enterprise Linux 8.1
  - kernel 4.18.0-147.el8.x86_64
- **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:** Version 2.7.1 released Feb-2020
- **File System:** tmpfs
- **System State:** Run level 3 (multi-user)
- **Base Pointers:** 64-bit
- **Peak Pointers:** 64-bit
- **Other:** malloc memory allocator V5.0.1
- **Power Management:** BIOS set to prefer performance at the cost of additional power usage.
SPEC CPU®2017 Floating Point Speed Result

Dell Inc.

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

SPECspeed®2017_fp_base = 138
SPECspeed®2017_fp_peak = 139

Results Table

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SPECspeed®2017_fp_base = 138
SPECspeed®2017_fp_peak = 139

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,compact"
LD_LIBRARY_PATH = "/dev/shm/cpu2017-ic19.1u1/lib/intel64:/dev/shm/cpu2017-ic19.1u1/je5.0.1 -64"
MALLOC_CONF = "retain:true"
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)
Dell Inc.

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

SPECspeed®2017_fp_base = 138
SPECspeed®2017_fp_peak = 139

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

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

General Notes (Continued)

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>
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:
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-ic19.1u1/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7ed1e6e46a485a0011
running on localhost.localdomain Sun Jun 21 14:08:47 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
Dell Inc.

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

| SPECspeed®2017_fp_base = 138 |
| SPECspeed®2017_fp_peak = 139 |

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

---

**Platform Notes (Continued)**

(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 9 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 96
On-line CPU(s) list: 0-95
Thread(s) per core: 2
Core(s) per socket: 24
Socket(s): 2
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: 3597.845
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):
0,2,4,6,8,10,12,14,16,18,20,22,24,26,28,30,32,34,36,38,40,42,44,46,48,50,52,54,56,58
60,62,64,66,68,70,72,74,76,78,80,82,84,86,88,90,92,94
NUMA node1 CPU(s):
1,3,5,7,9,11,13,15,17,19,21,23,25,27,29,31,33,35,37,39,41,43,45,47,49,51,53,55,57,59
61,63,65,67,69,71,73,75,77,79,81,83,85,87,89,91,93,95
Flags:
  fpu vmx 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 pdelpgb rdsc
  m constant_tsc arch_perfmon pebs bts rep_good nopl nofpu tsc_knownch xtopology nonstop_tsc cpuid
  aperfmpref pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16
  xtrr pdc 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 vni
  flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm
  cmq mpx rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd
  avx512bw avx512vl xsaveopt xsaves xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbb_total
  cqm_mbb_local dtherm ida arat pln pts pku ospke avx512_vnni md_clear flush_lld

(Continued on next page)
# SPEC CPU®2017 Floating Point Speed Result

## Dell Inc.

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

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### Platform Notes (Continued)

```plaintext
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 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 56 58 60 62 64 66 68 70 72 74 76 78 80 82 84 86 88 90 92 94
  node 0 size: 385602 MB
  node 0 free: 375883 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 57 59 61 63 65 67 69 71 73 75 77 79 81 83 85 87 89 91 93 95
  node 1 size: 387036 MB
  node 1 free: 379319 MB
  node distances:
    node   0   1
    0:  10  21
    1:  21  10

From /proc/meminfo
  MemTotal:       791182224 kB
  HugePages_Total:       0
  Hugepagesize:       2048 kB

From /etc/*release* /etc/*version*
  os-release:
    NAME="Red Hat Enterprise Linux"
    VERSION="8.1 (Ootpa)"
    ID="rhel"
    ID_LIKE="fedora"
    VERSION_ID="8.1"
    PLATFORM_ID="platform:el8"
    PRETTY_NAME="Red Hat Enterprise Linux 8.1 (Ootpa)"
    ANSI_COLOR="0;31"
  redhat-release: Red Hat Enterprise Linux release 8.1 (Ootpa)
  system-release: Red Hat Enterprise Linux release 8.1 (Ootpa)
  system-release-cpe: cpe:/o:redhat:enterprise_linux:8.1:ga

uname -a:
  Linux localhost.localdomain 4.18.0-147.el8.x86_64 #1 SMP Thu Sep 26 15:52:44 UTC 2019
  x86_64 x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:

CVE-2018-3620 (L1 Terminal Fault): Not affected
```

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

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

Platform Notes (Continued)

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

run-level 3 Jun 21 10:00

SPEC is set to: /dev/shm/cpu2017-ic19.1u1
Filesystem Type Size Used Avail Use% Mounted on
  tmpfs   tmpfs  378G  11G  368G   3% /dev/shm

From /sys/devices/virtual/dmi/id
  BIOS: Dell Inc. 2.7.1 02/14/2020
  Vendor: Dell Inc.
  Product: PowerEdge MX740c
  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:
  21x 00AD00B300AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933
  1x 00AD063200AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933
  2x 00AD069D00AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
C               | 619.lbm_s(base, peak) 638.imagick_s(base, peak)
               | 644.nab_s(base, peak)
==============================================================================

Intel(R) C 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.

