Lenovo Global Technology

ThinkSystem SR655
2.30 GHz, AMD EPYC 7352

SPECspeed®2017_fp_base = 90.2
SPECspeed®2017_fp_peak = 90.5

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

Hardware

CPU Name: AMD EPYC 7352
Max MHz: 3200
Nominal: 2300
Enabled: 24 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 / 3 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++/Fortran: Version 2.0.0 of AOCC
Parallel: Yes
Firmware: Lenovo BIOS Version CFE107O released Dec-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 v5.1.0
Power Management: BIOS set to prefer performance at the cost of additional power usage
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SPECspeed®2017_fp_base = 90.2
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Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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</thead>
<tbody>
<tr>
<td>603.bwaves_s</td>
<td>24</td>
<td>213</td>
<td>277</td>
<td>213</td>
<td>277</td>
<td>213</td>
<td>277</td>
</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td>24</td>
<td>110</td>
<td>152</td>
<td>109</td>
<td>153</td>
<td>109</td>
<td>153</td>
</tr>
<tr>
<td>619.lbm_s</td>
<td>24</td>
<td>189</td>
<td>27.8</td>
<td>189</td>
<td>27.8</td>
<td>189</td>
<td>27.8</td>
</tr>
<tr>
<td>621.wrf_s</td>
<td>24</td>
<td>131</td>
<td>101</td>
<td>131</td>
<td>101</td>
<td>130</td>
<td>101</td>
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<tr>
<td>627.cam4_s</td>
<td>24</td>
<td>152</td>
<td>58.3</td>
<td>151</td>
<td>58.5</td>
<td>152</td>
<td>58.3</td>
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<tr>
<td>628.pop2_s</td>
<td>24</td>
<td>197</td>
<td>60.3</td>
<td>197</td>
<td>60.1</td>
<td>196</td>
<td>60.6</td>
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<tr>
<td>638.imagick_s</td>
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<td>111</td>
<td>130</td>
<td>111</td>
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<tr>
<td>644.nab_s</td>
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<td>117</td>
<td>149</td>
<td>117</td>
<td>149</td>
<td>117</td>
<td>149</td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>24</td>
<td>160</td>
<td>56.8</td>
<td>161</td>
<td>56.7</td>
<td>160</td>
<td>56.8</td>
</tr>
<tr>
<td>654.roms_s</td>
<td>24</td>
<td>173</td>
<td>90.9</td>
<td>173</td>
<td>90.9</td>
<td>173</td>
<td>90.8</td>
</tr>
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</table>

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/

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

runcpu command invoked through numactl i.e.:
numactl --interleave=all runcpu <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
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)
Environment Variables Notes

Environment variables set by runcpu before the start of the run:
GOMP_CPU_AFFINITY = "0-23"
LD_LIBRARY_PATH = 
  "/home/cpu2017-1.1.0-amd-rome-aocc200-C3/amd_speed_aocc200_rome_C_lib/64
  ;/home/cpu2017-1.1.0-amd-rome-aocc200-C3/amd_speed_aocc200_rome_C_lib/32
"
MALLOC_CONF = "retain:true"
OMP_DYNAMIC = "false"
OMP_SCHEDULE = "static"
OMP_STACKSIZE = "128M"
OMP_THREAD_LIMIT = "24"

Environment variables set by runcpu during the 607.cactuBSSN_s peak run:
GOMP_CPU_AFFINITY = "0-23"

Environment variables set by runcpu during the 619.lbm_s peak run:
GOMP_CPU_AFFINITY = "0 12 1 13 2 14 3 15 4 16 5 17 6 18 7 19 8 20 9 21 10 22 11 23"

Environment variables set by runcpu during the 654.roms_s peak run:
GOMP_CPU_AFFINITY = "0-23"

General Notes

Binaries were compiled on a system with 2x AMD EPYC 7601 CPU + 512GB Memory using Fedora 26

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 v9.1.0 in Ubuntu 19.04 with -O3 -znver2 -flto
jemalloc 5.1.0 is available here:
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

