Dell Inc.
PowerEdge R640 (Intel Xeon Platinum 8276M, 2.20GHz)

<table>
<thead>
<tr>
<th>Test Sponsor</th>
<th>Dell Inc.</th>
<th>Hardware Availability</th>
<th>Apr-2019</th>
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<tr>
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<td>Dell Inc.</td>
<td>Software Availability</td>
<td>Feb-2019</td>
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<tr>
<td>CPU2017 License</td>
<td>55</td>
<td>Test Date</td>
<td>Mar-2019</td>
</tr>
<tr>
<td>CPU Name</td>
<td>Intel Xeon Platinum 8276M</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max MHz.</td>
<td>4000</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nominal</td>
<td>2200</td>
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<tr>
<td>Enabled</td>
<td>56 cores, 2 chips, 2 threads/core</td>
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<tr>
<td>Orderable</td>
<td>1.2 chips</td>
<td></td>
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<tr>
<td>Cache L1</td>
<td>32 KB I + 32 KB D on chip per core</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cache L2</td>
<td>1 MB I+D on chip per core</td>
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</tr>
<tr>
<td>Cache L3</td>
<td>38.5 MB I+D on chip per chip</td>
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<tr>
<td>Memory</td>
<td>384 GB (12 x 32 GB 2Rx4 PC4-2933Y-R)</td>
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<tr>
<td>Storage</td>
<td>1 x 1.5 TB NVMe SSD</td>
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<td></td>
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<tr>
<td>OS</td>
<td>Ubuntu 18.04.2 LTS</td>
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<td></td>
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<tr>
<td>Compiler</td>
<td>C/C++: Version 19.0.1.144 of Intel C/C++</td>
<td></td>
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<td>Compiler Build</td>
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<td>Firmware</td>
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<td>File System</td>
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<tr>
<td>System State</td>
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<tr>
<td>Peak Pointers</td>
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| SPECrate2017_fp_base = 252 |
| SPECrate2017_fp_peak = 258 |

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<tr>
<th>SPECrate2017_fp_base (252)</th>
<th>SPECrate2017_fp_peak (258)</th>
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<td>503.bwaves_r 112</td>
<td>227</td>
</tr>
<tr>
<td>507.cactuBSSN_r 112</td>
<td>227</td>
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<tr>
<td>508.namd_r 112</td>
<td>213</td>
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<tr>
<td>510.parest_r 112</td>
<td>128</td>
</tr>
<tr>
<td>511.povray_r 112</td>
<td>328</td>
</tr>
<tr>
<td>519.lbm_r 112</td>
<td>123</td>
</tr>
<tr>
<td>521.wrf_r 112</td>
<td>226</td>
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<tr>
<td>526.blender_r 112</td>
<td>308</td>
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<tr>
<td>527.cam4_r 112</td>
<td>320</td>
</tr>
<tr>
<td>538.imagick_r 112</td>
<td>709</td>
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<tr>
<td>544.nab_r 112</td>
<td>511</td>
</tr>
<tr>
<td>549.fotonik3d_r 112</td>
<td>166</td>
</tr>
<tr>
<td>554.roms_r 112</td>
<td>97.3</td>
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</table>
SPEC CPU2017 Floating Point Rate Result

Dell Inc.
PowerEdge R640 (Intel Xeon Platinum 8276M, 2.20GHz)

SPECrate2017_fp_base = 252
SPECrate2017_fp_peak = 258

Results Table

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<thead>
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<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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<tbody>
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<td>625</td>
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<tr>
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<td>511</td>
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<tr>
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<td>166</td>
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<td>1830</td>
<td>97.3</td>
<td>1830</td>
<td>97.3</td>
</tr>
</tbody>
</table>

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

Submit Notes

The numactl mechanism was used to bind copies to processors. The config file option 'submit' was used to generate numactl commands to bind each copy to a specific processor. For details, please see the config file.

