### Dell Inc.  
PowerEdge C6420 (Intel Xeon Platinum 8176, 2.10 GHz)  

<table>
<thead>
<tr>
<th>Thread</th>
<th>SPECspeed2017_fp_base</th>
<th>SPECspeed2017_fp_peak</th>
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<tbody>
<tr>
<td>603.bwaves_s</td>
<td>56</td>
<td>346</td>
</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td>56</td>
<td>393</td>
</tr>
<tr>
<td>619.lbm_s</td>
<td>56</td>
<td>393</td>
</tr>
<tr>
<td>621.wrf_s</td>
<td>56</td>
<td>393</td>
</tr>
<tr>
<td>627.cam4_s</td>
<td>56</td>
<td>393</td>
</tr>
<tr>
<td>628.pop2_s</td>
<td>56</td>
<td>393</td>
</tr>
<tr>
<td>638.imagick_s</td>
<td>56</td>
<td>393</td>
</tr>
<tr>
<td>644.nab_s</td>
<td>56</td>
<td>393</td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>56</td>
<td>393</td>
</tr>
<tr>
<td>654.roms_s</td>
<td>56</td>
<td>393</td>
</tr>
</tbody>
</table>

#### Hardware

- **CPU Name:** Intel Xeon Platinum 8176  
- **Max MHz:** 3800  
- **Nominal:** 2100  
- **Enabled:** 56 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:** 38.5 MB I+D on chip per chip  
- **Other:** None  
- **Memory:** 192 GB (12 x 16 GB 2Rx8 PC4-2666V-R)  
- **Storage:** 1 TB SATA SSD  
- **Other:** None

#### Software

- **OS:** SUSE Linux Enterprise Server 12 SP3 (x86_64)  
- **Compiler:** C/C++: Version 18.0.0.128 of Intel C/C++ Compiler for Linux; Fortran: Version 18.0.0.128 of Intel Fortran Compiler for Linux  
- **Parallel:** Yes  
- **Firmware:** Version 1.3.7 released Feb-2018  
- **File System:** btrfs  
- **System State:** Run level 3 (multi-user)  
- **Base Pointers:** 64-bit  
- **Peak Pointers:** 64-bit  
- **Other:** None
SPEC CPU2017 Floating Point Speed Result

Dell Inc.
PowerEdge C6420 (Intel Xeon Platinum 8176, 2.10 GHz)

SPECspeed2017_fp_base = 104
SPECspeed2017_fp_peak = 110

Results Table

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<th>Seconds</th>
<th>Ratio</th>
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<th>Seconds</th>
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<td>167</td>
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<td>97.1</td>
<td>102</td>
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<td>87.2</td>
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<td>140</td>
</tr>
</tbody>
</table>

SPECspeed2017_fp_base = 104
SPECspeed2017_fp_peak = 110

Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

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"
OMP_STACKSIZE = "192M"

Binaries compiled on a system with 1x Intel Core i7-4790 CPU + 32GB RAM memory using Redhat Enterprise Linux 7.4
Yes: 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:
Sub NUMA Cluster disabled
Virtualization Technology disabled

(Continued on next page)
Dell Inc.  
PowerEdge C6420 (Intel Xeon Platinum 8176, 2.10 GHz)  

| SPECspeed2017_fp_base | 104 | Dell Inc. |
| SPECspeed2017_fp_peak | 110 | Dell Inc. |
| CPU2017 License | 55 | Test Date | Feb-2018 |
| Test Sponsor | Dell Inc. | Hardware Availability | Sep-2017 |
| Tested by | Dell Inc. | Software Availability | Sep-2017 |

Platform Notes (Continued)

System Profile set to Custom  
CPU Performance set to Maximum Performance  
C States set to Autonomous  
C1EE 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 /root/cpu2017/bin/sysinfo  
Rev: r5797 of 2017-06-14 96c45e4568ad54c135fd618bcc091c0f  
runtime on linux-vfov Fri Feb 23 00:37:56 2018

