Lenovo Global Technology

ThinkSystem SR635
2.20 GHz, AMD EPYC 7552

<table>
<thead>
<tr>
<th>Threads</th>
<th>SPECspeed®2017_fp_base</th>
<th>SPECspeed®2017_fp_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>603.bwaves_s 48</td>
<td>308</td>
<td>210</td>
</tr>
<tr>
<td>607.cactuBSSN_s 48</td>
<td>310</td>
<td>205</td>
</tr>
<tr>
<td>619.lbm_s 48</td>
<td>310</td>
<td>206</td>
</tr>
<tr>
<td>621.wrf_s 48</td>
<td>310</td>
<td>206</td>
</tr>
<tr>
<td>627.cam4_s 48</td>
<td>310</td>
<td>206</td>
</tr>
<tr>
<td>628.pop2_s 48</td>
<td>310</td>
<td>206</td>
</tr>
<tr>
<td>638.imagick_s 48</td>
<td>310</td>
<td>206</td>
</tr>
<tr>
<td>644.nab_s 48</td>
<td>310</td>
<td>206</td>
</tr>
<tr>
<td>649.fotonik3d_s 48</td>
<td>310</td>
<td>206</td>
</tr>
<tr>
<td>654.roms_s 48</td>
<td>310</td>
<td>206</td>
</tr>
</tbody>
</table>

**Hardware**

- **CPU Name:** AMD EPYC 7552
- **Max MHz:** 3300
- **Nominal:** 2200
- **Enabled:** 48 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:** 192 MB I+D on chip per chip, 16 MB shared / 4 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 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 CFE1070 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

**Test Sponsor:** Lenovo Global Technology
**Test Date:** Feb-2020
**Hardware Availability:** Jan-2020
**Software Availability:** Dec-2019

---

**Lenovo Global Technology**

ThinkSystem SR635
2.20 GHz, AMD EPYC 7552

**CPU2017 License:** 9017
**Test Date:** Feb-2020
**Hardware Availability:** Jan-2020
**Test Sponsor:** Lenovo Global Technology
**Tested by:** Lenovo Global Technology

**Software**

- **OS:** SUSE Linux Enterprise Server 12 SP5 (x86_64)
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SPEC CPU®2017 Floating Point Speed Result

Copyright 2017-2020 Standard Performance Evaluation Corporation

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SPECspeed®2017_fp_base = 118
SPECspeed®2017_fp_peak = 119

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>
<th>Seconds</th>
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<tbody>
<tr>
<td>603.bwaves_s</td>
<td>48</td>
<td>192</td>
<td>308</td>
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<td>308</td>
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</tr>
<tr>
<td>607.cactuBSSN_s</td>
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<td>81.0</td>
<td>206</td>
<td>83.2</td>
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<td>205</td>
<td>81.3</td>
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<tr>
<td>619.lbm_s</td>
<td>48</td>
<td>167</td>
<td>31.3</td>
<td>167</td>
<td>31.3</td>
<td>167</td>
<td>31.3</td>
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<td>31.3</td>
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<tr>
<td>621.wrf_s</td>
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<td>121</td>
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<tr>
<td>627.cam4_s</td>
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<td>102</td>
<td>86.9</td>
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<td>86.9</td>
<td>102</td>
<td>86.9</td>
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<tr>
<td>628.pop2_s</td>
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<td>184</td>
<td>64.6</td>
<td>183</td>
<td>64.8</td>
<td>182</td>
<td>65.3</td>
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<tr>
<td>638.imagick_s</td>
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<td>75.5</td>
<td>191</td>
<td>75.1</td>
<td>192</td>
<td>75.1</td>
<td>192</td>
<td>75.2</td>
<td>192</td>
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<tr>
<td>644.nab_s</td>
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<td>67.5</td>
<td>259</td>
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<td>259</td>
<td>67.5</td>
<td>259</td>
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<tr>
<td>649.fotonik3d_s</td>
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<td>65.2</td>
<td>139</td>
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<td>131</td>
<td>121</td>
<td>131</td>
<td>121</td>
<td>132</td>
<td>125</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)
Lenovo Global Technology

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2.20 GHz, AMD EPYC 7552

SPECspeed®2017_fp_base = 118
SPECspeed®2017_fp_peak = 119

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

Environment Variables Notes

Environment variables set by runcpu before the start of the run:
GOMP_CPU_AFFINITY = "0-47"
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"
MALLOCCONF = "retain:true"
OMP_DYNAMIC = "false"
OMP_SCHEDULE = "static"
OMP_STACKSIZE = "128M"
OMP_THREADLIMIT = "48"

