



# SPEC CPU®2017 Floating Point Rate Result

Copyright 2017-2020 Standard Performance Evaluation Corporation

## Lenovo Global Technology

SPECrate®2017\_fp\_base = 249

ThinkSystem SD530  
(2.10 GHz, Intel Xeon Gold 6230R)

SPECrate®2017\_fp\_peak = Not Run

CPU2017 License: 9017

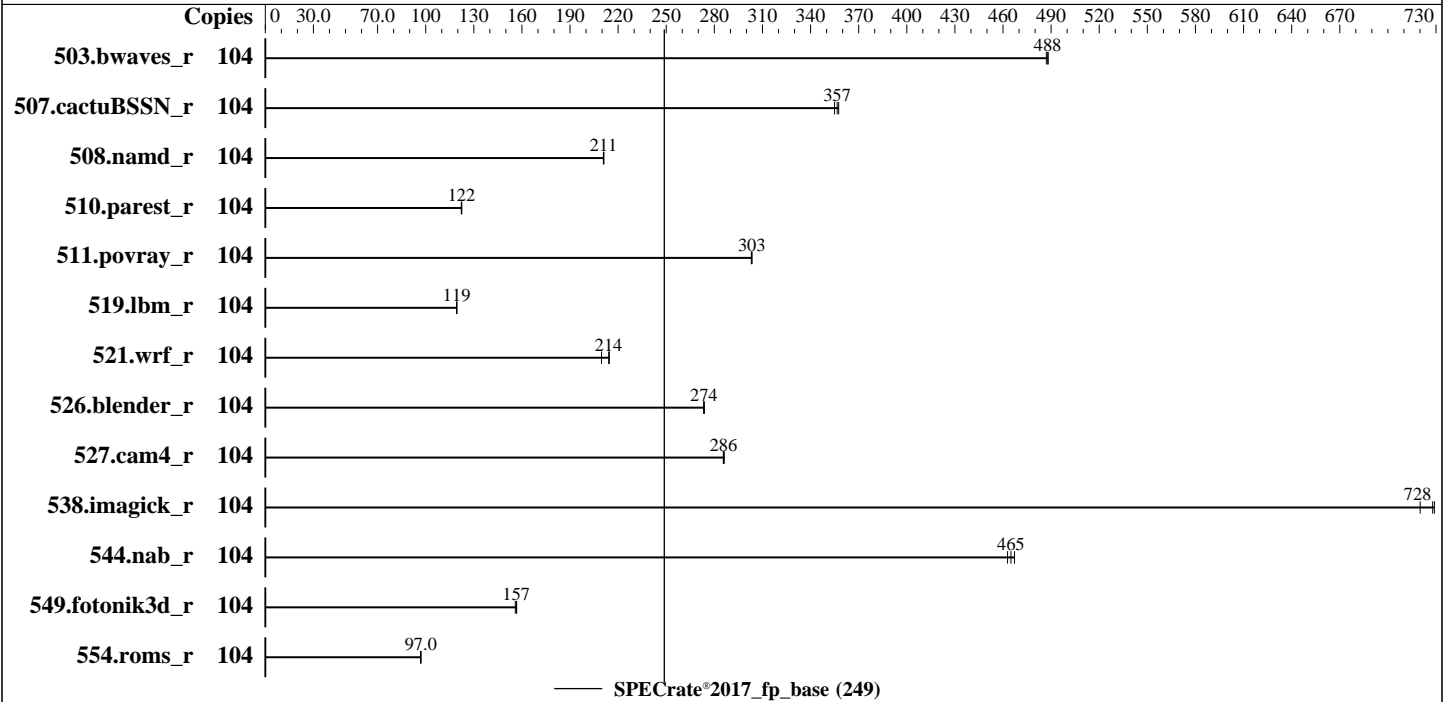
Test Date: Jun-2020

Test Sponsor: Lenovo Global Technology

Hardware Availability: Mar-2020

Tested by: Lenovo Global Technology

Software Availability: Apr-2020



### Hardware

CPU Name: Intel Xeon Gold 6230R  
 Max MHz: 4000  
 Nominal: 2100  
 Enabled: 52 cores, 2 chips, 2 threads/core  
 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: 192 GB (12 x 16 GB 2Rx8 PC4-2933Y-R)  
 Storage: 1 x 800 GB SATA SSD  
 Other: None

