## SPEC CPU® 2017 Floating Point Rate Result

**NEC Corporation**

**Express5800/T110j-S (Intel Xeon E-2274G)**

**Copyright 2017-2019 Standard Performance Evaluation Corporation**

### Test Details
- **Cpu2017 License**: 9006
- **Test Sponsor**: NEC Corporation
- **Tested by**: NEC Corporation
- **Test Date**: Nov-2019
- **Hardware Availability**: Nov-2019
- **Software Availability**: Aug-2019

### Hardware

<table>
<thead>
<tr>
<th>Software</th>
<th>SPECrate®2017_fp_base = 32.3</th>
<th>SPECrate®2017_fp_peak = 34.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU Name</td>
<td>Intel Xeon E-2274G</td>
<td></td>
</tr>
<tr>
<td>Max MHz</td>
<td>4900</td>
<td></td>
</tr>
<tr>
<td>Nominal</td>
<td>4000</td>
<td></td>
</tr>
<tr>
<td>Enabled</td>
<td>4 cores, 1 chip, 2 threads/core</td>
<td></td>
</tr>
<tr>
<td>Orderable</td>
<td>1 chip</td>
<td></td>
</tr>
<tr>
<td>Cache L1</td>
<td>32 KB I + 32 KB D on chip per core</td>
<td></td>
</tr>
<tr>
<td>L2</td>
<td>256 KB I+D on chip per core</td>
<td></td>
</tr>
<tr>
<td>L3</td>
<td>8 MB I+D on chip per chip</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>Memory</td>
<td>64 GB (4 x 16 GB 2Rx8 PC4-2666V-E)</td>
<td></td>
</tr>
<tr>
<td>Storage</td>
<td>1 x 1 TB SATA, 7200 RPM</td>
<td></td>
</tr>
<tr>
<td>Other</td>
<td>None</td>
<td></td>
</tr>
</tbody>
</table>

### Software

| OS: Red Hat Enterprise Linux Server release 7.7 (Maipo) |
| 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: No |
| Firmware: NEC BIOS Version F01 08/21/2019 released Nov-2019 |
| File System: ext4 |
| System State: Run level 3 (multi-user) |
| Base Pointers: 64-bit |
| Peak Pointers: 64-bit |
| Other: None |
| Power Management: -- |

### Test Results

<table>
<thead>
<tr>
<th>SPECrate®2017_fp_base</th>
<th>SPECrate®2017_fp_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>(32.3)</td>
<td>(34.1)</td>
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</tbody>
</table>

### Benchmarks

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>SPECrate®2017_fp_base</th>
<th>SPECrate®2017_fp_peak</th>
</tr>
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<tbody>
<tr>
<td>503.bwaves_r</td>
<td>29.1</td>
<td>73.2</td>
</tr>
<tr>
<td>507.cactuBSSN_r</td>
<td>29.1</td>
<td>73.2</td>
</tr>
<tr>
<td>508.namd_r</td>
<td>26.1</td>
<td>73.2</td>
</tr>
<tr>
<td>510.parest_r</td>
<td>17.1</td>
<td>73.2</td>
</tr>
<tr>
<td>511.povray_r</td>
<td>19.6</td>
<td>73.2</td>
</tr>
<tr>
<td>519.lbm_r</td>
<td>36.6</td>
<td>84.0</td>
</tr>
<tr>
<td>521.wrf_r</td>
<td>36.9</td>
<td>87.0</td>
</tr>
<tr>
<td>526.blender_r</td>
<td>36.9</td>
<td>87.0</td>
</tr>
<tr>
<td>527.cam4_r</td>
<td>36.9</td>
<td>87.0</td>
</tr>
<tr>
<td>538.imagick_r</td>
<td>37.4</td>
<td>87.0</td>
</tr>
<tr>
<td>544.nab_r</td>
<td>58.0</td>
<td>87.0</td>
</tr>
<tr>
<td>549.fotonik3d_r</td>
<td>22.4</td>
<td>87.0</td>
</tr>
<tr>
<td>554.roms_r</td>
<td>15.7</td>
<td>87.0</td>
</tr>
</tbody>
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NEC Corporation
Express5800/T110j-S (Intel Xeon E-2274G)

