## SPEC CPU®2017 Floating Point Speed Result

### Lenovo Global Technology

**ThinkSystem SR645**  
2.50 GHz, AMD EPYC 7502

**CPU2017 License:** 9017  
**Test Sponsor:** Lenovo Global Technology  
**Tested by:** Lenovo Global Technology  
**Test Date:** Jun-2020  
**Hardware Availability:** Jun-2020  
**Software Availability:** Dec-2019

### SPECspeed®2017_fp_base = 168

[Table of benchmarks with results]

### SPECspeed®2017_fp_peak = 174

#### Hardware

- **CPU Name:** AMD EPYC 7502  
- **Max MHz:** 3350  
- **Nominal:** 2500  
- **Enabled:** 64 cores, 2 chips, 2 threads/core  
- **Orderable:** 1.2 chips  
- **Cache L1:** 32 KB I + 32 KB D on chip per core  
- **L1:** 512 KB I+D on chip per core  
- **L3:** 128 MB I+D on chip per chip,  
  16 MB shared / 4 cores  
- **Other:** None  
- **Memory:** 1 TB (32 x 32 GB 2Rx8 PC4-3200AA-R)  
- **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++/Fortran: Version 2.0.0 of AOCC  
- **Parallel:** Yes  
- **Firmware:** Lenovo BIOS Version D8E105P 1.00 released May-2020  
- **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 = 168
SPECspeed®2017_fp_peak = 174

Results Table

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<td></td>
<td>Threads</td>
<td>Seconds</td>
<td>Ratio</td>
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</tr>
<tr>
<td>603.bwaves_s</td>
<td>64</td>
<td>97.7</td>
<td>604</td>
<td>97.6</td>
<td>604</td>
<td>97.8</td>
<td>603</td>
<td>97.7</td>
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<td>97.6</td>
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<tr>
<td>607.cactuBSSN_s</td>
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<td>274</td>
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<td>60.7</td>
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<td>64</td>
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<td>92.2</td>
<td>56.8</td>
<td>128</td>
<td>74.4</td>
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<tr>
<td>621.wrf_s</td>
<td>64</td>
<td>90.4</td>
<td>146</td>
<td>90.5</td>
<td>146</td>
<td>90.7</td>
<td>146</td>
<td>64</td>
<td>90.7</td>
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<tr>
<td>627.cam4_s</td>
<td>64</td>
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<td>115</td>
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<td>114</td>
<td>77.3</td>
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<td>628.pop2_s</td>
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<td>194</td>
<td>61.3</td>
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<tr>
<td>638.imagick_s</td>
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<td>243</td>
<td>59.6</td>
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<td>60.0</td>
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<td>59.3</td>
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<tr>
<td>644.nab_s</td>
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<td>51.6</td>
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<td>51.7</td>
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<tr>
<td>649.fotonik3d_s</td>
<td>64</td>
<td>96.4</td>
<td>94.5</td>
<td>96.3</td>
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<tr>
<td>654.roms_s</td>
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<td>66.3</td>
<td>237</td>
<td>66.3</td>
<td>238</td>
<td>66.5</td>
<td>237</td>
<td>64</td>
<td>65.2</td>
<td>242</td>
</tr>
</tbody>
</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)
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SPECspeed®2017_fp_base = 168
SPECspeed®2017_fp_peak = 174

Environment Variables Notes

Environment variables set by runcpu before the start of the run:
GOMP_CPU_AFFINITY = "0-127"
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_SCHEDULER = "static"
OMP_STACKSIZE = "128M"
OMP_THREAD_LIMIT = "128"

Environment variables set by runcpu during the 607.cactuBSSN_s peak run:
GOMP_CPU_AFFINITY = "0-63"

Environment variables set by runcpu during the 619.lbm_s peak run:
GOMP_CPU_AFFINITY = "0 64 1 65 2 66 3 67 4 68 5 69 6 70 7 71 8 72 9 73 10 74
11 75 12 76 13 77 14 78 15 79 16 80 17 81 18 82 19 83 20 84 21 85 22 86
23 87 24 88 25 89 26 90 27 91 28 92 29 93 30 94 31 95 32 96 33 97 34 98
35 99 36 100 37 101 38 102 39 103 40 104 41 105 42 106 43 107 44 108 45
109 46 110 47 111 48 112 49 113 50 114 51 115 52 116 53 117 54 118 55
119 56 120 57 121 58 122 59 123 60 124 61 125 62 126 63 127"

Environment variables set by runcpu during the 621.wrf_s peak run:
GOMP_CPU_AFFINITY = "0-63"

