



# SPEC® CPU2017 Floating Point Speed Result

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## Supermicro

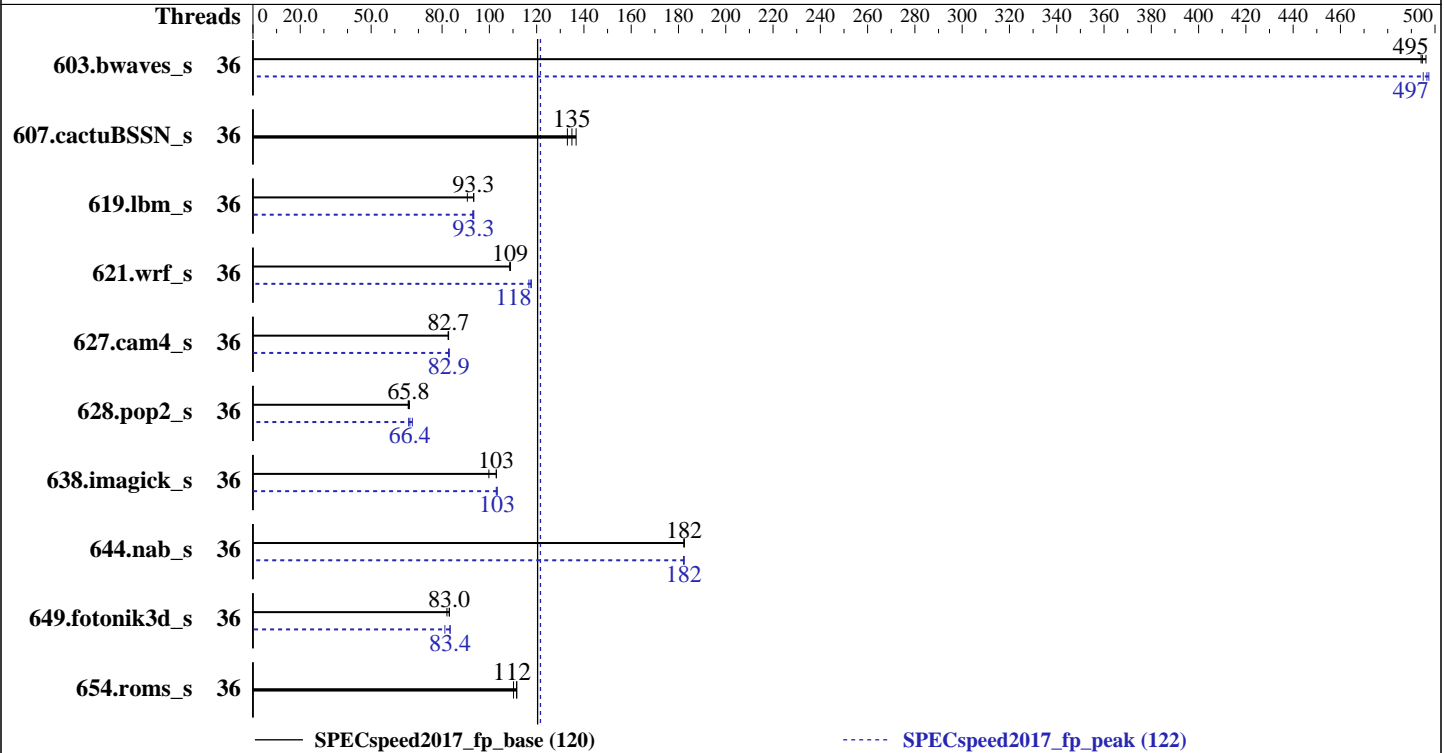
SuperServer 6029U-TR4 (X11DPU , Intel Xeon Gold 5220)

SPECspeed2017\_fp\_base = 120

SPECspeed2017\_fp\_peak = 122

CPU2017 License: 001176  
Test Sponsor: Supermicro  
Tested by: Supermicro

Test Date: Apr-2019  
Hardware Availability: Apr-2019  
Software Availability: Nov-2018



### Hardware

CPU Name: Intel Xeon Gold 5220  
Max MHz.: 3900  
Nominal: 2200  
Enabled: 36 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: 24.75 MB I+D on chip per chip  
Other: None  
Memory: 768 GB (24 x 32 GB 2Rx4 PC4-2933Y-R, running at 2666)  
Storage: 1 x 200 GB SATA III SSD  
Other: None