Environment variables set by runcpu during the 607.cactuBSSN_s peak run:
GOMP_CPU_AFFINITY = "0-47"

Environment variables set by runcpu during the 628.pop2_s peak run:
GOMP_CPU_AFFINITY = "0-47"

Environment variables set by runcpu during the 638.imagick_s peak run:
GOMP_CPU_AFFINITY = "0-47"

Environment variables set by runcpu during the 649.fotonik3d_s peak run:
GOMP_CPU_AFFINITY = "0-47"

Environment variables set by runcpu during the 654.roms_s peak run:
GOMP_CPU_AFFINITY = "0-47"

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
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ThinkSystem SR635
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Test Sponsor: Lenovo Global Technology
Tested by: Lenovo Global Technology

Platform Notes

BIOS settings:
Set Operating Mode set to Maximum Performance
SMT Mode set to Disabled

Sysinfo program /home/cpu2017-1.1.0-amd-rome-aocc200-C3/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7ed1e6e46a485a0011
running on linux-4au0 Mon Feb 24 20:07:43 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 7552 48-Core Processor
  1 "physical id"s (chips)
  48 "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 : 48
siblings : 48
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 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47

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): 48
On-line CPU(s) list: 0-47
Thread(s) per core: 1
Core(s) per socket: 48
Socket(s): 1
NUMA node(s): 1
Vendor ID: AuthenticAMD
CPU family: 23
Model: 49
Model name: AMD EPYC 7552 48-Core Processor
Stepping: 0
CPU MHz: 2200.000
CPU max MHz: 2200.0000
CPU min MHz: 1500.0000
BogoMIPS: 4392.23
Virtualization: AMD-V
L1d cache: 32K
L1i cache: 32K
L2 cache: 512K

(Continued on next page)
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SPECspeed®2017_fp_base = 118
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Test Date: Feb-2020
Hardware Availability: Jan-2020
Software Availability: Dec-2019

Platform Notes (Continued)

L3 cache: 16384K
NUMA node0 CPU(s): 0-47
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 misalignedsse 3nowprefetch osvw ibs
skinit wdt tce topoext perfctr_core perfctr_nb bpxext perfctr_l2 mwaitx cpb cat_13
cdp_13 hw_perftask sme ssbd sev ibrs ibpb stibp vmmcall fsgsbase bmi1 avx2 smep bmi2
cqm rdt_a rdseed adx smap clflushopt clwb sha_ni xsaveopt xsavec xgetbv1 xsaves
cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local clzero irperf xsaverptr wbnoinvd
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/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 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
  node 0 size: 257758 MB
  node 0 free: 256974 MB
  node distances:
    node 0
      0: 10

From /proc/meminfo
  MemTotal: 263944784 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"

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

SPECspeed®2017_fp_base = 118
SPECspeed®2017_fp_peak = 119

Platform Notes (Continued)

ANSI_COLOR="0;32"
CPE_NAME="cpe:/o:suse:sles:12:sp5"

uname -a:
Linux linux-4au0 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 sanitation
CVE-2017-5715 (Spectre variant 2): Mitigation: Full AMD retpoline, IBPB:
    conditional, IBRS_FW, STIBF: disabled, RSB
    filling
tsx_async_abort: Not affected

run-level 3 Feb 24 19:53

SPEC is set to: /home/cpu2017-1.1.0-amd-rome-aocc200-C3

From /sys/devices/virtual/dmi/id
BIOS: Lenovo CFE107O 12/28/2019
Vendor: Lenovo
Product: ThinkSystem SR635 -[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)
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SPECspeed®2017_fp_peak = 119

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Test Sponsor: Lenovo Global Technology
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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
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, 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
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Compiler Version Notes (Continued)

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

603.bwaves_s: -DSPEC_LP64
607.cactusBSSN_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
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SPECspeed®2017_fp_base = 118
SPECspeed®2017_fp_peak = 119

Base Optimization Flags

C benchmarks:
- -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 -library=global-vectorize-slp
- -mllvm -vector-library=LIBMVEC -mllvm -inline-threshold=1000
- -flv-function-specialization -z muldefs -DSPEC_OPENMP -fopenmp
- -fopenmp=libomp -lomp -lpthread -ldl -lmvec -lamdlibm -ljemalloc
- -lflang

Fortran benchmarks:
- -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 -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 -lamdlibm -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 -library=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 -lamdlibm -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 -library=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 -lamdlibm -ljemalloc -lflang
### Lenovo Global Technology

