## SPEC® CPU2017 Floating Point Rate Result

### Dell Inc.  
**PowerEdge R740xd (Intel Xeon Gold 5222, 3.80GHz)**

<table>
<thead>
<tr>
<th>Test Sponsor:</th>
<th>Dell Inc.</th>
<th>Software Availability:</th>
<th>Feb-2019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tested by:</td>
<td>Dell Inc.</td>
<td>Hardware Availability:</td>
<td>Jun-2019</td>
</tr>
<tr>
<td>Hardware</td>
<td></td>
<td>Test Date:</td>
<td>Jul-2019</td>
</tr>
<tr>
<td></td>
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<td></td>
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</tr>
</tbody>
</table>

### SPECrate2017_fp_base = 77.2

### SPECrate2017_fp_peak = 79.7

### Hardware

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU Name</td>
<td>Intel Xeon Gold 5222</td>
</tr>
<tr>
<td>Max MHz.</td>
<td>3900</td>
</tr>
<tr>
<td>Nominal</td>
<td>3800</td>
</tr>
<tr>
<td>Enabled</td>
<td>8 cores, 2 chips, 2 threads/core</td>
</tr>
<tr>
<td>Orderable</td>
<td>1.2 chips</td>
</tr>
<tr>
<td>Cache L1</td>
<td>32 KB I + 32 KB D on chip per core</td>
</tr>
<tr>
<td>L2:</td>
<td>1 MB I+D on chip per core</td>
</tr>
<tr>
<td>L3:</td>
<td>16.5 MB I+D on chip per chip</td>
</tr>
<tr>
<td>Other:</td>
<td>None</td>
</tr>
<tr>
<td>Memory</td>
<td>384 GB (12 x 32 GB 2Rx4 PC4-2933Y-R)</td>
</tr>
<tr>
<td>Storage</td>
<td>1 x 960 GB SATA SSD</td>
</tr>
<tr>
<td>Other:</td>
<td>None</td>
</tr>
</tbody>
</table>

### Software

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>OS:</td>
<td>Ubuntu 18.04.2 LTS</td>
</tr>
<tr>
<td></td>
<td>kernel 4.15.0-45-generic</td>
</tr>
<tr>
<td>Compiler:</td>
<td>C/C++: Version 19.0.1.144 of Intel C/C++</td>
</tr>
<tr>
<td></td>
<td>Compiler Build 20181018 for Linux;</td>
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<td></td>
<td>Fortran: Version 19.0.1.144 of Intel Fortran</td>
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<td>Compiler Build 20181018 for Linux</td>
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<td>Parallel:</td>
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<tr>
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<td>Version 2.2.11 released Jun-2019</td>
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<tr>
<td>File System:</td>
<td>ext4</td>
</tr>
<tr>
<td>System State:</td>
<td>Run level 5 (multi-user)</td>
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<tr>
<td>Base Pointers:</td>
<td>64-bit</td>
</tr>
<tr>
<td>Peak Pointers:</td>
<td>64-bit</td>
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<tr>
<td>Other:</td>
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</table>

### SPECrate2017_fp_base Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>Specrate2017_fp_base</th>
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<tbody>
<tr>
<td>503.bwaves_r</td>
<td>16</td>
<td>49.4</td>
</tr>
<tr>
<td>507.cactuBSSN_r</td>
<td>16</td>
<td>45.8</td>
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<tr>
<td>508.namd_r</td>
<td>16</td>
<td>58.8</td>
</tr>
<tr>
<td>510.parest_r</td>
<td>16</td>
<td>58.7</td>
</tr>
<tr>
<td>511.povray_r</td>
<td>16</td>
<td>72.0</td>
</tr>
<tr>
<td>519.lbm_r</td>
<td>16</td>
<td>46.0</td>
</tr>
<tr>
<td>521.wrf_r</td>
<td>16</td>
<td>87.6</td>
</tr>
<tr>
<td>526.blender_r</td>
<td>16</td>
<td>67.9</td>
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<tr>
<td>527.cam4_r</td>
<td>16</td>
<td>78.7</td>
</tr>
<tr>
<td>538.imagick_r</td>
<td>16</td>
<td>151</td>
</tr>
<tr>
<td>544.nab_r</td>
<td>16</td>
<td>103</td>
</tr>
<tr>
<td>549.fotonik3d_r</td>
<td>16</td>
<td>80.9</td>
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<tr>
<td>554.roms_r</td>
<td>16</td>
<td>57.7</td>
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### SPECrate2017_fp_peak Table

