# SPEC® CPU2017 Floating Point Speed Result

Dell Inc.  
PowerEdge R940  
(Intel Xeon Platinum 8164, 2.00 GHz)  

<table>
<thead>
<tr>
<th>Test Date:</th>
<th>Oct-2017</th>
<th>Hardware Availability:</th>
<th>Jul-2017</th>
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| SPECspeed2017_fp_base = 172  | SPECspeed2017_fp_peak = 172 |

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<tr>
<th>Thread</th>
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<th>228</th>
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<tr>
<td>Thread</td>
<td>607.cactuBSSN_s</td>
<td>104</td>
<td>228</td>
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<td></td>
<td>619.lbm_s</td>
<td>104</td>
<td>82.1</td>
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</tr>
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<td>225</td>
</tr>
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<td>104</td>
<td>29.2</td>
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<td></td>
<td>649.fotonik3d_s</td>
<td>104</td>
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<tr>
<td>Thread</td>
<td>654.roms_s</td>
<td>104</td>
<td>243</td>
</tr>
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## Hardware

- **CPU Name:** Intel Xeon Platinum 8164  
- **Max MHz.:** 3700  
- **Nominal:** 2000  
- **Enabled:** 104 cores, 4 chips  
- **Orderable:** 2,4 chip  
- **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 core  
- **Other:** None  
- **Memory:** 768 GB (48 x 16 GB 2Rx8 PC4-2666V-R)  
- **Storage:** 1 x 900 GB 15K RPM SAS12  
- **Other:** None

## Software

- **OS:** SUSE Linux Enterprise Server 12 SP2  
- **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 1.1.7 released Aug-2017  
- **File System:** xfs  
- **System State:** Run level 3 (multi-user)  
- **Base Pointers:** 64-bit  
- **Peak Pointers:** 64-bit  
- **Other:** None
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### Results Table

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<tr>
<th>Benchmark</th>
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<th>Ratio</th>
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<td>72.4</td>
<td>814</td>
<td>72.5</td>
<td>813</td>
<td>72.4</td>
<td>815</td>
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<td>73.9</td>
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<tr>
<td>607.cactuBSSN_s</td>
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<td><strong>82.1</strong></td>
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<td>104</td>
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<td>82.3</td>
<td><strong>63.7</strong></td>
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<td>621.wrf_s</td>
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<td><strong>174</strong></td>
<td><strong>76.1</strong></td>
<td>178</td>
<td>74.4</td>
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<td>104</td>
<td><strong>171</strong></td>
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<td>144</td>
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<td><strong>143</strong></td>
<td>62.3</td>
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<td>104</td>
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<td>215</td>
<td>55.3</td>
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<td><strong>58.8</strong></td>
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<td>64.2</td>
<td>225</td>
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<td><strong>212</strong></td>
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<td>654.roms_s</td>
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<td>250</td>
<td>68.4</td>
<td>230</td>
<td><strong>64.8</strong></td>
<td><strong>243</strong></td>
<td>104</td>
<td><strong>60.3</strong></td>
<td><strong>261</strong></td>
<td>59.6</td>
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**SPECspeed2017_fp_base** = 172  
**SPECspeed2017_fp_peak** = 172

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"
- **LD_LIBRARY_PATH** = "/home/cpu2017/lib/ia32:/home/cpu2017/lib/intel64:/home/cpu2017/je5.0.1-32:/home/cpu2017/je5.0.1-64"
- **OMP_STACKSIZE** = "192M"

Binaries compiled on a system with 1x Intel Core i7-4790 CPU + 32GB RAM memory using Redhat Enterprise Linux 7.4

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:
- Logical Processor Disabled
- Virtualization Technology Disabled
- Sub NUMA Cluster Disabled
- System Profile set to Custom
- CPU Performance set to Maximum Performance
- C1E Disabled
- C States set to Autonomous
- Uncore Frequency set to Dynamic

(Continued on next page)
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Dell Inc.
PowerEdge R940 (Intel Xeon Platinum 8164, 2.00 GHz)

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SPECspeed2017_fp_peak = 172

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

Platform Notes (Continued)

Memory Patrol Scrub Disabled
Energy Efficiency Policy set to Performance
CPU Interconnect Bus Link Power Management Disabled
PCI ASPM L1 Link Power Management Disabled
Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r5797 of 2017-06-14 96c45e4568ad54c135fd618b0e91c0f
running on linux-92x1 Sun Oct 15 01:13:26 2017

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 8164 CPU @ 2.00GHz
4 "physical id"s (chips)
104 "processors"
core, siblings (Caution: counting these is hw and system dependent. The following
excerpts from /proc/cpuinfo might not be reliable. Use with caution.)
cpu cores: 26
siblings: 26
physical 0: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 16 17 18 19 20 21 22 24 25 26 27 28 29
physical 1: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 16 17 18 19 20 21 22 24 25 26 27 28 29
physical 2: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 16 17 18 19 20 21 22 24 25 26 27 28 29
physical 3: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 16 17 18 19 20 21 22 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): 104
On-line CPU(s) list: 0-103
Thread(s) per core: 1
Core(s) per socket: 26
Socket(s): 4
NUMA node(s): 4
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Platinum 8164 CPU @ 2.00GHz
Stepping: 4
CPU MHz: 1995.307
BogoMIPS: 3990.61
Virtualization: VT-x