SPECrate®2017_fp_base = 32.3
SPECrate®2017_fp_peak = 34.1

Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>503.bwaves_r</td>
<td>8</td>
<td>1097</td>
<td>73.2</td>
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<td>73.2</td>
<td>4</td>
<td>534</td>
<td>75.1</td>
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<tr>
<td>507.cactuBSSN_r</td>
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<td>347</td>
<td>29.2</td>
<td>348</td>
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<td>354</td>
<td>28.6</td>
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<td>348</td>
<td>29.1</td>
<td>347</td>
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<tr>
<td>508.namd_r</td>
<td>8</td>
<td>291</td>
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<td>291</td>
<td>26.1</td>
<td>294</td>
<td>25.9</td>
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<td>521.wrf_r</td>
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<td>547</td>
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<td>36.8</td>
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<td>526.blender_r</td>
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<td>36.8</td>
<td>330</td>
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<td>8</td>
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<tr>
<td>527.cam4-r</td>
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<tr>
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<td>1393</td>
<td>22.4</td>
<td>1393</td>
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<td>1392</td>
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<tr>
<td>554.roms_r</td>
<td>8</td>
<td>1035</td>
<td>12.3</td>
<td>1033</td>
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<td>1034</td>
<td>12.3</td>
<td>4</td>
<td>406</td>
<td>15.7</td>
<td>409</td>
</tr>
</tbody>
</table>

SPECrate®2017_fp_base = 32.3
SPECrate®2017_fp_peak = 34.1

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

Submit Notes

The taskset mechanism was used to bind copies to processors. The config file option 'submit' was used to generate taskset 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"
IRQ balance service was stopped using "systemctl stop irqbalance.service"

Environment Variables Notes

Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH = "/home/cpu2017/lib/intel64"

General Notes

Binaries compiled on a system with 1x Intel Core i9-799X CPU + 32GB RAM
memory using Redhat Enterprise Linux 7.5
Transparent Huge Pages enabled by default
Prior to runcpu invocation
Filesystem page cache synced and cleared with:

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

```bash
csync; echo 3 > /proc/sys/vm/drop_caches
```

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.

---

**Platform Notes**

**BIOS Settings:**
- VT-x: Disabled
- Energy Efficient P-state: Disabled
- Energy Efficient Turbo: Disabled

**Sysinfo program /home/cpu2017/bin/sysinfo**
Rev: r6365 of 2019-08-21 295195f888a3d7eddb1e6e46a485a0011
running on t110js Tue Nov 5 19:01:34 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) E-2274G CPU @ 4.00GHz
 1 "physical id"s (chips)
   8 "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 0 1 2 3
```

From lscpu:
```
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 8
On-line CPU(s) list: 0-7
Thread(s) per core: 2
Core(s) per socket: 4
Socket(s): 1
NUMA node(s): 1
Vendor ID: GenuineIntel
```

(Continued on next page)
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Platform Notes (Continued)

CPU family: 6
Model: 158
Model name: Intel(R) Xeon(R) E-2274G CPU @ 4.00GHz
Stepping: 10
CPU MHZ: 4630.371
CPU max MHZ: 4900.0000
CPU min MHZ: 800.0000
BogoMIPS: 8016.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 256K
L3 cache: 8192K
NUMA node0 CPU(s): 0-7
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
aperfmperpf eagerfpu pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg
fma cx16 xtpr pdcm pcid sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes
xsave avx f16c rdrand lahf_lm abm 3dnowprefetch intel_pt ssbd ibrs ibpb stibp
tpr_shadow vnmi flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2
erms invpcid rtm mpx rdseed adx smap clflushopt xsaveopt xsavec xgetbv1 dtherm ida
arat pin pts hwp hwp_notify hwp_act_window hwp_epp md_clear spec_ctrl intel_stibp
flush_lld

/cache data
   cache size : 8192 KB

From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a
physical chip.
   available: 1 nodes (0)
   node 0 cpus: 0 1 2 3 4 5 6 7
   node 0 size: 65283 MB
   node 0 free: 63384 MB
   node distances:
      node 0
       0: 10

From /proc/meminfo
   MemTotal: 65718384 kB
   HugePages_Total: 0
   Hugepagesize: 2048 kB

From /etc/*release* /etc/*version*
   os-release:
      NAME="Red Hat Enterprise Linux Server"
      VERSION="7.7 (Maipo)"

(Continued on next page)
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**SPECrate®2017_fp_base = 32.3**

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<tr>
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<th>9006</th>
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<tbody>
<tr>
<td>Test Sponsor:</td>
<td>NEC Corporation</td>
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<td>Tested by:</td>
<td>NEC Corporation</td>
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<td>Test Date:</td>
<td>Nov-2019</td>
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<td>Nov-2019</td>
</tr>
<tr>
<td>Software Availability:</td>
<td>Aug-2019</td>
</tr>
</tbody>
</table>

**Platform Notes (Continued)**