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Dell Inc.  
PowerEdge R740xd (Intel Xeon Gold 5222, 3.80GHz)  

**SPEC CPU2017 Floating Point Rate Result**  
Copyright 2017-2019 Standard Performance Evaluation Corporation  

**SPECrate2017_fp_base** = 77.2  
**SPECrate2017_fp_peak** = 79.7  

CPU2017 License: 55  
Test Date: Jul-2019  
Test Sponsor: Dell Inc.  
Hardware Availability: Jun-2019  
Tested by: Dell Inc.  
Software Availability: Feb-2019  

---  

### Results Table

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<td>492</td>
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<td>16</td>
<td>490</td>
<td>51.9</td>
</tr>
</tbody>
</table>

**SPECrate2017_fp_base** = 77.2  
**SPECrate2017_fp_peak** = 79.7  

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
- 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:

(Continued on next page)
Dell Inc.
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CPU2017 License: 55
Test Sponsor: Dell Inc.
Test Date: Jul-2019
Tested by: Dell Inc.
Hardware Availability: Jun-2019
Software Availability: Feb-2019

General Notes (Continued)

sync; echo 3> /proc/sys/vm/drop_caches
runcpu command invoked through numacli i.e.:
numacli --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 Thu Jul 11 14:54:28 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) Gold 5222 CPU @ 3.80GHz
  2 "physical id"s (chips)
  16 "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 : 4
  siblings : 8
  physical 0: cores 5 8 9 12
  physical 1: cores 5 8 9 13

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 16
On-line CPU(s) list: 0-15

(Continued on next page)
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**Test Sponsor:** Dell Inc.  
**Tested by:** Dell Inc.  
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**Hardware Availability:** Jun-2019  
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### Platform Notes (Continued)

- **Thread(s) per core:** 2  
- **Core(s) per socket:** 4  
- **Socket(s):** 2  
- **NUMA node(s):** 4  
- **Vendor ID:** GenuineIntel  
- **CPU family:** 6  
- **Model:** 85  
- **Model name:** Intel(R) Xeon(R) Gold 5222 CPU @ 3.80GHz  
- **Stepping:** 6  
- **CPU MHz:** 1886.995  
- **BogoMIPS:** 7600.00  
- **Virtualization:** VT-x  
- **L1d cache:** 32K  
- **L1i cache:** 32K  
- **L2 cache:** 1024K  
- **L3 cache:** 16896K  
- **NUMA node0 CPU(s):** 0, 6, 8, 14  
- **NUMA node1 CPU(s):** 1, 3, 9, 11  
- **NUMA node2 CPU(s):** 2, 4, 10, 12  
- **NUMA node3 CPU(s):** 5, 7, 13, 15  
- **Flags:** fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36 clflush dts acp1 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 avx f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault epb cat_l3 cdp_l3 invlpg intel_pni ssbd ibrs ibpb ibrs_exc phys_load locks cmov mmxcd fp邹 popcnt lat tpr_shadow vnmi flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 ets invpcid rtm cqm mpx rdar a va512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd avx512bw avx512vl xsaveopt xsavec xsavec1 xsaves cqm_llc cqm_occup_llc cqm_mbb_total cqm_mbb_local dtherm ida arat plg pts pku ospke avx512_vnni flush_l1d arch_capabilities

/proc/cpuinfo cache data  
  
  cache size : 16896 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 6 8 14  
  node 0 size: 95128 MB  
  node 0 free: 94733 MB  
  node 1 cpus: 1 3 9 11  
  node 1 size: 96766 MB  
  node 1 free: 96394 MB  
  node 2 cpus: 2 4 10 12  
  node 2 size: 96767 MB  
  node 2 free: 96397 MB

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

Dell Inc.

