# SPEC® CPU2017 Floating Point Speed Result

**Lenovo Global Technology**

**ThinkSystem SR650**  
(2.30 GHz, Intel Xeon Gold 5218B)

**CPU2017 License:** 9017  
**Test Date:** May-2019  
**Hardware Availability:** Apr-2019

**Test Sponsor:** Lenovo Global Technology  
**Tested by:** Lenovo Global Technology  
**Software Availability:** Nov-2018

<table>
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<th>Threads</th>
<th>SPECspeed2017_fp_base</th>
<th>SPECspeed2017_fp_peak</th>
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</table>

**Hardware**

- **CPU Name:** Intel Xeon Gold 5218B  
- **Max MHz.:** 3900  
- **Nominal:** 2300  
- **Enabled:** 32 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:** 22 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 800 GB SATA SSD  
- **Other:** None

**Software**

- **OS:** Red Hat Enterprise Linux Server release 7.6 (Maipo)  
- **Kernel:** 3.10.0-957.el7.x86_64  
- **Compiler:** C/C++: Version 19.0.1.144 of Intel C/C++ Compiler Build 20181018 for Linux; Fortran: Version 19.0.1.144 of Intel Fortran Compiler Build 20181018 for Linux  
- **Parallel:** Yes  
- **Firmware:** Lenovo BIOS Version IVE135R 2.10 released Feb-2019  
- **File System:** xfs  
- **System State:** Run level 3 (multi-user)  
- **Base Pointers:** 64-bit  
- **Peak Pointers:** Not Applicable  
- **Other:** None
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RESULTS

Benchmark | Threads | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio
--- | --- | --- | --- | --- | --- | --- | ---
603.bwaves_s | 32 | 124 | 478 | 124 | 477 | 124 | 477
607.cactuBSSN_s | 32 | 128 | 130 | 131 | 127 | 129 | 129
619.lbm_s | 32 | 59.5 | 88.0 | 59.4 | 88.1 | 59.4 | 88.1
621.wrf_s | 32 | 118 | 112 | 118 | 112 | 118 | 112
627.cam4_s | 32 | 124 | 71.3 | 124 | 71.3 | 125 | 71.2
628.pop2_s | 32 | 192 | 62.0 | 192 | 62.0 | 192 | 61.7
638.imagick_s | 32 | 150 | 96.1 | 150 | 95.9 | 150 | 96.1
644.nab_s | 32 | 99.7 | 175 | 100 | 175 | 99.7 | 175
649.fotonik3d_s | 32 | 115 | 78.9 | 113 | 80.9 | 113 | 80.8
654.roms_s | 32 | 110 | 143 | 109 | 144 | 109 | 145

SPECspeed2017_fp_base = 118
SPECspeed2017_fp_peak = Not Run

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/cpu2017-1.0.5-ic19.0u1/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

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.
Yes: The test sponsor attests, as of date of publication, that CVE-2018-3640 (Spectre variant 3a) is mitigated in the system as tested and documented.
Yes: The test sponsor attests, as of date of publication, that CVE-2018-3639 (Spectre variant 4) is mitigated in the system as tested and documented.
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Platform Notes

BIOS configuration:
Choose Operating Mode set to Maximum Performance
Choose Operating Mode set to Custom Mode
C-states set to Legacy
Hyper-Threading set to Disable
Adjacent Cache Prefetch set to Disable
Stale AtoS set to Enable
Sysinfo program /home/cpu2017-1.0.5-ic19.0u1/bin/sysinfo
Rev: r5974 of 2018-05-19 9bcd8f2999c33d61f64985e45859ea9
running on localhost.localdomain Wed May 29 15:28:17 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 5218 CPU @ 2.30GHz
  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 : 16
  siblings : 16
  physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
  physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

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: 1
  Core(s) per socket: 16
  Socket(s): 2
  NUMA node(s): 2
  Vendor ID: GenuineIntel
  CPU family: 6
  Model: 85
  Model name: Intel(R) Xeon(R) Gold 5218 CPU @ 2.30GHz
  Stepping: 6
  CPU MHz: 2300.000
  BogoMIPS: 4600.00
  Virtualization: VT-x
  L1d cache: 32K
  L1i cache: 32K
  L2 cache: 1024K

(Continued on next page)
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Platform Notes (Continued)

L3 cache: 22528K
NUMA node0 CPU(s): 0-15
NUMA node1 CPU(s): 16-31

Flags:
fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov
pat pse36 clflush dtc acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtsscp
lm constant_tsc art arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc
aperfmperf eagerfpu nni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg
fma cx16 xtpr pdcm pcd 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_pt ssbd mba
ibrs ibpb stibp ibrsenhanced tpr_shadow vnlm flexpriority ept vpid fsgsbased
hlt cts_adjust bm1 hle avx2 smep bmi2 erms invpcid rtm cqm mpx rdt_a avx512f avx512dq
rdseed adx smap clflushopt clwb avx512cd avx512bw avx512vl xsaveopt xsaveopt xsavec xgetbv1
cqm_llc cqmmemcache llc cqmmemcache local dtherm ida arat pln pts pkup ospe
avx512_vnni spec_ctrl intel_stibp flush_l1d arch_capabilities

/proc/cpuinfo cache data
  cache size : 22528 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
  node 0 size: 392829 MB
  node 0 free: 383817 MB
  node 1 cpus: 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
  node 1 size: 393216 MB
  node 1 free: 384269 MB
  node distances:
  node 0 1
  0: 10 21
  1: 21 10

From /proc/meminfo
  MemTotal: 792179800 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"
    VARIANT="Server"
    VARIANT_ID="server"
    VERSION_ID="7.6"
    PRETTY_NAME="Red Hat Enterprise Linux Server 7.6 (Maipo)"

(Continued on next page)
Platform Notes (Continued)

redhat-release: Red Hat Enterprise Linux Server release 7.6 (Maipo)
system-release: Red Hat Enterprise Linux Server release 7.6 (Maipo)

uname -a:
    Linux localhost.localdomain 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 May 29 15:23

SPEC is set to: /home/cpu2017-1.0.5-ic19.0u1
Filesystem     Type  Size  Used Avail Use% Mounted on
/dev/sdb2      xfs   689G  116G  573G  17% /home

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 Lenovo -[IVE135R-2.10]- 02/27/2019
    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) 638.imagick_s(base) 644.nab_s(base)
==============================================================================
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)
==============================================================================
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.

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Compiler Version Notes (Continued)

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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)
==============================================================================

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) 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
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Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
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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
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### Base Portability Flags

- 603.bwaves_s: -DSPEC_LP64
- 607.cactuBSSN_s: -DSPEC_LP64
- 619.hm3_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

**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

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


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

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