SPEC CPU®2017 Floating Point Speed Result

Copyright 2017-2019 Standard Performance Evaluation Corporation

Lenovo Global Technology

ThinkSystem SR950
(2.10 GHz, Intel Xeon Gold 5218T)

SPECspeed®2017_fp_base =   161
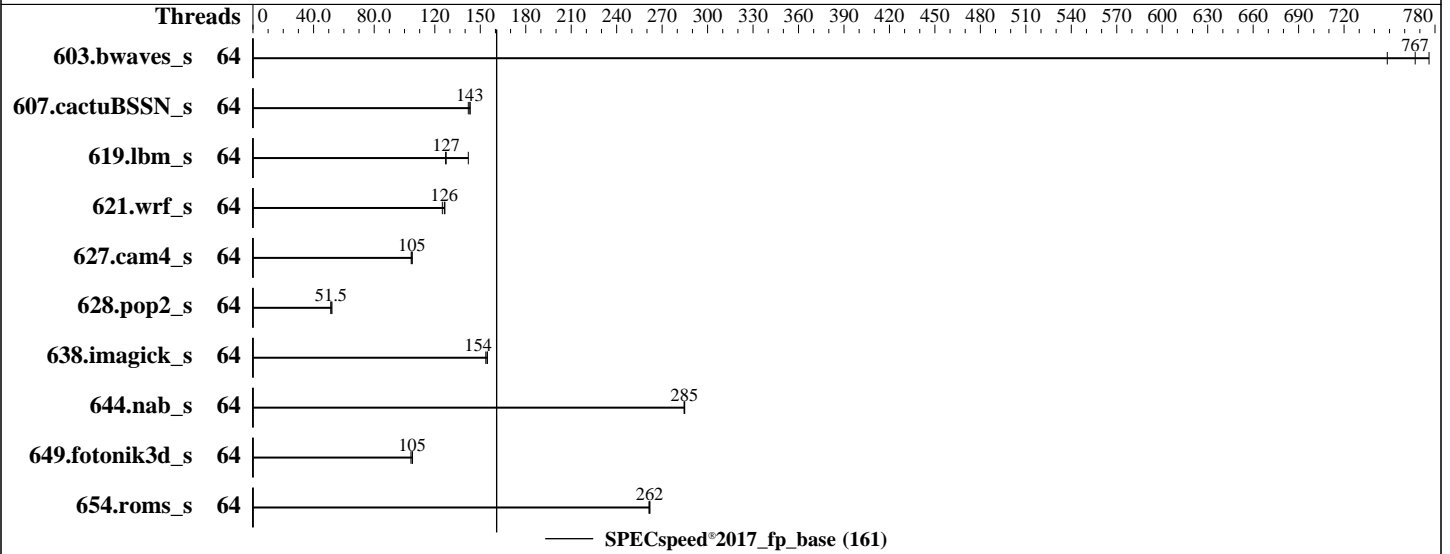
SPECspeed®2017_fp_peak = Not Run

CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Tested by: Lenovo Global Technology

Test Date: Aug-2019
Hardware Availability: Jul-2019
Software Availability: May-2019

Threads	
603.bwaves_s	64 — 767
607.cactuBSSN_s	64 — 143
619.lbm_s	64 — 127
621.wrf_s	64 — 126
627.cam4_s	64 — 105
628.pop2_s	64 — 51.5
638.imagick_s	64 — 154
644.nab_s	64 — 285
649.fotonik3d_s	64 — 105
654.roms_s	64 — 262

SPECspeed®2017_fp_base (161)

Hardware

CPU Name: Intel Xeon Gold 5218T
 Max MHz: 3800
 Nominal: 2100
Enabled: 64 cores, 4 chips
Orderable: 2,3,4 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: 1536 GB (48 x 32 GB 2Rx4 PC4-2933Y-R, running at 2666)
Storage: 1 x 800 GB SATA SSD
Other: None

Software

OS: SUSE Linux Enterprise Server 15 (x86_64)
 Kernel 4.12.14-25.13-default
Compiler: C/C++: Version 19.0.4.227 of Intel C/C++
 Compiler for Linux;
 Fortran: Version 19.0.4.227 of Intel Fortran
 Compiler for Linux
Parallel: Yes
Firmware: Lenovo BIOS Version PSE122R 1.53 released Aug-2019 tested as PSE121R 1.53 Jul-2019
File System: btrfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: Not Applicable
Other: None
Power Management: --

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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	64	**76.9**	**767**	76.0	776	78.8	749							
607.cactuBSSN_s	64	**116**	**143**	116	143	117	142							
619.lbm_s	64	36.9	142	**41.1**	**127**	41.2	127							
621.wrf_s	64	106	125	**105**	**126**	104	127							
627.cam4_s	64	84.9	104	**84.5**	**105**	84.3	105							
628.pop2_s	64	231	51.4	228	52.1	**230**	**51.5**							
638.imagick_s	64	93.9	154	93.3	155	**93.4**	**154**							
644.nab_s	64	**61.4**	**285**	61.4	285	61.3	285							
649.fotonik3d_s	64	86.6	105	87.4	104	**86.8**	**105**							
654.roms_s	64	60.1	262	**60.2**	**262**	60.3	261							
SPECspeed®2017_fp_base =	**161**													
SPECspeed®2017_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-ic19.0u4/lib/intel64"
OMP_STACKSIZE = "192M"

 Binaries compiled on a system with 1x Intel Core i9-799X CPU + 32GB RAM
 memory using Redhat Enterprise Linux 7.5
 Transparent Huge Pages disabled by default
 echo never > /sys/kernel/mm/transparent_hugepage/enabled
 echo never > /sys/kernel/mm/transparent_hugepage/defrag
 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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Hardware Availability: Jul-2019
Software Availability: May-2019

Platform Notes

```
BIOS configuration:
Choose Operating Mode set to Maximum Performance
Choose Operating Mode set to Custom Mode
CPU P-state Control set to Cooperative
Hyper-Threading set to Disable
Adjacent Cache Prefetch set to Disable
MONITOR/MWAIT set to Enable
Stale AtoS set to Enable
LLC dead line alloc set to Disable
 Sysinfo program /home/cpu2017-1.0.5-ic19.0u4/bin/sysinfo
 Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
 running on linux-i7o2 Tue Aug 27 00:19:53 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 5218T CPU @ 2.10GHz
       4  "physical id"s (chips)
       64 "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
       physical 2: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
       physical 3: 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):              64
    On-line CPU(s) list: 0-63
    Thread(s) per core:  1
    Core(s) per socket:  16
    Socket(s):           4
    NUMA node(s):        4
    Vendor ID:           GenuineIntel
    CPU family:          6
    Model:               85
    Model name:          Intel(R) Xeon(R) Gold 5218T CPU @ 2.10GHz
    Stepping:            7
    CPU MHz:             2100.000
    CPU max MHz:         3800.0000
```

(Continued on next page)

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Platform Notes (Continued)

```
         CPU min MHz:           1000.0000
         BogoMIPS:              4200.00
         Virtualization:        VT-x
         L1d cache:             32K
         L1i cache:             32K
         L2 cache:              1024K
         L3 cache:              22528K
         NUMA node0 CPU(s):     0-15
         NUMA node1 CPU(s):     16-31
         NUMA node2 CPU(s):     32-47
         NUMA node3 CPU(s):     48-63
         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 ssbd mba ibrs ibpb stibp 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 hwp hwp_act_window hwp_epp hwp_pkg_req pku ospke avx512_vnni
     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: 4 nodes (0-3)
     node 0 cpus: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
     node 0 size: 386641 MB
     node 0 free: 382804 MB
     node 1 cpus: 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
     node 1 size: 387022 MB
     node 1 free: 386782 MB
     node 2 cpus: 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
     node 2 size: 387051 MB
     node 2 free: 386679 MB
     node 3 cpus: 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63
     node 3 size: 387048 MB
     node 3 free: 386800 MB
     node distances:
     node   0   1   2   3
       0:  10  31  21  21
       1:  31  10  21  21
       2:  21  21  10  31
```

(Continued on next page)

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Platform Notes (Continued)

```
     3:  21  21  31  10

From /proc/meminfo
   MemTotal:       1584909724 kB
   HugePages_Total:        0
   Hugepagesize:        2048 kB

From /etc/*release* /etc/*version*
   os-release:
      NAME="SLES"
      VERSION="15"
      VERSION_ID="15"
      PRETTY_NAME="SUSE Linux Enterprise Server 15"
      ID="sles"
      ID_LIKE="suse"
      ANSI_COLOR="0;32"
      CPE_NAME="cpe:/o:suse:sles:15"

uname -a:
   Linux linux-i7o2 4.12.14-25.13-default #1 SMP Tue Aug 14 15:07:35 UTC 2018 (947aa51)
   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: __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Indirect Branch Restricted Speculation,
IBPB, IBRS_FW

run-level 3 Aug 27 00:18

SPEC is set to: /home/cpu2017-1.0.5-ic19.0u4
   Filesystem      Type    Size   Used Avail Use% Mounted on
   /dev/sda2       btrfs  742G    57G  686G   8% /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 -[PSE121R-1.53]- 07/03/2019
  Memory:
   48x NO DIMM NO DIMM
   48x Samsung M393A4K40CB2-CVF 32 GB 2 rank 2933, configured at 2666

(End of data from sysinfo program)
```

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Tested by:	Lenovo Global Technology	**Software Availability:**	May-2019

Compiler Version Notes

```
================================================================================
C                | 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 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
--------------------------------------------------------------------------------


================================================================================
C++, C, Fortran | 607.cactuBSSN_s(base)
--------------------------------------------------------------------------------
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) 649.fotonik3d_s(base) 654.roms_s(base)
--------------------------------------------------------------------------------
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
  64, Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
--------------------------------------------------------------------------------


================================================================================
Fortran, C       | 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 19.0.4.227 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.
--------------------------------------------------------------------------------
```

Base Compiler Invocation

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

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Base Compiler Invocation (Continued)

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
```

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
```

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Base Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++ (continued):

`-nostandard-realloc-lhs`

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/Lenovo-Platform-SPECcpu2017-Flags-V1.2-CLX-D.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/Lenovo-Platform-SPECcpu2017-Flags-V1.2-CLX-D.xml`

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

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