PowerEdge R740xd (Intel Xeon Gold 5222, 3.80GHz)

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CPU2017 License: 55
Test Sponsor: Dell Inc.
Test Date: Jul-2019
CPU2017 License: 55
Tested by: Dell Inc.
Hardware Availability: Jun-2019
Software Availability: Feb-2019

Platform Notes (Continued)

node 3 cpus: 5 7 13 15
node 3 size: 96767 MB
node 3 free: 96397 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: 394679776 kB
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: Enhanced IBRS, IBPB

run-level 5 Jul 11 10:04

SPEC is set to: /home/cpu2017

Filesystem Type Size Used Avail Use% Mounted on
/dev/sda2 ext4 439G 24G 395G 6% /

Additional information from dmidecode follows. WARNING: Use caution when you interpret

(Continued on next page)
### Dell Inc.

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### Platform Notes (Continued)

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. 2.2.11 06/13/2019  
Memory:  
- 12x 00AD00B300AD HMA84GR7CJR4N-WM 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.  
==============================================================================  
CC  519.lbm_r(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.  
==============================================================================  
CXXC 508.namd_r(base) 510.parest_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.  
==============================================================================  
CXXC 508.namd_r(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.  
==============================================================================  
CC  511.povray_r(base) 526.blender_r(base, peak)  
(Continued on next page)
Dell Inc.

PowerEdge R740xd (Intel Xeon Gold 5222, 3.80GHz)

SPECrate2017_fp_base = 77.2
SPECrate2017_fp_peak = 79.7

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

Test Date: Jul-2019
Hardware Availability: Jun-2019
Software Availability: Feb-2019

Compiler Version Notes (Continued)

Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.1.144 Build 20181018
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Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
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CC 511.povray_r(peak)
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------------------------------------------------------------------------------
FC 507.cactuBSSN_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.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.1.144 Build 20181018
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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)
------------------------------------------------------------------------------
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 554.roms_r(peak)
------------------------------------------------------------------------------
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
64, Version 19.0.1.144 Build 20181018

(Continued on next page)
**Dell Inc.**

**PowerEdge R740xd (Intel Xeon Gold 5222, 3.80GHz)**

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</tbody>
</table>

**Compiler Version Notes (Continued)**

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**Base 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
```
**SPEC CPU2017 Floating Point Rate Result**

**Dell Inc.**

PowerEdge R740xd (Intel Xeon Gold 5222, 3.80GHz)

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</table>

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

**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

**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

Test Date: Jul-2019  
Hardware Availability: Jun-2019  
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Dell Inc.

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Tested by: Dell Inc.
Test Date: Jul-2019
Hardware Availability: Jun-2019
Software Availability: Feb-2019

Peak Compiler Invocation

C benchmarks:
\texttt{icc -m64 -std=c11}

C++ benchmarks:
\texttt{icpc -m64}

Fortran benchmarks:
\texttt{ifort -m64}

Benchmarks using both Fortran and C:
\texttt{ifort -m64 icc -m64 -std=c11}

Benchmarks using both C and C++:
\texttt{icpc -m64 icc -m64 -std=c11}

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

Peak Portability Flags

Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:
\begin{verbatim}
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: Same as 538.imagick_r
\end{verbatim}

C++ benchmarks:
\begin{verbatim}
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
\end{verbatim}

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

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

Fortran benchmarks:

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

549.fotonik3d_r: Same as 503.bwaves_r

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

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

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:
Dell Inc.

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