SPEC CPU®2017 Floating Point Rate Result

Copyright 2017-2019 Standard Performance Evaluation Corporation

Lenovo Global Technology

SPECrate®2017_fp_base =   473

ThinkSystem SN850
(2.10 GHz, Intel Xeon Gold 6252)

SPECrate®2017_fp_peak = Not Run

CPU2017 License: 9017

Test Sponsor: Lenovo Global Technology

Tested by: Lenovo Global Technology

Test Date: Sep-2019

Hardware Availability: Apr-2019

Software Availability: May-2019

Benchmark	Copies	Result
503.bwaves_r	192	1060
507.cactuBSSN_r	192	412
508.namd_r	192	366
510.parest_r	192	259
511.povray_r	192	559
519.lbm_r	192	250
521.wrf_r	192	471
526.blender_r	192	549
527.cam4_r	192	571
538.imagick_r	192	1160
544.nab_r	192	856
549.fotonik3d_r	192	344
554.roms_r	192	203

SPECrate®2017_fp_base (473)

Hardware

CPU Name: Intel Xeon Gold 6252
 Max MHz: 3700
 Nominal: 2100
Enabled: 96 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: 35.75 MB I+D on chip per chip
 Other: None
Memory: 1536 GB (48 x 32 GB 2Rx4 PC4-2933Y-R)
Storage: 1 x 960 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 19.0.4.227 of Intel C/C++
 Compiler for Linux;
 Fortran: Version 19.0.4.227 of
 Intel Fortran
 Compiler for Linux
Parallel: No
Firmware: Lenovo BIOS Version IVE142E 2.30 released Aug-2019 tested as IVE141E 2.30 Jul-2019
File System: xfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: Not Applicable
Other: None
Power Management: --

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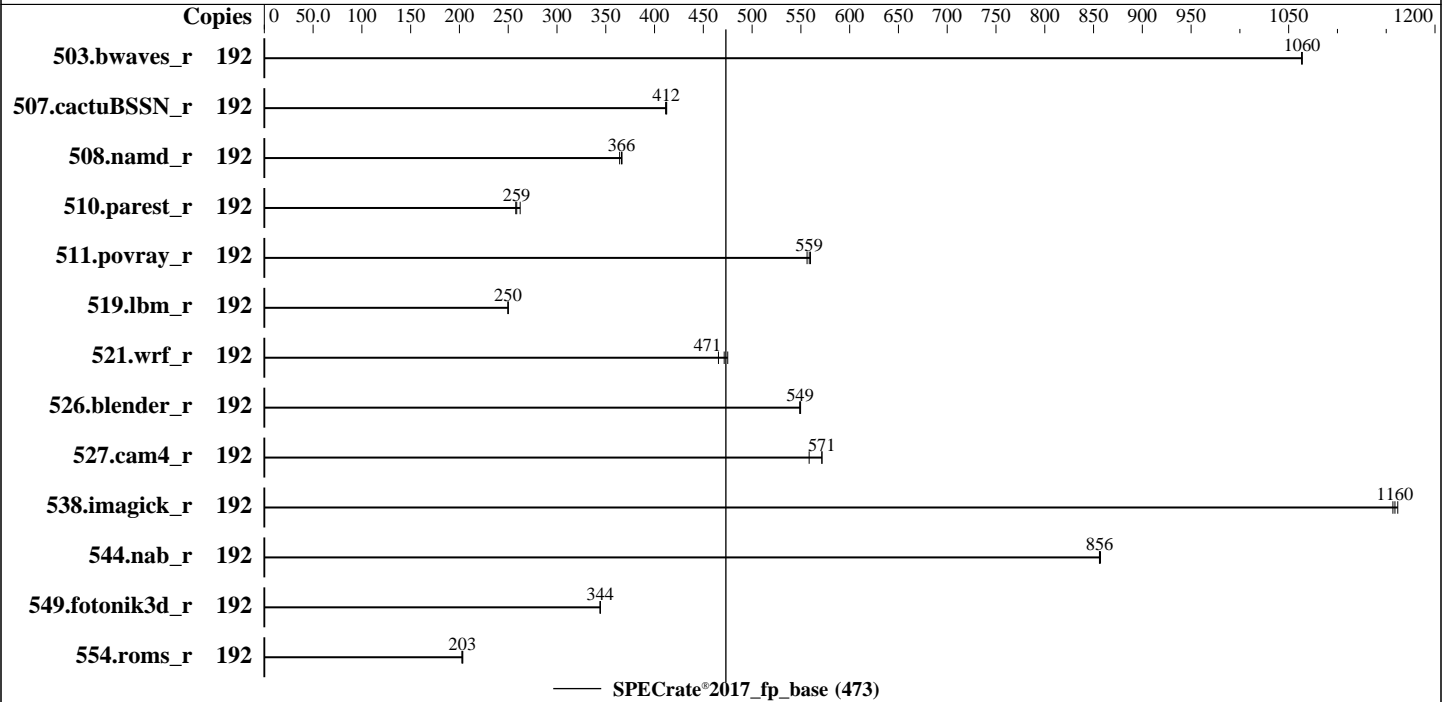
SPECrate®2017_fp_peak = Not Run

