NEC Corporation

Express5800/D120h (Intel Xeon Silver 4110)

SPECrates:
- SPECrate2017_fp_base = 42.5
- SPECrate2017_fp_peak = 43.8

Hardware:
- CPU Name: Intel Xeon Silver 4110
- Max MHz.: 3000
- Nominal: 2100
- Enabled: 8 cores, 1 chip, 2 threads/core
- Orderable: 1.2 chips
- Cache L1: 32 KB I + 32 KB D on chip per core
- L2: 1 MB I+D on chip per core
- L3: 11 MB I+D on chip per chip
- Other: None
- Memory: 192 GB (6 x 32 GB 2Rx4 PC4-2666V-R, running at 2400)
- Storage: 1 x 1 TB SATA, 7200 RPM
- Other: None

Software:
- OS: Red Hat Enterprise Linux Server release 7.4 (Maipo)
- Compiler: C/C++: Version 18.0.0.128 of Intel C/C++ Compiler for Linux;
  Fortran: Version 18.0.0.128 of Intel Fortran Compiler for Linux
- Parallel: No
- Firmware: Version F21 02/22/2018 released Apr-2018
- File System: ext4
- System State: Run level 3 (multi-user)
- Base Pointers: 64-bit
- Peak Pointers: 64-bit
- Other: None
SPEC CPU2017 Floating Point Rate Result

NEC Corporation

Express5800/D120h (Intel Xeon Silver 4110)

SPECrate2017_fp_base = 42.5
SPECrate2017_fp_peak = 43.8

CPU2017 License: 9006
Test Date: Jul-2018
Test Sponsor: NEC Corporation
Hardware Availability: Jan-2018
Tested by: NEC Corporation
Software Availability: Mar-2018

Results Table

<table>
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<th>Benchmark</th>
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<th>Seconds</th>
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<td>554.roms_r</td>
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<td>26.6</td>
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<td></td>
</tr>
</tbody>
</table>

SPECrate2017_fp_base = 42.5
SPECrate2017_fp_peak = 43.8

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"

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 i7-4790 CPU + 32GB RAM
memory using Redhat Enterprise Linux 7.4
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

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)

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

NEC Corporation

Express5800/D120h (Intel Xeon Silver 4110)

<table>
<thead>
<tr>
<th>SPECrate2017_fp_base</th>
<th>SPECrate2017_fp_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>42.5</td>
<td>43.8</td>
</tr>
</tbody>
</table>

CPU2017 License: 9006
Test Sponsor: NEC Corporation
Test Date: Jul-2018
Hardware Availability: Jan-2018
Tested by: NEC Corporation
Software Availability: Mar-2018

General Notes (Continued)

is mitigated in the system as tested and documented.
Yes: The test sponsor attests, as of date of publication, that CVE-2017-5715 (Spectre variant 2) is mitigated in the system as tested and documented.

Platform Notes

BIOS Settings:
ENERGY_PERF_BIAS_CFG mode: Performance
LLC dead line alloc: Disable
Patrol Scrub: Disable
Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r5797 of 2017-06-14 96c45e4568ad54c135fd618bcc091c0f
running on d120h Wed Jul 11 11:48:33 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) Silver 4110 CPU @ 2.10GHz
 1 "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 : 8
  siblings : 16
  physical 0: cores 0 1 2 3 4 5 6 7

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: 8
Socket(s): 1
NUMA node(s): 1
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Silver 4110 CPU @ 2.10GHz
Stepping: 4
CPU MHz: 1445.062
CPU max MHz: 3000.0000

(Continued on next page)
NEC Corporation

Express5800/D120h (Intel Xeon Silver 4110)  

SPECrat2017_fp_base = 42.5  
SPECrat2017_fp_peak = 43.8

CPU2017 License: 9006  
Test Sponsor: NEC Corporation  
Tested by: NEC Corporation  
Test Date: Jul-2018  
Hardware Availability: Jan-2018  
Software Availability: Mar-2018