(Continued on next page)
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**Platform Notes (Continued)**

```
L1d cache: 32K  
L1i cache: 32K  
L2 cache: 1024K  
L3 cache: 36608K  

NUMA node0 CPU(s):  
0,4,8,12,16,20,24,28,32,36,40,44,48,52,56,60,64,68,72,76,80,84,88,92,96,100  
NUMA node1 CPU(s):  
1,5,9,13,17,21,25,29,33,37,41,45,49,53,57,61,65,69,73,77,81,85,89,93,97,101  
NUMA node2 CPU(s):  
2,6,10,14,18,22,26,30,34,38,42,46,50,54,58,62,66,70,74,78,82,86,90,94,98,102  
NUMA node3 CPU(s):  

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 rdtsscp  
lm constant_tsc art arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc  
aperfmpref eagerfpu pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg  
fma cx16 xtpr pdcm pcid dca sse4_1_l sse4_2 x2apic movbe popcnt tsc_deadline_timer aes  
xsafe avx f16c rdrand lahf_lm abm 3dnowprefetch ida arat epb pln pts dtherm intel_pt  
tpr_shadow vni flexpriority ept vpid fsgsbase tsc_adjust bm1 lhe avx2 smep bmi2  
erms invpcid rtm cqm mpx avx512 f avx512d q rdseed adx smap clflushopt clwb avx512cd  
avx512bw avx512vl xsxvopt xsvec xgetbv1 cqm_llc cqm_occup_llc
```

```
/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: 4 nodes (0-3)  
node 0 cpus: 0 4 8 12 16 20 24 28 32 36 40 44 48 52 56 60 64 68 72 76 80 84 88 92 96  
100  
node 0 size: 192118 MB  
node 0 free: 191474 MB  
node 1 cpus: 1 5 9 13 17 21 25 29 33 37 41 45 49 53 57 61 65 69 73 77 81 85 89 93 97  
101  
node 1 size: 193521 MB  
node 1 free: 192905 MB  
node 2 cpus: 2 6 10 14 18 22 26 30 34 38 42 46 50 54 58 62 66 70 74 78 82 86 90 94 98  
102  
node 2 size: 193521 MB  
node 2 free: 192967 MB  
node 3 cpus: 3 7 11 15 19 23 27 31 35 39 43 47 51 55 59 63 67 71 75 79 83 87 91 95 99  
103  
node 3 size: 193518 MB  
node 3 free: 192926 MB  
node distances:  
node 0 1 2 3  
0: 10 21 21 21
```

(Continued on next page)
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Platform Notes (Continued)

1:  21 10 21 21
2:  21 21 10 21
3:  21 21 21 10

From /proc/meminfo
MemTotal: 791224416 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

/usr/bin/lsb_release -d
SUSE Linux Enterprise Server 12 SP2

From /etc/*release*, /etc/*version*
SuSE-release:
  SUSE Linux Enterprise Server 12 (x86_64)
  VERSION = 12
  PATCHLEVEL = 2
  # 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-SP2"
  VERSION_ID="12.2"
  PRETTY_NAME="SUSE Linux Enterprise Server 12 SP2"
  ID="sles"
  ANSI_COLOR="0;32"
  CPE_NAME="cpe:/o:suse:sles:12:sp2"

uname -a:
  Linux linux-92x1 4.4.21-69-default #1 SMP Tue Oct 25 10:58:20 UTC 2016 (9464f67)
  x86_64 x86_64 x86_64 GNU/Linux

run-level 3 Oct 14 20:15

SPEC is set to: /home/cpu2017
  Filesystem Type Size Used Avail Use% Mounted on
  /dev/sda4 xfs 796G 17G 779G 3% /home

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. 1.1.7 08/10/2017
  Memory:
    48x 00CE063200CE M393A2K43BB1-CTD 16 GB 2 rank 2666

(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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FC  607.cactuBSSN_s(base)
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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   607.cactuBSSN_s(peak)
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icc (ICC) 18.0.0 20170811  
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icc (ICC) 18.0.0 20170811  
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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.cactusBSSN_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

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**Base Portability Flags (Continued)**

- 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=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_OPENMPP

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

644.nab_s: Same as 638.imagick_s

Fortran benchmarks:

-prof-gen(pass 1) -prof-use(pass 2) -DSPEC_SUPPRESS_OPENMPP
-DSPEC_OPENMPP -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_OPENMPP -qopenmp

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

Dell Inc.
PowerEdge R940
(Intel Xeon Platinum 8164, 2.00 GHz)

SPECspeed2017_fp_base = 172
SPECspeed2017_fp_peak = 172

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

Test Date: Oct-2017
Hardware Availability: Jul-2017
Software Availability: Sep-2017

Peak Optimization Flags (Continued)

621.wrf_s (continued):
-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

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
http://www.spec.org/cpu2017/flags/Intel-ic18.0-official-linux64.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/Intel-ic18.0-official-linux64.xml

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For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

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