Dell Inc.

PowerEdge R840 (Intel Xeon Platinum 8276, 2.20GHz)

<table>
<thead>
<tr>
<th>SPECspeed2017_fp_base</th>
<th>SPECspeed2017_fp_peak</th>
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</thead>
<tbody>
<tr>
<td>189</td>
<td>185</td>
</tr>
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</table>

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

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

<table>
<thead>
<tr>
<th>Threads</th>
<th>SPECspeed2017_fp_base</th>
<th>SPECspeed2017_fp_peak</th>
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<tr>
<td>0</td>
<td>40.0</td>
<td>74.2</td>
</tr>
<tr>
<td>40.0</td>
<td>80.0</td>
<td>74.2</td>
</tr>
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<td>120.0</td>
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<td>180.0</td>
<td>210.0</td>
<td>74.2</td>
</tr>
<tr>
<td>240.0</td>
<td>300.0</td>
<td>74.2</td>
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<tr>
<td>360.0</td>
<td>450.0</td>
<td>74.2</td>
</tr>
<tr>
<td>420.0</td>
<td>510.0</td>
<td>74.2</td>
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<tr>
<td>480.0</td>
<td>570.0</td>
<td>74.2</td>
</tr>
<tr>
<td>540.0</td>
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<td>74.2</td>
</tr>
<tr>
<td>600.0</td>
<td>720.0</td>
<td>74.2</td>
</tr>
<tr>
<td>660.0</td>
<td>751.0</td>
<td>74.2</td>
</tr>
</tbody>
</table>

**Hardware**

CPU Name: Intel Xeon Platinum 8276
Max MHz.: 4000
Nominal: 2200
Enabled: 112 cores, 4 chips, 2 threads/core
Orderable: 2,4 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: 768 GB (24 x 32 GB 2Rx4 PC4-2933Y-R)
Storage: 1 x 1.6 TB NVMe SSD
Other: None

**Software**

OS: Ubuntu 18.04.2 LTS
kernel 4.15.0-45-generic
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 2.2.9 released May-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 R840 (Intel Xeon Platinum 8276, 2.20GHz)

SPECspeed2017_fp_base = 189
SPECspeed2017_fp_peak = 185

Results Table

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<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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</thead>
<tbody>
<tr>
<td>603.bwaves_s</td>
<td>224</td>
<td>79.4</td>
<td>743</td>
<td>78.6</td>
<td>751</td>
<td>78.4</td>
<td>752</td>
<td>224</td>
<td>79.5</td>
<td>742</td>
<td>87.8</td>
<td>672</td>
<td>78.4</td>
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<td>607.cactUBSSN_s</td>
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<td>199</td>
<td>84.1</td>
<td>198</td>
<td>84.7</td>
<td>197</td>
<td>224</td>
<td>84.9</td>
<td>196</td>
<td>81.8</td>
<td>204</td>
<td>85.0</td>
<td>196</td>
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<tr>
<td>619.lbm_s</td>
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<td>121</td>
<td>54.3</td>
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<td>118</td>
<td>224</td>
<td>75.1</td>
<td>69.7</td>
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<td>621.wrf_s</td>
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<td>116</td>
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<td>114</td>
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<tr>
<td>627.cam4_s</td>
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<td>54.3</td>
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<td>53.8</td>
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<tr>
<td>628.pop2_s</td>
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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>95.8</td>
<td>95.1</td>
<td>98.3</td>
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</tr>
<tr>
<td>654.roms_s</td>
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<td>46.5</td>
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<td>46.6</td>
<td>338</td>
<td>46.6</td>
<td>338</td>
<td>46.6</td>
<td>338</td>
</tr>
</tbody>
</table>

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

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
System Profile set to Custom
CPU Performance set to Maximum Performance
C States set to Autonomous

(Continued on next page)
### Dell Inc. PowerEdge R840 (Intel Xeon Platinum 8276, 2.20GHz)

<table>
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<tr>
<th>SPECspeed2017_fp_base = 189</th>
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<tr>
<td>SPECspeed2017_fp_peak = 185</td>
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| SPEC CPU2017 Floating Point Speed Result |