(Continued on next page)
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Software Availability: Aug-2019

SPECspeed®2017_fp_base = 90.2
SPECspeed®2017_fp_peak = 90.5

Platform Notes (Continued)

SMT Mode set to Disabled

Sysinfo program /home/cpu2017-1.1.0-amd-rome-accc200-C3/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f88a3d7edble6e46a485a0011
running on linux-01om Fri Mar 13 17:40:12 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 : AMD EPYC 7352 24-Core Processor
1  "physical id"s (chips)
24 "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 : 24
physical 0: cores 0 1 2 4 5 6 8 9 10 12 13 14 16 17 18 20 21 22 24 25 26 28 29 30

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): 24
On-line CPU(s) list: 0-23
Thread(s) per core: 1
Core(s) per socket: 24
Socket(s): 1
NUMA node(s): 1
Vendor ID: AuthenticAMD
CPU family: 23
Model: 49
Model name: AMD EPYC 7352 24-Core Processor
Stepping: 0
CPU MHz: 2300.000
CPU max MHz: 2300.0000
CPU min MHz: 1500.0000
BogoMIPS: 4591.59
Virtualization: AMD-V
L1d cache: 32K
L1i cache: 32K
L2 cache: 512K
L3 cache: 16384K
NUMA node0 CPU(s): 0-23
Flags: fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov

(Continued on next page)
Lenovo Global Technology

ThinkSystem SR655
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SPEC CPU®2017 Floating Point Speed Result

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Lenovo Global Technology

SPECspeed®2017_fp_base = 90.2
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Platform Notes (Continued)

pat pse36 clflush mmx fxsr 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 cxt6 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 kinit wdt tce topoext perfctr_core perfctr_nb bperf perfctr_l2 mwaitx cpb cat_l3 cdp_l3 hw_pstate sme ssbd sev ibrs ibpb stibp vmmcall fsgsbase bmi1 avx2 smep bmi2 cmq rdt_a rdsqopt clflushopt clwb sha ni xsaveopt xsaves cmq llc cmq_occup llc cmq_mmb_total cmq_mmb_local clzero iperf xsavesopt arat npt lbv svm_lock nrip_save tsc_scale vmcb_clean flushbyasid decodeassists pausefilter pfthreshold avic v_vmsave_vmload vgif umip rdpid overflow_recov succor smca

 PROC_CACHE

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 16 17 18 19 20 21 22 23
node 0 size: 257765 MB
node 0 free: 256972 MB
node distances:
node 0
0: 10

From /proc/meminfo

MemTotal: 263951884 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-01om 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-2018-3620 (L1 Terminal Fault): Not affected

(Continued on next page)
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SPECspeed\textsuperscript{\textcopyright}2017\textsuperscript{\textregistered}fp\textunderscore base = 90.2
SPECspeed\textsuperscript{\textcopyright}2017\textsuperscript{\textregistered}fp\textunderscore peak = 90.5

CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Tested by: Lenovo Global Technology
Test Date: Mar-2020
Hardware Availability: Jan-2020
Software Availability: Aug-2019

Platform Notes (Continued)

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: \texttt{___user} pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Full AMD retpoline, IBPB: conditional, IBRS\_FW, STIBP: disabled, RSB filling

run-level 3 Mar 13 17:36
SPEC is set to: /home/cpu2017-1.1.0-amd-rome-aocc200-C3

Filesystem Type Size Used Avail Use% Mounted on
/dev/sda2 xfs 893G 71G 823G 8% /

From /sys/devices/virtual/dmi/id
BIOS: Lenovo CFE107O 12/28/2019
Vendor: Lenovo
Product: ThinkSystem SR655 -[7Y00000000]-
Product Family: ThinkSystem
Serial: 0123456789

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:
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)
==============================================================================
AOCCLLVM.2.0.0.B191.2019\_07_19 clang version 8.0.0 (CLANG: Jenkins AOCCLLVM.2.0.0-Build\#191) (based on LLVM AOCCLLVM.2.0.0.B191.2019\_07_19)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin

(Continued on next page)
## Compiler Version Notes (Continued)

### C++, C, Fortran

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<th>607.cactuBSSN_s (base, peak)</th>
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------------------------------------------------------------------------------

### Fortran

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### Fortran, C

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**CPU2017 License:** 9017

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**Test Date:** Mar-2020

**Hardware Availability:** Jan-2020

**Software Availability:** Aug-2019

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**Compiler Version Notes (Continued)**

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**Base Compiler Invocation**

C benchmarks:  
clang

Fortran benchmarks:  
flang

Benchmarks using both Fortran and C:  
flang clang

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

**Base Portability Flags**

603.bwaves_s: -DSPEC_LP64  
607.cactuBSSN_s: -DSPEC_LP64  
619.lbm_s: -DSPEC_LP64

621.wrf_s: -DSPEC_CASE_FLAG -Mbyteswapio -DSPEC_LP64  
627.cam4_s: -DSPEC_CASE_FLAG -DSPEC_LP64  
628.pop2_s: -DSPEC_CASE_FLAG -Mbyteswapio -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:  
-fflto -Wl,-mllym -Wl,-function-specialize  
-Wl,-mllym -Wl,-region-vectorize -Wl,-mllym -Wl,-vector-library=LIBMVEC  
-Wl,-mllym -Wl,-reduce-array-computations=3 -O3 -ffast-math  
-march=znerver2 -fstruct-layout=3 -mllym -unroll-threshold=50  
-fremap-arrays -mllym -function-specialize -mllym -enable-gvn-hoist  
-mllym -reduce-array-computations=3 -mllym -global-vectorize-slp  
-mllym -vector-library=LIBMVEC -mllym -inline-threshold=1000  
-ffunction-specialization -z muldefs -DSPEC_OPENMP -fopenmp  
-fopenmp=libomp -lomp -lpthread -ldl -lmvec -lamdlibm -ljemalloc  
-lflang

Fortran benchmarks:  
-fflto -Wl,-mllym -Wl,-function-specialize  
-Wl,-mllym -Wl,-region-vectorize -Wl,-mllym -Wl,-vector-library=LIBMVEC

(Continued on next page)
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Spec CPU®2017 Floating Point Speed Result
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Base Optimization Flags (Continued)

Fortran benchmarks (continued):
-Wl,-mlllvm -Wl,-reduce-array-computations=3 -O3 -march=znver2
-funroll-loops -Mrecursive -mlllvm -vector-library=LIBMVEC -z muldefs
-Kieee -fno-finite-math-only -DSPEC_OPENMP -fopenmp -fopenmp=libomp
-lomp -lpthread -ldl -lmvec -lamlb -ljemalloc -lflang

Benchmarks using both Fortran and C:
-ffto -Wl,-mlllvm -Wl,-function-specialize
-Wl,-mlllvm -Wl,-region-vectorize -Wl,-mlllvm -Wl,-vector-library=LIBMVEC
-Wl,-mlllvm -Wl,-reduce-array-computations=3 -O3 -ffast-math
-march=znver2 -fstruct-layout=3 -mlllvm -unroll-threshold=50
-fremap-arrays -mlllvm -function-specialize -mlllvm -enable-gvn-hoist
-mlllvm -reduce-array-computations=3 -mlllvm -global-vectorize-slp
-mlllvm -vector-library=LIBMVEC -mlllvm -inline-threshold=1000
-flv-function-specialization -funroll-loops -Mrecursive -z muldefs
-Kieee -fno-finite-math-only -DSPEC_OPENMP -fopenmp -fopenmp=libomp
-lomp -lpthread -ldl -lmvec -lamlb -ljemalloc -lflang

