Lenovo Global Technology
ThinkSystem SR645
2.90 GHz, AMD EPYC 7542

<table>
<thead>
<tr>
<th>Software Availability:</th>
<th>Dec-2019</th>
<th>Hardware Availability:</th>
<th>Jun-2020</th>
</tr>
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<tr>
<td>Test Sponsor:</td>
<td>Lenovo Global Technology</td>
<td>Test Date:</td>
<td>Jun-2020</td>
</tr>
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<td>Tested by:</td>
<td>Lenovo Global Technology</td>
<td>Hardware</td>
<td>Software</td>
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<table>
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<tr>
<th>SPECspeed®2017_fp_peak</th>
<th>176</th>
</tr>
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<tbody>
<tr>
<td>SPECspeed®2017_fp_base</td>
<td>170</td>
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<table>
<thead>
<tr>
<th>603.bwaves_s</th>
<th>64</th>
<th>279</th>
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<tr>
<td>607.cactuBSSN_s</td>
<td>64</td>
<td>283</td>
</tr>
<tr>
<td>619.ibm_s</td>
<td>128</td>
<td>70.4</td>
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<td>621.wrf_s</td>
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<td>627.cam4_s</td>
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<td>628.pop2_s</td>
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<td>638.imagick_s</td>
<td>64</td>
<td>251</td>
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<td>644.nab_s</td>
<td>128</td>
<td>350</td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>64</td>
<td>94.7</td>
</tr>
<tr>
<td>654.roms_s</td>
<td>64</td>
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**Threads**

<table>
<thead>
<tr>
<th>SPECspeed®2017_fp_base</th>
<th>170</th>
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<tbody>
<tr>
<td>SPECspeed®2017_fp_peak</td>
<td>176</td>
</tr>
</tbody>
</table>

**Hardware**

- **CPU Name:** AMD EPYC 7542
- **Max MHz:** 3400
- **Nominal:** 2900
- **Enabled:** 64 cores, 2 chips, 2 threads/core
- **Orderable:** 1.2 chips
- **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 / 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)
- **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
**Lenovo Global Technology**

**ThinkSystem SR645**  
2.90 GHz, AMD EPYC 7542

**SPECspeed®2017_fp_base = 170**  
**SPECspeed®2017_fp_peak = 176**

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### Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Base</th>
<th>Peak</th>
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<tr>
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<td>Seconds</td>
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<td>607.cactuBSSN_s</td>
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<td>59.7 279</td>
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<td>619.lbm_s</td>
<td>64</td>
<td>91.8 57.0</td>
<td>71.0 115</td>
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<td>89.8 147</td>
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<td>627.cam4_s</td>
<td>64</td>
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<td>628.pop2_s</td>
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<td>638.imagick_s</td>
<td>64</td>
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<td>644.nab_s</td>
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<td>64</td>
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<td>64</td>
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</tr>
</tbody>
</table>

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**Compiler Notes**


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**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 = 170
SPECspeed®2017_fp_peak = 176

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 
;"
MALLOCONF = "retain:true"
OMP_DYNAMIC = "false"
OMP_SCHEDULE = "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 638.imagick_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"

Environment variables set by runcpu during the 654.roms_s peak run:
GOMP_CPU_AFFINITY = "0-63"

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.

(Continued on next page)
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ThinkSystem SR645
2.90 GHz, AMD EPYC 7542

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

SPECspeed®2017_fp_base = 170
SPECspeed®2017_fp_peak = 176

Test Date: Jun-2020
Hardware Availability: Jun-2020
Software Availability: Dec-2019

General Notes (Continued)
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 295195f888a3d7edb1e6e46a485a0011
running on linux-d9uk Sat Jun 27 18:14:17 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 7542 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
Thread(s) per core: 2
Core(s) per socket: 32
Socket(s): 2

(Continued on next page)
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CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Tested by: Lenovo Global Technology

Platform Notes (Continued)

NUMA node(s): 4
Vendor ID: AuthenticAMD
CPU family: 23
Model: 49
Model name: AMD EPYC 7542 32-Core Processor
Stepping: 0
CPU MHz: 2900.000
CPU max MHz: 2900.0000
CPU min MHz: 1500.0000
BogoMIPS: 5789.32
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 tce topoext perfctr_core perfctr_nb bprext perfctr_l2 mwaitx cpb cat_l3
cdp_l3 hw_pstate sme ssbd sev ibrs iopb stibp svmcall fsgsbase bmi1 avx2 smep bmi2
cqm rdt_a rdseed adx smap clflushopt clwb sha_ni xsaveopt xsaves xsaveopt xsaveopt
ar at npt lbrv svm_lock nrip_save tsc_scale vmcb_clean flushbyasid decodeassists
pausefilter pfthreshold avic v_vmsave_vmload vgif umip rdpid overflow_recover succor
smca