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) Platinum 8176 CPU @ 2.10GHz  
    2 "physical id"s (chips)  
      56 "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 : 28  
      siblings : 28  
      physical 0: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27 28 29 30  
      physical 1: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27 28 29 30

From lscpu:  
    Architecture: x86_64  
    CPU op-mode(s): 32-bit, 64-bit  
    Byte Order: Little Endian  
    CPU(s): 56  
    On-line CPU(s) list: 0-55  
    Thread(s) per core: 1  
    Core(s) per socket: 28  
    Socket(s): 2  
    NUMA node(s): 2  
    Vendor ID: GenuineIntel  
    CPU family: 6  
    Model: 85  
    Model name: Intel(R) Xeon(R) Platinum 8176 CPU @ 2.10GHz  
    Stepping: 4  
    CPU MHz: 2095.070

(Continued on next page)
## Dell Inc.

**PowerEdge C6420 (Intel Xeon Platinum 8176, 2.10 GHz)**

### SPEC CPU2017 Floating Point Speed Result

<table>
<thead>
<tr>
<th>SPECspeed2017 fp_base</th>
<th>SPECspeed2017 fp_peak</th>
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<tbody>
<tr>
<td>104</td>
<td>110</td>
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</table>

**CPU2017 License:** 55  
**Test Sponsor:** Dell Inc.  
**Tested by:** Dell Inc.  
**Test Date:** Feb-2018  
**Hardware Availability:** Sep-2017  
**Software Availability:** Sep-2017

### Platform Notes (Continued)

- **BogoMIPS:** 4190.14
- **Virtualization:** VT-x
- **L1d cache:** 32K
- **L1i cache:** 32K
- **L2 cache:** 1024K
- **L3 cache:** 39424K

**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

**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

**Flags:**
- fpu, vme, de, pse, tsc, mtrr, 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, rdtsscp, lm, constant_tsc, arch_perfmon, pebs, bts, rep_good, nopl, xtopology, nonstop_tsc, aperfmperf, eagerfpu, pni, pclmulqdq, dtes64, monitor, ds_cpl, vmx, smx, est, tm2, ssse3, sdbg, fma, cx16, xtpr, pdcm, pcid, dca, sse4_1, mcache, sse4_2, x2apic, movbe, popcnt, tsc_deadline_timer, aes, xsave, avx, f16c, rdrand, lahf_lm, abm, 3dnowprefetch, ida, arat, epb, invpcid_single, pln, ptx, dtherm, intel_pt, rsb, ctxsw, spec_ctrl, retpoline, kaiser, tpr_shadow, vnmi, flexpriority, ept, vpid, fsbase, tsc_adjust, bmi1, hle, avx2, smep, bmi2, erms, invpcid, rtm, cmp, mx, avx512f, avx512dq, rdseed, adx, smap, clflushopt, clwb, avx512cd, avx512bw, avx512vl, xsaveopt, xsavec, xgetbv1, cqm, l1c, cqm, occup, l1c, pku, ospke

From `/proc/cpuinfo`

```
cache size : 39424 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
node 0 size: 95352 MB
node 0 free: 91563 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
node 1 size: 96747 MB
node 1 free: 92551 MB
node distances:
  node 0 1
  0: 10 21
  1:  21 10
```

From `/proc/meminfo`

```
MemTotal:       196710048 kB
HugePages_Total:       0
Hugepagesize:       2048 kB
```

From `/etc/*release*` `/etc/*version*`

```
SuSE-release:
```

(Continued on next page)
Dell Inc.  
PowerEdge C6420 (Intel Xeon Platinum 8176, 2.10 GHz)  

<table>
<thead>
<tr>
<th>SPECspeed2017_fp_base = 104</th>
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CPU2017 License: 55
Test Sponsor: Dell Inc.
Tested by: Dell Inc.

