## SPEC CPU®2017 Floating Point Rate Result

**NEC Corporation**

**Express5800/R120h-1M (Intel Xeon Gold 6244)**

| Copies | 0 | 15 | 30 | 45 | 60 | 75 | 90 | 105 | 120 | 135 | 150 | 165 | 180 | 195 | 210 | 225 | 240 | 255 | 270 | 285 | 300 | 315 | 330 | 345 | 360 |
|--------|---|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 503.bwaves_r | 32 | 16 | 100 | |
| 507.cactuBSSN_r | 32 | 100 | 95.3 | |
| 508.namd_r | 32 | 95.8 | 98.4 | |
| 510.parest_r | 32 | 100 | | |
| 511.povray_r | 32 | 144 | 175 | |
| 519.lbm_r | 32 | 71.2 | 75.0 | |
| 521.wrf_r | 32 | 130 | 163 | |
| 526.blender_r | 32 | 147 | 155 | |
| 527.cam4_r | 32 | | 308 | |
| 538.imagick_r | 32 | 104 | 218 | |
| 544.nab_r | 32 | 76.2 | 87.4 | |
| 549.fotonik3d_r | 32 | 104 | | |
| 554.roms_r | 32 | | 218 | |

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### Hardware

- **CPU Name:** Intel Xeon Gold 6244
- **Max MHz:** 4400
- **Enabled:** 16 cores, 2 chips, 2 threads/core
- **Orderable:** 1.2 chips
- **Cache L1:** 32 KB I + 32 KB D on chip per core
- **Cache L2:** 1 MB I+D on chip per core
- **Cache L3:** 24.75 MB I+D on chip per chip
- **Memory:** 384 GB (24 x 16 GB 2Rx8 PC4-2933Y-R)
- **Storage:** 1 x 1 TB SATA, 7200 RPM, RAID 0
- **Other:** None

### 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 U32 v2.32 03/09/2020 released Jun-2020
- **File System:** ext4
- **System State:** Run level 3 (multi-user)
- **Base Pointers:** 64-bit
- **Peak Pointers:** 64-bit
- **Other:** None
- **Power Management:** BIOS set to prefer performance at the cost of additional power usage.

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**SPECrate®2017_fp_base = 137**

**SPECrate®2017_fp_peak = 142**

**NEC Corporation**

**Test Sponsor:** NEC Corporation

**Test Date:** Oct-2020

**Hardware Availability:** Dec-2019

**Tested by:** NEC Corporation

**Software Availability:** Sep-2019

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**CPU2017 License:** 9006

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| SPECrate®2017_fp_base | 137 |
| SPECrate®2017_fp_peak | 142 |

**CPU2017 License:** 9006  
**Test Sponsor:** NEC Corporation  
**Tested by:** NEC Corporation  
**Test Date:** Oct-2020  
**Hardware Availability:** Dec-2019  
**Software Availability:** Sep-2019

## Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
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<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
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<td>544.nab_r</td>
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<td>87.4</td>
</tr>
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</table>

**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"

**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 i9-7900X 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.:

(Continued on next page)
General Notes (Continued)

numactl --interleave=all runcpu <etc>

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.

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
Enhanced Processor Performance: Enabled

Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7edble6e46a485a0011
running on r120h1m Tue Oct 13 15:46:54 2020

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 6244 CPU @ 3.60GHz
  2 "physical id"s (chips)
  32 "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 3 8 17 18 24 25 27
  physical 1: cores 2 8 9 18 19 20 25 26

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 32
On-line CPU(s) list: 0-31
Thread(s) per core: 2

(Continued on next page)
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CPU2017 License: 9006
Test Sponsor: NEC Corporation
Test Date: Oct-2020
Hardware Availability: Dec-2019
Tested by: NEC Corporation
Software Availability: Sep-2019

Platform Notes (Continued)

Core(s) per socket: 8
Socket(s): 2
NUMA node(s): 4
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Gold 6244 CPU @ 3.60GHz
Stepping: 6
CPU MHz: 3600.000
BogoMIPS: 7200.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 25344K
NUMA node0 CPU(s): 4-7,20-23
NUMA node1 CPU(s): 0-3,16-19
NUMA node2 CPU(s): 8-11,24-27
NUMA node3 CPU(s): 12-15,28-31
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
aperfmpref eagerfpu 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 tsc_deadline_timer aes
xsave avx f16c rdrand lahf_lm abm 3dnowprefetch ebx cat_l3 cdp_l3 invpcid_single
intel_pinn intel_pt ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vmmi
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 xsavesopt xsaveopt xsave xgetbv1 cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local
dtherm ida arat pin pts pku ospke avx512_vnni md_clear spec_ctrl intel_stibp
flush_lld arch_capabilities