### Software

OS: Red Hat Enterprise Linux Server 7.6 (Maipo)  
Kernel 3.10.0-957.el7.x86\_64  
Compiler: C/C++: Version 19.0.1.144 of Intel C/C++ Compiler for Linux;  
Fortran: Version 19.0.1.144 of Intel Fortran Compiler for Linux  
Parallel: Yes  
Firmware: Version 3.0b released Mar-2019  
File System: xfs  
System State: Run level 3 (multi-user)  
Base Pointers: 64-bit  
Peak Pointers: 64-bit  
Other: None



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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    | 36      | 119        | 494        | 119         | 496         | <b>119</b> | <b>495</b>  | 36      | <b>119</b>  | <b>497</b>  | 119        | 495         | 119         | 497         |
| 607.cactuBSSN_s | 36      | <b>124</b> | <b>135</b> | 122         | 137         | 125        | 133         | 36      | <b>124</b>  | <b>135</b>  | 122        | 137         | 125         | 133         |
| 619.lbm_s       | 36      | 57.8       | 90.7       | <b>56.1</b> | <b>93.3</b> | 56.1       | 93.4        | 36      | <b>56.1</b> | <b>93.3</b> | 56.1       | 93.4        | 56.3        | 93.0        |
| 621.wrf_s       | 36      | <b>122</b> | <b>109</b> | 121         | 109         | 122        | 109         | 36      | <b>113</b>  | <b>118</b>  | 112        | 118         | 113         | 117         |
| 627.cam4_s      | 36      | 107        | 82.6       | <b>107</b>  | <b>82.7</b> | 107        | 82.8        | 36      | 107         | 83.0        | 107        | 82.7        | <b>107</b>  | <b>82.9</b> |
| 628.pop2_s      | 36      | 181        | 65.7       | 179         | 66.2        | <b>180</b> | <b>65.8</b> | 36      | 176         | 67.4        | <b>179</b> | <b>66.4</b> | 180         | 65.9        |
| 638.imagick_s   | 36      | <b>140</b> | <b>103</b> | 140         | 103         | 145        | 99.8        | 36      | 140         | 103         | 140        | 103         | <b>140</b>  | <b>103</b>  |
| 644.nab_s       | 36      | 95.8       | 182        | <b>95.8</b> | <b>182</b>  | 95.8       | 182         | 36      | 95.8        | 182         | 95.9       | 182         | <b>95.9</b> | <b>182</b>  |
| 649.fotonik3d_s | 36      | 110        | 83.1       | 111         | 82.1        | <b>110</b> | <b>83.0</b> | 36      | <b>109</b>  | <b>83.4</b> | 109        | 83.4        | 112         | 81.2        |
| 654.roms_s      | 36      | 141        | 112        | <b>141</b>  | <b>112</b>  | 143        | 110         | 36      | 141         | 112         | <b>141</b> | <b>112</b>  | 143         | 110         |

SPECspeed2017\_fp\_base = **120**

SPECspeed2017\_fp\_peak = **122**

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"

## General 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"

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

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) 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:  
Hyper-Threading = Disable

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### Platform Notes (Continued)

```
LLC prefetch = Disable
Power Technology = Custom
Power Performance Tuning = BIOS Controls EPB
ENERGY_PERF_BIAS_CFG mode = Performance
Hardware P-state = Out of Band Mode
XPT Prefetch = Disable
Stale AtoS = Disable
LLC dead line alloc = Enable
SDDC Plus One = Disable
ADDDC Sparing = Disable
Patrol Scrub = Disable
Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
running on CPU2017-01 Mon Apr 8 15:00:58 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) Gold 5220 CPU @ 2.20GHz
 2 "physical id"s (chips)
 36 "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 : 18
siblings : 18
physical 0: cores 0 1 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27
physical 1: cores 0 1 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27
```

```
From lscpu:
Architecture:          x86_64
CPU op-mode(s):        32-bit, 64-bit
Byte Order:             Little Endian
CPU(s):                 36
On-line CPU(s) list:   0-35
Thread(s) per core:    1
Core(s) per socket:    18
Socket(s):              2
NUMA node(s):          2
Vendor ID:              GenuineIntel
CPU family:             6
Model:                  85
Model name:             Intel(R) Xeon(R) Gold 5220 CPU @ 2.20GHz
Stepping:               6
CPU MHz:                2200.000
BogoMIPS:               4400.00
```

