# SPEC CPU®2017 Floating Point Speed Result

**NEC Corporation**

Express5800/R120h-1M (Intel Xeon Platinum 8280)

| SPECspeed®2017_fp_peak | 156 |
| SPECspeed®2017_fp_base | 155 |

**CPU2017 License:** 9006

**Test Sponsor:** NEC Corporation

**Test Date:** Aug-2020

**Hardware Availability:** Dec-2019

**Tested by:** NEC Corporation

**Software Availability:** Sep-2019

## Threads

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
</tr>
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<tbody>
<tr>
<td>603.bwaves_s</td>
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<tr>
<td>607.cactuBSSN_s</td>
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<tr>
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</tr>
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</tr>
<tr>
<td>644.nab_s</td>
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</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>56</td>
</tr>
<tr>
<td>654.roms_s</td>
<td>56</td>
</tr>
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**SPECspeed®2017_fp_base (155)**

**SPECspeed®2017_fp_peak (156)**

## Hardware

**CPU Name:** Intel Xeon Platinum 8280

**Max MHz:** 4000

**Nominal:** 2700

**Enabled:** 56 cores, 2 chips

**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:** 38.5 MB I+D on chip per chip

**Other:** None

**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)

**Kernel:** 3.10.0-1062.1.1.el7.x86_64

**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:** Yes

**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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### SPECspeed®2017_fp_base = 155

### SPECspeed®2017_fp_peak = 156

## Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
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<tr>
<td>603.bwaves_s</td>
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<td>513</td>
<td>115</td>
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<tr>
<td>607.cactuBSSN_s</td>
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<td>89.7</td>
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<td>91.6</td>
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<td>619.lbm_s</td>
<td>56</td>
<td>49.1</td>
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<td>49.7</td>
<td>105</td>
<td>48.9</td>
<td>107</td>
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<td>621.wrf_s</td>
<td>56</td>
<td>102</td>
<td>129</td>
<td>101</td>
<td>130</td>
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<td>63.2</td>
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<td>62.6</td>
<td>189</td>
<td>62.9</td>
</tr>
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<td>81.8</td>
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<td>644.nab_s</td>
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<td>101</td>
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<td>97.3</td>
<td>162</td>
<td>97.3</td>
<td>162</td>
</tr>
</tbody>
</table>

### 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:
  - KMP_AFFINITY = "granularity=fine,compact"
  - LD_LIBRARY_PATH = "/home/cpu2017/lib/intel64"
  - OMP_STACKSIZE = "192M"

### 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

**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.
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**Test Date:** Aug-2020

**Hardware Availability:** Dec-2019

**Software Availability:** Sep-2019

## Platform Notes

**BIOS Settings:**
- Thermal Configuration: Maximum Cooling
- Workload Profile: General Peak Frequency Compute
- Intel Hyper-Threading: Disabled
- Memory Patrol Scrubbing: Disabled
- LLC Dead Line Allocation: Disabled
- LLC Prefetch: Enabled
- Enhanced Processor Performance: Enabled
- Workload Profile: Custom
  - Advanced Memory Protection: Advanced ECC Support
  - NUMA Group Size Optimization: Flat

**Sysinfo program /home/cpu2017/bin/sysinfo**

Rev: r6365 of 2019-08-21 295195f888a3d7edble6e46a485a0011
running on r120h1m Sun Aug 23 19:30:09 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](https://www.spec.org/cpu2017/Docs/config.html#sysinfo)

**From /proc/cpuinfo**

- model name : Intel(R) Xeon(R) Platinum 8280 CPU @ 2.70GHz
- 2 "physical id"s (chips)
- 56 "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 : 28
- siblings : 28
- physical 0: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27 28 29 30
- physical 1: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27 28 29 30

**From lscpu:**

- Architecture: x86_64
- CPU op-mode(s): 32-bit, 64-bit
- Byte Order: Little Endian
- CPU(s): 56
- On-line CPU(s) list: 0-55
- Thread(s) per core: 1
- Core(s) per socket: 28
- Socket(s): 2
- NUMA node(s): 2
- Vendor ID: GenuineIntel
- CPU family: 6
- Model: 85
- Model name: Intel(R) Xeon(R) Platinum 8280 CPU @ 2.70GHz

(Continued on next page)
## NEC Corporation

**Express5800/R120h-1M (Intel Xeon Platinum 8280)**

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### Platform Notes (Continued)