==============================================================================
C++, C, Fortran | 607.cactuBSSN_s(base, peak)

(Continued on next page)
Dell Inc.

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

SPECspeed®2017_fp_base = 138
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CPU2017 License: 55
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Test Date: May-2020
Hardware Availability: Feb-2020
Software Availability: Apr-2020

Compiler Version Notes (Continued)

Intel(R) C++ 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.

Intel(R) C 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.

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.

Fortran, C

Fortran: 603.bwaves_s(base, peak) 649.fotonik3d_s(base, peak)
654.roms_s(base, peak)

Fortran, C: 621.wrf_s(base, peak) 627.cam4_s(base, peak)
628.pop2_s(base, peak)

Base Compiler Invocation

C benchmarks:
icc

Fortran benchmarks:
ifort

Benchmarks using both Fortran and C:
ifort icc

Benchmarks using Fortran, C, and C++:
icpc icc ifort
## Dell Inc.

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### Base Portability Flags

- `603.bwaves_s`: -DSPEC_LP64  
- `607.cactuBSSN_s`: -DSPEC_LP64  
- `619.lbm_s`: -DSPEC_LP64  
- `621.wrf_s`: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian  
- `627.cam4_s`: -DSPEC_LP64 -DSPEC_CASE_FLAG  
- `628.pop2_s`: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian -assume byterecl  
- `638.imagick_s`: -DSPEC_LP64  
- `644.nab_s`: -DSPEC_LP64  
- `649.fotonik3d_s`: -DSPEC_LP64  
- `654.roms_s`: -DSPEC_LP64

### Base Optimization Flags

**C benchmarks:**

```bash
-m64 -std=c11 -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP -mbranches-within-32B-boundaries
```

**Fortran benchmarks:**

```bash
-m64 -Wl,-z,muldefs -DSPEC_OPENMP -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -nostandard-realloc-lhs -mbranches-within-32B-boundaries -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

**Benchmarks using both Fortran and C:**

```bash
-m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP -mbranches-within-32B-boundaries -nostandard-realloc-lhs -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

**Benchmarks using Fortran, C, and C++:**

```bash
-m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP -mbranches-within-32B-boundaries -nostandard-realloc-lhs -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

### Peak Compiler Invocation

**C benchmarks:**

```bash
icc
```

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

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Test Sponsor: Dell Inc.  
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**Peak Compiler Invocation (Continued)**

Fortran benchmarks:  
ifort

Benchmarks using both Fortran and C:  
ifort icc

Benchmarks using Fortran, C, and C++:  
icpc icc ifort

---

**Peak Portability Flags**

Same as Base Portability Flags

---

**Peak Optimization Flags**

C benchmarks:

619.lbm_s: basepeak = yes
638.imagick_s: basepeak = yes

644.nab_s: -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX2 -ipo -O3  
-no-prec-div -qopt-prefetch -ffinite-math-only  
-qopt-mem-layout-trans=4 -gopenmp -DSPEC_OPENMP  
-mbranches-within-32B-boundaries  
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

Fortran benchmarks:

603.bwaves_s: -m64 -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2)  
-DSPEC_SUPPRESS_OPENMP -DSPEC_OPENMP -ipo -xCORE-AVX2  
-03 -no-prec-div -qopt-prefetch -ffinite-math-only  
-qopt-mem-layout-trans=4 -gopenmp -nostandard-realloc-lhs  
-mbranches-within-32B-boundaries  
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

649.fotonik3d_s: Same as 603.bwaves_s
654.roms_s: basepeak = yes

Benchmarks using both Fortran and C:

(Continued on next page)
## Peak Optimization Flags (Continued)

621.wrf_s: `-m64 -std=c11 -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4 -DSPEC_SUPPRESS_OPENMP -qopenmp -DSPEC_OPENMP -mbranches-within-32B-boundaries -nostandard-realloc-lhs -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc`

627.cam4_s: `basepeak = yes`

628.pop2_s: `basepeak = yes`

Benchmarks using Fortran, C, and C++:

607.cactuBSSN_s: `basepeak = yes`

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: