## NEC Corporation

Express5800/T120h (Intel Xeon Silver 4114)

### SPECrate2017_fp_base = 110

<table>
<thead>
<tr>
<th>SPECrate2017_fp_peak = 112</th>
</tr>
</thead>
</table>

**CPU2017 License:** 9006

**Test Sponsor:** NEC Corporation

**Tested by:** NEC Corporation

**Test Date:** Apr-2019

**Hardware Availability:** Nov-2017

**Software Availability:** Jan-2019

---

### Hardware

**CPU Name:** Intel Xeon Silver 4114

**Max MHz.:** 3000

**Nominal:** 2200

**Enabled:** 20 cores, 2 chips, 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:** 13.75 MB I+D on chip per chip

**Other:** None

**Memory:** 384 GB (24 x 16 GB 2Rx8 PC4-2666V-R, running at 2400)

**Storage:** 1 x 1 TB SATA, 7200 RPM, RAID 0

**Other:** None

---

### Software

**OS:** Red Hat Enterprise Linux Server release 7.6 (Maipo)

**Compiler:** 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

**Parallel:** No

**Firmware:** NEC BIOS Version U41 v2.02 03/19/2019 released May-2019

**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/T120h (Intel Xeon Silver 4114)

SPECrate2017_fp_base = 110

SPECrate2017_fp_peak = 112

Results Table

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<td>59.5</td>
</tr>
</tbody>
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SPECrate2017_fp_base = 110
SPECrate2017_fp_peak = 112

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/intel64"

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.:
numactl --interleave=all runcpu <etc>

Yes: The test sponsor attests, as of date of publication, that CVE-2017-5754 (Meltdown)
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
Workload Profile: Custom
Sub-NUMA Clustering: Disabled
Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
running on t120h Fri Apr 19 08:09:27 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) Silver 4114 CPU @ 2.20GHz
  2 "physical id"s (chips)
  40 "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 : 10
  siblings : 20
    physical 0: cores 0 1 2 3 4 8 9 10 11 12
    physical 1: cores 0 1 2 3 4 8 9 10 11 12

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 40
On-line CPU(s) list: 0-39
Thread(s) per core: 2
Core(s) per socket: 10
Socket(s): 2
NUMA node(s): 2

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

NEC Corporation
Express5800/T120h (Intel Xeon Silver 4114)

SPECRate2017_fp_base = 110
SPECRate2017_fp_peak = 112

CPU2017 License: 9006
Test Sponsor: NEC Corporation
Hardware Availability: Nov-2017
Tested by: NEC Corporation
Software Availability: Jan-2019
Test Date: Apr-2019

Platform Notes (Continued)

Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Silver 4114 CPU @ 2.20GHz
Stepping: 4
CPU MHz: 2200.000
BogoMIPS: 4400.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 14080K
NUMA node0 CPU(s): 0-9,20-29
NUMA node1 CPU(s): 10-19,30-39
Flags: fpu vme de pse tsc msr pae mce 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 sdbg fma cx16 xtpr pdcm pcid dca sse4_1_l sse4_2_x2apic movbe popcnt tsc_deadline_timer aes xsave avx flc rcx xladh lm abm 3nowprefetch epb cat_13 cdp_13 intel_pni intel_pt ssbd mba ibrs ibpb stibp tpr_shadow vnmf flexpriority ept vpid fsgsbase tsc_adjust bm1 hle avx2 smep bmi2 erms invpcid rtm cmpl mxs mpx rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb avx512cd avx512bw avx512vl xsaveopt xsavec xgetbv1 cmpxchg16b cmpxchglc cmpxchglc dmb mbt mbc mbm_mb_total mbm_mb_local dtherm ida arat pln pts pku ospace spec_ctrl intel_stibp flush_l1d

