## Lenovo Global Technology

**ThinkSystem SR635**

**3.00 GHz, AMD EPYC 7302P**

### SPECspeed®2017_fp_base = 75.5

**SPECspeed®2017_fp_peak = 75.8**

<table>
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<tr>
<td>2017_fp_base</td>
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<tr>
<td>2017_fp_peak</td>
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</table>

#### Lenovo Global Technology

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

<table>
<thead>
<tr>
<th>Threads</th>
<th>SPECspeed®2017_fp_base (75.5)</th>
<th>SPECspeed®2017_fp_peak (75.8)</th>
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<th>Threads</th>
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<td>73.9</td>
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<td>619.lbm_s</td>
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<td>621.wrf_s</td>
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<td>627.cam4_s</td>
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<tr>
<td>654.roms_s</td>
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</tbody>
</table>

#### Hardware

- **CPU Name:** AMD EPYC 7302P  
- **Max MHz:** 3300  
- **Nominal:** 3000  
- **Enabled:** 16 cores, 1 chip  
- **Orderable:** 1 chip  
- **Cache L1:** 32 KB I + 32 KB D on chip per core  
- **L2:** 512 KB I+D on chip per core  
- **L3:** 128 MB I+D on chip per chip, 16 MB shared / 2 cores  
- **Other:** None  
- **Memory:** 256 GB (8 x 32 GB 2Rx4 PC4-3200AA-R)  
- **Storage:** 1 x 960 GB SATA SSD  
- **Other:** None

#### Software

- **OS:** SUSE Linux Enterprise Server 15 SP1 (x86_64)  
- **Kernel:** 4.12.14-195-default  
- **Compiler:** C/C++: Version 1.3.0 of AOCC, Fortran: Version 4.8.2 for GCC  
- **Parallel:** Yes  
- **Firmware:** Lenovo BIOS Version CFE105D released Sep-2019  
- **File System:** xfs  
- **System State:** Run level 3 (multi-user)  
- **Base Pointers:** 64-bit  
- **Peak Pointers:** 64-bit  
- **Other:** jemalloc: jemalloc memory allocator library version 5.1.0  
- **Power Management:** --
SPEC CPU®2017 Floating Point Speed Result

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Lenovo Global Technology
ThinkSystem SR635
3.00 GHz, AMD EPYC 7302P

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

SPECspeed®2017_fp_base = 75.5
SPECspeed®2017_fp_peak = 75.8

Test Date: Oct-2019
Hardware Availability: Aug-2019
Software Availability: Jun-2019

Results Table

<table>
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<th>Seconds</th>
<th>Ratio</th>
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</tbody>
</table>

SPECspeed®2017_fp_base = 75.5
SPECspeed®2017_fp_peak = 75.8

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

Compiler Notes

The AMD64 AOCC Compiler Suite is available at http://developer.amd.com/amd-aocc/

The AOCC Fortran Plugin version 1.3.0 was used to leverage AOCC optimizers with gfortran. It is available here: http://developer.amd.com/amd-aocc/

Submit Notes

The config file option 'submit' was used.
'numactl' was used to bind copies to the cores.
See the configuration file for details.

Operating System Notes

'ulimit -s unlimited' was used to set environment stack size
'ulimit -l 2097152' was used to set environment locked pages in memory limit

runspec command invoked through numactl i.e.:
numactl --interleave=all runspec <etc>

Set dirty_ratio=8 to limit dirty cache to 8% of memory
Set swappiness=1 to swap only if necessary
Set zone_reclaim_mode=1 to free local node memory and avoid remote memory sync then drop_caches=3 to reset caches before invoking runcpu

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SPECspeed®2017_fp_base = 75.5
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Operating System Notes (Continued)

dirty_ratio, swappiness, zone_reclaim_mode and drop_caches were
all set using privileged echo (e.g. echo 1 > /proc/sys/vm/swappiness).
Transparent huge pages set to 'always' for this run (OS default)