### Software

OS: SUSE Linux Enterprise Server 12 SP5 (x86\_64)  
 Kernel 4.12.14-120-default  
 Compiler: C/C++: Version 19.1.1.217 of Intel C/C++  
 Compiler for Linux;  
 Fortran: Version 19.1.1.217 of Intel Fortran  
 Compiler for Linux  
 Parallel: No  
 Firmware: Lenovo BIOS Version TEE155L 2.61 released May-2020  
 File System: btrfs  
 System State: Run level 3 (multi-user)  
 Base Pointers: 64-bit  
 Peak Pointers: Not Applicable  
 Other: jemalloc memory allocator V5.0.1  
 Power Management: BIOS set to prefer performance at the cost of additional power usage



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### Results Table

Benchmark	Base						Peak							
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
503.bwaves_r	104	2136	488	2141	487	<u>2138</u>	<u>488</u>							
507.cactuBSSN_r	104	368	358	371	355	<u>369</u>	<u>357</u>							
508.namd_r	104	<u>468</u>	<u>211</u>	469	211	468	211							
510.parest_r	104	<u>2224</u>	<u>122</u>	2220	123	2227	122							
511.povray_r	104	<u>800</u>	<u>303</u>	801	303	800	303							
519.lbm_r	104	919	119	<u>918</u>	<u>119</u>	918	119							
521.wrf_r	104	<u>1088</u>	<u>214</u>	1086	215	1111	210							
526.blender_r	104	579	273	<u>579</u>	<u>274</u>	579	274							
527.cam4_r	104	<u>637</u>	<u>286</u>	636	286	637	286							
538.imagick_r	104	359	720	<u>355</u>	<u>728</u>	355	729							
544.nab_r	104	<u>376</u>	<u>465</u>	378	463	375	467							
549.fotonik3d_r	104	<u>2589</u>	<u>157</u>	2586	157	2600	156							
554.roms_r	104	1703	97.0	<u>1704</u>	<u>97.0</u>	1707	96.8							

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Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

### Compiler Notes

The inconsistent Compiler version information under Compiler Version section is due to a discrepancy in Intel Compiler. The correct version of C/C++ compiler is: Version 19.1.1.217 Build 20200306 Compiler for Linux  
The correct version of Fortran compiler is: Version 19.1.1.217 Build 20200306 Compiler for Linux

### Submit Notes

The numactl mechanism was used to bind copies to processors. The config file option 'submit' was used to generate numactl commands to bind each copy to a specific processor. For details, please see the config file.

### 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:  
LD\_LIBRARY\_PATH =  
"/home/cpu2017-1.1.0-ic19.1.1/lib/intel64:/home/cpu2017-1.1.0-ic19.1.1/j  
e5.0.1-64"  
MALLOCONF = "retain:true"



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## 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
```

runcpu command invoked through numactl i.e.:

```
numactl --interleave=all runcpu <etc>
```

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.

jemalloc, a general purpose malloc implementation

built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5

sources available from jemalloc.net or <https://github.com/jemalloc/jemalloc/releases>

## Platform Notes

BIOS configuration:

Choose Operating Mode set to Maximum Performance and then set it to Custom Mode

Intel Virtualization Technology set to Disable

MONITOR/MWAIT set to Enable

SNC set to Enable

Sysinfo program /home/cpu2017-1.1.0-ic19.1.1/bin/sysinfo

Rev: r6365 of 2019-08-21 295195f888a3d7edble6e46a485a0011

running on linux-4xwo Thu Jun 4 01:05:31 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 6230R CPU @ 2.10GHz
```

```
2 "physical id"s (chips)
```

```
104 "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 : 26
```

```
siblings : 52
```

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### Platform Notes (Continued)

physical 0: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 16 17 18 19 20 21 22 24 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 22 24 25 26 27 28 29

From lscpu:

```
Architecture:          x86_64
CPU op-mode(s):        32-bit, 64-bit
Byte Order:            Little Endian
Address sizes:         46 bits physical, 48 bits virtual
CPU(s):                104
On-line CPU(s) list:  0-103
Thread(s) per core:   2
Core(s) per socket:   26
Socket(s):             2
NUMA node(s):         4
Vendor ID:             GenuineIntel
CPU family:            6
Model:                 85
Model name:            Intel(R) Xeon(R) Gold 6230R CPU @ 2.10GHz
Stepping:              7
CPU MHz:               2100.000
CPU max MHz:           4000.0000
CPU min MHz:           1000.0000
BogoMIPS:              4200.00
Virtualization:       VT-x
L1d cache:             32K
L1i cache:             32K
L2 cache:              1024K
L3 cache:              36608K
NUMA node0 CPU(s):    0-3,7-9,13-15,20-22,52-55,59-61,65-67,72-74
NUMA node1 CPU(s):    4-6,10-12,16-19,23-25,56-58,62-64,68-71,75-77
NUMA node2 CPU(s):    26-29,33-35,39-41,46-48,78-81,85-87,91-93,98-100
NUMA node3 CPU(s):    30-32,36-38,42-45,49-51,82-84,88-90,94-97,101-103
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
aperfmpperf 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_lld
arch_capabilities
```

