**Lenovo Global Technology**

ThinkSystem ST250  
(4.00 GHz, Intel Xeon E-2286G)

**SPECrater®2017_fp_base = 41.3**  
**SPECrater®2017_fp_peak = 41.8**

**Hardware**
- **CPU Name:** Intel Xeon E-2286G  
  - **Max MHz:** 4900  
  - **Nominal:** 4000  
  - **Enabled:** 6 cores, 1 chip  
  - **Orderable:** 1 chip  
  - **Cache L1:** 32 KB I + 32 KB D on chip per core  
  - **L2:** 256 KB I+D on chip per core  
  - **L3:** 12 MB I+D on chip per chip  
  - **Memory:** 128 GB (4 x 32 GB 2Rx4 PC4-2666V-E)  
  - **Storage:** 1 x 960 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  
  - **Compiler:** Lenovo BIOS Version ISE115D 2.10 released Apr-2020  
  - **File System:** xfs  
  - **System State:** Run level 3 (multi-user)  
  - **Base Pointers:** 64-bit  
  - **Peak Pointers:** 64-bit  
  - **Other:** jemalloc memory allocator V5.0.1  
  - **Power Management:** BIOS set to prefer performance at the cost of additional power usage
## Lenovo Global Technology

**ThinkSystem ST250**  
(4.00 GHz, Intel Xeon E-2286G)

**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

### Results Table

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**SPECrate®2017_fp_base = 41.3**  
**SPECrate®2017_fp_peak = 41.8**