General Notes

Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH = "~/home/cpu2017-1.0.5-amd-na/amd_speed_aocc130_naples_A_lib/64"
LD_LIBRARY_PATH = "$LD_LIBRARY_PATH:/home/cpu2017-1.0.5-amd-na/amd_speed_aocc130_naples_A_lib/32"
OMP_DYNAMIC = "false"
OMP_PLACES = "cores"
OMP_PROC_BIND = "close"
OMP_SCHEDULE = "static"
OMP_STACKSIZE = "192M"
OMP_WAIT_POLICY = "active"
Binaries were compiled on a system with 2p AMD EPYC 7601 CPU + 512GB Memory using RHEL 7.6

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: configured and built with GCC v4.8.5 in RHEL v7.2 under default conditions.
https://github.com/jemalloc/jemalloc/releases/download/5.1.0/jemalloc-5.1.0.tar.bz2

Platform Notes

BIOS settings:
Set Operating Mode set to Maximum Performance
SMT Mode set to Disabled
EfficiencyModeEn set to Auto
Sysinfo program /home/cpu2017-1.0.5-amd-na/bin/sysinfo
Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
running on linux-vapu Thu Oct 17 23:30:39 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

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Test Date: Oct-2019
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Hardware Availability: Aug-2019
Software Availability: Jun-2019

Platform Notes (Continued)

From /proc/cpuinfo
    model name : AMD EPYC 7302P 16-Core Processor
    1 "physical id"s (chips)
    16 "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 4 5 8 9 12 13 16 17 20 21 24 25 28 29

From lscpu:
    Architecture: x86_64
    CPU op-mode(s): 32-bit, 64-bit
    Byte Order: Little Endian
    Address sizes: 43 bits physical, 48 bits virtual
    CPU(s): 16
    On-line CPU(s) list: 0-15
    Thread(s) per core: 1
    Core(s) per socket: 16
    Socket(s): 1
    NUMA node(s): 1
    Vendor ID: AuthenticAMD
    CPU family: 23
    Model: 49
    Model name: AMD EPYC 7302P 16-Core Processor
    Stepping: 0
    CPU MHz: 3000.000
    CPU max MHz: 3000.000
    CPU min MHz: 1500.000
    BogoMIPS: 5988.65
    Virtualization: AMD-V
    L1d cache: 32K
    L1i cache: 32K
    L2 cache: 512K
    L3 cache: 16384K
    NUMA node0 CPU(s): 0-15
    Flags: fpu vme de pse tsc msr pae mca cmov pat pse36 clflush mmx fxsr sse sse2 ht syscall nx mmxext fxsr_opt pdpe1gb rdtscp lm constant_tsc rep_good nopl xtopology nonstop_tsc cpuid extd_apicid aperfmperf pni pclmulqdq monitor ssse3 fma cx16 sse4_1 sse4_2 movbe popcnt aes xsave avx f16c rdrand lahf_lm cmp_legacy svm extapic cr8_legacy abm sse4a misalignsse 3dnowprefetch osvw ibs kini wdt tce topoext perfctr_core perfctr_nb perfctr_l2 mwait txcb cat cdp_13 hw_pstate sme ssbd sib ibs ibpb stibp vmmcall fsgsbase bmi1 avx2 smep bmi2 cqm rdt_a rseed adx smap clflushopt clwb sha ni xsaveopt xsavec xgetbv vxsave xsaves cgmm llc cgmm_occup_llc cgmm_mbb_total cgmm_mbb_local clzero iperf xsaeverptr arat npt lbrv svm_lock nirp_save tsc_scale vmcb_clean flushbyasid decodeassists pausefilter pfthreshold avic v_vmsave_vmload vgfl umip rpdpid overflow_recvov succor smca

(Continued on next page)
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Platform Notes (Continued)

/proc/cpuinfo cache data
cache size : 512 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 6 7 8 9 10 11 12 13 14 15
node 0 size: 257759 MB
node 0 free: 257033 MB
node distances:
node 0
0: 10