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:
LD_LIBRARY_PATH = "/home/cpu2017/lib/ia32:/home/cpu2017/lib/intel64"

Binaries compiled on a system with 1x Intel Core i9-7900X CPU + 32GB RAM
memory using Redhat Enterprise Linux 7.5
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

(Continued on next page)
## SPEC CPU2017 Floating Point Rate Result

**Dell Inc.**

PowerEdge R640 (Intel Xeon Platinum 8276M, 2.20GHz)

<table>
<thead>
<tr>
<th>SPECrate2017_fp_base</th>
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<tr>
<td>SPECrate2017_fp_peak</td>
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**CPU2017 License:** 55  
**Test Sponsor:** Dell Inc.  
**Test Date:** Mar-2019  
**Tested by:** Dell Inc.  
**Hardware Availability:** Apr-2019  
**Software Availability:** Feb-2019

### General Notes (Continued)

Filesystem page cache synced and cleared with:
```
sync; echo 3> /proc/sys/vm/drop_caches
```
runcpu command invoked through numactl i.e.:
```
umactl --interleave=all runcpu <etc>
```

### Platform Notes

**BIOS settings:**
- ADDDC setting disabled
- Sub NUMA Cluster enabled
- Virtualization Technology disabled
- DCU Streamer Prefetcher disabled
- 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 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 Wed Mar 20 02:38:20 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](https://www.spec.org/cpu2017/Docs/config.html#sysinfo)

From /proc/cpuinfo:

```
model name : Intel(R) Xeon(R) Platinum 8276M CPU @ 2.20GHz
  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
```

(Continued on next page)
Dell Inc.  
PowerEdge R640 (Intel Xeon Platinum 8276M, 2.20GHz)  

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

Test Date: Mar-2019  
Hardware Availability: Apr-2019  
Software Availability: Feb-2019

Platform Notes (Continued)

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): 4  
Vendor ID: GenuineIntel  
CPU family: 6  
Model: 85  
Model name: Intel(R) Xeon(R) Platinum 8276M CPU @ 2.20GHz  
Stepping: 6  
CPU MHz: 2659.649  
BogoMIPS: 4400.00  
Virtualization: VT-x  
L1d cache: 32K  
L1i cache: 32K  
L2 cache: 1024K  
L3 cache: 39424K  
NUMA node0 CPU(s): 0,4,8,12,16,20,24,28,32,36,40,44,48,52,56,60,64,68,72,76,80,84,88,92,96,100,104,108  
NUMA node1 CPU(s): 1,5,9,13,17,21,25,29,33,37,41,45,49,53,57,61,65,69,73,77,81,85,89,93,97,101,105,109  
NUMA node2 CPU(s): 2,6,10,14,18,22,26,30,34,38,42,46,50,54,58,62,66,70,74,78,82,86,90,94,98,102,106,110  
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 xtpr pdcm pcid dca sse4_1 sse4_2 x2apic movbe popcnt aes xsave avx1 f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault ebpx lcpl cdp l3invpcid_single ssbd mba ibrs ibpb ibrsenhanced tpr_shadow vnni flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erts invpcid rtm cqm mpx rdt_a avx512f avx512d avx512bw avx512vl xsaveopt xsaves cqm_llc cqm_occup_llc cqm_mbb_total cqm_mbb_local dtherm ida arat pln pts pku ospke avx512_vnni flush_l1d arch_capabilities

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 96 100 104 108

(Continued on next page)
## Dell Inc.

PowerEdge R640 (Intel Xeon Platinum 8276M, 2.20GHz)

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**Test Sponsor:** Dell Inc.  
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**Test Date:** Mar-2019  
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### Platform Notes (Continued)

- node 0 size: 95166 MB  
- node 0 free: 94527 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 97 101 105 109  
- node 1 size: 96741 MB  
- node 1 free: 96174 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 98 102 106 110  
- node 2 size: 96762 MB  
- node 2 free: 96223 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 99 103 107 111  
- node 3 size: 96761 MB  
- node 3 free: 96134 MB  
- node distances:  
  - node 0 1 2 3  
  - 0: 10 21 11 21  
  - 1: 21 10 21 11  
  - 2: 11 21 10 21  
  - 3: 21 11 21 10

From /proc/meminfo
- MemTotal: 394682448 kB  
- HugePages_Total: 0  
- Hugepagesize: 2048 kB

```bash
/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/"

```bash
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:

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

Dell Inc.
PowerEdge R640 (Intel Xeon Platinum 8276M, 2.20GHz)

SPECrate2017_fp_base = 252
SPECrate2017_fp_peak = 258

CPU2017 License: 55
Test Sponsor: Dell Inc.
Test Date: Mar-2019
Tested by: Dell Inc.
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Platform Notes (Continued)

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 3 Mar 19 20:11 last=5
SPEC is set to: /home/cpu2017
    Filesystem Type Size Used Avail Use% Mounted on
    /dev/nvme0n1p2 ext4 439G 19G 398G 5% /

