## SPEC® CPU2017 Floating Point Speed Result

**Dell Inc.**

PowerEdge M640 (Intel Xeon Platinum 8176, 2.10 GHz)

<table>
<thead>
<tr>
<th>Threads</th>
<th>SPECspeed2017_fp_base</th>
<th>SPECspeed2017_fp_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-20.0</td>
<td>112</td>
<td>159</td>
</tr>
<tr>
<td>20.0-40.0</td>
<td>112</td>
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<tr>
<td>40.0-60.0</td>
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<tr>
<td>60.0-80.0</td>
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<tr>
<td>80.0-100</td>
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<tr>
<td>100-120</td>
<td>112</td>
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<tr>
<td>120-140</td>
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<td>159</td>
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<tr>
<td>140-160</td>
<td>112</td>
<td>159</td>
</tr>
<tr>
<td>160-180</td>
<td>112</td>
<td>159</td>
</tr>
<tr>
<td>180-200</td>
<td>112</td>
<td>159</td>
</tr>
<tr>
<td>200-220</td>
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<td>159</td>
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<tr>
<td>220-240</td>
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<td>159</td>
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<td>240-260</td>
<td>112</td>
<td>159</td>
</tr>
<tr>
<td>260-280</td>
<td>112</td>
<td>159</td>
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<tr>
<td>280-300</td>
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<td>300-320</td>
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<td>380-400</td>
<td>112</td>
<td>159</td>
</tr>
<tr>
<td>400-440</td>
<td>112</td>
<td>159</td>
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</table>

### Software

**OS:** SUSE Linux Enterprise Server 12 SP3 (x86_64) 4.4.114-94.11-default

**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

### Hardware

**CPU Name:** Intel Xeon Platinum 8176

**Max MHz.:** 3800

**Nominal:** 2100

**Enabled:** 56 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:** 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

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SPECspeed2017_fp_base = 117
SPECspeed2017_fp_peak = 118

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

Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Base</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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<tbody>
<tr>
<td>603.bwaves_s</td>
<td>112</td>
<td>136</td>
<td>433</td>
<td>134</td>
<td>439</td>
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<td>428</td>
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<td>607.cactuBSSN_s</td>
<td>112</td>
<td>104</td>
<td>160</td>
<td>105</td>
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<td>105</td>
<td>158</td>
<td>112</td>
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<tr>
<td>619.ibm_s</td>
<td>112</td>
<td>129</td>
<td>40.6</td>
<td>130</td>
<td>40.4</td>
<td>129</td>
<td>40.6</td>
<td>112</td>
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<td>621.wrf_s</td>
<td>112</td>
<td>173</td>
<td>76.6</td>
<td>172</td>
<td>76.8</td>
<td>172</td>
<td>77.1</td>
<td>112</td>
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<tr>
<td>627.cam4_s</td>
<td>112</td>
<td>81.9</td>
<td>108</td>
<td>79.8</td>
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<td>628.pop2_s</td>
<td>112</td>
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<td>58.2</td>
<td>202</td>
<td>58.9</td>
<td>202</td>
<td>58.9</td>
<td>112</td>
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<tr>
<td>638.imagick_s</td>
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<td>133</td>
<td>109</td>
<td>133</td>
<td>112</td>
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<tr>
<td>644.nab_s</td>
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<td>66.4</td>
<td>263</td>
<td>66.4</td>
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<tr>
<td>649.fotonik3d_s</td>
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<td>119</td>
<td>132</td>
<td>119</td>
<td>133</td>
<td>112</td>
</tr>
</tbody>
</table>

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 M640 (Intel Xeon Platinum 8176, 2.10 GHz)

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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 enabled
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 96c45e4568ad54c135fd618bccc091c0f
running on linux-ejwa Tue Feb 27 09:28:29 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)
112 "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 : 56
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): 112
On-line CPU(s) list: 0-111
Thread(s) per core: 2
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: 2095.100

(Continued on next page)
Dell Inc.