From /proc/meminfo
MemTotal: 263946072 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

From /etc/*release* /etc/*version*
os-release:
NAME="SLES"
VERSION="15-SP1"
VERSION_ID="15.1"
PRETTY_NAME="SUSE Linux Enterprise Server 15 SP1"
ID="sles"
ID_LIKE="suse"
ANSI_COLOR="0;32"
CPE_NAME="cpe:/o:suse:sles:15:sp1"

uname -a:
Linux linux-vapu 4.12.14-195-default #1 SMP Tue May 7 10:55:11 UTC 2019 (8fba516)
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: Full AMD retpoline, IBPB: conditional, IBRS_FW, STIBP: disabled, RSB filling
run-level 3 Oct 17 20:08

SPEC is set to: /home/cpu2017-1.0.5-amd-na

Filesystem Type Size Used Avail Use% Mounted on
/dev/sdb2 xfs 893G 101G 792G 12% /

(Continued on next page)
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Platform Notes (Continued)
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 CFE105D 09/17/2019
Memory:
8x Samsung M393A4K40DB2-CWE 32 kB 2 rank 3200
8x Unknown Unknown

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
C               | 619.lbm_s(base, peak) 638.imagick_s(base, peak) 644.nab_s(base, peak)
|----------------------------------------------------------
AOCC.LLVM.1.3.0.B34.2018_10_22 clang version 7.0.0 (CLANG: Jenkins
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /root/work/compilers/aocc1.3.0/AOCC-1.3.0-Compiler/bin

==============================================================================
C++, C, Fortran | 607.cactuBSSN_s(base, peak)
|----------------------------------------------------------
AOCC.LLVM.1.3.0.B34.2018_10_22 clang version 7.0.0 (CLANG: Jenkins
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /root/work/compilers/aocc1.3.0/AOCC-1.3.0-Compiler/bin
AOCC.LLVM.1.3.0.B34.2018_10_22 clang version 7.0.0 (CLANG: Jenkins
AOCC_1_3_0_Release-Build#34) (based on LLVM AOCC.LLVM.1.3.0.B34.2018_10_22)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /root/work/compilers/aocc1.3.0/AOCC-1.3.0-Compiler/bin

GNU Fortran (GCC) 4.8.2
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## Lenovo Global Technology

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**SPECspeed®2017_fp_base = 75.5**  
**SPECspeed®2017_fp_peak = 75.8**

### Compiler Version Notes (Continued)

**Fortran**

- 603.bwaves_s(base, peak) 649.fotonik3d_s(base, peak) 654.roms_s(base, peak)

GNU Fortran (GCC) 4.8.2  
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**Fortran, C**

- 621.wrf_s(base, peak) 627.cam4_s(base, peak) 628.pop2_s(base, peak)

GNU Fortran (GCC) 4.8.2  
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AOCC.LLVM.1.3.0.B34.2018_10_22 clang version 7.0.0 (CLANG: Jenkins  
AOCC_1_3_0_Release-Build#34) (based on LLVM AOCC.LLVM.1.3.0.B34.2018_10_22)  
Target: x86_64-unknown-linux-gnu  
Thread model: posix  
InstalledDir: /root/work/compilers/aocc1.3.0/AOCC-1.3.0-Compiler/bin

### Base Compiler Invocation

**C benchmarks:**

- clang

**Fortran benchmarks:**

- clang gfortran

**Benchmarks using both Fortran and C:**

- clang gfortran

**Benchmarks using Fortran, C, and C++:**

- clang++ clang gfortran
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Base Portability Flags

