SPEC® CPU2017 Floating Point Speed Result

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Lenovo Global Technology

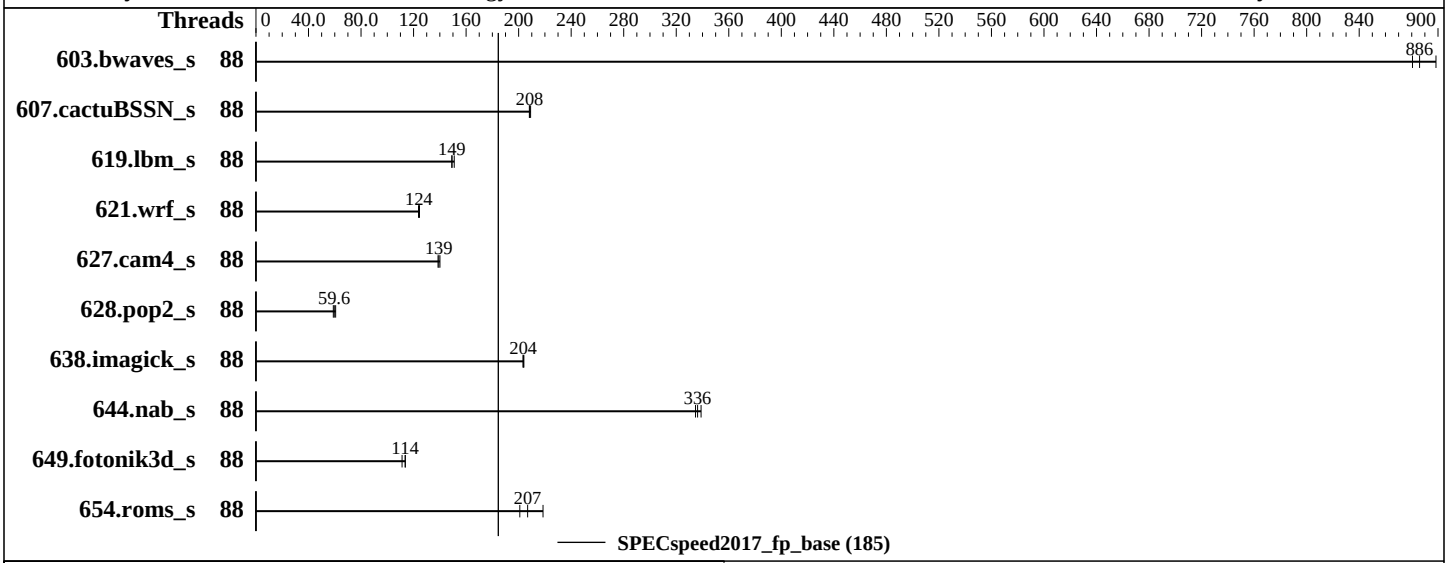
ThinkSystem SN850
(1.90 GHz, Intel Xeon Gold 6238T)

SPECspeed2017_fp_base = 185

SPECspeed2017_fp_peak = Not Run

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

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



Hardware

CPU Name:	Intel Xeon Gold 6238T
Max MHz.:	3700
Nominal:	1900
Enabled:	88 cores, 4 chips, 2 threads/core
Orderable:	2,4 chips
Cache L1:	32 KB I + 32 KB D on chip per core
L2:	1 MB I+D on chip per core
L3:	30.25 MB I+D on chip per chip
Other:	None
Memory:	768 GB (48 x 16 GB 2Rx8 PC4-2666V-R)
Storage:	960 GB tmpfs
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 IVE135L 2.10 released Jan-2019
File System:	tmpfs
System State:	Run level 3 (multi-user)
Base Pointers:	64-bit
Peak Pointers:	Not Applicable
Other:	None

Results Table

Benchmark	Base							Peak						
	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
603.bwaves_s	88	67.0	881	65.7	898	**66.6**	**886**							
607.cactuBSSN_s	88	80.1	208	79.7	209	**80.0**	**208**							
619.lbm_s	88	34.7	151	35.1	149	**35.1**	**149**							
621.wrf_s	88	106	125	**107**	**124**	107	124							
627.cam4_s	88	**63.7**	**139**	63.9	139	63.3	140							
628.pop2_s	88	**199**	**59.6**	196	60.7	202	58.9							
638.imagick_s	88	71.0	203	**70.8**	**204**	70.7	204							
644.nab_s	88	51.6	339	52.2	335	**52.0**	**336**							
649.fotonik3d_s	88	**80.2**	**114**	80.2	114	81.9	111							
654.roms_s	88	72.0	219	78.4	201	**76.1**	**207**							