Environment variables set by runcpu during the 628.pop2_s peak run:
GOMP_CPU_AFFINITY = "0-63"

Environment variables set by runcpu during the 644.nab_s peak run:
GOMP_CPU_AFFINITY = "0 64 1 65 2 66 3 67 4 68 5 69 6 70 7 71 8 72 9 73 10 74
11 75 12 76 13 77 14 78 15 79 16 80 17 81 18 82 19 83 20 84 21 85 22 86
23 87 24 88 25 89 26 90 27 91 28 92 29 93 30 94 31 95 32 96 33 97 34 98
35 99 36 100 37 101 38 102 39 103 40 104 41 105 42 106 43 107 44 108 45
109 46 110 47 111 48 112 49 113 50 114 51 115 52 116 53 117 54 118 55
119 56 120 57 121 58 122 59 123 60 124 61 125 62 126 63 127"

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)

(Continued on next page)
## General Notes (Continued)

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: 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:**
Choose Operating Mode set to Maximum Performance and then set it to Custom Mode
NUMA nodes per socket set to NPS2
SOC P-States set to P0
Global C-state Control set to Disable

**Sysinfo program** /home/cpu2017-1.1.0-amd-rome-aocc200-C3/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7ed1e6e46a485a0011
running on linux-d9uk Thu Jun 25 22:01:50 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 7502 32-Core Processor
  2 "physical id"s (chips)
  128 "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 : 32
  siblings : 64
  physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
  25 26 27 28 29 30 31
  physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
  25 26 27 28 29 30 31
```

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):                  128
On-line CPU(s) list:     0-127
```
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**Tested by:** Lenovo Global Technology  
**Hardware Availability:** Jun-2020

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**Software Availability:** Dec-2019

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**Platform Notes (Continued)**

- Thread(s) per core: 2
- Core(s) per socket: 32
- Socket(s): 2
- NUMA node(s): 4
- Vendor ID: AuthenticAMD
- CPU family: 23
- Model: 49
- Model name: AMD EPYC 7502 32-Core Processor
- Stepping: 0
- CPU MHz: 2500.000
- CPU max MHz: 2500.0000
- CPU min MHz: 1500.0000
- BogoMIPS: 4990.98
- Virtualization: AMD-V
- L1d cache: 32K
- L1i cache: 32K
- L2 cache: 512K
- L3 cache: 16384K
- NUMA node0 CPU(s): 0-15,64-79
- NUMA node1 CPU(s): 16-31,80-95
- NUMA node2 CPU(s): 32-47,96-111
- NUMA node3 CPU(s): 48-63,112-127
- Flags: fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov
  pat pse36 clflush mmx fxsr sse sse2 ht syscall nx mmxext fxsr_opt pdpe1gb rdtscp lm
  constant_tsc rep_good nopl 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
  skinit wdt tce topoext perfctr_core perfctr_nb bpext perfctr_l2 mwaitx cpb cat_l3
  cdp_l3 hw_pstate sme ssbd sev ibrs ibpb stibp vmcall fsgsbase bmi1 avx2 smep bmi2
  cqm rdtd_a rdsuid adx smap clflushopt clwb sha_ni xsaveopt xsavec xgetbv1 xsaves
  cqm_llc cqm_occup_llc cqm_mbb_total cqm_mbb_local czero irperf xsaveerptr wbnoinvd
  arat npt lbrv svm_lock nrip_save tsc_scale vmcb_clean flushbyasid decodeassist
  pausefilter pftime threshold avic v_msave_vmload vgif umip rpidd overflow_recov succor
  smca

/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: 4 nodes (0-3)
- node 0 cpus: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 64 65 66 67 68 69 70 71 72 73 74 75
  76 77 78 79
- node 0 size: 257847 MB
- node 0 free: 257496 MB
- node 1 cpus: 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 80 81 82 83 84 85 86 87 88
  89 90 91 92 93 94 95

(Continued on next page)

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

node 1 size: 258028 MB
node 1 free: 257776 MB
node 2 cpus: 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 50 51 52 53 54 55 56 57 58 60 61 62 63 112 113 114 115 116 117
node 2 size: 258040 MB
node 2 free: 257686 MB
node 3 cpus: 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 118 119 120 121 122 123 124 125 126 127
node 3 size: 258009 MB
node 3 free: 257583 MB
node distances:
node 0 1 2 3
0: 10 12 32 32
1: 12 10 32 32
2: 32 32 10 12
3: 32 32 12 10

