## NEC Corporation

### Express5800/R120h-2M (Intel Xeon Platinum 8156)

<table>
<thead>
<tr>
<th>Test Sponsor</th>
<th>NEC Corporation</th>
<th>Hardware Availability</th>
<th>Software Availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tested by</td>
<td>NEC Corporation</td>
<td>Aug-2017</td>
<td>Mar-2018</td>
</tr>
</tbody>
</table>

### SPECrate2017_fp_base = 75.7

### SPECrate2017_fp_peak = 77.6

#### Hardware

<table>
<thead>
<tr>
<th>CPU Name</th>
<th>Intel Xeon Platinum 8156</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max MHz.</td>
<td>3700</td>
</tr>
<tr>
<td>Nominal</td>
<td>3600</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 (24 x 16 GB 2Rx8 PC4-2666V-R)</td>
</tr>
<tr>
<td>Storage</td>
<td>1 x 1 TB SATA, 7200 RPM, RAID 0</td>
</tr>
<tr>
<td>Other</td>
<td>None</td>
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</tbody>
</table>

#### Software

<table>
<thead>
<tr>
<th>OS</th>
<th>Red Hat Enterprise Linux Server release 7.4 (Maipo)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Compiler</td>
<td>C/C++: Version 18.0.2.199 of Intel C/C++ Compiler for Linux; Fortran: Version 18.0.2.199 of Intel Fortran Compiler for Linux</td>
</tr>
<tr>
<td>Parallel</td>
<td>No</td>
</tr>
<tr>
<td>Firmware</td>
<td>NEC BIOS Version U30 02/15/2018 released Mar-2018</td>
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<tr>
<td>File System</td>
<td>ext4</td>
</tr>
<tr>
<td>System State</td>
<td>Run level 3 (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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SPEC CPU2017 Floating Point Rate Result

NEC Corporation

Express5800/R120h-2M (Intel Xeon Platinum 8156)

SPECrate2017_fp_base = 75.7
SPECrate2017_fp_peak = 77.6

Results Table

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<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>
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<tr>
<td>503.bwaves_r</td>
<td>16</td>
<td>536</td>
<td>300</td>
<td>535</td>
<td>300</td>
<td>536</td>
<td>299</td>
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<tr>
<td>507.cactuBSSN_r</td>
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<td>427</td>
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<td>428</td>
<td>47.3</td>
<td>429</td>
<td>47.2</td>
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<tr>
<td>508.namd_r</td>
<td>16</td>
<td>350</td>
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<td>347</td>
<td>43.8</td>
<td>350</td>
<td>43.4</td>
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<td>510.parest_r</td>
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<td>58.3</td>
<td>720</td>
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<td>519.lbm_r</td>
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<td>44.2</td>
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<tr>
<td>521.wrf_r</td>
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<td>88.8</td>
<td>412</td>
<td>87.0</td>
<td>404</td>
<td>88.8</td>
</tr>
<tr>
<td>526.blender_r</td>
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<td>63.8</td>
<td>382</td>
<td>63.7</td>
<td>383</td>
<td>63.6</td>
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<tr>
<td>527.cam4_r</td>
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<td>70.0</td>
<td>389</td>
<td>71.9</td>
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<td>538.imagick_r</td>
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<td>276</td>
<td>144</td>
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<tr>
<td>544.nab_r</td>
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<td>276</td>
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<td>98.0</td>
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<td>83.3</td>
<td>785</td>
<td>79.4</td>
<td>747</td>
<td>83.4</td>
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<tr>
<td>554.roms_r</td>
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<td>486</td>
<td>52.3</td>
<td>489</td>
<td>52.0</td>
<td>474</td>
<td>53.6</td>
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</tbody>
</table>

SPECrate2017_fp_base = 75.7
SPECrate2017_fp_peak = 77.6

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:/home/cpu2017/je5.0.1-32:/home/cpu2017/je5.0.1-64"

Binaries compiled on a system with 1x Intel Core i7-6700K 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:
sync; echo 3 > /proc/sys/vm/drop_caches
runcpu command invoked through numactl i.e.:
umactl --interleave=all runcpu <etc>

Yes: The test sponsor attests, as of date of publication, that CVE-2017-5754 (Meltdown)

(Continued on next page)
General Notes (Continued)

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:
Thermal Configuration: Maximum Cooling
Workload Profile: General Throughput Compute
Memory Patrol Scrubbing: Disabled
LLC Dead Line Allocation: Disabled
LLC Prefetch: Enabled
Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
running on r120h2m Tue Sep 25 16:14:40 2018

