Dell Inc. PowerEdge R740xd (Intel Xeon Gold 6226, 2.70GHz)

<table>
<thead>
<tr>
<th>SPECspeed2017_fp_base</th>
<th>110</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECspeed2017_fp_peak</td>
<td>112</td>
</tr>
</tbody>
</table>

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

**Threads**

| 603.bwaves_s | 24 | 114 |
| 607.cactuBSSN_s | 24 | 113 |
| 619.lbm_s | 24 | 109 |
| 621.wrf_s | 24 | 117 |
| 627.cam4_s | 24 | 117 |
| 628.pop2_s | 24 | 117 |
| 638.imagick_s | 24 | 117 |
| 644.nab_s | 24 | 117 |
| 649.fotonik3d_s | 24 | 117 |
| 654.roms_s | 24 | 117 |

**Hardware**

- CPU Name: Intel Xeon Gold 6226
- Max MHz.: 3700
- Nominal: 2700
- Enabled: 24 cores, 2 chips
- 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 core
- Other: None
- Memory: 384 GB (12 x 32 GB 2Rx4 PC4-2933Y-R)
- Storage: 1 x 960 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: Yes
- Firmware: Version 2.2.11 released Jun-2019
- File System: ext4
- System State: Run level 5 (multi-user)
- Base Pointers: 64-bit
- Peak Pointers: 64-bit
- Other: None
SPEC CPU2017 Floating Point Speed Result

Dell Inc.

PowerEdge R740xd (Intel Xeon Gold 6226, 2.70GHz)

Copyright 2017-2019 Standard Performance Evaluation Corporation

SPECspeed2017_fp_peak = 112
SPECspeed2017_fp_base = 110

Results Table

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<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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<tr>
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<tr>
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<td>60.5</td>
<td>86.6</td>
<td>60.2</td>
<td>87.0</td>
<td>60.3</td>
<td>86.9</td>
<td>24</td>
<td>60.3</td>
<td>86.9</td>
<td>60.2</td>
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<td>60.1</td>
<td>87.2</td>
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<tr>
<td>628.pop2_s</td>
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<tr>
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<tr>
<td>644.nab_s</td>
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<tr>
<td>649.fotonik3d_s</td>
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<td>115</td>
<td>79.3</td>
<td>116</td>
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<td>78.8</td>
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<tr>
<td>654.roms_s</td>
<td>24</td>
<td>142</td>
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<td>142</td>
<td>111</td>
<td>141</td>
<td>112</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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:
- KMP_AFFINITY = "granularity=fine,compact"
- LD_LIBRARY_PATH = "/home/cpu2017/lib/intel64"
- OMP_STACKSIZE = "192M"

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

Platform Notes

BIOS settings:
- ADDDC setting disabled
- Virtualization Technology disabled
- DCU Streamer Prefetcher disabled

(Continued on next page)
Dell Inc.

PowerEdge R740xd (Intel Xeon Gold 6226, 2.70GHz)

<table>
<thead>
<tr>
<th>SPECspeed2017_fp_base = 110</th>
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<td>SPECspeed2017_fp_peak = 112</td>
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CPU2017 License: 55
Test Sponsor: Dell Inc.
Tested by: Dell Inc.

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

Platform Notes (Continued)

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 Fri Jul 19 16:23:01 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)
 24 "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 : 12
physical 0: cores 0 1 2 3 4 5 6 8 10 11 12 14
physical 1: cores 1 2 3 4 5 6 8 9 10 11 12 13
```

From lscpu:

```
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 24
On-line CPU(s) list: 0-23
Thread(s) per core: 1
Core(s) per socket: 12
Socket(s): 2
NUMA node(s): 2
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Gold 6226 CPU @ 2.70GHz
Stepping: 7
CPU MHz: 2398.271
BogoMIPS: 5400.00
Virtualization: VT-x
```

(Continued on next page)
Dell Inc.  
PowerEdge R740xd (Intel Xeon Gold 6226, 2.70GHz)  

**SPEC CPU2017 Floating Point Speed Result**

**Dell Inc.**

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

**SPECspeed2017_fp_base = 110**

**SPECspeed2017_fp_peak = 112**

**Test Date:** Jul-2019  
**Hardware Availability:** Jun-2019  
**Software Availability:** May-2019

---

**Platform Notes (Continued)**

```
L1d cache:   32K
L1i cache:   32K
L2 cache:    1024K
L3 cache:    19712K
NUMA node0 CPU(s):   0,2,4,6,8,10,12,14,16,18,20,22
NUMA node1 CPU(s):   1,3,5,7,9,11,13,15,17,19,21,23
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
             xtrf pdcm pcid dca sse4_1 sse4_2 x2apic movbe popcnt aes xsave avx f16c rdrand
             lahf_lm abm 3dnowprefetch cpuid_fault epb cat_l3 cdp l3invvd_single intel_pme
             ssbd mba ibpb ibrs ibrs_enhanced tpr_shadow vnmi flexpriority ept vpid
             fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2  invpcid rtm cmp mpx rdrr_a avx512f
             avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd avx512bw avx512vl
             xsaveopt xsavec xsavec llc cqm_occup_llc cqm_mbb_total cqm_mbb_local
             dtherm ida arat pku ospke avx512_vnni flush_lld arch_capabilities

