## SPEC CPU®2017 Floating Point Rate Result

**Dell Inc.**

PowerEdge MX740c (Intel Xeon Gold 6226, 2.70GHz)

<table>
<thead>
<tr>
<th>CPU2017 License:</th>
<th>55</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Sponsor:</td>
<td>Dell Inc.</td>
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<tr>
<td>Tested by:</td>
<td>Dell Inc.</td>
</tr>
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<td>Test Date:</td>
<td>Jul-2019</td>
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<tr>
<td>Hardware Availability:</td>
<td>Jun-2019</td>
</tr>
<tr>
<td>Software Availability:</td>
<td>Aug-2019</td>
</tr>
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<table>
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<tr>
<th>Copies</th>
<th>SPECrate®2017_fp_base = 167</th>
<th>SPECrate®2017_fp_peak = 172</th>
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<tbody>
<tr>
<td>503.bwaves_r</td>
<td>126</td>
<td>172</td>
</tr>
<tr>
<td>507.cactuBSSN_r</td>
<td>115</td>
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<td>508.namd_r</td>
<td>104</td>
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<td>510.parest_r</td>
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<td>511.povray_r</td>
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<td>519.lbm_r</td>
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<td>521.wrf_r</td>
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<td>526.blender_r</td>
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<td>527.cam4_r</td>
<td>175</td>
<td>386</td>
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<tr>
<td>538.imagick_r</td>
<td>175</td>
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<td>549.fotonik3d_r</td>
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<tr>
<td>554.roms_r</td>
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</tbody>
</table>

### Hardware

- CPU Name: Intel Xeon Gold 6226
- Max MHz: 3700
- Nominal: 2700
- Enabled: 24 cores, 2 chips, 2 threads/core
- Orderable: 1,2 chips
- Cache L1: 32 KB I + 32 KB D on chip per core
- Cache L2: 1 MB I+D on chip per core
- Cache L3: 19.25 MB I+D on chip per chip
- Other: None
- Memory: 384 GB (12 x 32 GB 2Rx4 PC4-2933Y-R)
- Storage: 1 x 480 GB SATA SSD
- Other: None

### Software

- OS: Ubuntu 18.04.2 LTS
- Compiler: C/C++: Version 19.0.4.227 of Intel C/C++ Compiler Build 20190416 for Linux
- Fortran: Version 19.0.4.227 of Intel Fortran Compiler Build 20190416 for Linux
- Parallel: No
- Firmware: Version 2.3.10 released Aug-2019
- File System: ext4
- System State: Run level 3 (multi-user)
- Base Pointers: 64-bit
- Peak Pointers: 64-bit
- Other: None
- Power Management: --
Dell Inc. PowerEdge MX740c (Intel Xeon Gold 6226, 2.70GHz) SPEC CPU®2017 Floating Point Rate Result Dell Inc. PowerEdge MX740c (Intel Xeon Gold 6226, 2.70GHz)

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

RESULTS TABLE

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</tr>
</tbody>
</table>

SPECrate®2017_fp_base = 167
SPECrate®2017_fp_peak = 172

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/intel64:/home/cpu2017/lib/ia32:/home/cpu2017/je5.0.1-32"
Binaries compiled on a system with 1x Intel Core i9-799X 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:

(Continued on next page)
Dell Inc. PowerEdge MX740c (Intel Xeon Gold 6226, 2.70GHz) Dell Inc.

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**General Notes (Continued)**

sync; echo 3> /proc/sys/vm/drop_caches
runcpu command invoked through numaclt i.e.:
numactl --interleave=all runcpu <etc>

**Platform Notes**

BIOS settings:
ADDDC setting disabled
Sub NUMA Cluster enabled
Virtualization Technology disabled
DCU Streamer Prefetcher 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 disabled
Logical Processor enabled
CPU Interconnect Bus Link Power Management enabled
PCI ASPM L1 Link Power Management enabled
Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r5974 of 2018-05-19 9bcede8f2999c33d61f64985e45859ea9
running on intel-sut Tue Nov 19 04:26:06 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 6226 CPU @ 2.70GHz
  2 "physical id"s (chips)
  48 "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 : 12
siblings : 24
physical 0: cores 1 2 3 5 6 8 9 10 11 12 13 14
physical 1: cores 0 2 3 4 5 8 9 10 11 12 13 14

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 48
On-line CPU(s) list: 0-47

