



# SPEC CPU®2017 Floating Point Speed Result

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## NEC Corporation

SPECspeed®2017\_fp\_base = 77.5

Express5800/R120h-1M (Intel Xeon Silver 4215)

SPECspeed®2017\_fp\_peak = 78.3

CPU2017 License: 9006

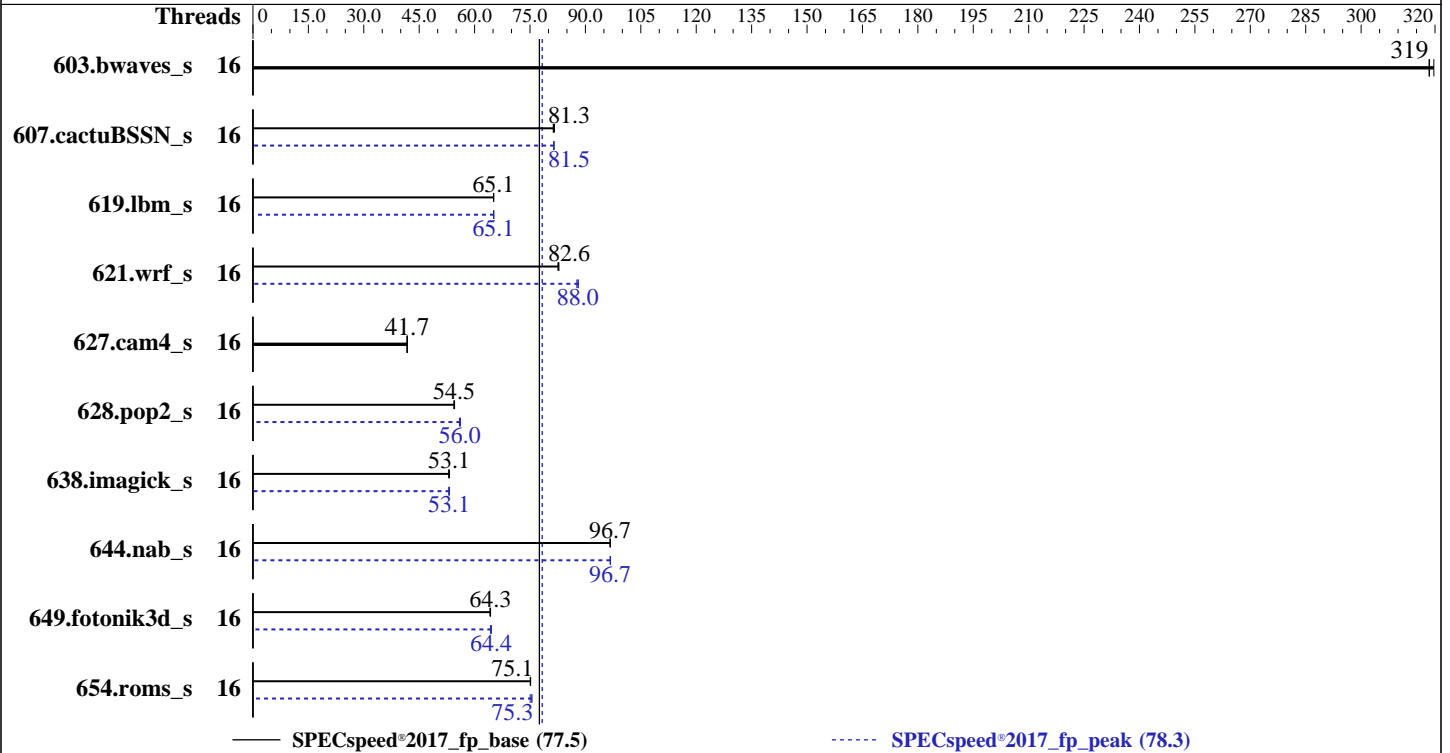
Test Date: Sep-2020

Test Sponsor: NEC Corporation

Hardware Availability: Dec-2019

Tested by: NEC Corporation

Software Availability: Sep-2019



### Hardware

CPU Name: Intel Xeon Silver 4215  
 Max MHz: 3500  
 Nominal: 2500  
 Enabled: 16 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: 11 MB I+D on chip per chip  
 Other: None  
 Memory: 384 GB (24 x 16 GB 2Rx8 PC4-2933Y-R, running at 2400)  
 Storage: 1 x 1 TB SATA, 7200 RPM, RAID 0  
 Other: None

### Software

OS: Red Hat Enterprise Linux Server release 7.7 (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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## Results Table