/proc/cpuinfo cache data
  cache size: 14080 KB

From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a physical chip.
  available: 2 nodes (0-1)
    node 0 cpu(s): 0 1 2 3 4 5 6 7 8 9 20 21 22 23 24 25 26 27 28 29
    node 0 size: 196257 MB
    node 0 free: 191211 MB
    node 1 cpu(s): 10 11 12 13 14 15 16 17 18 19 30 31 32 33 34 35 36 37 38 39
    node 1 size: 196607 MB
    node 1 free: 192073 MB
    node distances:
      node 0 1
      0: 10 21
      1: 21 10

From /proc/meminfo
  MemTotal: 395915604 kB
  HugePages_Total: 0
  Hugepagesize: 2048 kB

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

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Tested by: NEC Corporation

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Platform Notes (Continued)

From /etc/*release* /etc/*version*
   os-release:
      NAME="Red Hat Enterprise Linux Server"
      VERSION="7.6 (Maipo)"
      ID=rhel
      ID_LIKE="fedora"
      VARIANT="Server"
      VARIANT_ID="server"
      VERSION_ID="7.6"
      PRETTY_NAME="Red Hat Enterprise Linux Server 7.6 (Maipo)"
redhat-release: Red Hat Enterprise Linux Server release 7.6 (Maipo)
system-release: Red Hat Enterprise Linux Server release 7.6 (Maipo)

uname -a:
   Linux t120h 3.10.0-957.5.1.el7.x86_64 #1 SMP Wed Dec 19 10:46:58 EST 2018 x86_64
   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, __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: IBRS (kernel)

run-level 3 Apr 19 08:03

SPEC is set to: /home/cpu2017
   Filesystem   Type  Size  Used Avail Use% Mounted on
   /dev/sda3    ext4  909G  91G  772G  11% /

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 U41 03/19/2019
   Memory:
      6x HPE 840756-091 16 GB 2 rank 2666, configured at 2400
      18x UNKNOWN NOT AVAILABLE 16 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, peak)

(Continued on next page)
NEC Corporation

Express5800/T120h (Intel Xeon Silver 4114)

SPEC CPU2017 Floating Point Rate Result

SPECrate2017_fp_base = 110
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CPU2017 License: 9006
Test Sponsor: NEC Corporation
Test Date: Apr-2019
Tested by: NEC Corporation
Hardware Availability: Nov-2017
Software Availability: Jan-2019

Compiler Version Notes (Continued)

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

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CC  519.lbm_r(peak)
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icc (ICC) 18.0.2 20180210
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==============================================================================
CXXC 508.namd_r(base) 510.parest_r(base, peak)
==============================================================================
icpc (ICC) 18.0.2 20180210
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==============================================================================
CXXC 508.namd_r(peak)
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Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
icpc (ICC) 18.0.2 20180210
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.

==============================================================================
FC  507.cactuBSSN_r(base, peak)
==============================================================================

(Continued on next page)
NEC Corporation
Express5800/T120h (Intel Xeon Silver 4114)

SPEC CPU2017 Floating Point Rate Result

Copyright 2017-2019 Standard Performance Evaluation Corporation

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Compiler Version Notes (Continued)

icpc (ICC) 18.0.2 20180210
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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.

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FC 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak) 554.roms_r(base)
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ifort (IFORT) 18.0.2 20180210
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FC 554.roms_r(peak)
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==============================================================================
CC 521.wrf_r(base) 527.cam4_r(base)
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icc (ICC) 18.0.2 20180210
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Base Compiler Invocation
C benchmarks:
icc -m64 -std=c11

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

NEC Corporation
Express5800/T120h (Intel Xeon Silver 4114)

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CPU2017 License: 9006  
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### 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)
## NEC Corporation

**Express5800/T120h (Intel Xeon Silver 4114)**

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</table>

### 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**

Express5800/T120h (Intel Xeon Silver 4114)

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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: `basepeak = yes`
- 544.nab_r: `-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=3`

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

(Continued on next page)
## NEC Corporation

**Express5800/T120h (Intel Xeon Silver 4114)**

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

---

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:

- [http://www.spec.org/cpu2017/flags/NEC-Platform-Settings-V1.2-R120h-RevB.xml](http://www.spec.org/cpu2017/flags/NEC-Platform-Settings-V1.2-R120h-RevB.xml)

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