/proc/cpuinfo cache data
  cache size : 19712 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
  node 0 size:  191916 MB
  node 0 free: 188625 MB
  node 1 cpus: 1 3 5 7 9 11 13 15 17 19 21 23
  node 1 size: 193512 MB
  node 1 free: 188891 MB
  node distances:
    node 0 1
    0: 10 21
    1: 21 10

From /proc/meminfo
  MemTotal:  394678648 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"
```

(Continued on next page)
Dell Inc. PowerEdge R740xd (Intel Xeon Gold 6226, 2.70GHz)

SPECspeed2017_fp_base = 110
SPECspeed2017_fp_peak = 112

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

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

Platform Notes (Continued)

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 4.15.0-45-generic #48-Ubuntu SMP Tue Jan 29 16:28:13 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 Jul 19 11:13

SPEC is set to: /home/cpu2017

Filesystem Type Size Used Avail Use% Mounted on
/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. 2.2.11 06/13/2019
Memory:
  12x 00AD00B300AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933
  12x Not Specified Not Specified

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
CC  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 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
==============================================================================

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

FC 607.cactuBSSN_s(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.

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

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.

FC 603.bwaves_s(peak) 649.fotonik3d_s(peak)

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.

CC 621.wrf_s(base) 627.cam4_s(base, peak) 628.pop2_s(base)

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.
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.

CC 621.wrf_s(peak) 628.pop2_s(peak)

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.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Dell Inc.
PowerEdge R740xd (Intel Xeon Gold 6226, 2.70GHz)

SPECspeed2017_fp_base = 110
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CPU2017 License: 55
Test Sponsor: Dell Inc.
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Test Date: Jul-2019
Hardware Availability: Jun-2019
Software Availability: May-2019

Compiler Version Notes (Continued)

Version 19.0.4.227 Build 20190416
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Base Compiler Invocation

C benchmarks:
icc -m64 -std=c11

Fortran benchmarks:
ifort -m64

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

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

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:
-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP

Fortran benchmarks:
-DSPEC_OPENMP -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp

(Continued on next page)
Dell Inc.

PowerEdge R740xd (Intel Xeon Gold 6226, 2.70GHz)

SPEC CPU2017 Floating Point Speed Result

Copyright 2017-2019 Standard Performance Evaluation Corporation

SPECspeed2017_fp_base = 110
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CPU2017 License: 55
Test Sponsor: Dell Inc.
Test Date: Jul-2019
Tested by: Dell Inc.
Hardware Availability: Jun-2019
Software Availability: May-2019

---

Base Optimization Flags (Continued)

Fortran benchmarks (continued):
- nostandard-realloc-lhs

Benchmarks using both Fortran and C:
-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
-nostandard-realloc-lhs

Benchmarks using Fortran, C, and C++:
-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
-nostandard-realloc-lhs

---

Peak Compiler Invocation

C benchmarks:
icc -m64 -std=c11

Fortran benchmarks:
ifort -m64

Benchmarks using both Fortran and C:
ifort -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:
-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP

Fortran benchmarks:

---

(Continued on next page)
SPEC CPU2017 Floating Point Speed Result

Dell Inc.
PowerEdge R740xd (Intel Xeon Gold 6226, 2.70GHz)

SPECspeed2017_fp_base = 110
SPECspeed2017_fp_peak = 112

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

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

Peak Optimization Flags (Continued)

603.bwaves_s: -prof-gen(pass 1) -prof-use(pass 2) -DSPEC_SUPPRESS_OPENMP
-DSPEC_OPENMP -02 -xCORE-AVX512 -qopt-prefetch -ipo -O3
-ffinite-math-only -no-prec-div -qopt-mem-layout-trans=4
-qopenmp -nstandard-realloc-lhs

649.fotonik3d_s: Same as 603.bwaves_s

654.roms_s: -DSPEC_OPENMP -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4
-qopenmp -nstandard-realloc-lhs

Benchmarks using both Fortran and C:

621.wrf_s: -prof-gen(pass 1) -prof-use(pass 2) -02 -xCORE-AVX512
-qopt-prefetch -ipo -O3 -ffinite-math-only -no-prec-div
-qopt-mem-layout-trans=4 -DSPEC_SUPPRESS_OPENMP -qopenmp
-DSPEC_OPENMP -nstandard-realloc-lhs

627.cam4_s: -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp
-DSPEC_OPENMP -nstandard-realloc-lhs

628.pop2_s: Same as 621.wrf_s

Benchmarks using Fortran, C, and C++:
-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
-nstandard-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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