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 8156 CPU @ 3.60GHz
  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 1 5 9 13
physical 1: cores 0 3 10 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
Thread(s) per core: 2
Core(s) per socket: 4
Socket(s): 2
NUMA node(s): 4
Vendor ID: GenuineIntel
CPU family: 6

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

Copyright 2017-2018 Standard Performance Evaluation Corporation

NEC Corporation

Express5800/R120h-2M (Intel Xeon Platinum 8156)

SPECrate2017_fp_base = 75.7
SPECrate2017_fp_peak = 77.6

CPU2017 License: 9006
Test Sponsor: NEC Corporation
Test Date: Sep-2018
Hardware Availability: Aug-2017
Tested by: NEC Corporation
Software Availability: Mar-2018

Platform Notes (Continued)

Model: 85
Model name: Intel(R) Xeon(R) Platinum 8156 CPU @ 3.60GHz
Stepping: 4
CPU MHz: 3600.000
BogoMIPS: 7200.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 16896K
NUMA node0 CPU(s): 0,1,8,9
NUMA node1 CPU(s): 2,3,10,11
NUMA node2 CPU(s): 4,5,12,13
NUMA node3 CPU(s): 6,7,14,15
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
aperfmperf eagerfpu pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 fma
cx16 xtpr pdcm pcid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes
xsave avx f16c rdrand lahf_lm abm 3nowprefetch epb cat_l3 cdp_l3 invpcid_single
intel_pt spec_ctrl ibpb_support tpr_shadow vmx flexpriority ept vpid fsgsbase
tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm cqm mpx rdt_a avx512f avx512dq
rdseed adx smap clflushopt clwb avx512cd avx512bw avx512vl xsaveopt xsavec xgetbv1
cqm_llc cqm_occmap llc cqm_mbb_total cqm_mbb_local dtherm ida arat pln pts

/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 1 8 9
  node 0 size: 97964 MB
  node 0 free: 95633 MB
  node 1 cpus: 2 3 10 11
  node 1 size: 98304 MB
  node 1 free: 96060 MB
  node 2 cpus: 4 5 12 13
  node 2 size: 98304 MB
  node 2 free: 96063 MB
  node 3 cpus: 6 7 14 15
  node 3 size: 98303 MB
  node 3 free: 96085 MB
  node distances:
    node 0  1  2  3
    0: 10 21 31 31
    1: 21 10 31 31

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

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Platform Notes (Continued)

2: 31 31 10 21
3: 31 31 21 10

From /proc/meminfo
MemTotal: 395931112 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

From /etc/*release* /etc/*version*

os-release:
NAME="Red Hat Enterprise Linux Server"
VERSION="7.4 (Maipo)"
ID="rhel"
ID_LIKE="fedora"
VARIANT="Server"
VARIANT_ID="server"
VERSION_ID="7.4"
PRETTY_NAME="Red Hat Enterprise Linux Server 7.4 (Maipo)"
redhat-release: Red Hat Enterprise Linux Server release 7.4 (Maipo)
system-release: Red Hat Enterprise Linux Server release 7.4 (Maipo)
system-release-cpe: cpe:/o:redhat:enterprise_linux:7.4:ga:server

uname -a:
Linux r120h2m 3.10.0-693.21.1.el7.x86_64 #1 SMP Fri Feb 23 18:54:16 UTC 2018 x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:
CVE-2017-5754 (Meltdown): Mitigation: PTI
CVE-2017-5753 (Spectre variant 1): Mitigation: Load fences
CVE-2017-5715 (Spectre variant 2): Mitigation: IBRS (kernel)

run-level 3 Sep 25 16:09

SPEC is set to: /home/cpu2017
Filesystem Type Size Used Avail Use% Mounted on
/dev/sda3 ext4 909G 470G 393G 55% /

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 NEC U30 02/15/2018
Memory:
24x UNKNOWN NOT AVAILABLE 16 GB 2 rank 2666

(End of data from sysinfo program)
NEC Corporation

Express5800/R120h-2M (Intel Xeon Platinum 8156)

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<td>77.6</td>
</tr>
</tbody>
</table>

CPU2017 License: 9006
Test Sponsor: NEC Corporation
Hardware Availability: Aug-2017
Test Date: Sep-2018
Tested by: NEC Corporation
Software Availability: Mar-2018

