SPEC CPU®2017 Floating Point Speed Result

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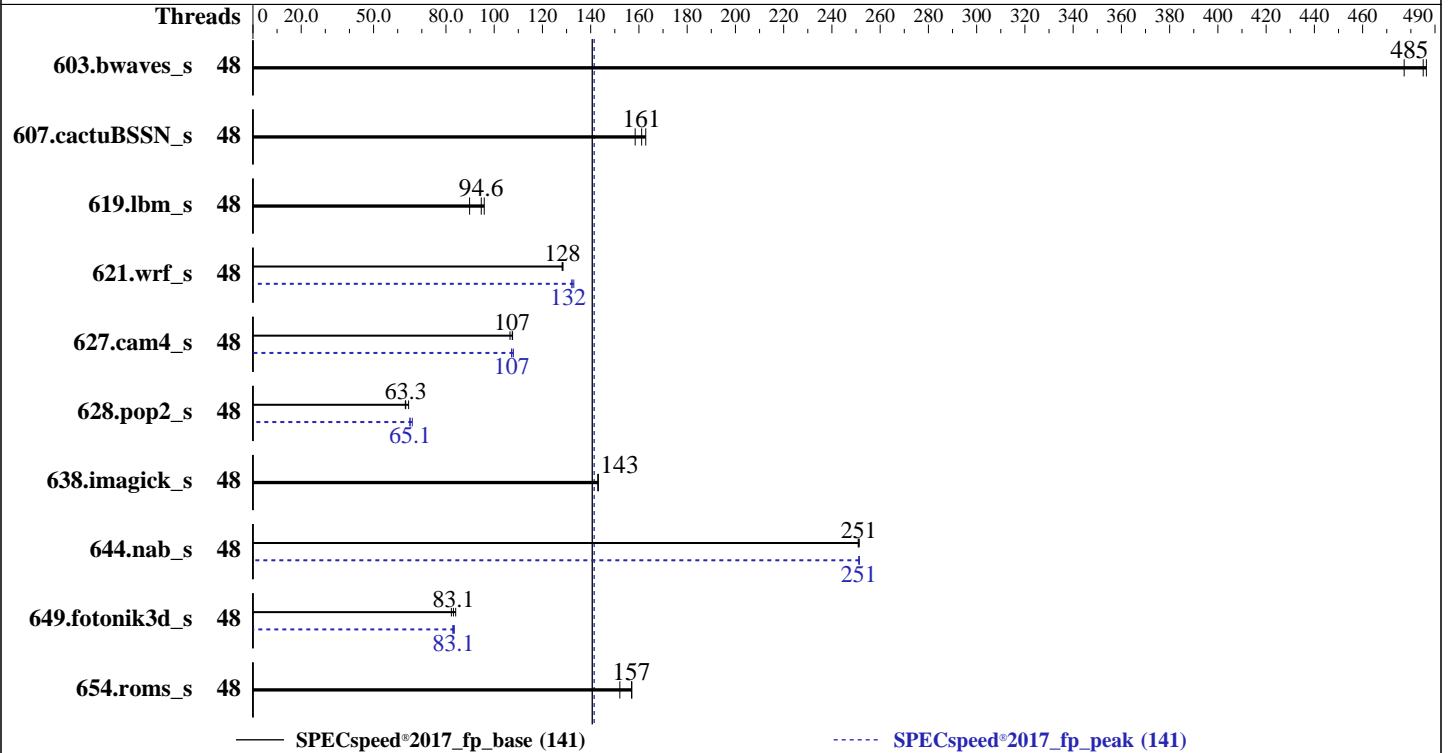
SuperServer 6029U-TR4
(X11DPU , Intel Xeon Gold 5220R)

$SPECspeed^{®}2017\_fp\_base = 141$

$SPECspeed^{®}2017\_fp\_peak = 141$

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

Test Date: Apr-2020
Hardware Availability: Feb-2020
Software Availability: Nov-2019

Threads

Benchmark	Threads	Result
603.bwaves_s	48	485
607.cactuBSSN_s	48	161
619.lbm_s	48	94.6
621.wrf_s	48	128 / 132
627.cam4_s	48	107 / 107
628.pop2_s	48	63.3 / 65.1
638.imagick_s	48	143
644.nab_s	48	251 / 251
649.fotonik3d_s	48	83.1 / 83.1
654.roms_s	48	157

SPECspeed®2017_fp_base (141)   SPECspeed®2017_fp_peak (141)