Test Date: Feb-2018
Hardware Availability: Sep-2017
Software Availability: Sep-2017

Platform Notes (Continued)

    SUSE Linux Enterprise Server 12 (x86_64)
    VERSION = 12
    PATCHLEVEL = 3
    # This file is deprecated and will be removed in a future service pack or release.
    # Please check /etc/os-release for details about this release.
    os-release:
        NAME="SLES"
        VERSION="12-SP3"
        VERSION_ID="12.3"
        PRETTY_NAME="SUSE Linux Enterprise Server 12 SP3"
        ID="sles"
        ANSI_COLOR="0;32"
        CPE_NAME="cpe:/o:suse:sles:12:sp3"

    uname -a:
        Linux linux-vfov 4.4.114-94.11-default #1 SMP Thu Feb 1 19:28:26 UTC 2018 (4309ff9)
        x86_64 x86_64 x86_64 GNU/Linux

    run-level 3 Feb 22 16:40

    SPEC is set to: /root/cpu2017
    Filesystem     Type    Size  Used Avail Use% Mounted on
    /dev/sda2      btrfs    928G  31G  897G   4% /

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. 1.3.7 02/09/2018
    Memory:
    6x 002C00B3002C 18ASF2G72PDZ-2G6D1 16 GB 2 rank 2666
    6x 00AD00B300AD HMA82GR7AFR8N-VK 16 GB 2 rank 2666
    4x Not Specified Not Specified

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
 CC  619.lbm_s(base) 638.imagick_s(base, peak) 644.nab_s(base, peak)
==============================================================================
 icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
==============================================================================

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

Dell Inc.
PowerEdge C6420 (Intel Xeon Platinum 8176, 2.10 GHz)

SPECspeed2017_fp_base = 104
SPECspeed2017_fp_peak = 110

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

Compiler Version Notes (Continued)

CC  619.lbm_s(peak)

icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.

------------------------------------------------------------------------------
FC  607.cactuBSSN_s(base)

icpc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
ifort (IFORT) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.

------------------------------------------------------------------------------
==============================================================================
FC   607.cactuBSSN_s(peak)

icpc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
ifort (IFORT) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.

------------------------------------------------------------------------------
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FC  603.bwaves_s(base) 649.fotonik3d_s(base) 654.roms_s(base)

ifort (IFORT) 18.0.0 20170811
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------------------------------------------------------------------------------
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ifort (IFORT) 18.0.0 20170811
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------------------------------------------------------------------------------
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(Continued on next page)
Dell Inc.
PowerEdge C6420 (Intel Xeon Platinum 8176, 2.10 GHz)

SPEC CPU2017 Floating Point Speed Result

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

Test Date: Feb-2018
Hardware Availability: Sep-2017
Software Availability: Sep-2017

Compiler Version Notes (Continued)

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ifort (IFORT) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.

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

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 -03`  
- `-no-prec-div`  
- `-qopt-prefetch`  
- `-ffinite-math-only`  
- `-qopt-mem-layout-trans=3`  
- `-qopenmp`  
- `-DSPEC_OPENMP`

Fortran benchmarks:
- `-DSPEC_OPENMP`  
- `-xCORE-AVX512`  
- `-ipo -03`  
- `-no-prec-div`  
- `-qopt-prefetch`  
- `-ffinite-math-only`  
- `-qopt-mem-layout-trans=3`  
- `-qopenmp`  
- `-nostandard-realloc-lhs`  
- `-align array32byte`

Benchmarks using both Fortran and C:
- `-xCORE-AVX512`  
- `-ipo -03`  
- `-no-prec-div`  
- `-qopt-prefetch`  
- `-ffinite-math-only`  
- `-qopt-mem-layout-trans=3`  
- `-qopenmp`  
- `-DSPEC_OPENMP`  
- `-nostandard-realloc-lhs`  
- `-align array32byte`