603.bwaves_s: -DSPEC_LP64
607.cactuBSSN_s: -DSPEC_LP64
619.lbm_s: -DSPEC_LP64
621.wrf_s: -DSPEC_CASE_FLAG -fconvert=big-endian -DSPEC_LP64
627.cam4_s: -DSPEC_CASE_FLAG -DSPEC_LP64
628.pop2_s: -DSPEC_CASE_FLAG -fconvert=big-endian -DSPEC_LP64
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:
-flt0 -Wl,-plugin-opt=-merge-constant
-flt0 -Wl,-plugin-opt=-lsr-in-nested-loop
-flt0 -Wl,-plugin-opt=-enable-vectorize-compares=false -O3 -ffast-math
-march=znver1 -mno-avx2 -fstruct-layout=3 -mlllvm -unroll-threshold=50
-fremap-arrays -mlllvm -inline-threshold=1000
-flv-function-specialization -mlllvm -enable-gvn-hoist
-mlllvm -function-specialize -z muldefs -DSPEC_OPENMP -fopenmp
-DSPEC_OPENMP -fopenmp=libomp -lomp -lpthread -ldl -ljemalloc
-landlibm

Fortran benchmarks:
-flt0 -Wl,-plugin-opt=-merge-constant
-flt0 -Wl,-plugin-opt=-lsr-in-nested-loop
-flt0 -Wl,-plugin-opt=-enable-vectorize-compares=false -O3 -mavx -madx
-funroll-loops -ffast-math -z muldefs -fplugin=dragonegg.so
-fplugin-arg-dragonegg-llvm-option=-merge-constant
-fplugin-arg-dragonegg-llvm-option=-enable-vectorize-compares:false
-DSPEC_OPENMP -DUSE_OPENMP -fopenmp -fopenmp=libomp -lomp -lpthread
-ldl -ljemalloc -landlibm -lgfortran

Benchmarks using both Fortran and C:
-flt0 -Wl,-plugin-opt=-merge-constant
-flt0 -Wl,-plugin-opt=-lsr-in-nested-loop
-flt0 -Wl,-plugin-opt=-enable-vectorize-compares=false -O3 -ffast-math
-march=znver1 -mno-avx2 -fstruct-layout=3 -mlllvm -unroll-threshold=50
-fremap-arrays -mlllvm -inline-threshold=1000
-flv-function-specialization -mlllvm -enable-gvn-hoist
-mlllvm -function-specialize -mavx -madx -funroll-loops -z muldefs
-fplugin=dragonegg.so -fplugin-arg-dragonegg-llvm-option=-merge-constant
-fplugin-arg-dragonegg-llvm-option=-enable-vectorize-compares:false

(Continued on next page)
Base Optimization Flags (Continued)

-DSPEC_OPENMP -DUSE_OPENMP -fopenmp -fopenmp=libomp -lomp -lpthread
-ldl -ljemalloc -lamlibm -lgfortran

Benchmarks using Fortran, C, and C++:
-std=c++98 -flto -Wl,-plugin-opt=-merge-constant
-std=c++98 -flto -Wl,-plugin-opt=-merge-constant
-Wl,-plugin-opt=-enable-vectorize-compares=false -O3 -ffast-math
-march=znver1 -mno-avx2 -fstruct-layout=3 -mlibvm -unroll-threshold=50
-fremap-arrays -mlibvm -inline-threshold=1000
-flv-function-specialization -mlibvm -enable-gvn-hoist
-mlibvm -function-specialize -mlibvm -unroll-threshold=100
-finline-aggressive -mlibvm -enable-vectorize-compares=false -mavx
-madx -funroll-loops -z muldefs -fplugin=dragonegg.so
-fplugin-arg-dragonegg-llvm-option=-merge-constant
-fplugin-arg-dragonegg-llvm-option=-enable-vectorize-compares:false
-DSPEC_OPENMP -fopenmp -DUSE_OPENMP -fopenmp=libomp -lomp -lpthread
-ldl -ljemalloc -lamlibm

Base Other Flags

C benchmarks:
-Wno-return-type

Fortran benchmarks:
-Wno-return-type

Benchmarks using both Fortran and C:
-Wno-return-type

Benchmarks using Fortran, C, and C++:
-Wno-return-type

Peak Compiler Invocation

C benchmarks:
clang

Fortran benchmarks:
clang gfortran

(Continued on next page)
Lenovo Global Technology
ThinkSystem SR635
3.00 GHz, AMD EPYC 7302P