Hardware

CPU Name: Intel Xeon Gold 5220R
 Max MHz: 4000
 Nominal: 2200
 Enabled: 48 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: 35.75 MB I+D on chip per chip
 Other: None
 Memory: 384 GB (12 x 32 GB 2Rx4 PC4-2933V-R, running at 2666)
 Storage: 1 x 200 GB SATA III SSD
 Other: None

Software

OS: Red Hat Enterprise Linux release 8.1
Kernel 4.18.0-147.el8.x86_64
Compiler: C/C++: Version 19.0.5.281 of Intel C/C++ Compiler for Linux; Fortran: Version 19.0.5.281 of Intel Fortran Compiler for Linux
Parallel: Yes
Firmware: Version 3.3 released Feb-2020
File System: xfs
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	48	121	486	**122**	**485**	124	477	48	121	486	**122**	**485**	124	477
607.cactuBSSN_s	48	102	163	105	158	**103**	**161**	48	102	163	105	158	**103**	**161**
619.lbm_s	48	54.6	95.9	**55.3**	**94.6**	58.3	89.8	48	54.6	95.9	**55.3**	**94.6**	58.3	89.8
621.wrf_s	48	103	128	**103**	**128**	103	129	48	**100**	**132**	100	132	99.4	133
627.cam4_s	48	83.2	107	82.4	108	**82.5**	**107**	48	82.7	107	**82.6**	**107**	82.1	108
628.pop2_s	48	184	64.5	188	63.2	**187**	**63.3**	48	180	66.1	**182**	**65.1**	183	65.0
638.imagick_s	48	**101**	**143**	101	143	101	143	48	**101**	**143**	101	143	101	143
644.nab_s	48	69.5	251	69.6	251	**69.6**	**251**	48	69.5	251	**69.6**	**251**	69.6	251
649.fotonik3d_s	48	**110**	**83.1**	111	82.2	108	84.0	48	**110**	**83.1**	109	83.5	110	82.8
654.roms_s	48	**100**	**157**	104	152	100	157	48	**100**	**157**	104	152	100	157
SPECspeed®2017_fp_base =	**141**													
SPECspeed®2017_fp_peak =	**141**													

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 i9-7980XE CPU + 64GB RAM
 memory using Redhat Enterprise Linux 8.0
 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:
Hyper-Threading = Disable
Power Technology = Custom
Power Performance Tuning = BIOS Controls EPB
ENERGY_PERF_BIAS_CFG mode = Performance
Stale AtoS = Disable
Patrol Scrub = Disable


Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7edb1e6e46a485a0011
running on RHEL81-01 Mon Apr  6 23:23:25 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 5220R CPU @ 2.20GHz
      2  "physical id"s (chips)
      48 "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 : 24
      siblings  : 24
      physical 0: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 16 17 18 19 20 21 25 26 27 28 29
      physical 1: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 16 17 18 19 20 21 25 26 27 28 29

From lscpu:
   Architecture:        x86_64
   CPU op-mode(s):      32-bit, 64-bit
   Byte Order:          Little Endian
   CPU(s):              48
   On-line CPU(s) list: 0-47
   Thread(s) per core:  1
   Core(s) per socket:  24
   Socket(s):           2
   NUMA node(s):        2
   Vendor ID:           GenuineIntel
   CPU family:          6
   Model:               85
   Model name:          Intel(R) Xeon(R) Gold 5220R CPU @ 2.20GHz
   Stepping:            7
   CPU MHz:             1032.355
   CPU max MHz:         4000.0000
   CPU min MHz:         1000.0000
   BogoMIPS:            4400.00
   Virtualization:      VT-x
```

(Continued on next page)

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Platform Notes (Continued)

```
      L1d cache:             32K
      L1i cache:             32K
      L2 cache:              1024K
      L3 cache:              36608K
      NUMA node0 CPU(s):     0-23
      NUMA node1 CPU(s):     24-47
      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 cpuid
   aperfmperf 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 cpuid_fault epb cat_l3 cdp_l3
   invpcid_single intel_ppin 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 intel_pt avx512cd
   avx512bw avx512vl xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbm_total
   cqm_mbm_local dtherm ida arat pln pts pku ospke avx512_vnni md_clear flush_l1d
   arch_capabilities

 /proc/cpuinfo cache data
    cache size : 36608 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 18 19 20 21 22 23
   node 0 size: 192116 MB
   node 0 free: 191730 MB
   node 1 cpus: 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
   node 1 size: 193505 MB
   node 1 free: 185547 MB
   node distances:
   node   0   1
     0:  10  21
     1:  21  10