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

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

---

**Platform Notes (Continued)**

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 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 5 19:41:35 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) Platinum 8276 CPU @ 2.20GHz
  4 "physical id"s (chips)
  224 "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
physical 2: 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 3: 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):            224
On-line CPU(s) list: 0-223
Thread(s) per core: 2
Core(s) per socket: 28
Socket(s):         4
NUMA node(s):      8
Vendor ID:         GenuineIntel
CPU family:        6
Model:             85
Model name:        Intel(R) Xeon(R) Platinum 8276 CPU @ 2.20GHz
Stepping:          5
```

(Continued on next page)
Platform Notes (Continued)

CPU MHz: 3643.845
BogoMIPS: 4400.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 39424K
NUMA node0 CPU(s): 0,8,16,24,32,40,48,56,64,72,80,88,96,104,112,120,128,136,144,152,160,168,176,184,192,200,208,216
NUMA node1 CPU(s): 1,9,17,25,33,41,49,57,65,73,81,89,97,105,113,121,129,137,145,153,161,169,177,185,193,201,209,217
NUMA node2 CPU(s): 2,10,18,26,34,42,50,58,66,74,82,90,98,106,114,122,130,138,146,154,162,170,178,186,194,202,210,218
NUMA node4 CPU(s): 4,12,20,28,36,44,52,60,68,76,84,92,100,108,116,124,132,140,148,156,164,172,180,188,196,204,212,220
NUMA node5 CPU(s): 5,13,21,29,37,45,53,61,69,77,85,93,101,109,117,125,133,141,149,157,165,173,181,189,197,205,213,221
NUMA node6 CPU(s): 6,14,22,30,38,46,54,62,70,78,86,94,102,110,118,126,134,142,150,158,166,174,182,190,198,206,214,222
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 cpuid aperfmperf pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtpr 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_l3 invpcid_single intel_pinn ssbd mba ibrs ibpb stibp tpr_shadow vnmi flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2  3dnow avx2 smep bmi2  3dnow invpcid rtm cm3 mpx rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd avx512bw avx512vl xsaveopt xsavec xgtb v1 xsaveas vmm mcr3l1l cqm mml_te qm mml_mb_total qm_mml_local dtherm ida arat pln pts pku ospke flush_lld arch_capabilities

From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a
Dell Inc.

PowerEdge R840 (Intel Xeon Platinum 8276, 2.20GHz)

SPECspeed2017_fp_base = 189
SPECspeed2017_fp_peak = 185

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

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

Platform Notes (Continued)

physical chip.
available: 8 nodes (0-7)
node 0 cpus: 0 8 16 24 32 40 48 56 64 72 80 88 96 104 112 120 128 136 144 152 160 168
176 184 192 200 208 216
node 0 size: 95145 MB
node 0 free: 94890 MB
node 1 cpus: 1 9 17 25 33 41 49 57 65 73 81 89 97 105 113 121 129 137 145 153 161 169
177 185 193 201 209 217
node 1 size: 96741 MB
node 1 free: 96568 MB
node 2 cpus: 2 10 18 26 34 42 50 58 66 74 82 90 98 106 114 122 130 138 146 154 162 170
178 186 194 202 210 218
node 2 size: 96762 MB
node 2 free: 96582 MB
node 3 cpus: 3 11 19 27 35 43 51 59 67 75 83 91 99 107 115 123 131 139 147 155 163 171
179 187 195 203 211 219
node 3 size: 96762 MB
node 3 free: 96543 MB
node 4 cpus: 4 12 20 28 36 44 52 60 68 76 84 92 100 108 116 124 132 140 148 156 164 172
180 188 196 204 212 220
node 4 size: 96762 MB
node 4 free: 96336 MB
node 5 cpus: 5 13 21 29 37 45 53 61 69 77 85 93 101 109 117 125 133 141 149 157 165 173
181 189 197 205 213 221
node 5 size: 96762 MB
node 5 free: 96518 MB
node 6 cpus: 6 14 22 30 38 46 54 62 70 78 86 94 102 110 118 126 134 142 150 158 166 174
182 190 198 206 214 222
node 6 size: 96762 MB
node 6 free: 96534 MB
node 7 cpus: 7 15 23 31 39 47 55 63 71 79 87 95 103 111 119 127 135 143 151 159 167 175
183 191 199 207 215 223
node 7 size: 96760 MB
node 7 free: 96565 MB
node distances:
node 0 1 2 3 4 5 6 7
0: 10 21 21 21 11 21 21 21
1: 21 10 21 21 11 21 21 21
2: 21 21 10 21 21 21 21 21
3: 21 21 21 10 21 21 21 21
4: 11 21 21 21 10 21 21 21
5: 21 11 21 21 21 21 21 21
6: 21 21 11 21 21 21 21 21
7: 21 21 21 11 21 21 21 21

From /proc/meminfo
MemTotal: 791000020 kB

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

Dell Inc.
PowerEdge R840 (Intel Xeon Platinum 8276, 2.20GHz)

SPECspeed2017_fp_base = 189
SPECspeed2017_fp_peak = 185

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

Platform Notes (Continued)

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 4.15.0-45-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: Full generic retpoline, IBPB, IBRS_FW

run-level 5 Jul 4 01:02

SPEC is set to: /home/cpu2017

Filesystem       Type  Size  Used Avail Use% Mounted on
/dev/sda2        ext4   439G  47G  370G  12% /

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. 2.2.9 05/08/2019
Memory:
  24x 00AD000B300AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933
  24x Not Specified Not Specified

(End of data from sysinfo program)
Dell Inc.

PowerEdge R840 (Intel Xeon Platinum 8276, 2.20GHz)

**SPECspeed2017_fp_base** = 189  
**SPECspeed2017_fp_peak** = 185

---

### 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.

