# Lenovo Global Technology

**ThinkSystem SR655**

**SPEC CPU®2017 Integer Speed Result**

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>SPECspeed®2017_int_base</th>
<th>SPECspeed®2017_int_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>perlbench_s</td>
<td>64</td>
<td>6.86</td>
<td>12.8</td>
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<tr>
<td>gcc_s</td>
<td>64</td>
<td>12.9</td>
<td>19.9</td>
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<tr>
<td>mcf_s</td>
<td>64</td>
<td>7.89</td>
<td>13.5</td>
</tr>
<tr>
<td>omnetpp_s</td>
<td>64</td>
<td>7.94</td>
<td>13.5</td>
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<tr>
<td>xalancbmk_s</td>
<td>64</td>
<td>19.9</td>
<td>23.5</td>
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<tr>
<td>x264_s</td>
<td>64</td>
<td>13.5</td>
<td>22.4</td>
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<tr>
<td>deepsjeng_s</td>
<td>64</td>
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<td>24.0</td>
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<tr>
<td>leela_s</td>
<td>64</td>
<td>5.56</td>
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<tr>
<td>exchange2_s</td>
<td>64</td>
<td>5.55</td>
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<td>xz_s</td>
<td>64</td>
<td>6.10</td>
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<td></td>
<td>SPECspeed®2017_int_base (11.9)</td>
<td>SPECspeed®2017_int_peak (11.9)</td>
</tr>
</tbody>
</table>

## Hardware

- **CPU Name:** AMD EPYC 7763
- **Max MHz:** 3500
- **Nominal:** 2450
- **Enabled:** 64 cores, 1 chip, 2 threads/core
- **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:** 256 MB I+D on chip per chip, 32 MB shared / 8 cores
- **Other:** None
- **Memory:** 512 GB (8 x 64 GB 2Rx4 PC4-3200AA-R)
- **Storage:** 1 x 960 GB SATA SSD
- **Other:** None

## Software

- **OS:** SUSE Linux Enterprise Server 15 SP2 (x86_64)
- **Kernel:** 5.3.18-22-default
- **Compiler:** C/C++/Fortran: Version 3.0.0 of AOCC
- **Parallel:** Yes
- **Firmware:** Lenovo BIOS Version CFE125S 6.0 released May-2021
- **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 and OS set to prefer performance at the cost of additional power usage
Lenovo Global Technology
ThinkSystem SR655
2.45 GHz, AMD EPYC 7763

SPECspeed®2017_int_base = 11.9
SPECspeed®2017_int_peak = 11.9

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>
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<tbody>
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<td>631.deepsjeng_s</td>
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<td>648.exchange2_s</td>
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<td>257</td>
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<td>258</td>
<td>24.0</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>

'echo 8 > /proc/sys/vm/dirty_ratio' run as root to limit dirty cache to 8% of memory.
'echo 1 > /proc/sys/vm/swappiness' run as root to limit swap usage to minimum necessary.
'echo 1 > /proc/sys/vm/zone_reclaim_mode' run as root to free node-local memory and avoid remote memory usage.
'sync; echo 3 > /proc/sys/vm/drop_caches' run as root to reset filesystem caches.
'sysctl -w kernel.randomize_va_space=0' run as root to disable address space layout randomization (ASLR) to reduce run-to-run variability.

(Continued on next page)
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SPECspeed®2017_int_base = 11.9
SPECspeed®2017_int_peak = 11.9

Operating System Notes (Continued)

'echo always > /sys/kernel/mm/transparent_hugepage/enabled' and
'echo always > /sys/kernel/mm/transparent_hugepage/defrag' run as root to enable
Transparent Hugepages (THP) for this run.
'echo madvise > /sys/kernel/mm/transparent_hugepage/enabled' run as root for peak
runs of 628.pop2_s and 638.imagick_s to enable THP only on request.