 From /proc/meminfo
    MemTotal:       394876684 kB
    HugePages_Total:        0
    Hugepagesize:        2048 kB

 From /etc/*release* /etc/*version*
    os-release:
      NAME="Red Hat Enterprise Linux"
      VERSION="8.1 (Ootpa)"
      ID="rhel"
      ID_LIKE="fedora"
```

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Platform Notes (Continued)

```
     VERSION_ID="8.1"
     PLATFORM_ID="platform:el8"
     PRETTY_NAME="Red Hat Enterprise Linux 8.1 (Ootpa)"
     ANSI_COLOR="0;31"
  redhat-release: Red Hat Enterprise Linux release 8.1 (Ootpa)
  system-release: Red Hat Enterprise Linux release 8.1 (Ootpa)
  system-release-cpe: cpe:/o:redhat:enterprise_linux:8.1:ga

uname -a:
  Linux RHEL81-01 4.18.0-147.el8.x86_64 #1 SMP Thu Sep 26 15:52:44 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: usercopy/swapgs barriers and __user
                                          pointer sanitization
CVE-2017-5715 (Spectre variant 2):        Mitigation: Enhanced IBRS, IBPB: conditional,
                                          RSB filling


run-level 3 Apr 6 18:47

SPEC is set to: /home/cpu2017
  Filesystem     Type  Size  Used Avail Use% Mounted on
  /dev/sda3      xfs   185G   65G  120G  36% /

From /sys/devices/virtual/dmi/id
   BIOS:    American Megatrends Inc. 3.3 02/21/2020
   Vendor:  Supermicro
   Product: Super Server
   Serial:  0123456789

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:
    12x Micron Technology 36ASF4G72PZ-2G9E2 32 GB 2 rank 2933
    12x NO DIMM NO DIMM

(End of data from sysinfo program)
```

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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 19.0.5.281 Build 20190815
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 19.0.5.281 Build 20190815
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.5.281 Build 20190815
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
  64, Version 19.0.5.281 Build 20190815
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 19.0.5.281 Build 20190815
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 19.0.5.281 Build 20190815
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.5.281 Build 20190815
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------
```

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Base Compiler Invocation

C benchmarks:
`icc`

Fortran benchmarks:
`ifort`

Benchmarks using both Fortran and C:
`ifort icc`

Benchmarks using Fortran, C, and C++:
`icpc icc ifort`

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:
`-m64 -std=c11 -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch`
`-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP`

Fortran benchmarks:
`-m64 -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:
`-m64 -std=c11 -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch`
`-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP`
`-nostandard-realloc-lhs`

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Standard Performance Evaluation Corporation (info@spec.org)
https://www.spec.org/

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Base Optimization Flags (Continued)

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

Fortran benchmarks:
```
ifort
```

Benchmarks using both Fortran and C:
```
ifort icc
```

Benchmarks using Fortran, C, and C++:
```
icpc icc ifort
```

Peak Portability Flags

```
Same as Base Portability Flags
```

Peak Optimization Flags

C benchmarks:

619.lbm_s: `basepeak = yes`

638.imagick_s: `basepeak = yes`

644.nab_s: `-m64 -std=c11 -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`

(Continued on next page)

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Peak Optimization Flags (Continued)

649.fotonik3d_s: `-m64` `-prof-gen`(pass 1) `-prof-use`(pass 2)
`-DSPEC_SUPPRESS_OPENMP` `-DSPEC_OPENMP` `-O2` `-xCORE-AVX512`
`-qopt-prefetch` `-ipo` `-O3` `-ffinite-math-only` `-no-prec-div`
`-qopt-mem-layout-trans=4` `-qopenmp` `-nostandard-realloc-lhs`

654.roms_s: `basepeak = yes`

Benchmarks using both Fortran and C:

621.wrf_s: `-m64` `-std=c11` `-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: `-m64` `-std=c11` `-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-ic19.0u5-official-linux64_revD.html
http://www.spec.org/cpu2017/flags/Supermicro-Platform-Settings-V1.2-CLX-revF.html

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You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/Intel-ic19.0u5-official-linux64_revD.xml
http://www.spec.org/cpu2017/flags/Supermicro-Platform-Settings-V1.2-CLX-revF.xml

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

Tested with SPEC CPU®2017 v1.1.0 on 2020-04-06 11:23:24-0400.
Report generated on 2020-04-28 15:31:57 by CPU2017 PDF formatter v6255.
Originally published on 2020-04-28.