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### Platform Notes (Continued)

```

Virtualization:      VT-x
L1d cache:          32K
L1i cache:          32K
L2 cache:           1024K
L3 cache:           25344K
NUMA node0 CPU(s):  0-17
NUMA node1 CPU(s):  18-35
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
aperfmpperf 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 intel_ppin
intel_pt ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vnmi 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
xsavc xgetbv1 cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local dtherm ida arat pln
pts hwp_epp pku ospke avx512_vnni spec_ctrl intel_stibp flush_l1d arch_capabilities

```

```

/proc/cpuinfo cache data
cache size : 25344 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 8 9 10 11 12 13 14 15 16 17
node 0 size: 391838 MB
node 0 free: 379466 MB
node 1 cpus: 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35
node 1 size: 393216 MB
node 1 free: 380321 MB
node distances:
node  0  1
 0:  10  21
 1:  21  10

```

```

From /proc/meminfo
MemTotal:      791182176 kB
HugePages_Total:      0
Hugepagesize:    2048 kB

```

```

From /etc/*release* /etc/*version*
os-release:
NAME="Red Hat Enterprise Linux Server"
VERSION="7.6 (Maipo)"
ID="rhel"
ID_LIKE="fedora"

```

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### Platform Notes (Continued)

```
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)
system-release-cpe: cpe:/o:redhat:enterprise_linux:7.6:ga:server
```

```
uname -a:
Linux CPU2017-01 3.10.0-957.el7.x86_64 #1 SMP Thu Oct 4 20:48:51 UTC 2018 x86_64
x86_64 x86_64 GNU/Linux
```

Kernel self-reported vulnerability status:

```
CVE-2017-5754 (Meltdown): Not affected
CVE-2017-5753 (Spectre variant 1): Mitigation: Load fences, __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Enhanced IBRS
```

```
run-level 3 Apr 8 10:22
```

```
SPEC is set to: /home/cpu2017
Filesystem Type Size Used Avail Use% Mounted on
/dev/sdb2 xfs 185G 28G 157G 15% /
```

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 American Megatrends Inc. 3.0b 03/04/2019
Memory:
24x Samsung M393A4K40CB2-CVF 32 GB 2 rank 2933, configured at 2666
```

(End of data from sysinfo program)

### Compiler Version Notes

```
=====
CC 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 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
-----
FC 607.cactuBSSN_s(base, peak)
=====
```

(Continued on next page)



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### Compiler Version Notes (Continued)

```
-----
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
  64, Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
-----
```

```
=====
FC 603.bwaves_s(base) 649.fotonik3d_s(base) 654.roms_s(base, peak)
-----
```

```
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
  64, Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
-----
```

```
=====
FC 603.bwaves_s(peak) 649.fotonik3d_s(peak)
-----
```

```
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
  64, Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
-----
```

```
=====
CC 621.wrf_s(base) 627.cam4_s(base, peak) 628.pop2_s(base)
-----
```

```
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
  64, Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
-----
```

```
=====
CC 621.wrf_s(peak) 628.pop2_s(peak)
-----
```

```
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
  64, Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.1.144 Build 20181018
-----
```

(Continued on next page)



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## Compiler Version Notes (Continued)

Copyright (C) 1985-2018 Intel Corporation. All rights reserved.  
-----

## 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: -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)

603.bwaves\_s (continued):

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

649.fotonik3d\_s: Same as 603.bwaves\_s

654.roms\_s: basepeak = yes

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++:

607.cactuBSSN\_s: basepeak = yes

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

<http://www.spec.org/cpu2017/flags/Intel-ic18.0-official-linux64.2019-04-02.html>  
<http://www.spec.org/cpu2017/flags/Supermicro-Platform-Settings-V1.2-CLX-revC.html>

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

<http://www.spec.org/cpu2017/flags/Intel-ic18.0-official-linux64.2019-04-02.xml>  
<http://www.spec.org/cpu2017/flags/Supermicro-Platform-Settings-V1.2-CLX-revC.xml>

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For questions about this result, please contact the tester. For other inquiries, please contact [info@spec.org](mailto:info@spec.org).

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