Benchmarks using Fortran, C, and C++:
- `-xCORE-AVX512`  
- `-ipo -03`  
- `-no-prec-div`  
- `-qopt-prefetch`  
- `-ffinite-math-only`  
- `-qopt-mem-layout-trans=3`  
- `-qopenmp`  
- `-DSPEC_OPENMP`  
- `-nostandard-realloc-lhs`  
- `-align array32byte`

**Base Other Flags**

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

Fortran benchmarks:
- `-m64`

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

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

**Peak Compiler Invocation**

C benchmarks:
- `icc`

Fortran benchmarks:
- `ifort`

(Continued on next page)
Dell Inc.  
PowerEdge C6420 (Intel Xeon Platinum 8176, 2.10 GHz)  

<table>
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<tr>
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**CPU2017 License:** 55 
**Test Sponsor:** Dell Inc. 
**Tested by:** Dell Inc. 
**Test Date:** Feb-2018 
**Hardware Availability:** Sep-2017 
**Software Availability:** Sep-2017 

**Peak Compiler Invocation (Continued)**

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: -prof-gen(pass 1) -prof-use(pass 2) -O2 -xCORE-AVX512
-qopt-prefetch -ipo -O3 -ffinite-math-only -no-prec-div
-qopt-mem-layout-trans=3 -DSPEC_SUPPRESS_OPENMP -qopenmp
-DSPEC_OPENMP
```

```
638.imagick_s: -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=3 -qopenmp
-DSPEC_OPENMP
```

```
644.nab_s: Same as 638.imagick_s
```

Fortran benchmarks:

```
-prof-gen(pass 1) -prof-use(pass 2) -DSPEC_SUPPRESS_OPENMP
-DSPEC_OPENMP -O2 -xCORE-AVX512 -qopt-prefetch -ipo -O3
-ffinite-math-only -no-prec-div -qopt-mem-layout-trans=3 -qopenmp
-nostandard-realloc-lhs -align array32byte
```

Benchmarks using both Fortran and C:

```
621.wrf_s: -prof-gen(pass 1) -prof-use(pass 2) -O2 -xCORE-AVX512
-qopt-prefetch -ipo -O3 -ffinite-math-only -no-prec-div
-qopt-mem-layout-trans=3 -DSPEC_SUPPRESS_OPENMP -qopenmp
-DSPEC_OPENMP -nostandard-realloc-lhs -align array32byte
```

```
627.cam4_s: -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=3 -qopenmp
-DSPEC_OPENMP -nostandard-realloc-lhs -align array32byte
```

(Continued on next page)
Dell Inc.  
PowerEdge C6420 (Intel Xeon Platinum 8176, 2.10 GHz)  

SPECspeed2017_fp_base = 104  
SPECspeed2017_fp_peak = 110

CPU2017 License: 55  
Test Sponsor: Dell Inc.  
Tested by: Dell Inc.  
Test Date: Feb-2018  
Hardware Availability: Sep-2017  
Software Availability: Sep-2017

Peak Optimization Flags (Continued)

628.pop2_s: Same as 621.wrf_s

Benchmarks using Fortran, C, and C++:
-prof-gen(pass 1) -prof-use(pass 2) -O2 -xCORE-AVX512 -qopt-prefetch
-ipo -O3 -ffinite-math-only -no-prec-div -qopt-mem-layout-trans=3
-DSPEC_SUPPRESS_OPENMP -qopenmp -DSPEC_OPENMP -nostandard-realloc-lhs
-align array32byte

Peak Other Flags

C benchmarks:
-m64 -std=c11

Fortran benchmarks:
-m64

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

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

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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Tested with SPEC CPU2017 v1.0.2 on 2018-02-23 01:37:55-0500.
Report generated on 2018-10-31 17:08:33 by CPU2017 PDF formatter v6067.
Originally published on 2018-03-20.