Benchmarks using Fortran, C, and C++:
-std=c++98 -ffto -Wl,-mlllvm -Wl,-function-specialize
-Wl,-mlllvm -Wl,-region-vectorize -Wl,-mlllvm -Wl,-vector-library=LIBMVEC
-Wl,-mlllvm -Wl,-reduce-array-computations=3
-Wl,-mlllvm -Wl,-suppress-fmas -O3 -ffast-math -march=znver2
-fstruct-layout=3 -mlllvm -unroll-threshold=50 -fremap-arrays
-mlllvm -function-specialize -mlllvm -enable-gvn-hoist
-mlllvm -reduce-array-computations=3 -mlllvm -global-vectorize-slp
-mlllvm -vector-library=LIBMVEC -mlllvm -inline-threshold=1000
-flv-function-specialization -mlllvm -loop-unswitch-threshold=200000
-mlllvm -unroll-threshold=100 -mlllvm -enable-partial-unswitch
-funroll-loops -Mrecursive -z muldefs -Kieee -fno-finite-math-only
-DSPEC_OPENMP -fopenmp -fopenmp=libomp -lomp -lpthread -ldl -lmvec
-lamlb -ljemalloc -lflang

Base Other Flags

C benchmarks:
- WARRANTYRETURN-TYPE

Fortran benchmarks:
-WNO-RETURN-TYPE

Benchmarks using both Fortran and C:
-WNO-RETURN-TYPE

(Continued on next page)
SPEC CPU®2017 Floating Point Speed Result

Lenovo Global Technology

ThinkSystem SR655
2.30 GHz, AMD EPYC 7352

SPECspeed®2017_fp_peak = 90.5
SPECspeed®2017_fp_base = 90.2

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2.30 GHz, AMD EPYC 7352

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CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Tested by: Lenovo Global Technology
Test Date: Mar-2020
Hardware Availability: Jan-2020
Software Availability: Aug-2019

Base Other Flags (Continued)

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

Peak Compiler Invocation

C benchmarks:
clang

Fortran benchmarks:
flang

Benchmarks using both Fortran and C:
flang clang

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

Peak Portability Flags

Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:

619.lbm_s: -flto -Wl,-mllvm -Wl,-function-specialize
-W1,-mllvm -Wl,-region-vectorize
-W1,-mllvm -Wl,-vector-library=LIBMVEC
-W1,-mllvm -Wl,-reduce-array-computations=3 -Ofast
-march=znver2 -mno-sse4a -fstruct-layout=5
-mllvm -vectorize-memory-aggressively
-mllvm -function-specialize -mllvm -enable-gvn-hoist
-mllvm -unroll-threshold=50 -fremap-arrays
-mllvm -vector-library=LIBMVEC
-mllvm -reduce-array-computations=3
-mllvm -global-vectorize-slp -mllvm -inline-threshold=1000
-fly-function-specialization -DSPEC_OPENMP -fopenmp
-lmvec -landibm -fopenmp=libomp -lomp -lpthread -ldl
-ljemalloc -llflang

(Continued on next page)
Lenovo Global Technology
ThinkSystem SR655
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**SPECspeed®2017_fp_base = 90.2**
**SPECspeed®2017_fp_peak = 90.5**

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<th>Test Date: Mar-2020</th>
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<td>Software Availability: Aug-2019</td>
</tr>
</tbody>
</table>

## Peak Optimization Flags (Continued)

638.imagick_s: basepeak = yes

644.nab_s: basepeak = yes

**Fortran benchmarks:**

603.bwaves_s: basepeak = yes

649.fotonik3d_s: basepeak = yes


**Benchmarks using both Fortran and C:**

621.wrf_s: basepeak = yes

627.cam4_s: basepeak = yes

628.pop2_s: basepeak = yes

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

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ThinkSystem SR655
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SPECspeed®2017_fp_base = 90.2
SPECspeed®2017_fp_peak = 90.5

CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Test Date: Mar-2020
Tested by: Lenovo Global Technology
Hardware Availability: Jan-2020
Software Availability: Aug-2019

Peak 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

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-E.html

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-E.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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