From /proc/meminfo
MemTotal: 1056693724 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"

uname -a:
Linux linux-d9uk 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: Not affected
CVE-2018-3620 (L1 Terminal Fault): Not affected
Microarchitectural Data Sampling: Not affected

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Platform Notes (Continued)
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/swapgs barriers and __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Full AMD retpoline, IBPB: conditional, IBRS_FW, STIBP: conditional, RSB filling
tsx_async_abort: Not affected
run-level 3 Jun 25 21:56
SPEC is set to: /home/cpu2017-1.1.0-amd-rome-aocc200-C3
Filesystem Type Size Used Avail Use% Mounted on
/dev/sdb3 xfs 889G 82G 808G 10% /

From /sys/devices/virtual/dmi/id
BIOS: Lenovo D8E105P-1.00 05/08/2020
Vendor: Lenovo
Product: ThinkSystem SR645 MB
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:
32x Samsung M393A4G43AB3-CWE 32 kB 2 rank 3200

This system support 16 DIMMs per processor, total 32 DIMMs.
32 DIMM slots installed with 32 GB DIMM for this run.

Compiler Version Notes
==============================================================================
| C               | 619.lbm_s(base, peak) 638.imagick_s(base, peak) |
| 644.nab_s(base, peak) |
==============================================================================
AOCC.LLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins
AOCC_2_0_0-Build#191) (based on LLVM AOCC.LLVM.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

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Compiler Version Notes (Continued)

C++, C, Fortran | 607.cactuBSSN\_s(base, peak)

 AOCC.LLVM.2.0.0.B191.2019\_07\_19 clang version 8.0.0 (CLANG: Jenkins
AOCC\_2\_0\_0-Build\#191) (based on LLVM AOCC.LLVM.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

 AOCC.LLVM.2.0.0.B191.2019\_07\_19 clang version 8.0.0 (CLANG: Jenkins
AOCC\_2\_0\_0-Build\#191) (based on LLVM AOCC.LLVM.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

------------------------------------------------------------------------------

Fortran         | 603.bwaves\_s(base, peak) 649.fotonik3d\_s(base, peak)
| 654.roms\_s(base, peak)

 AOCC.LLVM.2.0.0.B191.2019\_07\_19 clang version 8.0.0 (CLANG: Jenkins
AOCC\_2\_0\_0-Build\#191) (based on LLVM AOCC.LLVM.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

------------------------------------------------------------------------------

Fortran, C      | 621.wrf\_s(base, peak) 627.cam4\_s(base, peak)
| 628.pop2\_s(base, peak)

 AOCC.LLVM.2.0.0.B191.2019\_07\_19 clang version 8.0.0 (CLANG: Jenkins
AOCC\_2\_0\_0-Build\#191) (based on LLVM AOCC.LLVM.2.0.0.B191.2019\_07\_19)
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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,-mltv -Wl,-function-specialize
-mltv -Wl,-region-vectorize -Wl,-mltv -Wl,-vector-library=LIBMVEC
-Wl,-mltv -Wl,-reduce-array-computations=3 -O3 -ffast-math
-march=znver2 -fstruct-layout=3 -mltv -unroll-threshold=50
-fremap-arrays -mltv -function-specialize -mltv -enable-gvn-hoist
-mltv -reduce-array-computations=3 -mltv -global-vectorize-slp
-mltv -vector-library=LIBMVEC -mltv -inline-threshold=1000
-flv-function-specialization -Z muldefs -DSPEC_OPENMP -fopenmp
-fopenmp=libomp -lomp -lpthread -ldl -lmvec -lamdlibm -ljemalloc
-llflang

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

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

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

Benchmarks using both Fortran and C:
-`-flto -Wl,-mllvm -Wl,-function-specialize`
-`-Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-vector-library=LIBMVEC`
-`-Wl,-mllvm -Wl,-reduce-array-computations=3 -O3 -ffast-math`
-`-march=znver2 -fstruct-layout=3 -mllvm -unroll-threshold=50`
-`-fremap-arrays -mllvm -function-specialize -mllvm -enable-gvn-hoist`
-`-mllvm -reduce-array-computations=3 -mllvm -global-vectorize-slp`
-`-mllvm -vector-library=LIBMVEC -mllvm -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 -lxmlbblem -ljemalloc -lflang`

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

Base Other Flags

C benchmarks:
-`-Wno-return-type`

Fortran benchmarks:
-`-Wno-return-type`

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

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

**ThinkSystem SR645**  
**2.50 GHz, AMD EPYC 7502**

<table>
<thead>
<tr>
<th>SPECspeed®2017_fp_base</th>
<th>168</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECspeed®2017_fp_peak</td>
<td>174</td>
</tr>
</tbody>
</table>