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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	192	**1810**	**1060**	1811	1060	1810	1060							
507.cactuBSSN_r	192	589	412	**590**	**412**	591	411							
508.namd_r	192	501	364	**498**	**366**	497	367							
510.parest_r	192	1915	262	**1941**	**259**	1949	258							
511.povray_r	192	806	556	801	560	**803**	**559**							
519.lbm_r	192	810	250	810	250	**810**	**250**							
521.wrf_r	192	905	475	**912**	**471**	924	466							
526.blender_r	192	532	550	533	549	**532**	**549**							
527.cam4_r	192	587	572	**588**	**571**	601	558							
538.imagick_r	192	411	1160	413	1160	**412**	**1160**							
544.nab_r	192	377	857	**377**	**856**	377	856							
549.fotonik3d_r	192	2174	344	**2173**	**344**	2172	344							
554.roms_r	192	**1503**	**203**	1499	203	1507	203							

SPECrate®2017_fp_base = 473

SPECrate®2017_fp_peak = Not Run

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

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"

General Notes

Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH = "/home/cpu2017-1.0.5-ic19.0u4/lib/intel64"

 Binaries compiled on a system with 1x Intel Core i9-799X 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
 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.

(Continued on next page)

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Test Date: Sep-2019
Hardware Availability: Apr-2019
Software Availability: May-2019

General Notes (Continued)

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.

Platform Notes

```
BIOS configuration:
Choose Operating Mode set to Maximum Performance
SNC 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 localhost.localdomain Thu Sep 19 16:44:23 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 6252 CPU @ 2.10GHz
       4  "physical id"s (chips)
       192 "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  : 48
       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 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29
       physical 2: 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 3: cores 0 1 2 3 4 5 6 9 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29

  From lscpu:
       Architecture:          x86_64
       CPU op-mode(s):        32-bit, 64-bit
       Byte Order:            Little Endian
       CPU(s):                192
       On-line CPU(s) list:   0-191
       Thread(s) per core:    2
       Core(s) per socket:    24
       Socket(s):             4
       NUMA node(s):          8
```

(Continued on next page)

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

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Test Date: Sep-2019
Hardware Availability: Apr-2019
Software Availability: May-2019

Platform Notes (Continued)

```
          Vendor ID:              GenuineIntel
          CPU family:             6
          Model:                  85
          Model name:             Intel(R) Xeon(R) Gold 6252 CPU @ 2.10GHz
          Stepping:               6
          CPU MHz:                2100.000
          BogoMIPS:               4200.00
          Virtualization:         VT-x
          L1d cache:              32K
          L1i cache:              32K
          L2 cache:               1024K
          L3 cache:               36608K
          NUMA node0 CPU(s):      0-3,7-9,13-15,19,20,96-99,103-105,109-111,115,116
          NUMA node1 CPU(s):      4-6,10-12,16-18,21-23,100-102,106-108,112-114,117-119
          NUMA node2 CPU(s):      24-27,31,32,36-38,42-44,120-123,127,128,132-134,138-140
          NUMA node3 CPU(s):      28-30,33-35,39-41,45-47,124-126,129-131,135-137,141-143
          NUMA node4 CPU(s):      48-51,55-57,61-63,67,68,144-147,151-153,157-159,163,164
          NUMA node5 CPU(s):      52-54,58-60,64-66,69-71,148-150,154-156,160-162,165-167
          NUMA node6 CPU(s):      72-75,79,80,84-86,90-92,168-171,175,176,180-182,186-188
          NUMA node7 CPU(s):      76-78,81-83,87-89,93-95,172-174,177-179,183-185,189-191
          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 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_ppin 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 pku ospke
          avx512_vnni spec_ctrl intel_stibp 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: 8 nodes (0-7)
      node 0 cpus: 0 1 2 3 7 8 9 13 14 15 19 20 96 97 98 99 103 104 105 109 110 111 115 116
      node 0 size: 196277 MB
      node 0 free: 191644 MB
      node 1 cpus: 4 5 6 10 11 12 16 17 18 21 22 23 100 101 102 106 107 108 112 113 114 117
      118 119
      node 1 size: 196608 MB
      node 1 free: 191378 MB
      node 2 cpus: 24 25 26 27 31 32 36 37 38 42 43 44 120 121 122 123 127 128 132 133 134
      138 139 140
```