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 16 17 18 19 20 21 22 23 24 25 26
27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51
52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75
76 77 78 79
node 0 size: 257847 MB
node 0 free: 257328 MB
node 1 cpus: 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35
36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59
60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79
node 1 size: 257999 MB
node 1 free: 257542 MB
node 2 cpus: 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 96 97 98 99
100 101 102
(Continued on next page)
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CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Tested by: Lenovo Global Technology

SPECspeed\textsuperscript{2017\_fp\_base} = 170
SPECspeed\textsuperscript{2017\_fp\_peak} = 176

Test Date: Jun-2020
Hardware Availability: Jun-2020
Software Availability: Dec-2019

Platform Notes (Continued)

103 104 105 106 107 108 109 110 111
node 2 size: 258040 MB
node 2 free: 257769 MB
node 3 cpus: 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127
node 3 size: 258039 MB
node 3 free: 257765 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: 1056693728 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
CVE-2017-5754 (Meltdown): Not affected
CVE-2018-3639 (Speculative Store Bypass): Mitigation: Speculative Store Bypass disabled via prctl and seccomp

(Continued on next page)
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| SPECspeed®2017_fp_base = 170 |
| SPECspeed®2017_fp_peak = 176 |

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

Platform Notes (Continued)

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 27 18:11

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

(End of data from sysinfo program)

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.ibm_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

==============================================================================
C++, C, Fortran | 607.cactuBSSN_s(base, peak)
(Continued on next page)
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SPECspeed®2017_fp_base = 170
SPECspeed®2017_fp_peak = 176

Compiler Version Notes (Continued)

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
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)
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
## 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

<table>
<thead>
<tr>
<th>Base Portability Flags</th>
<th>C benchmarks</th>
<th>Fortran benchmarks</th>
</tr>
</thead>
</table>
| 603.bwaves_s: -DSPEC_LP64 | -flto -Wl,-mllvm -Wl,-function-specialize
-ml1vm -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
-ml1vm -vector-library=LIBMVEC -mllvm -inline-threshold=1000
-llvm-function-specialization -z muldefs -DSPEC_OPENMP -fopenmp
-fopenmp=libomp -lomp -lpthread -ldl -lmvec -lamlidlibm -ljemalloc
-lflang |
| 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 |

(Continued on next page)
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SPECspeed®2017_fp_base = 170
SPECspeed®2017_fp_peak = 176

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 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 -lamdlibm -ljemalloc -lflang

Benchmarks using both Fortran and C:
-flto -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 -lamdlibm -ljemalloc -lflang

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
-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
-lamdlibm -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)
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:
- f1to -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 -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 -DSPEC_OPENMP -fopenmp -lmvec -lamdlibm
- fopenmp=libomp -lomp -lpthread -ldl -ljemalloc -lflang

Fortran benchmarks:
603.bwaves_s: basepeak = yes

(Continued on next page)
Lenovo Global Technology
ThinkSystem SR645
2.90 GHz, AMD EPYC 7542

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

SPECspeed\textsuperscript{®}2017\_fp\_base = 170
SPECspeed\textsuperscript{®}2017\_fp\_peak = 176

Test Date: Jun-2020
Hardware Availability: Jun-2020
Software Availability: Dec-2019

Peak Optimization Flags (Continued)

649.fotonik3d\_s: basepeak = yes

654.roms\_s: -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,-enable-X86-prefetching -O3 -march=znver2
-\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: basepeak = yes

627.cam4\_s: basepeak = yes

628.pop2\_s: basepeak = yes

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 -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 -mllvm -unroll-threshold=100
-\mllvm -enable-partial-unswitch -mllvm -loop-unswitch-threshold=200000
-\O3 -funroll-loops -Mrecursive -\Kieee -fno-finite-math-only
-\DSPEC\_OPENMP -fopenmp -fopenmp=libomp -lomp -lpthread -ldl -lmvec
-\landdllibm -ljemalloc -lflang

Peak Other Flags

C benchmarks:
-\Wno-return-type

Fortran benchmarks:
-\Wno-return-type

(Continued on next page)
Lenovo Global Technology
ThinkSystem SR645
2.90 GHz, AMD EPYC 7542

SPECSpeed®2017_fp_base = 170
SPECSpeed®2017_fp_peak = 176

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

Peak Other Flags (Continued)

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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