(Continued on next page)
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- **Test Date:** Jul-2019
- **Hardware Availability:** Jun-2019
- **Software Availability:** Aug-2019

## Platform Notes (Continued)

- **Thread(s) per core:** 2
- **Core(s) per socket:** 12
- **Socket(s):** 2
- **NUMA node(s):** 4
- **Vendor ID:** GenuineIntel
- **CPU family:** 6
- **Model:** 85
- **Model name:** Intel(R) Xeon(R) Gold 6226 CPU @ 2.70GHz
- **Stepping:** 7
- **CPU MHz:** 2137.467
- **BogoMIPS:** 5400.00
- **Virtualization:** VT-x
- **L1d cache:** 32K
- **L1i cache:** 32K
- **L2 cache:** 1024K
- **L3 cache:** 19712K
- **NUMA node0 CPU(s):** 0,4,8,12,16,20,24,28,32,36,40,44
- **NUMA node1 CPU(s):** 1,5,9,13,17,21,25,29,33,37,41,45
- **NUMA node2 CPU(s):** 2,6,10,14,18,22,26,30,34,38,42,46
- **NUMA node3 CPU(s):** 3,7,11,15,19,23,27,31,35,39,43,47
- **Flags:** fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov
- **/proc/cpuinfo cache data**
  - **cache size:** 19712 KB

```
#define COLUMNS 3
#define COLUMNS2 4

rm=
```

## Platform Notes (Continued)

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

<table>
<thead>
<tr>
<th>available:</th>
<th>4 nodes (0-3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>node 0 cpus:</td>
<td>0 4 8 12 16 20 24 28 32 36 40 44</td>
</tr>
<tr>
<td>node 0 size:</td>
<td>95148 MB</td>
</tr>
<tr>
<td>node 0 free:</td>
<td>94687 MB</td>
</tr>
<tr>
<td>node 1 cpus:</td>
<td>1 5 9 13 17 21 25 29 33 37 41 45</td>
</tr>
<tr>
<td>node 1 size:</td>
<td>96765 MB</td>
</tr>
<tr>
<td>node 1 free:</td>
<td>96229 MB</td>
</tr>
<tr>
<td>node 2 cpus:</td>
<td>2 6 10 14 18 22 26 30 34 38 42 46</td>
</tr>
<tr>
<td>node 2 size:</td>
<td>96744 MB</td>
</tr>
</tbody>
</table>

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

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PowerEdge MX740c (Intel Xeon Gold 6226, 2.70GHz)

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Platform Notes (Continued)

node 2 free: 96184 MB
node 3 cpus: 3 7 11 15 19 23 27 31 35 39 43 47
node 3 size: 96764 MB
node 3 free: 96344 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: 394673364 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 4.15.0-58-generic #64-Ubuntu SMP Tue Aug 6 11:12:41 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: usercopy/swapgs barriers and __user
pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Enhanced IBRS, IBPB: conditional, RSB
filling

run-level 3 Nov 18 20:54

SPEC is set to: /home/cpu2017
Filesystem Type Size Used Avail Use% Mounted on

(Continued on next page)
SPECCPU®2017 Floating Point Rate Result

Dell Inc.

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Platform Notes (Continued)

/dev/sda2 ext4 439G 32G 385G 8% /

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. 2.3.10 08/15/2019

Memory:
1x 002C0632002C 36ASF4G72P2-3G2E2 32 GB 2 rank 3200, configured at 2933
10x 00AD00B300AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933
1x 00AD063200AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933
12x Not Specified Not Specified

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
C | 519.lbm_r(base, peak) 538.imagick_r(base, peak)
   | 544.nab_r(base, peak)
==============================================================================
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------

==============================================================================
C++ | 508.namd_r(base, peak) 510.parest_r(base, peak)
------------------------------------------------------------------------------
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------

==============================================================================
C++, C | 511.povray_r(base, peak) 526.blender_r(base, peak)
------------------------------------------------------------------------------
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
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------------------------------------------------------------------------------

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Compiler Version Notes (Continued)

C++, C, Fortran | 507.cactuBSSN_r(base, peak)

Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
64, Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

Fortran | 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak)
554.roms_r(base, peak)

Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
64, Version 19.0.4.227 Build 20190416
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Fortran, C | 521.wrf_r(base, peak) 527.cam4_r(base, peak)

Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
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Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
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---