Platform Notes (Continued)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU min MHz:</td>
<td>800.0000</td>
</tr>
<tr>
<td>BogoMIPS:</td>
<td>4200.00</td>
</tr>
<tr>
<td>Virtualization:</td>
<td>VT-x</td>
</tr>
<tr>
<td>L1d cache:</td>
<td>32K</td>
</tr>
<tr>
<td>L1i cache:</td>
<td>32K</td>
</tr>
<tr>
<td>L2 cache:</td>
<td>1024K</td>
</tr>
<tr>
<td>L3 cache:</td>
<td>11264K</td>
</tr>
<tr>
<td>NUMA node0 CPU(s):</td>
<td>0-15</td>
</tr>
</tbody>
</table>
| 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 aperfmperf eagerfpu pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 fma cx16 xtpre pdcm pcid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c rdrand lahf_lm abm 3dnowprefetch epb cat_i3 cdp_i3 invpcid_single intel_pt spec_ctrl ibpb_support tpr_shadow vnni 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 xsaves xsavec xgetbv1 cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local dtherm ida arat pln pts hwp hwp_act_window hwp_epp hwp_pkg_req
| /proc/cpuinfo cache data          | cache size : 11264 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 8 9 10 11 12 13 14 15 |
| node 0 size:                      | 195236 MB             |
| node 0 free:                      | 190086 MB             |
| node distances:                   | node 0                |
|                                   | 0: 10                 |

From /proc/meminfo

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>MemTotal:</td>
<td>196476416 kB</td>
</tr>
<tr>
<td>HugePages_Total:</td>
<td>0</td>
</tr>
<tr>
<td>Hugepagesize:</td>
<td>2048 kB</td>
</tr>
</tbody>
</table>

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"

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

NEC Corporation

Express5800/D120h (Intel Xeon Silver 4110)

SPECrate2017_fp_base = 42.5
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CPU2017 License: 9006
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Platform Notes (Continued)

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 d120h 3.10.0-693.21.1.el7.x86_64 #1 SMP Fri Feb 23 18:54:16 UTC 2018 x86_64
    x86_64 x86_64 GNU/Linux

run-level 3 Jul 11 11:42
SPEC is set to: /home/cpu2017

Filesystem Type Size Used Avail Use% Mounted on
/dev/sda3 ext4 909G 402G 461G 47% /

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 GIGABYTE F21 02/22/2018
    Memory:
        10x NO DIMM NO DIMM
        6x Samsung M393A4K40BB2-CTD 32 GB 2 rank 2666, configured at 2400

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
| CC  519.lbm_r(base) 538.imagick_r(base, peak) 544.nab_r(base) |
|==============================================================================|
| icc (ICC) 18.0.0 20170811 |
| Copyright (C) 1985-2017 Intel Corporation. All rights reserved. |
|==============================================================================|

==============================================================================
| CC  519.lbm_r(peak) 544.nab_r(peak) |
|==============================================================================|
| icc (ICC) 18.0.0 20170811 |
| Copyright (C) 1985-2017 Intel Corporation. All rights reserved. |
|==============================================================================|

==============================================================================
| CXXC 508.namd_r(base) 510.parest_r(base) |
|==============================================================================|
| icpc (ICC) 18.0.0 20170811 |
| (Continued on next page) |
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Compiler Version Notes (Continued)

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==============================================================================
CXXC 508.namd_r(peak) 510.parest_r(peak)
icpc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.

==============================================================================
CC  511.povray_r(base) 526.blender_r(base)
icpc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.

==============================================================================
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icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.

==============================================================================
FC  507.cactuBSSN_r(base)
icpc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
ifort (IFORT) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.

==============================================================================
FC   507.cactuBSSN_r(peak)
icpc (ICC) 18.0.0 20170811
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icc (ICC) 18.0.0 20170811
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ifort (IFORT) 18.0.0 20170811
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(Continued on next page)
SPEC CPU2017 Floating Point Rate Result

NEC Corporation
Express5800/D120h (Intel Xeon Silver 4110)

SPECrate2017_fp_base = 42.5
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Compiler Version Notes (Continued)

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==============================================================================
FC 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak) 554.roms_r(base)
------------------------------------------------------------------------------
ifort (IFORT) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.

------------------------------------------------------------------------------
FC 554.roms_r(peak)
------------------------------------------------------------------------------
ifort (IFORT) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.

------------------------------------------------------------------------------
CC 521.wrf_r(base) 527.cam4_r(base)
------------------------------------------------------------------------------
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icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.

------------------------------------------------------------------------------
CC 521.wrf_r(peak) 527.cam4_r(peak)
------------------------------------------------------------------------------
ifort (IFORT) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.