SPECspeed®2017_fp_base = 75.5
SPECspeed®2017_fp_peak = 75.8

CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Test Date: Oct-2019
Tested by: Lenovo Global Technology
Hardware Availability: Aug-2019
Software Availability: Jun-2019

Peak Compiler Invocation (Continued)

Benchmarks using both Fortran and C:
clang gfortran

Benchmarks using Fortran, C, and C++:
clang++ clang gfortran

Peak Portability Flags

Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:

619.lbm_s: basepeak = yes
638.imagick_s: basepeak = yes
644.nab_s: basepeak = yes

Fortran benchmarks:

603.bwaves_s: basepeak = yes
649.fotonik3d_s: -flto -Wl,-plugin-opt=-merge-constant
-Wl,-plugin-opt=-lsr-in-nested-loop -O3 -mavx2 -madx
-funroll-loops -ffast-math -fplugin=dragonegg.so
-fplugin-arg-dragonegg-llvm-option=-merge-constant
-fplugin-arg-dragonegg-llvm-option=-inline-threshold:1000
-DSPEC_OPENMP -DUSE_OPENMP -fopenmp -fopenmp=libomp
-lomp -lpthread -ldl -ljemalloc -lamdlibm -lgfortran
654.roms_s: Same as 649.fotonik3d_s

Benchmarks using both Fortran and C:

621.wrf_s: basepeak = yes
627.cam4_s: -flto -Wl,-plugin-opt=-merge-constant
-Wl,-plugin-opt=-lsr-in-nested-loop -Ofast -march=znver1
-ffstruct-layout=3 -mllvm -vectorize-memory-aggressively
-mno-avx2 -mllvm -unroll-threshold=100 -fremap-arrays

(Continued on next page)
### Lenovo Global Technology

#### CPU2017 License: 9017

#### Test Sponsor: Lenovo Global Technology

#### Tested by: Lenovo Global Technology

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**Peak Optimization Flags (Continued)**

627.cam4_s (continued):

-mlir -inline-threshold=1000 -O3 -mavx2 -madx
-ffast-math -fplugin=dragonegg.so
-fplugin-arg-dragonegg-llvm-option=-merge-constant
-fplugin-arg-dragonegg-llvm-option=-inline-threshold:1000
-DSPEC_OPENMP -DUSE_OPENMP -fopenmp -fopenmp=libomp
-lomp -lpthread -ldl -ljemalloc -lamdlibm -lgfortran

628.pop2_s_basepeak = yes

**Benchmarks using Fortran, C, and C++:**

-std=c++98 -flto -Wl,-plugin-opt=-merge-constant
-Wl,-plugin-opt=-lsr-in-nested-loop -Ofast -march=znver1
-fstruct-layout=3 -mlir -vectorize-memory-aggressively -mno-avx2
-mlir -unroll-threshold=100 -fremap-arrays
-mlir -inline-threshold=1000 -finline-aggressive -O3 -mavx2 -madx
-ffast-math -fplugin=dragonegg.so
-fplugin-arg-dragonegg-llvm-option=-merge-constant
-fplugin-arg-dragonegg-llvm-option=-inline-threshold:1000 -DSPEC_OPENMP
-fopenmp -DUSE_OPENMP -fopenmp=libomp -lomp -lpthread -ldl
-ljemalloc -lamdlibm

---

**Peak Other Flags**

**C benchmarks:**

-wo -return-type

**Fortran benchmarks:**

-wo -return-type

**Benchmarks using both Fortran and C:**

-wo -return-type

**Benchmarks using Fortran, C, and C++:**

-wo -return-type

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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-Rome-C.html](http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-Rome-C.html)
### Lenovo Global Technology

**ThinkSystem SR635**  
*3.00 GHz, AMD EPYC 7302P*

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

- [http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-Rome-C.xml](http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-Rome-C.xml)

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