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 taskset mechanism was used to bind copies to processors. The config file option 'submit' was used to generate taskset 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"
MALLOC_CONF = "retain:true"
```
Lenovo Global Technology
ThinkSystem ST250
(4.00 GHz, Intel Xeon E-2286G)

Copyright 2017-2020 Standard Performance Evaluation Corporation

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

Yes: 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.
jemalloc, a general purpose malloc implementation
built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5

Platform Notes

BIOS configuration:
Choose Operating Mode set to Maximum Performance
Hyper-Threading set to Disable

Sysinfo program /home/cpu2017-1.1.0-ic19.1.1/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7edbl6e6a485a0011
running on linux-tzna Tue Jun 30 09:26:56 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) E-2286G CPU @ 4.00GHz
       1 "physical id"s (chips)
       6 "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 : 6
   siblings : 6
   physical 0: cores 0 1 2 3 4 5

From lscpu:
   Architecture: x86_64
   CPU op-mode(s): 32-bit, 64-bit
   Byte Order: Little Endian
   Address sizes: 39 bits physical, 48 bits virtual
   CPU(s): 6

(Continued on next page)
Lenovo Global Technology

ThinkSystem ST250
(4.00 GHz, Intel Xeon E-2286G)

SPEC®2017 Floating Point Rate Result

Copyright 2017-2020 Standard Performance Evaluation Corporation

Lenovo Global Technology

SPECrate®2017_fp_base = 41.3
SPECrate®2017_fp_peak = 41.8

CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Test Date: Jun-2020
Hardware Availability: Mar-2020
Tested by: Lenovo Global Technology
Software Availability: Apr-2020

Platform Notes (Continued)

On-line CPU(s) list: 0-5
Thread(s) per core: 1
Core(s) per socket: 6
Socket(s): 1
NUMA node(s): 1
Vendor ID: GenuineIntel
CPU family: 6
Model: 158
Model name: Intel(R) Xeon(R) E-2286G CPU @ 4.00GHz
Stepping: 10
CPU MHz: 4000.000
CPU max MHz: 4900.000
CPU min MHz: 800.000
BogoMIPS: 8016.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 256K
L3 cache: 12288K
NUMA node0 CPU(s): 0-5
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
    aperf perfctr tsc_known_freq pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3
    sdbg fma cx16 xtr 🌕 pdcv pclid sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer
    aes xsave avx f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault epb invpcid_single
    pti ssbd ibrs ibpb stibp tpr_shadow vmmi flexpriority ept vpid fsgsbase tsc_adjust
    bmi1 hle avx2 smep bmi2 ets invpcid rtm mpx rdseed adx smap clflushopt intel_pt
    xsaveopt xsavec xgetbv1 xsaves dtherm ida arat pln pts hwp hwp_notif hwp_act_window
    hwp_epp md_clear flush_l1d

From /proc/cpuinfo cache data
    cache size : 12288 KB

From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a
    physical chip.
    available: 1 nodes (0)
    node 0 cpus: 0 1 2 3 4 5
    node 0 size: 128865 MB
    node 0 free: 128362 MB
    node distances:
        node 0
        0: 10

From /proc/meminfo
    MemTotal: 131958660 kB
    HugePages_Total: 0

(Continued on next page)
Lenovo Global Technology
ThinkSystem ST250 (4.00 GHz, Intel Xeon E-2286G)

SPEC CPU®2017 Floating Point Rate Result

Copyright 2017-2020 Standard Performance Evaluation Corporation

SPECrate®2017_fp_base = 41.3
SPECrate®2017_fp_peak = 41.8

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

Test Date: Jun-2020
Hardware Availability: Mar-2020
Software Availability: Apr-2020

Platform Notes (Continued)

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"

uname -a:
  x86_64 x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:
- itlb_multihit: KVM: Mitigation: Split huge pages
- CVE-2018-3620 (L1 Terminal Fault): Mitigation: PTE Inversion; VMX: conditional cache flushes, SMT disabled
- Microarchitectural Data Sampling: Mitigation: Clear CPU buffers; SMT disabled
- CVE-2017-5754 (Meltdown):
- Mitigation: PTI
- 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: Full generic retpoline, IBPB: conditional, IBRS_FW, RSB filling
- tsx_async_abort:
- Mitigation: Clear CPU buffers; SMT disabled

run-level 3 Jun 30 09:26

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

Filesystem Type Size Used Avail Use% Mounted on
/dev/sdb3 xfs 893G 64G 829G 8% /

From /sys/devices/virtual/dmi/id
- BIOS: Lenovo -[ISE115D-2.10]- 04/24/2020
- Vendor: Lenovo
- Product: ThinkSystem ST250 -[7Y45CTO0WW]-

(Continued on next page)
Lenovo Global Technology  
ThinkSystem ST250  
(4.00 GHz, Intel Xeon E-2286G)

**SPECrate®2017_fp_base = 41.3**  
**SPECrate®2017_fp_peak = 41.8**

**Platform Notes (Continued)**

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 SK Hynix HMAA4GU7AJR8N-VK 32767 MB 2 rank 2666

(End of data from sysinfo program)

**Compiler Version Notes**

---------------------------------------------------------------------  
| C               | 519.lbm_r(base, peak) 538.imagick_r(base, peak) 544.nab_r(base, peak) |
---------------------------------------------------------------------  
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, peak) 510.parest_r(base, peak) |
---------------------------------------------------------------------  
Intel(R) C++ Compiler for applications running on Intel(R) 64, Version 2021.1  
NextGen Build 20200304  
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---------------------------------------------------------------------  

---------------------------------------------------------------------  
| C++, C          | 511.povray_r(base) 526.blender_r(base, peak) |
---------------------------------------------------------------------  
Intel(R) C++ Compiler for applications running on Intel(R) 64, Version 2021.1  
NextGen Build 20200304  
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Intel(R) C Compiler for applications running on Intel(R) 64, Version 2021.1  
NextGen Build 20200304  
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---------------------------------------------------------------------  

---------------------------------------------------------------------  
| C++, C          | 511.povray_r(peak) |
---------------------------------------------------------------------  
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
Lenovo Global Technology
ThinkSystem ST250
(4.00 GHz, Intel Xeon E-2286G)

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

SPECraten®2017 fp_base = 41.3
SPECraten®2017 fp_peak = 41.8

Test Date: Jun-2020
Hardware Availability: Mar-2020
Software Availability: Apr-2020

Compiler Version Notes (Continued)

Version 19.1.1.217 Build 20200306
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Intel(R) C 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.

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

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==============================================================================
C++, C          | 511.povray_r(peak)
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Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
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==============================================================================
C++, C, Fortran | 507.cactuBSSN_r(base, peak)
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Intel(R) C++ Compiler for applications running on Intel(R) 64, Version 2021.1
NextGen Build 20200304
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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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==============================================================================
Fortran         | 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak) 554.roms_r(base, peak)
==============================================================================

(Continued on next page)
Lenovo Global Technology
ThinkSystem ST250
(4.00 GHz, Intel Xeon E-2286G)

Compiler Version Notes (Continued)

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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Fortran, C | 521.wrf_r(base) 527.cam4_r(base, peak)
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Fortran, C | 521.wrf_r(base) 527.cam4_r(base, peak)
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Fortran, C | 521.wrf_r(peak)
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------------------------------------------------------------------------------

(Continued on next page)
Lenovo Global Technology
ThinkSystem ST250
(4.00 GHz, Intel Xeon E-2286G)

**SPECrade®2017_fp_base = 41.3**
**SPECrade®2017_fp_peak = 41.8**

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<td>Lenovo Global Technology</td>
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### Compiler Version Notes (Continued)

#### Base Compiler Invocation

**C benchmarks:**
```makefile
c -DSPEC_LP64
```

**C++ benchmarks:**
```makefile
icpc -DSPEC_LP64
```

**Fortran benchmarks:**
```makefile
ifort
```

**Benchmarks using both Fortran and C:**
```makefile
ifort icc
```

**Benchmarks using both C and C++:**
```makefile
icpc icc
```

**Benchmarks using Fortran, C, and C++:**
```makefile
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
- 544.nab_r: -DSPEC_LP64
- 549.fotonik3d_r: -DSPEC_LP64
- 554.roms_r: -DSPEC_LP64
Lenovo Global Technology
ThinkSystem ST250
(4.00 GHz, Intel Xeon E-2286G)