Base Compiler Invocation

C benchmarks:
icc -m64 -std=c11

C++ benchmarks:
icpc -m64

Fortran benchmarks:
ifort -m64

Benchmarks using both Fortran and C:
ifort -m64 icc -m64 -std=c11

(Continued on next page)
Base Compiler Invocation (Continued)

Benchmarks using both C and C++:
```
icpc -m64 icc -m64 -std=c11
```

Benchmarks using Fortran, C, and C++:
```
icpc -m64 icc -m64 -std=c11 ifort -m64
```

Base Portability Flags

503.bwaves_r: -DSPEC_LP64
507.cactuBSSN_r: -DSPEC_LP64
508.namd_r: -DSPEC_LP64
510.parest_r: -DSPEC_LP64
511.povray_r: -DSPEC_LP64
519.lbm_r: -DSPEC_LP64
521.wrf_r: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
526.blender_r: -DSPEC_LP64 -DSPEC_LP64 -DSPEC_LINUX -funsigned-char
527.cam4_r: -DSPEC_LP64 -DSPEC_CASE_FLAG
538.imagick_r: -DSPEC_LP64
544.nab_r: -DSPEC_LP64
549.fotonik3d_r: -DSPEC_LP64
554.roms_r: -DSPEC_LP64

Base Optimization Flags

C benchmarks:
```
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4
```

C++ benchmarks:
```
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4
```

Fortran benchmarks:
```
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs
-align array32byte
```

Benchmarks using both Fortran and C:
```
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs
```

(Continued on next page)
Dell Inc.  
PowerEdge MX740c (Intel Xeon Gold 6226, 2.70GHz)  

Test Sponsor: Dell Inc.  
Hardware Availability: Jun-2019  
Test Date: Jul-2019  
Software Availability: Aug-2019  

Base Optimization Flags (Continued)

Benchmarks using both Fortran and C (continued):
- -align array32byte

Benchmarks using both C and C++:
- -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
- -qopt-mem-layout-trans=4

Benchmarks using Fortran, C, and C++:
- -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
- -qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs
- -align array32byte

Peak Compiler Invocation

C benchmarks:
icc -m64 -std=c11

C++ benchmarks:
icpc -m64

Fortran benchmarks:
ifort -m64

Benchmarks using both Fortran and C:
ifort -m64 icc -m64 -std=c11

Benchmarks using both C and C++:
icpc -m64 icc -m64 -std=c11

Benchmarks using Fortran, C, and C++:
icpc -m64 icc -m64 -std=c11 ifort -m64

Peak Portability Flags

Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:

(Continued on next page)
Dell Inc.

PowerEdge MX740c (Intel Xeon Gold 6226, 2.70GHz)

Dell Inc.

Test Date: Jul-2019
Hardware Availability: Jun-2019
Software Availability: Aug-2019

**Peak Optimization Flags (Continued)**

519.lbm_r: -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

538.imagick_r: -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4

544.nab_r: Same as 538.imagick_r

C++ benchmarks:

508.namd_r: -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

510.parest_r: -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4

Fortran benchmarks:

503.bwaves_r: -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -auto
-nostandard-realloc-lhs -align array32byte

549.fotonik3d_r: Same as 503.bwaves_r

554.roms_r: -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 -auto -nostandard-realloc-lhs
-align array32byte

Benchmarks using both Fortran and C:

511.povray_r: -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 -auto -nostandard-realloc-lhs
-align array32byte

Benchmarks using both C and C++:

526.blender_r: -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4

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

### Dell Inc.

**PowerEdge MX740c (Intel Xeon Gold 6226, 2.70GHz)**

<table>
<thead>
<tr>
<th>SPECrate®2017_fp_base</th>
<th>SPECrate®2017_fp_peak</th>
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</thead>
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<tr>
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<td>172</td>
</tr>
</tbody>
</table>

- **CPU2017 License:** 55
- **Test Sponsor:** Dell Inc.
- **Tested by:** Dell Inc.
- **Test Date:** Jul-2019
- **Hardware Availability:** Jun-2019
- **Software Availability:** Aug-2019

### Peak Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++:
- `-xCORE-AVX2` `-ipo` `-O3` `-no-prec-div` `-qopt-prefetch` `-ffinite-math-only`
- `-qopt-mem-layout-trans=4` `-auto` `-nostandard-realloc-lhs`
- `-align array32byte`

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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