Benchmark	Base							Peak						
	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
603.bwaves_s	16	185	320	185	318	<b>185</b>	<b>319</b>	16	185	320	185	318	<b>185</b>	<b>319</b>
607.cactuBSSN_s	16	<b>205</b>	<b>81.3</b>	204	81.6	205	81.3	16	205	81.4	204	81.5	<b>205</b>	<b>81.5</b>
619.lbm_s	16	<b>80.4</b>	<b>65.1</b>	80.4	65.1	80.4	65.2	16	80.4	65.1	<b>80.4</b>	<b>65.1</b>	80.3	65.3
621.wrf_s	16	160	82.6	<b>160</b>	<b>82.6</b>	160	82.8	16	151	87.7	150	88.1	<b>150</b>	<b>88.0</b>
627.cam4_s	16	212	41.8	<b>212</b>	<b>41.7</b>	213	41.7	16	212	41.8	<b>212</b>	<b>41.7</b>	213	41.7
628.pop2_s	16	218	54.6	<b>218</b>	<b>54.5</b>	218	54.4	16	212	55.9	211	56.2	<b>212</b>	<b>56.0</b>
638.imagick_s	16	271	53.2	<b>272</b>	<b>53.1</b>	272	53.0	16	<b>272</b>	<b>53.1</b>	272	53.0	271	53.2
644.nab_s	16	181	96.7	181	96.7	<b>181</b>	<b>96.7</b>	16	181	96.7	181	96.8	<b>181</b>	<b>96.7</b>
649.fotonik3d_s	16	<b>142</b>	<b>64.3</b>	142	64.3	142	64.2	16	141	64.5	<b>141</b>	<b>64.4</b>	142	64.3
654.roms_s	16	210	75.1	209	75.2	<b>210</b>	<b>75.1</b>	16	208	75.5	<b>209</b>	<b>75.3</b>	210	75.0

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Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

## 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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### 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 Sep 6 21:22:22 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) Silver 4215 CPU @ 2.50GHz
 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 : 8
siblings : 8
physical 0: cores 0 1 2 3 4 5 6 7
physical 1: 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: 1
Core(s) per socket: 8
Socket(s): 2
NUMA node(s): 2
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Silver 4215 CPU @ 2.50GHz
Stepping: 6
CPU MHz: 2500.000
```

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### Platform Notes (Continued)

BogoMIPS: 5000.00  
Virtualization: VT-x  
L1d cache: 32K  
L1i cache: 32K  
L2 cache: 1024K  
L3 cache: 11264K  
NUMA node0 CPU(s): 0-7  
NUMA node1 CPU(s): 8-15

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 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\_l3 cdp\_l3 invpcid\_single intel\_ppin intel\_pt ssbd mba ibrs ibpb stibp ibrs\_enhanced tpr\_shadow vnmi flexpriority ept vpid fsgsbase tsc\_adjust bmil 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\_occup\_llc cqm\_mbm\_total cqm\_mbm\_local dtherm ida arat pln pts pku ospke avx512\_vnni md\_clear spec\_ctrl intel\_stibp flush\_lld arch\_capabilities

```
/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: 2 nodes (0-1)
node 0 cpus: 0 1 2 3 4 5 6 7
node 0 size: 196265 MB
node 0 free: 191758 MB
node 1 cpus: 8 9 10 11 12 13 14 15
node 1 size: 196607 MB
node 1 free: 192038 MB
node distances:
node  0  1
  0:  10  21
  1:  21  10
```

```
From /proc/meminfo
MemTotal: 395927628 kB
HugePages_Total: 0
Hugepagesize: 2048 kB
```

```
From /etc/*release* /etc/*version*
os-release:
NAME="Red Hat Enterprise Linux Server"
VERSION="7.7 (Maipo)"
```

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### Platform Notes (Continued)

```
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 Sep 6 21:16

```
SPEC is set to: /home/cpu2017
Filesystem      Type  Size  Used Avail Use% Mounted on
/dev/sda3       ext4  908G  186G  677G  22% /
```

```
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)  
Regarding the sysinfo display about the memory speed, the correct configured memory speed is 2400 MT/s. The dmidecode description should be as follows:

(Continued on next page)



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### Platform Notes (Continued)

24x HPE P03050-091 16 GB 2 rank 2933, configured at 2400

### 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.

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

=====  
Fortran, C | 621.wrf\_s(base, peak) 627.cam4\_s(base, peak)  
| 628.pop2\_s(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.  
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,  
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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:

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

Fortran benchmarks:

```
603.bwaves_s: basepeak = yes
```

```
649.fotonik3d_s: -prof-gen(pass 1) -prof-use(pass 2) -DSPEC_SUPPRESS_OPENMP
-DSPEC_OPENMP -O2 -xCORE-AVX512 -qopt-prefetch -ipo -O3
```

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## Peak Optimization Flags (Continued)

649.fotonik3d\_s (continued):

```
-ffinite-math-only -no-prec-div -qopt-mem-layout-trans=4  
-qopenmp -nostandard-realloc-lhs
```

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: basepeak = yes

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/Intel-ic19.0u1-official-linux64.2019-07-09.html>

<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/Intel-ic19.0u1-official-linux64.2019-07-09.xml>

<http://www.spec.org/cpu2017/flags/NEC-Platform-Settings-V1.2-R120h-RevE.xml>

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