SPECrater®2017_fp_base = 41.3
SPECrater®2017_fp_peak = 41.8

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

Test Date: Jun-2020
Hardware Availability: Mar-2020
Software Availability: Apr-2020

Base Optimization Flags

C benchmarks:
-m64 -qnextgen -std=c11
-Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs
-fuse-ld=gold -xCORE-AVX2 -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-AVX2 -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-AVX2 -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-AVX2 -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-AVX2 -Ofast -ffast-math -flto -mfpmath=sse
-funroll-loops -qopt-mem-layout-trans=4
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

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-AVX2 -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

(Continued on next page)
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Base Optimization Flags (Continued)
Benchmarks using Fortran, C, and C++ (continued):
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

Peak 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

Peak Portability Flags
Same as Base Portability Flags

Peak Optimization Flags
C benchmarks:
519.lbm_r: basepeak = yes
538.imagick_r: basepeak = yes
544.nab_r: basepeak = yes

C++ benchmarks:

(Continued on next page)
Lenovo Global Technology
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Peak Optimization Flags (Continued)

508.namd_r: basepeak = yes

510.parest_r: -m64 -qnextgen
-W1,-plugin-opt=-x86-branches-within-32B-boundaries
-W1,-z,muldefs -fuse-ld=gold -xCORE-AVX2 -Ofast
-ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -L/usr/local/jemalloc64-5.0.1/lib
-ljemalloc

Fortran benchmarks:

503.bwaves_r: -m64 -W1,-plugin-opt=-x86-branches-within-32B-boundaries
-W1,-z,muldefs -fuse-ld=gold -xCORE-AVX2 -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

549.fotonik3d_r: basepeak = yes

554.roms_r: Same as 503.bwaves_r

Benchmarks using both Fortran and C:

521.wrf_r: -prof-gen(pass 1) -prof-use(pass 2) -xCORE-AVX2 -O3 -ipo
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-multiple-gather-scatter-by-shuffles
-qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries
-nostandard-realloc-lhs -align array32byte -auto
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

527.cam4_r: basepeak = yes

Benchmarks using both C and C++:

511.povray_r: -prof-gen(pass 1) -prof-use(pass 2) -xCORE-AVX2 -O3 -ipo
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-multiple-gather-scatter-by-shuffles
-qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

526.blender_r: basepeak = yes

Benchmarks using Fortran, C, and C++:

(Continued on next page)
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Software Availability: Apr-2020

Peak Optimization Flags (Continued)

507.cactuBSSN_r: basepeak = yes

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-SKL-J.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/Intel-ic19.1u1-official-linux64_revA.xml
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-SKL-J.xml

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

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