**ThinkSystem SR635**  
**2.20 GHz, AMD EPYC 7552**

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<th>SPECspeed®2017_fp_base</th>
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**CPU2017 License:** 9017  
**Test Date:** Feb-2020  
**Test Sponsor:** Lenovo Global Technology  
**Hardware Availability:** Jan-2020  
**Tested by:** Lenovo Global Technology  
**Software Availability:** Dec-2019

### 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:**  
  - `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: `basepeak = yes`


*(Continued on next page)*
Lenovo Global Technology
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Peak Optimization Flags (Continued)

638.imagick_s (continued):
- -march=znver2 -mno-sse4a -fstruct-layout=5
- -mlir -vectorize-memory-aggressively
- -mlir -function-specialize -mlir -enable-gvn-hoist
- -mlir -unroll-threshold=50 -fremap-arrays
- -mlir -vector-library=LIBMVEC
- -mlir -reduce-array-computations=3
- -mlir -global-vectorize-slp -mlir -inline-threshold=1000
- -fly -function-specialization -DSPEC_OPENMP -fopenmp
- -lmvec -lamlc -fopenmp=libomp -lomp -lpthread -ldl
- -ljemalloc -lflang

644.nab_s: basepeak = yes

Fortran benchmarks:

603.bwaves_s: basepeak = yes

649.fotonik3d_s: -flto -Wl,-mlir -Wl,-function-specialize
- -Wl,-mlir -Wl,-region-vectorize
- -Wl,-mlir -Wl,-vector-library=LIBMVEC
- -Wl,-mlir -Wl,-reduce-array-computations=3 -O3
- -march=znver2 -funroll-loops -Mrecursive
- -mlir -vector-library=LIBMVEC -Kieee
- -fno-finite-math-only -DSPEC_OPENMP -fopenmp
- -fopenmp=libomp -lomp -lpthread -ldl -lmvec -lamlc
- -ljemalloc -lflang

654.roms_s: -flto -Wl,-mlir -Wl,-function-specialize
- -Wl,-mlir -Wl,-region-vectorize
- -Wl,-mlir -Wl,-vector-library=LIBMVEC
- -Wl,-mlir -Wl,-reduce-array-computations=3
- -Wl,-mlir -Wl,-enable-X86-prefetching -O3 -march=znver2
- -funroll-loops -Mrecursive -mlir -vector-library=LIBMVEC
- -Kieee -fno-finite-math-only -DSPEC_OPENMP -fopenmp
- -fopenmp=libomp -lomp -lpthread -ldl -lmvec -lamlc
- -ljemalloc -lflang

Benchmarks using both Fortran and C:

621.wrf_s: basepeak = yes

627.cam4_s: basepeak = yes

628.pop2_s: -flto -Wl,-mlir -Wl,-function-specialize
- -Wl,-mlir -Wl,-region-vectorize

(Continued on next page)
## Lenovo Global Technology

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## Peak Optimization Flags (Continued)

- 628.pop2_s (continued):  
  -Wl,-ml1vm -Wl,-vector-library=LIBMVEC  
  -Wl,-ml1vm -Wl,-reduce-array-computations=3 -Ofast  
  -march=znver2 -mno-sse4a -fstruct-layout=5  
  -ml1vm -vectorize-memory-aggressively  
  -ml1vm -function-specialize -ml1vm -enable-gvn-hoist  
  -ml1vm -unroll-threshold=50 -fremap-arrays  
  -ml1vm -vector-library=LIBMVEC  
  -ml1vm -reduce-array-computations=3  
  -ml1vm -global-vectorize-slp -ml1vm -inline-threshold=1000  
  -fvl-function-specialization -O3 -funroll-loops  
  -Mrecursive -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,-ml1vm -ml1vm -Wl,-function-specialize  
- Wl,-ml1vm -Wl,-region-vectorize -Wl,-ml1vm -ml1vm -Wl,-vector-library=LIBMVEC  
- Wl,-ml1vm -Wl,-reduce-array-computations=3 -Ofast -march=znver2  
- mno-sse4a -fstruct-layout=5 -ml1vm -vectorize-memory-aggressively  
- ml1vm -function-specialize -ml1vm -enable-gvn-hoist  
- ml1vm -unroll-threshold=50 -fremap-arrays  
- ml1vm -vector-library=LIBMVEC -ml1vm -reduce-array-computations=3  
- ml1vm -global-vectorize-slp -ml1vm -inline-threshold=1000  
- fvl-function-specialization -ml1vm -unroll-threshold=100  
- ml1vm -enable-partial-unswitch -ml1vm -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++:**  
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You can also download the XML flags sources by saving the following links:

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