Base Compiler Invocation

C benchmarks:
icc

C++ benchmarks:
icpc

Fortran benchmarks:
ifort

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

| NEC Corporation | SPECrate2017_fp_base = 42.5 |
| Express5800/D120h (Intel Xeon Silver 4110) | SPECrate2017_fp_peak = 43.8 |

| CPU2017 License: | 9006 |
| Test Sponsor: | NEC Corporation |
| Tested by: | NEC Corporation |
| Test Date: | Jul-2018 |
| Hardware Availability: | Jan-2018 |
| Software Availability: | Mar-2018 |

### Base Compiler Invocation (Continued)

- Benchmarks using both Fortran and C:
  - ifort icc
- Benchmarks using both C and C++:
  - icpc icc
- Benchmarks using Fortran, C, and C++:
  - icpc icc ifort

### Base Portability Flags

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Flags</th>
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<tbody>
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<td>bwaves_r</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>cactuBSSN_r</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>namd_r</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>parest_r</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>povray_r</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>lbm_r</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>wrf_r</td>
<td>-DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian</td>
</tr>
<tr>
<td>blender_r</td>
<td>-DSPEC_LP64 -DSPEC_LINUX -funsigned-char</td>
</tr>
<tr>
<td>cam4_r</td>
<td>-DSPEC_LP64 -DSPEC_CASE_FLAG</td>
</tr>
<tr>
<td>imagick_r</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>nab_r</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>fotonik3d_r</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>roms_r</td>
<td>-DSPEC_LP64</td>
</tr>
</tbody>
</table>

### 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

- **Fortran benchmarks**:
  - -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
  - -qopt-mem-layout-trans=3 -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=3 -nostandard-realloc-lhs -align array32byte

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

NEC Corporation
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CPU2017 License: 9006
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Test Date: Jul-2018
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Software Availability: Mar-2018

Base Optimization Flags (Continued)

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 -nostandard-realloc-lhs -align array32byte

Base Other Flags

C benchmarks:
-m64 -std=c11

C++ benchmarks:
-m64

Fortran benchmarks:
-m64

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

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

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

Peak Compiler Invocation

C benchmarks:
icc

C++ benchmarks:
icpc

Fortran benchmarks:
ifort

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

Benchmarks using both Fortran and C:

```
ifort icc
```

Benchmarks using both C and C++:

```
icpc icc
```

Benchmarks using Fortran, C, and C++:

```
icpc icc ifort
```

### 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=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 519.lbm_r

#### C++ benchmarks:

- `--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`

#### Fortran benchmarks:

503.bwaves_r:  
- `--xCORE-AVX2`  
- `--ipo -O3`  
- `--no-prec-div`  
- `--qopt-prefetch`  
- `--ffinite-math-only`  
- `--qopt-mem-layout-trans=3`
- `--nostandard-realloc-lhs`  
- `--align array32byte`

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`  
- `--nostandard-realloc-lhs`

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

**NEC Corporation**

**Express5800/D120h (Intel Xeon Silver 4110)**

<table>
<thead>
<tr>
<th>Benchmark</th>
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<td>42.5</td>
<td>43.8</td>
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**CPU2017 License:** 9006  
**Test Sponsor:** NEC Corporation  
**Tested by:** NEC Corporation  
**Test Date:** Jul-2018  
**Hardware Availability:** Jan-2018  
**Software Availability:** Mar-2018

### Peak Optimization Flags (Continued)

554.roms_r (continued):
- -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=3 -nostandard-realloc-lhs -align array32byte

Benchmarks using both C and C++:
- -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -03  
- -no-prec-div -qopt-prefetch -ffinite-math-only  
- qopt-mem-layout-trans=3

Benchmarks using Fortran, C, and C++:
- 507.cactuBSSN_r: basepeak = yes

### Peak Other Flags

**C benchmarks:**
- -m64 -std=c11

**C++ benchmarks:**
- -m64

**Fortran benchmarks:**
- -m64

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

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

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

The flags files that were used to format this result can be browsed at
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### NEC Corporation

**Expression5800/D120h (Intel Xeon Silver 4110)**

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You can also download the XML flags sources by saving the following links:

http://www.spec.org/cpu2017/flags/NEC-Platform-Settings-V1.2-D120h-RevA.xml

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