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### Platform Notes (Continued)

```
/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: 4 nodes (0-3)
node 0 cpus: 0 1 2 3 7 8 9 13 14 15 20 21 22 52 53 54 55 59 60 61 65 66 67 72 73 74
node 0 size: 47988 MB
node 0 free: 44614 MB
node 1 cpus: 4 5 6 10 11 12 16 17 18 19 23 24 25 56 57 58 62 63 64 68 69 70 71 75 76 77
node 1 size: 48349 MB
node 1 free: 48117 MB
node 2 cpus: 26 27 28 29 33 34 35 39 40 41 46 47 48 78 79 80 81 85 86 87 91 92 93 98 99
node 2 size: 48379 MB
node 2 free: 48166 MB
node 3 cpus: 30 31 32 36 37 38 42 43 44 45 49 50 51 82 83 84 88 89 90 94 95 96 97 101
node 3 size: 48377 MB
node 3 free: 47798 MB
node distances:
node  0  1  2  3
 0:  10  11  21  21
 1:  11  10  21  21
 2:  21  21  10  11
 3:  21  21  11  10
```

```
From /proc/meminfo
MemTotal:      197729108 kB
HugePages_Total:      0
Hugepagesize:    2048 kB
```

From /etc/\*release\* /etc/\*version\*

```
SuSE-release:
SUSE Linux Enterprise Server 12 (x86_64)
VERSION = 12
PATCHLEVEL = 5
# This file is deprecated and will be removed in a future service pack or release.
# Please check /etc/os-release for details about this release.
os-release:
NAME="SLES"
VERSION="12-SP5"
VERSION_ID="12.5"
PRETTY_NAME="SUSE Linux Enterprise Server 12 SP5"
ID="sles"
ANSI_COLOR="0;32"
CPE_NAME="cpe:/o:suse:sles:12:sp5"
```

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## Platform Notes (Continued)

uname -a:

```
Linux linux-4xwo 4.12.14-120-default #1 SMP Thu Nov 7 16:39:09 UTC 2019 (fd9dc36)
x86_64 x86_64 x86_64 GNU/Linux
```

Kernel self-reported vulnerability status:

itlb_multihit:	KVM: Vulnerable
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/swaps barriers and __user pointer sanitization
CVE-2017-5715 (Spectre variant 2):	Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling
tsx_async_abort:	Mitigation: Clear CPU buffers; SMT vulnerable

run-level 3 Jun 4 01:04

SPEC is set to: /home/cpu2017-1.1.0-ic19.1.1

Filesystem	Type	Size	Used	Avail	Use%	Mounted on
/dev/sda3	btrfs	744G	49G	694G	7%	/home

From /sys/devices/virtual/dmi/id

```
BIOS:      Lenovo  -[TEE155L-2.61]- 05/20/2020
Vendor:    Lenovo
Product:   THINKSYSTEM SD530  -[7X2104Z000]-
Product Family: ThinkSystem
Serial:    1234567890
```

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:

```
4x NO DIMM NO DIMM
12x SK Hynix HMA82GR7CJR8N-WM 16 GB 2 rank 2933
```

(End of data from sysinfo program)

## Compiler Version Notes

```
=====
C          | 519.lbm_r(base) 538.imagick_r(base) 544.nab_r(base)
```

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### Compiler Version Notes (Continued)

-----  
Intel(R) C Compiler for applications running on Intel(R) 64, Version 2021.1  
NextGen Build 20200304  
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.  
-----

=====  
C++ | 508.namd\_r(base) 510.parest\_r(base)  
-----

Intel(R) C++ Compiler for applications running on Intel(R) 64, Version 2021.1  
NextGen Build 20200304  
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.  
-----

=====  
C++, C | 511.povray\_r(base) 526.blender\_r(base)  
-----

Intel(R) C++ Compiler for applications running on Intel(R) 64, Version 2021.1  
NextGen Build 20200304  
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.  
Intel(R) C Compiler for applications running on Intel(R) 64, Version 2021.1  
NextGen Build 20200304  
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.  
-----