```plaintext
ID="rhel"
ID_LIKE="fedora"
VARIANT="Server"
VARIANT_ID="server"
VERSION_ID="7.7"
PRETTY_NAME="Red Hat Enterprise Linux Server 7.7 (Maipo)"
redhat-release: Red Hat Enterprise Linux Server release 7.7 (Maipo)
system-release: Red Hat Enterprise Linux Server release 7.7 (Maipo)
system-release-cpe: cpe:/o:redhat:enterprise_linux:7.7:ga:server

uname -a:
    Linux t110js 3.10.0-1062.el7.x86_64 #1 SMP Thu Jul 18 20:25:13 UTC 2019 x86_64 x86_64
    x86_64 GNU/Linux

 Kernel self-reported vulnerability status:

CVE-2018-3620 (L1 Terminal Fault): Mitigation: PTE Inversion
Microarchitectural Data Sampling: Mitigation: Clear CPU buffers; SMT vulnerable
CVE-2017-5754 (Meltdown): Mitigation: PTI
CVE-2018-3639 (Speculative Store Bypass): Mitigation: Speculative Store Bypass disabled via prctl and seccomp
CVE-2017-5753 (Spectre variant 1): Mitigation: Load fences, __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Full retpoline, IBPB

run-level 3 Nov 5 18:55

SPEC is set to: /home/cpu2017
    Filesystem  Type  Size  Used Avail Use% Mounted on
    /dev/sda3    ext4  908G  78G  784G  9% /

From /sys/devices/virtual/dmi/id
    BIOS: American Megatrends Inc. F01 08/21/2019
    Vendor: NEC
    Product: Express5800/T110j-S [N8100-2803Y]
    Serial: 0000002

    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.
    Memory:
        4x Samsung M391A2K43BB1-CTD 16 GB 2 rank 2667

    (End of data from sysinfo program)
```

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NEC Corporation

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Compiler Version Notes

C

| 519.lbm_r(base, peak) 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 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

C++

| 508.namd_r(base, peak) 510.parest_r(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.

C++, C

| 511.povray_r(base, peak) 526.blender_r(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.

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.

Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

C++, C, Fortran

| 507.cactuBSSN_r(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.

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)
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Fortran

| 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak)
| 554.roms_r(base, peak)

Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)

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Compiler Version Notes (Continued)

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Fortran, C      | 521.wrf_r(base, peak) 527.cam4_r(base, peak)

Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
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Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
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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

Base Portability Flags

503.bwaves_r: -DSPEC_LP64
507.cactusBSSN_r: -DSPEC_LP64
508.namd_r: -DSPEC_LP64
510.parest_r: -DSPEC_LP64
511.povray_r: -DSPEC_LP64
519.lbm_r: -DSPEC_LP64

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### Base Portability Flags (Continued)

- 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:**

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

**C++ benchmarks:**

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

**Fortran benchmarks:**

-DCORE-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:**

-DCORE-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++:**

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

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

-DCORE-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

(Continued on next page)
### Peak Compiler Invocation (Continued)

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

### 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: Same as 538.imagick_r

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

(Continued on next page)
SPEC CPU®2017 Floating Point Rate Result

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NEC Corporation

Expression5800/T110j-S (Intel Xeon E-2274G)

SPECrate®2017_fp_base = 32.3
SPECrate®2017_fp_peak = 34.1

CPU2017 License: 9006
Test Sponsor: NEC Corporation
Test Date: Nov-2019
Tested by: NEC Corporation
Hardware Availability: Nov-2019
Software Availability: Aug-2019

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

Peak Optimization Flags (Continued)

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 CPU®2017 v1.1.0 on 2019-11-05 05:01:33-0500.