(Continued on next page)

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CPU2017 License: 9017　　　　　　　　　　　　　　　　　　　**Test Date:**　　　Sep-2019
Test Sponsor:　　Lenovo Global Technology　　　　　　　**Hardware Availability:** Apr-2019
Tested by:　　　　Lenovo Global Technology　　　　　　　**Software Availability:**　May-2019

Platform Notes (Continued)

```
    node 2 size: 196608 MB
    node 2 free: 192166 MB
    node 3 cpus: 28 29 30 33 34 35 39 40 41 45 46 47 124 125 126 129 130 131 135 136 137
    141 142 143
    node 3 size: 196608 MB
    node 3 free: 192115 MB
    node 4 cpus: 48 49 50 51 55 56 57 61 62 63 67 68 144 145 146 147 151 152 153 157 158
    159 163 164
    node 4 size: 196608 MB
    node 4 free: 192046 MB
    node 5 cpus: 52 53 54 58 59 60 64 65 66 69 70 71 148 149 150 154 155 156 160 161 162
    165 166 167
    node 5 size: 196608 MB
    node 5 free: 192086 MB
    node 6 cpus: 72 73 74 75 79 80 84 85 86 90 91 92 168 169 170 171 175 176 180 181 182
    186 187 188
    node 6 size: 196608 MB
    node 6 free: 192157 MB
    node 7 cpus: 76 77 78 81 82 83 87 88 89 93 94 95 172 173 174 177 178 179 183 184 185
    189 190 191
    node 7 size: 196608 MB
    node 7 free: 192117 MB
    node distances:
    node   0   1   2   3   4   5   6   7
      0:  10  11  21  21  21  21  21  21
      1:  11  10  21  21  21  21  21  21
      2:  21  21  10  11  21  21  21  21
      3:  21  21  11  10  21  21  21  21
      4:  21  21  21  21  10  11  21  21
      5:  21  21  21  21  11  10  21  21
      6:  21  21  21  21  21  21  10  11
      7:  21  21  21  21  21  21  11  10

  From /proc/meminfo
    MemTotal:       1584958284 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"
```

(Continued on next page)

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Platform Notes (Continued)

```
        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 Sep 19 16:42

 SPEC is set to: /home/cpu2017-1.0.5-ic19.0u4
    Filesystem      Type  Size  Used Avail Use% Mounted on
    /dev/sda2       xfs   839G   24G  815G   3% /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 -[IVE141E-2.30]- 07/02/2019
    Memory:
     48x Samsung M393A4K40CB2-CVF 32 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)
------------------------------------------------------------------------------
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++              | 508.namd_r(base) 510.parest_r(base)
------------------------------------------------------------------------------
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.4.227 Build 20190416
```

(Continued on next page)

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Compiler Version Notes (Continued)

```
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
--------------------------------------------------------------------------------


==============================================================================
C++, C            | 511.povray_r(base) 526.blender_r(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.
--------------------------------------------------------------------------------


==============================================================================
C++, C, Fortran | 507.cactuBSSN_r(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         | 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 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
--------------------------------------------------------------------------------


==============================================================================
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 19.0.4.227 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.
--------------------------------------------------------------------------------
```

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Base Compiler Invocation

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

C++ benchmarks:
```
icpc -m64
```

Fortran benchmarks:
```
ifort -m64
```

Benchmarks using both Fortran and C:
```
ifort -m64 icc -m64 -std=c11
```

Benchmarks using both C and C++:
```
icpc -m64 icc -m64 -std=c11
```

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

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`
544.nab_r: `-DSPEC_LP64`
549.fotonik3d_r: `-DSPEC_LP64`
554.roms_r: `-DSPEC_LP64`

Base Optimization Flags

C benchmarks:
```
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4
```

C++ benchmarks:
```
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
```

(Continued on next page)

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Base Optimization Flags (Continued)

C++ benchmarks (continued):
```
-qopt-mem-layout-trans=4
```

Fortran benchmarks:
```
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs
-align array32byte
```

Benchmarks using both Fortran and C:
```
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs
-align array32byte
```

Benchmarks using both C and C++:
```
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4
```

Benchmarks using Fortran, C, and C++:
```
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs
-align array32byte
```

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-F.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-F.xml

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

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