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**Platform Notes (Continued)**

BogoMIPS: 4190.20  
Virtualization: VT-x  
L1d cache: 32K  
L1i cache: 32K  
L2 cache: 1024K  
L3 cache: 39424K  
NUMA node0 CPU(s): 0,2,4,6,8,10,12,14,16,18,20,22,24,26,28,30,32,34,36,38,40,42,44,46,48,50,52,54,56,58,60,62,64,66,68,70,72,74,76,78,80,82,84,86,88,90,92,94,96,98,100,102,104,106,108,110,112  
NUMA node1 CPU(s): 1,3,5,7,9,11,13,15,17,19,21,23,25,27,29,31,33,35,37,39,41,43,45,47,49,51,53,55,57,59,61,63,65,67,69,71,73,75,77,79,81,83,85,87,89,91,93,95,97,99,101,103,105,107,109,111  
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 arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc aperfmperf eafgerfpu pni pclmulqdq dtsg64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtpr pdcm pcid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c rdrand lahf_lm abm 3dnowprefetch ida arat epb invpcid_single pln pts dtherm intel_pt rsb_ctxsw spec_ctrl retpoline kaiser tpr_shadow vni flexpriority  
ep2 vpid fsgsbase tsc_adjust bml1 hle avx2 smep bmi2  
ems invpcid rtm cqm mpq avx512f avx512dq rdseed adx smap clflushopt clwb avx512cd avx512bw avx512vl xsaveopt xsaves xgetbv1 cqm_llc cqm_occup_llc pku ospk e  

/pro/cpupinfo cache data  

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 56 58 60 62 64 66 68 70 72 74 76 78 80 82 84 86 88 90 92 94 96 98 100 102 104 106 108 110  

node 0 size: 95343 MB  

node 0 free: 90825 KB  

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 97 99 101 103 105 107 109 111  

node 1 size: 96743 MB  

node 1 free: 93163 MB  

node distances:  

node 0 1  

0: 10 21  

1: 21 10  

From /proc/meminfo  

MemTotal: 196696764 kB  

HugePages_Total: 0  

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Dell Inc.  
PowerEdge M640 (Intel Xeon Platinum 8176, 2.10 GHz)  

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</tbody>
</table>

**Platform Notes (Continued)**

Hugepagesize: 2048 kB

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

SuSE-release:

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-ejwa 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 27 04:36

SPEC is set to: /root/cpu2017

<table>
<thead>
<tr>
<th>Filesystem</th>
<th>Type</th>
<th>Size</th>
<th>Used</th>
<th>Avail</th>
<th>Use%</th>
<th>Mounted on</th>
</tr>
</thead>
<tbody>
<tr>
<td>/dev/sda3</td>
<td>btrfs</td>
<td>855G</td>
<td>42G</td>
<td>814G</td>
<td>5%</td>
<td>/</td>
</tr>
</tbody>
</table>

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:

3x 002C00B3002C 18ASF2G72PDZ-2G6D1 16 GB 2 rank 2666

9x 00AD00B3000AD HMA82GR7AF8N-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

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**PowerEdge M640 (Intel Xeon Platinum 8176, 2.10 GHz)**

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**Software Availability:** Sep-2017

### Compiler Version Notes (Continued)

Copyright (C) 1985-2017 Intel Corporation. All rights reserved.

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**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.

---

**FC** 607.cactuBSSN_s (peak)

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

---

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

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

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icc (ICC) 18.0.0 20170811
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icc (ICC) 18.0.0 20170811
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------------------------------------------------------------------------------
CC   621.wrf_s(peak) 628.pop2_s(peak)
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------------------------------------------------------------------------------

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 byte-recl
638.imagick_s: -DSPEC_LP64
644.nab_s: -DSPEC_LP64
649.fotonik3d_s: -DSPEC_LP64

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Base Portability Flags (Continued)

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=3 -qopenmp -DSPEC_OPENMP

Fortran benchmarks:
-DSPEC_OPENMP -xCORE-AVX512 -ipo -O3 -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 -O3 -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 -O3 -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
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### Peak 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`

### 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`


- **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`

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Peak Optimization Flags (Continued)

621.wrf_s (continued):
-DSPEC_OPENMP -nstandard-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 -nstandard-realloc-lhs -align array32byte

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_SUPERPRESS_OPENMP -qopenmp -DSPEC_OPENMP -nstandard-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 2018-02-27 10:28:29-0500.
Report generated on 2018-10-31 17:09:03 by CPU2017 PDF formatter v6067.
Originally published on 2018-03-20.