Compiler Version Notes

```plaintext
==---------------------------------==
| CC  519.lbm_r(base) 538.imagick_r(base, peak) 544.nab_r(base, peak) |
==---------------------------------==
| icc (ICC) 18.0.2 20180210         |
| Copyright (C) 1985-2018 Intel Corporation. All rights reserved. |
==---------------------------------==

==---------------------------------==
| CC  519.lbm_r(peak)              |
==---------------------------------==
| icc (ICC) 18.0.2 20180210         |
| Copyright (C) 1985-2018 Intel Corporation. All rights reserved. |
==---------------------------------==

==---------------------------------==
| CXXC 508.namd_r(base) 510.parest_r(base, peak) |
==---------------------------------==
| icpc (ICC) 18.0.2 20180210          |
| Copyright (C) 1985-2018 Intel Corporation. All rights reserved. |
==---------------------------------==

==---------------------------------==
| CXXC 508.namd_r(peak)             |
==---------------------------------==
| icpc (ICC) 18.0.2 20180210         |
| Copyright (C) 1985-2018 Intel Corporation. All rights reserved. |
==---------------------------------==

==---------------------------------==
| CC  511.povray_r(base) 526.blender_r(base, peak) |
==---------------------------------==
| icpc (ICC) 18.0.2 20180210          |
| Copyright (C) 1985-2018 Intel Corporation. All rights reserved. |
| icc (ICC) 18.0.2 20180210          |
| Copyright (C) 1985-2018 Intel Corporation. All rights reserved. |
==---------------------------------==

==---------------------------------==
| CC  511.povray_r(peak)            |
==---------------------------------==
| icpc (ICC) 18.0.2 20180210         |
| Copyright (C) 1985-2018 Intel Corporation. All rights reserved. |
| icc (ICC) 18.0.2 20180210          |
| Copyright (C) 1985-2018 Intel Corporation. All rights reserved. |
==---------------------------------==
```

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### NEC Corporation

**Express5800/R120h-2M (Intel Xeon Platinum 8156)**

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**Test Sponsor:** NEC Corporation  
**Tested by:** NEC Corporation  
**Test Date:** Sep-2018  
**Hardware Availability:** Aug-2017  
**Software Availability:** Mar-2018  

### Compiler Version Notes (Continued)

```plaintext
 FC  507.cactuBSSN_r(base, peak)

icpc (ICC) 18.0.2 20180210
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
icc (ICC) 18.0.2 20180210
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
ifort (IFORT) 18.0.2 20180210
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
```

```plaintext
 FC  503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak) 554.roms_r(base)

ifort (IFORT) 18.0.2 20180210
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
```

```plaintext
 FC  554.roms_r(peak)

ifort (IFORT) 18.0.2 20180210
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
```

```plaintext
 CC  521.wrf_r(base) 527.cam4_r(base)

ifort (IFORT) 18.0.2 20180210
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
icc (ICC) 18.0.2 20180210
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
```

```plaintext
 CC  521.wrf_r(peak) 527.cam4_r(peak)

ifort (IFORT) 18.0.2 20180210
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
icc (ICC) 18.0.2 20180210
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
```

### Base Compiler Invocation

**C benchmarks:**

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

(Continued on next page)
## NEC Corporation

**Express5800/R120h-2M (Intel Xeon Platinum 8156)**

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<tbody>
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</tbody>
</table>

---

## Base 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
```

---

## 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=3
```

### C++ benchmarks:

```
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=3
```

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

**Fortran benchmarks:**
- `xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only`
- `qopt-mem-layout-trans=3 -auto -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=3 -auto -nostandard-realloc-lhs`

**Benchmarks using both C and C++:**
- `xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only`
- `qopt-mem-layout-trans=3`

**Benchmarks using Fortran, C, and C++:**
- `xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only`
- `qopt-mem-layout-trans=3 -auto -nostandard-realloc-lhs`

## 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

## NEC Corporation

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</tr>
<tr>
<td>Tested by: NEC Corporation</td>
<td>Software Availability: Mar-2018</td>
</tr>
</tbody>
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## 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=3`

- 538.imagick_r: `-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=3`

- 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=3`

- 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=3 -auto -nostandard-realloc-lhs`

### 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=3 -auto -nostandard-realloc-lhs`

### 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=3`

- 526.blender_r: basepeak = yes

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

- `-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=3 -auto -nostandard-realloc-lhs`
SPEC CPU2017 Floating Point Rate Result

NEC Corporation

Express5800/R120h-2M (Intel Xeon Platinum 8156)

SPECrate2017_fp_base = 75.7
SPECrate2017_fp_peak = 77.6

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The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/NEC-Platform-Settings-V1.2-R120h-RevB.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/Intel-ic18.0-official-linux64.2017-12-21.xml
http://www.spec.org/cpu2017/flags/NEC-Platform-Settings-V1.2-R120h-RevB.xml

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