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. 2.1.6 03/03/2019
    Memory: 12x 002C069D002C 36ASF4G72PZ-2G9E2 32 GB 2 rank 2933
            12x Not Specified Not Specified

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
CC  519.lbm_r(base) 538.imagick_r(base, peak) 544.nab_r(base, peak)
------------------------------------------------------------------------------
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------

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CC   519.lbm_r(peak)
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------------------------------------------------------------------------------

==============================================================================
CXXC 508.namd_r(base) 510.parest_r(base, peak)
------------------------------------------------------------------------------
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
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Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,  
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Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R) 64,  
Version 19.0.1.144 Build 20181018  
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FC 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak) 554.roms_r(base)
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Compiler Version Notes (Continued)

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FC 554.roms_r(peak)

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Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.0.1.144 Build 20181018
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Base Compiler Invocation

C benchmarks:
icc -m64 -std=c11

C++ benchmarks:
icpc -m64

Fortran benchmarks:
ifort -m64

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

Dell Inc.
PowerEdge R640 (Intel Xeon Platinum 8276M, 2.20GHz)

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Base Compiler Invocation (Continued)

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

Benchmarks using both C and C++:
icpc -m64 icc -m64 -std=c11

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

Base Portability Flags

503.bwaves_r: -DSPEC_LP64
507.cactuBSSN_r: -DSPEC_LP64
508.namd_r: -DSPEC_LP64
510.parest_r: -DSPEC_LP64
511.povray_r: -DSPEC_LP64
519.lbm_r: -DSPEC_LP64
521.wrf_r: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
526.blender_r: -DSPEC_LP64 -DSPEC_LINUX -funsigned-char
527.cam4_r: -DSPEC_LP64 -DSPEC_CASE_FLAG
538.imagick_r: -DSPEC_LP64
544.nab_r: -DSPEC_LP64
549.fotonik3d_r: -DSPEC_LP64
554.roms_r: -DSPEC_LP64

Base Optimization Flags

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

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

Fortran benchmarks:
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs
-align array32byte

(Continued on next page)
**SPEC CPU2017 Floating Point Rate Result**

**Dell Inc.**

PowerEdge R640 (Intel Xeon Platinum 8276M, 2.20GHz)  

<table>
<thead>
<tr>
<th>SPECrate2017_fp_base</th>
<th>252</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECrate2017_fp_peak</td>
<td>258</td>
</tr>
</tbody>
</table>

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

**CPU2017 License:** 55  
**Test Date:** Mar-2019  
**Hardware Availability:** Apr-2019  
**Software Availability:** Feb-2019

---

### Base Optimization Flags (Continued)

Benchmarks using both Fortran and C:

```
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs
-align array32byte
```

Benchmarks using both C and C++:

```
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4
```

Benchmarks using Fortran, C, and C++:

```
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs
-align array32byte
```

---

### Peak Compiler Invocation

**C benchmarks:**

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

**C++ benchmarks:**

```
icpc -m64
```

**Fortran benchmarks:**

```
ifort -m64
```

Benchmarks using both Fortran and C:

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

Benchmarks using both C and C++:

```
icpc -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 Rate Result

Dell Inc.
PowerEdge R640 (Intel Xeon Platinum 8276M, 2.20GHz)

SPECrate2017_fp_base = 252
SPECrate2017_fp_peak = 258

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

Test Date: Mar-2019
Hardware Availability: Apr-2019
Software Availability: Feb-2019

Peak Optimization Flags

C benchmarks:

519.lbm_r: -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4

538.imagick_r: -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4

544.nab_r: basepeak = yes

C++ benchmarks:

508.namd_r: -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4

510.parest_r: basepeak = yes

Fortran benchmarks:

503.bwaves_r: basepeak = yes

549.fotonik3d_r: basepeak = yes

554.roms_r: -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs
-align array32byte

Benchmarks using both Fortran and C:

-prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs
-align array32byte

Benchmarks using both C and C++:

511.povray_r: -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4

526.blender_r: -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4

(Continued on next page)
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### Peak Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++:
- `-xCORE-AVX2`  
- `-ipo`  
- `-no-prec-div`  
- `-qopt-prefetch`  
- `-ffinite-math-only`  
- `-qopt-mem-layout-trans=4`  
- `-auto`  
- `-nostandard-realloc-lhs`  
- `-align array32byte`

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

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