=====  
C++, C, Fortran | 507.cactuBSSN\_r(base)  
-----

Intel(R) C++ Compiler for applications running on Intel(R) 64, Version 2021.1  
NextGen Build 20200304  
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.  
Intel(R) C Compiler for applications running on Intel(R) 64, Version 2021.1  
NextGen Build 20200304  
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.  
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)  
64, Version 19.1.1.217 Build 20200306  
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.  
-----

=====  
Fortran | 503.bwaves\_r(base) 549.fotonik3d\_r(base) 554.roms\_r(base)  
-----

Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)  
64, Version 19.1.1.217 Build 20200306  
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### Compiler Version Notes (Continued)

```

=====
Fortran, C      | 521.wrf_r(base) 527.cam4_r(base)
=====
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
 64, Version 19.1.1.217 Build 20200306
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
Intel(R) C Compiler for applications running on Intel(R) 64, Version 2021.1
  NextGen Build 20200304
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
=====

```

### Base Compiler Invocation

C benchmarks:  
icc

C++ benchmarks:  
icpc

Fortran benchmarks:  
ifort

Benchmarks using both Fortran and C:  
ifort icc

Benchmarks using both C and C++:  
icpc icc

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

### Base Portability Flags

```

503.bwaves_r: -DSPEC_LP64
507.cactuBSSN_r: -DSPEC_LP64
508.namd_r: -DSPEC_LP64
510.parest_r: -DSPEC_LP64
511.povray_r: -DSPEC_LP64
519.lbm_r: -DSPEC_LP64
521.wrf_r: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
526.blender_r: -DSPEC_LP64 -DSPEC_LINUX -funsigned-char
527.cam4_r: -DSPEC_LP64 -DSPEC_CASE_FLAG
538.imagick_r: -DSPEC_LP64

```

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## Base Portability Flags (Continued)

544.nab\_r: -DSPEC\_LP64  
549.fotonik3d\_r: -DSPEC\_LP64  
554.roms\_r: -DSPEC\_LP64

## Base Optimization Flags

### C benchmarks:

```
-m64 -qnextgen -std=c11
-Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs
-fuse-ld=gold -xCORE-AVX512 -Ofast -ffast-math -flto -mfpmath=sse
-funroll-loops -qopt-mem-layout-trans=4
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

### C++ benchmarks:

```
-m64 -qnextgen -Wl,-plugin-opt=-x86-branches-within-32B-boundaries
-Wl,-z,muldefs -fuse-ld=gold -xCORE-AVX512 -Ofast -ffast-math -flto
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

### Fortran benchmarks:

```
-m64 -Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs
-fuse-ld=gold -xCORE-AVX512 -O3 -ipo -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-multiple-gather-scatter-by-shuffles
-qopt-mem-layout-trans=4 -nostandard-realloc-lhs -align array32byte
-auto -mbranches-within-32B-boundaries
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

### Benchmarks using both Fortran and C:

```
-m64 -qnextgen -std=c11
-Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs
-fuse-ld=gold -xCORE-AVX512 -Ofast -ffast-math -flto -mfpmath=sse
-funroll-loops -qopt-mem-layout-trans=4 -O3 -ipo -no-prec-div
-qopt-prefetch -ffinite-math-only
-qopt-multiple-gather-scatter-by-shuffles -nostandard-realloc-lhs
-align array32byte -auto -mbranches-within-32B-boundaries
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

### Benchmarks using both C and C++:

```
-m64 -qnextgen -std=c11
-Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs
-fuse-ld=gold -xCORE-AVX512 -Ofast -ffast-math -flto -mfpmath=sse
-funroll-loops -qopt-mem-layout-trans=4
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

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## Base Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++:

```
-m64 -qnextgen -std=c11  
-Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs  
-fuse-ld=gold -xCORE-AVX512 -Ofast -ffast-math -flto -mfpmath=sse  
-funroll-loops -qopt-mem-layout-trans=4 -O3 -ipo -no-prec-div  
-qopt-prefetch -ffinite-math-only  
-qopt-multiple-gather-scatter-by-shuffles -nostandard-realloc-lhs  
-align array32byte -auto -mbranches-within-32B-boundaries  
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

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

[http://www.spec.org/cpu2017/flags/Intel-ic19.1ul-official-linux64\\_revA.html](http://www.spec.org/cpu2017/flags/Intel-ic19.1ul-official-linux64_revA.html)

<http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-CLX-H.html>

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

[http://www.spec.org/cpu2017/flags/Intel-ic19.1ul-official-linux64\\_revA.xml](http://www.spec.org/cpu2017/flags/Intel-ic19.1ul-official-linux64_revA.xml)

<http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-CLX-H.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).

Tested with SPEC CPU®2017 v1.1.0 on 2020-06-03 13:05:30-0400.

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