```
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.

```
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.

```
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.

(Continued on next page)
Dell Inc.

PowerEdge R840 (Intel Xeon Platinum 8276, 2.20GHz)

**SPEC CPU2017 Floating Point Speed Result**

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**CPU2017 License:** 55

**Test Sponsor:** Dell Inc.

**Test Date:** Jul-2019

**Hardware Availability:** Apr-2019

**Tested by:** Dell Inc.

**Software Availability:** May-2019

---

**Compiler Version Notes (Continued)**

```plaintext
------------------------------------------------------------------------------
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,
  Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------
```

---

**Base Compiler Invocation**

**C benchmarks:**

```plaintext
icc -m64 -std=c11
```

**Fortran benchmarks:**

```plaintext
ifort -m64
```

**Benchmarks using both Fortran and C:**

```plaintext
ifort -m64 icc -m64 -std=c11
```

**Benchmarks using Fortran, C, and C++:**

```plaintext
icpc -m64 icc -m64 -std=c11 ifort -m64
```

---

**Base Portability Flags**

```plaintext
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
```
# SPEC CPU2017 Floating Point Speed Result

## Dell Inc.

### PowerEdge R840 (Intel Xeon Platinum 8276, 2.20GHz)

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### CPU2017 License: 55

| Test Date: | Jul-2019 |
| Hardware Availability: | Apr-2019 |
| Software Availability: | May-2019 |

| Test Sponsor: | Dell Inc. |
| Tested by: | Dell Inc. |

## Base Optimization Flags

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

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

- **Benchmarks using both Fortran and C:**
  - `-xCORE-AVX2` `-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-AVX2` `-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
SPEC CPU2017 Floating Point Speed Result

Dell Inc.

PowerEdge R840 (Intel Xeon Platinum 8276, 2.20GHz)

SPECspeed2017_fp_base = 189
SPECspeed2017_fp_peak = 185

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<td>Dell Inc.</td>
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<tr>
<td>Software Availability:</td>
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Peak Optimization Flags

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

Fortran benchmarks:

603.bwaves_s: -prof-gen(pass 1) -prof-use(pass 2) -DSPEC_SUPPRESS_OPENMP
-DSPEC_OPENMP -O2 -xCORE-AVX2 -qopt-prefetch -ipo -O3
-ffinite-math-only -no-prec-div -qopt-mem-layout-trans=4
-qopenmp -nostandard-realloc-lhs

649.fotonik3d_s: Same as 603.bwaves_s

654.roms_s: -DSPEC_OPENMP -xCORE-AVX2 -ipo -O3 -no-prec-div
-qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4
-qopenmp -nostandard-realloc-lhs

Benchmarks using both Fortran and C:

621.wrf_s: -prof-gen(pass 1) -prof-use(pass 2) -O2 -xCORE-AVX2
-qopt-prefetch -ipo -O3 -ffinite-math-only -no-prec-div
-qopt-mem-layout-trans=4 -DSPEC_SUPPRESS_OPENMP -qopenmp
-DSPEC_OPENMP -nostandard-realloc-lhs

627.cam4_s: -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp
-DSPEC_OPENMP -nostandard-realloc-lhs

628.pop2_s: Same as 621.wrf_s

Benchmarks using Fortran, C, and C++:
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
-nostandard-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:
### SPEC CPU2017 Floating Point Speed Result

**Dell Inc.**

PowerEdge R840 (Intel Xeon Platinum 8276, 2.20GHz)

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