- Stepping: 6
- CPU MHz: 2700.000
- BogoMIPS: 5400.00
- Virtualization: VT-x
- L1d cache: 32K
- L1i cache: 32K
- L2 cache: 1024K
- L3 cache: 39424K
- NUMA node0 CPU(s): 0-27
- NUMA node1 CPU(s): 28-55

Flags: fpu vme de pse ts 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 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 epb cat_13 cdtp_13 invpcid_single intel_pni intel_pt ssbd mba ibrs ibpb ibrs enhanced tpr_shadow vnmi flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm cmqm mpx rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb avx512bw avx512vl xsaveopt xsaves xsavec xgetbv1 cmq_l1c cmq_occmap_l1c cmq_mbm_total cmq_mbm local dtherm ida arat pin pts pku ospke avx512_vnni md_clear spec_ctrl intel_stibp flush_l1d arch_capabilities

/proc/cpuinfo cache data
cache size: 39424 KB

From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a physical chip.
node 0 cpus: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27
node 0 size: 196264 MB
node 0 free: 191616 MB
node 1 cpus: 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55
node 1 size: 196607 MB
node 1 free: 192014 MB
node distances:
node 0 1
0: 10 21
1: 21 10

From /proc/meminfo
MemTotal: 395920456 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

From /etc/*release* /etc/*version*
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Platform Notes (Continued)

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 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 sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Full retpoline, IBPB

run-level 3 Aug 23 19:24

SPEC is set to: /home/cpu2017

filesystem     type  size  used avail use% mounted on
/dev/sda3      ext4  908G  181G  682G  21% /

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

(Continued on next page)
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Platform Notes (Continued)

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
C                    | 619.lbm_s(base, peak) 638.imagick_s(base, peak) 644.nab_s(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, Fortran     | 607.cactuBSSN_s(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.

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Fortran              | 603.bwaves_s(base, peak) 649.fotonik3d_s(base, peak) 654.roms_s(base, peak)
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
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==============================================================================
Fortran, C           | 621.wrf_s(base, peak) 627.cam4_s(base, peak) 628.pop2_s(base, peak)
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**Compiler Version Notes (Continued)**

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**Base Compiler Invocation**

C benchmarks:
```
icc -m64 -std=c11
```

Fortran benchmarks:
```
ifort -m64
```

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

Benchmarks using Fortran, C, and C++:
```
icpc -m64 icc -m64 -std=c11 ifort -m64
```

---

**Base Portability Flags**

- 603.bwaves_s: -DSPEC_LP64
- 607.cactuBSSN_s: -DSPEC_LP64
- 619.lbm_s: -DSPEC_LP64
- 621.wrf_s: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
- 627.cam4_s: -DSPEC_LP64 -DSPEC_CASE_FLAG
- 628.pop2_s: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
  -assume byterecl
- 638.imagick_s: -DSPEC_LP64
- 644.nab_s: -DSPEC_LP64
- 649.fotonik3d_s: -DSPEC_LP64
- 654.roms_s: -DSPEC_LP64

---

**Base Optimization Flags**

C benchmarks:
```
-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
```

Fortran benchmarks:
```
-DSPEC_OPENMP -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp
-nostandard-realloc-lhs
```

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Base Optimization Flags (Continued)

Benchmarks using both Fortran and C:
-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
-nostandard-realloc-lhs

Benchmarks using Fortran, C, and C++:
-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
-nostandard-realloc-lhs

Peak Compiler Invocation

C benchmarks:
icc -m64 -std=c11

Fortran benchmarks:
ifort -m64

Benchmarks using both Fortran and C:
ifort -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:
619.lbm_s: -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP

638.imagick_s: basepeak = yes

644.nab_s: Same as 619.lbm_s

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

Fortran benchmarks:

603.bwaves_s: `basepeak = yes`
649.fotonik3d_s: `basepeak = yes`
654.roms_s: `-DSPEC_OPENMP -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -nostandard-realloc-lhs`

Benchmarks using both Fortran and C:

621.wrf_s: `-prof-gen(pass 1) -prof-use(pass 2) -O2 -xCORE-AVX512 -qopt-prefetch -ipo -O3 -ffinite-math-only -no-prec-div -qopt-mem-layout-trans=4 -DSPEC_SUPPRESS_OPENMP -qopenmp -DSPEC_OPENMP -nostandard-realloc-lhs`
627.cam4_s: `-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP -nostandard-realloc-lhs`
628.pop2_s: Same as 621.wrf_s

Benchmarks using Fortran, C, and C++:

`-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP -nostandard-realloc-lhs`

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