From numactl --hardware
WARNING: a numactl 'node' might or might not correspond to a physical chip.
available: 4 nodes (0-3)
node 0 cpus: 4 5 6 7 20 21 22 23
node 0 size: 98304 MB
node 0 free: 96023 MB
node 1 cpus: 0 1 2 3 16 17 18 19
node 1 size: 97960 MB
node 1 free: 95594 MB
node 2 cpus: 8 9 10 11 24 25 26 27
node 2 size: 65536 MB
node 2 free: 63898 MB

(Continued on next page)
### Platform Notes (Continued)

- **node 3 cpus:** 12 13 14 15 28 29 30 31
- **node 3 size:** 98303 MB
- **node 3 free:** 96063 MB
- **node distances:**
  - node 0 1 2 3
  - 0: 10 21 21 21
  - 1: 21 10 21 21
  - 2: 21 21 10 21
  - 3: 21 21 21 10

From `/proc/meminfo`
- **MemTotal:** 362893468 kB
- **HugePages_Total:** 0
- **Hugepagesize:** 2048 kB

From `/etc/*release*` /`/etc/*version*`
- **os-release:**
  - NAME="Red Hat Enterprise Linux Server"
  - VERSION="7.7 (Maipo)"
  - 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 r120h1m 3.10.0-1062.1.1.el7.x86_64 #1 SMP Tue Aug 13 18:39:59 UTC 2019 x86_64 x86_64 GNU/Linux
```

Kernel self-reported vulnerability status:

- **CVE-2018-3620 (L1 Terminal Fault):** Not affected
- **Microarchitectural Data Sampling:** Not affected
- **CVE-2017-5754 (Meltdown):** Not affected
- **CVE-2018-3639 (Speculative Store Bypass):** Mitigation: Speculative Store Bypass disabled via prctl and seccomp
- **CVE-2017-5753 (Spectre variant 1):** Mitigation: Load fences, usercopy/swapgs barriers and __user pointer sanitation
- **CVE-2017-5715 (Spectre variant 2):** Mitigation: Full retpoline, IBPB

**run-level 3 Oct 13 15:41**

**SPEC is set to:** /home/cpu2017

(Continued on next page)
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<table>
<thead>
<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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<tr>
<td>Tested by:</td>
<td>NEC Corporation</td>
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**SPECrate®2017_fp_base = 137**  
**SPECrate®2017_fp_peak = 142**

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## Platform Notes (Continued)

<table>
<thead>
<tr>
<th>Filesystem</th>
<th>Type</th>
<th>Size</th>
<th>Used</th>
<th>Avail</th>
<th>Use%</th>
<th>Mounted on</th>
</tr>
</thead>
<tbody>
<tr>
<td>/dev/sda3</td>
<td>ext4</td>
<td>908G</td>
<td>186G</td>
<td>677G</td>
<td>22%</td>
<td>/</td>
</tr>
</tbody>
</table>

From /sys/devices/virtual/dmi/id

- **BIOS:** NEC U32 03/09/2020
- **Vendor:** NEC
- **Product:** Express5800/R120h-1M
- **Serial:** JPN0084094

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:** 24x HPE P03050-091 16 GB 2 rank 2933

(End of data from sysinfo program)

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## Compiler Version Notes

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### C

<table>
<thead>
<tr>
<th>519.lbm_r(base, peak)</th>
<th>538.imagick_r(base, peak)</th>
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<tbody>
<tr>
<td>544.nab_r(base, peak)</td>
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</tbody>
</table>

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.

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### 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.

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### 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,  
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(Continued on next page)
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Compiler Version Notes (Continued)

==============================================================================
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,
    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)
64, Version 19.0.4.227 Build 20190416
 Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
==============================================================================
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)
64, Version 19.0.4.227 Build 20190416
 Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
==============================================================================
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)
64, Version 19.0.4.227 Build 20190416
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 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.

Base Compiler Invocation

C benchmarks:
  icc -m64 -std=c11

C++ benchmarks:
  icpc -m64

Fortran benchmarks:
  ifort -m64

(Continued on next page)
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Base Compiler Invocation (Continued)

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=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

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

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

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
PEC CPU®2017 Floating Point Rate Result

NEC Corporation
Express5800/R120h-1M (Intel Xeon Gold 6244)

SPECrate®2017_fp_base = 137
SPECrate®2017_fp_peak = 142

CPU2017 License: 9006
Test Sponsor: NEC Corporation
Tested by: NEC Corporation

Test Date: Oct-2020
Hardware Availability: Dec-2019
Software Availability: Sep-2019

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

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:

521.wrf_r: basepeak = yes

527.cam4_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 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

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

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Peak Optimization Flags (Continued)

511.povray_r (continued):
-qopt-mem-layout-trans=4

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=4 -auto -nounder-realoc-lhs
-align array32byte

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-RevE.html

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-RevE.xml

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

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