## SPEC CPU®2017 Floating Point Speed Result

**Lenovo Global Technology**

**ThinkSystem SR645**  
2.35 GHz, AMD EPYC 7452

<table>
<thead>
<tr>
<th>Tests</th>
<th>SPECspeed®2017_fp_base</th>
<th>SPECspeed®2017_fp_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>603.bwaves_s</td>
<td>64</td>
<td>269</td>
</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td>64</td>
<td>269</td>
</tr>
<tr>
<td>619.lbm_s</td>
<td>128</td>
<td>68.6</td>
</tr>
<tr>
<td>621.wrf_s</td>
<td>64</td>
<td>142</td>
</tr>
<tr>
<td>627.cam4_s</td>
<td>64</td>
<td>112</td>
</tr>
<tr>
<td>628.pop2_s</td>
<td>64</td>
<td>58.5</td>
</tr>
<tr>
<td>638.imagick_s</td>
<td>64</td>
<td>240</td>
</tr>
<tr>
<td>644.nab_s</td>
<td>128</td>
<td>338</td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>64</td>
<td>93.2</td>
</tr>
<tr>
<td>654.roms_s</td>
<td>64</td>
<td>238</td>
</tr>
</tbody>
</table>

### Hardware

- **CPU Name:** AMD EPYC 7452  
- **Max MHz:** 3350  
- **Nominal:** 2350  
- **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)  
- **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
Lenovo Global Technology

ThinkSystem SR645
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SPECspeed®2017_fp_base = 165
SPECspeed®2017_fp_peak = 170

Results Table

<table>
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<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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<tr>
<td>603.bwaves_s</td>
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<td>593</td>
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<tr>
<td>607.cactuBSSN_s</td>
<td>64</td>
<td>61.8</td>
<td>270</td>
<td>61.9</td>
<td>269</td>
<td>62.1</td>
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<tr>
<td>619.lbm_s</td>
<td>64</td>
<td>93.3</td>
<td>56.2</td>
<td>93.9</td>
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<td>621.wrf_s</td>
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<td>233</td>
<td>67.6</td>
<td>233</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)
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 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 36 100 101 102 103 104 40 40 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 36 100 101 102 103 104 40 40 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.
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

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SPECspeed®2017_fp_base = 165  
SPECspeed®2017_fp_peak = 170

General Notes (Continued)
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 295195f888a3d7eddb1e6e46a485a0011  
running on linux-d9uk Wed Jun 17 23:52:30 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 7452 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  
    NUMA node(s): 4  
    Vendor ID: AuthenticAMD  
    CPU family: 23

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SPECspeed®2017_fp_base = 165
SPECspeed®2017_fp_peak = 170

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

Platform Notes (Continued)

Model: 49
Model name: AMD EPYC 7452 32-Core Processor
Stepping: 0
CPU MHz: 2350.000
CPU max MHz: 2350.0000
CPU min MHz: 1500.0000
BogoMIPS: 4691.17
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 dnowprefetch osvw ibs
skinit wdt tce topoext perfctr_core perfctr_nb pbext perfctr_l2 mwaitx cpb cat_l3
cdp_l3 hw_pstate sme ssbd sev ibrs iibp stibp vmmcall fsgsbase bmi1 avx2 smep bmi2
cqm rdt_a rdseed clflushopt clwb sha_ni xsaveopt xsaves lc0_mbm_total lc0_mbm_local clzero irperf xsaveerptr wbnoinvd
arat npt lbrv svm_lock nrp_save tsc_scale vmcb_clean flushbyasid decodeassist
pausefilter pfthreshold avic v_vmsave_vmload vgif umip rpdist overflow_recover 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: 257418 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
 node 1 size: 258028 MB
 node 1 free: 257719 MB
 node 2 cpus: 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 96 97 98 99 100 101 102
  103 104 105 106 107 108 109 110 111
 node 2 size: 258011 MB
 node 2 free: 257820 MB

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

Platform Notes (Continued)

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: 257872 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
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:

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SPECspeed®2017_fp_base = 165
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CPU2017 License: 9017
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Platform Notes (Continued)
conditional, IBRS_FW, STIBP: conditional, RSB filling
tsx_async_abort:
Not affected
run-level 3 Jun 17 22:13
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.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

==============================================================================
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
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
------------------------------------------------------------------------------

Base Compiler Invocation

C benchmarks:
 clang

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<td>Software Availability: Dec-2019</td>
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</table>

**Base Compiler Invocation (Continued)**

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:

-flto -W1,-mllvm -W1,-function-specialize  
-W1,-mllvm -W1,-region-vectorize -W1,-mllvm -W1,-vector-library=LIBMVEC  
-W1,-mllvm -W1,-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  
-fllvm-function-specialization -z muldefs -DSPEC_OPENMP -fopenmp
 
-fopenmp=libomp -lomp -lpthread -ldl -lmvec -lamdlibm -ljemalloc  
-lflang

Fortran benchmarks:

-fflto -W1,-mllvm -W1,-function-specialize  
-W1,-mllvm -W1,-region-vectorize -W1,-mllvm -W1,-vector-library=LIBMVEC  
-W1,-mllvm -W1,-reduce-array-computations=3 -O3 -march=znver2

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SPECspeed®2017_fp_base = 165
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Base Optimization Flags (Continued)

Fortran benchmarks (continued):
-ffunroll-loops -mrecursive -mllvm -vector-library=LIBMVEC -z muldefs
-Kieee -fno-finite-math-only -DSPEC_OPENMP -fopenmp -fnopenmp=libomp
-lomp -lpthread -ldl -lmvec -lamdlibm -ljemalloc -lflang

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

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

Base Other Flags

C benchmarks:
-ffno-return-type

Fortran benchmarks:
-ffno-return-type

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

(Continued on next page)
Lenovo Global Technology
ThinkSystem SR645
2.35 GHz, AMD EPYC 7452

SPECspeed®2017_fp_base = 165
SPECspeed®2017_fp_peak = 170

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

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:
-flto -Wl, -mllvm -flto -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 -llflang

Fortran benchmarks:
603.bwaves_s: basepeak = yes

(Continued on next page)
Lenovo Global Technology

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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 -vector-library=LIBMVEC
-keepe -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++:

607.cactuBSSN_s: basepeak = yes

Peak Other Flags

C benchmarks:
-#no-return-type

Fortran benchmarks:
-#no-return-type

Benchmarks using both Fortran and C:
-#no-return-type

Benchmarks using Fortran, C, and C++:
-#no-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
# Lenovo Global Technology

**ThinkSystem SR645**  
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You can also download the XML flags sources by saving the following links:


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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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