SPECspeed2017_fp_base = 185

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"
Tmpfs filesystem can be set with:
 mount -t tmpfs -o size=960g tmpfs /home
Process tuning setting:
 echo 50000     > /proc/sys/kernel/sched_cfs_bandwidth_slice_us
```

General Notes

```
Environment variables set by runcpu before the start of the run:
KMP_AFFINITY = "granularity=fine,compact,1,0"
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.
```

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General Notes (Continued)

```
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.
```

Platform Notes

```
BIOS configuration:
Choose Operating Mode set to Custom Mode
Memory Power Manangment set to Automatic
Energy Efficient Turbo set to Disable
C-States set to Disable
Page Policy set to Adaptive
Trusted Execution Technology set to Enable
Stale AtoS set to Enable
 Sysinfo program /home/cpu2017-1.0.5-ic19.0u1/bin/sysinfo
 Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
 running on localhost.localdomain Wed May 29 19:55:29 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 6238T CPU @ 1.90GHz
       4  "physical id"s (chips)
       176 "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 : 22
       siblings  : 44
       physical 0: cores 0 1 2 3 4 5 8 9 10 11 12 16 17 18 19 20 21 24 25 26 27 28
       physical 1: cores 0 1 2 3 4 5 8 9 10 11 12 16 17 18 19 20 21 24 25 26 27 28
       physical 2: cores 0 1 2 3 4 5 8 9 10 11 12 16 17 18 19 20 21 24 25 26 27 28
       physical 3: cores 0 1 2 3 4 5 8 9 10 11 12 16 17 18 19 20 21 24 25 26 27 28

 From lscpu:
      Architecture:          x86_64
      CPU op-mode(s):        32-bit, 64-bit
      Byte Order:            Little Endian
      CPU(s):                176
      On-line CPU(s) list:   0-175
      Thread(s) per core:    2
      Core(s) per socket:    22
      Socket(s):             4
      NUMA node(s):          4
      Vendor ID:             GenuineIntel
      CPU family:            6
```

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Platform Notes (Continued)

```
      Model:                 85
      Model name:            Intel(R) Xeon(R) Gold 6238T CPU @ 1.90GHz
      Stepping:              6
      CPU MHz:               1900.000
      BogoMIPS:              3800.00
      Virtualization:        VT-x
      L1d cache:             32K
      L1i cache:             32K
      L2 cache:              1024K
      L3 cache:              30976K
      NUMA node0 CPU(s):     0-21,88-109
      NUMA node1 CPU(s):     22-43,110-131
      NUMA node2 CPU(s):     44-65,132-153
      NUMA node3 CPU(s):     66-87,154-175
      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 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 xsavec 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 : 30976 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 16 17 18 19 20 21 88 89 90 91 92 93
    94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109
    node 0 size: 196277 MB
    node 0 free: 186455 MB
    node 1 cpus: 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 110 111
    112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127 128 129 130 131
    node 1 size: 196608 MB
    node 1 free: 192087 MB
    node 2 cpus: 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 132 133
    134 135 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150 151 152 153
    node 2 size: 196608 MB
    node 2 free: 183630 MB
    node 3 cpus: 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 154 155
    156 157 158 159 160 161 162 163 164 165 166 167 168 169 170 171 172 173 174 175
    node 3 size: 196608 MB
```

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Platform Notes (Continued)

```
  node 3 free: 192068 MB
  node distances:
  node   0   1   2   3
    0:  10  21  21  21
    1:  21  10  21  21
    2:  21  21  10  21
    3:  21  21  21  10

From /proc/meminfo
   MemTotal:       792235936 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)"
   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 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 19:51

SPEC is set to: /home/cpu2017-1.0.5-ic19.0u1
   Filesystem     Type   Size  Used Avail Use% Mounted on
   tmpfs          tmpfs  800G  8.3G  792G   2% /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.
```

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Platform Notes (Continued)

```
   BIOS Lenovo -[IVE135L-2.10]- 01/10/2019
   Memory:
    48x Samsung M393A2K43BB1-CTD 16 GB 2 rank 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.
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)
------------------------------------------------------------------------------
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
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
```

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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

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-A.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-A.xml

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