**CPU2017 License:** 9017  
**Test Sponsor:** Lenovo Global Technology  
**Test Date:** Jun-2020  
**Tested by:** Lenovo Global Technology  
**Hardware Availability:** Jun-2020  
**Software Availability:** Dec-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: -fito -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-region-vectorize
-Wl,-mllvm -Wl,-vector-library=LIBMVEC
-Wl,-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
-flv-function-specialization -DSPEC_OPENMP -fopenmp
-lmvec -lamdlibm -fopenmp=libomp -lomp -lpthread -ldl
-ljemalloc -lflang
```

(Continued on next page)
Lenovo Global Technology

ThinkSystem SR645
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SPECspeed®2017 fp_base = 168
SPECspeed®2017 fp_peak = 174

Peak Optimization Flags (Continued)

638.imagick_s: basepeak = yes

644.nab_s: Same as 619.lbm_s

Fortran benchmarks:

603.bwaves_s: basepeak = yes

649.fotonik3d_s: basepeak = yes

654.roms_s: -flto -Wl,-mlllvm -Wl,-function-specialize
    -Wl,-mlllvm -Wl,-region-vectorize
    -Wl,-mlllvm -Wl,-vector-library=LIBMVEC
    -Wl,-mlllvm -Wl,-reduce-array-computations=3
    -funroll-loops -Mrecursive -mllvm -Wl,-vector-library=LIBMVEC
    -Kieee -fno-finite-math-only -DSPEC_OPENMP -fopenmp
    -fopenmp=libomp -lomp -lpthread -ldl -lmvec -lamdlibm
    -ljemalloc -lflang

Benchmarks using both Fortran and C:

621.wrf_s: -flto -Wl,-mlllvm -Wl,-function-specialize
    -Wl,-mlllvm -Wl,-region-vectorize
    -Wl,-mlllvm -Wl,-vector-library=LIBMVEC
    -Wl,-mlllvm -Wl,-reduce-array-computations=3 -Ofast
    -march=znver2 -mno-sse4a -fstruct-layout=5
    -mlllvm -vectorize-memory-aggressively
    -mlllvm -function-specialize -mlllvm -enable-gvn-hoist
    -mlllvm -unroll-threshold=50 -fremap-arrays
    -mlllvm -vector-library=LIBMVEC
    -mlllvm -reduce-array-computations=3
    -mlllvm -global-vectorize-slp -mlllvm -inline-threshold=1000
    -fly-function-specialization -O3 -funroll-loops
    -Mrecursive -Kieee -fno-finite-math-only -DSPEC_OPENMP
    -fopenmp -fopenmp=libomp -lomp -lpthread -ldl -lmvec
    -lamdlibm -ljemalloc -lflang

627.cam4_s: basepeak = yes

628.pop2_s: Same as 621.wrf_s

Benchmarks using Fortran, C, and C++:

-std=c++98 -flto -Wl,-mlllvm -Wl,-function-specialize
    -Wl,-mlllvm -Wl,-region-vectorize -Wl,-mlllvm -Wl,-vector-library=LIBMVEC
    -Wl,-mlllvm -Wl,-reduce-array-computations=3 -Ofast -march=znver2
Lenovo Global Technology
ThinkSystem SR645
2.50 GHz, AMD EPYC 7502

SPECSpeed®2017_fp_base = 168
SPECSpeed®2017_fp_peak = 174

CPU2017 License: 9017
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Hardware Availability: Jun-2020
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Peak Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++ (continued):
- mno-sse4a -fstruct-layout=5 -mlllvm -vectorize-memory-aggressively
- mlllvm -function-specialize -mlllvm -enable-gvn-hoist
- mlllvm -unroll-threshold=50 -fremap-arrays
- mlllvm -vector-library=LIBMVEC -mlllvm -reduce-array-computations=3
- mlllvm -global-vectorize-slp -mlllvm -inline-threshold=1000
- flv-function-specialization -mlllvm -unroll-threshold=100
- mlllvm -enable-hint=unswitch -mlllvm -loop-unswitch-threshold=200000
- O3 -funroll-loops -Mrecursive -Kieee -fno-finite-math-only
- DSPEC_OPENMP -fopenmp -fopenmp=libomp -lomp -lpthread -ldl -lmvec
- lamdlibm -ljemalloc -lflang

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-Rome2P-K.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-Rome2P-K.xml

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