Environment Variables Notes

Environment variables set by runcpu before the start of the run:
GOMP_CPU_AFFINITY = "0-127"
LD_LIBRARY_PATH = 
"/home/cpu2017-1.1.7-amd-aocc300-milan-B1/amd_speed_aocc300_milan_B_lib/64;/home/cpu2017-1.1.7-amd-aocc300-milan-B1/amd_speed_aocc300_milan_B_lib/32:" MALLOC_CONF = "retain:true"
OMP_DYNAMIC = "false"
OMP_SCHEDULE = "static"
OMP_STACKSIZE = "128M"
OMP_THREAD_LIMIT = "128"

Environment variables set by runcpu during the 600.perlbench_s peak run:
GOMP_CPU_AFFINITY = "0"

Environment variables set by runcpu during the 602.gcc_s peak run:
GOMP_CPU_AFFINITY = "0"

Environment variables set by runcpu during the 605.mcf_s peak run:
GOMP_CPU_AFFINITY = "0"

Environment variables set by runcpu during the 620.omnetpp_s peak run:
GOMP_CPU_AFFINITY = "0"

Environment variables set by runcpu during the 623.xalancbmk_s peak run:
GOMP_CPU_AFFINITY = "0"

Environment variables set by runcpu during the 625.x264_s peak run:
GOMP_CPU_AFFINITY = "0"

Environment variables set by runcpu during the 631.deepsjeng_s peak run:
GOMP_CPU_AFFINITY = "0"

Environment variables set by runcpu during the 641.leela_s peak run:
GOMP_CPU_AFFINITY = "0"

Environment variables set by runcpu during the 648.exchange2_s peak run:

(Continued on next page)
Environment Variables Notes (Continued)

GOMP_CPU_AFFINITY = "0"

Environment variables set by runcpu during the 657.xz_s peak run:
GOMP_CPU_AFFINITY = "0-63"

General Notes

Binaries were compiled on a system with 2x AMD EPYC 7742 CPU + 1TiB Memory using openSUSE 15.2

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 v4.8.2 in RHEL 7.4 (No options specified)  
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 configuration:
Set Operating Mode set to Maximum Performance
LLC as NUMA Node set to Disabled

Sysinfo program /home/cpu2017-1.1.7-amd-aocc300-milan-B1/bin/sysinfo  
Rev: r6538 of 2020-09-24 e8664e66d2d7080afeaa89d4b38e2f1c  
running on localhost Mon May 24 11:40:44 2021

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 7763 64-Core Processor  
  1 "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 : 64  
siblings : 128
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 48 49 50 51 52

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Test Date: May-2021
Tested by: Lenovo Global Technology
Hardware Availability: Jun-2021
Software Availability: Mar-2021

Platform Notes (Continued)

53 54 55 56 57 58 59 60 61 62 63

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
Address sizes: 48 bits physical, 48 bits virtual
CPU(s): 128
On-line CPU(s) list: 0-127
Thread(s) per core: 2
Core(s) per socket: 64
Socket(s): 1
NUMA node(s): 1
Vendor ID: AuthenticAMD
CPU family: 25
Model: 1
Model name: AMD EPYC 7763 64-Core Processor
Stepping: 1
CPU MHz: 1826.980
CPU max MHz: 2450.0000
CPU min MHz: 1500.0000
BogoMIPS: 4890.93
Virtualization: AMD-V
L1d cache: 32K
L1i cache: 32K
L2 cache: 512K
L3 cache: 32768K
NUMA node0 CPU(s): 0-127
Flags: fpu vme de pse tsc msr pae 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 pcid sse4_1 sse4_2 movbe popcnt aes xsave avx f16c rdrand lahf_lm cmp_legacy svm extapic cr8_legacy abm sse4a misalignsse 3dnowprefetch osvw ibr skinit wdt tce topoext perfctr_core perfctr_nb bpext perfctr_l1d mwaitx cpb cat_l3 cdp_l3 invpcid_single hw_pstate ssbd mba ibrs ibpb tibp vmmcall fsgsbase bm1 avx2 smep bmi2 erms invpcid cqm rdt_a rdseed adx smap clflushopt clwb sha_ni xsaveopt xsavepreclop mmccall cqm_occup_llc cqm_mbb_total cqm_mbb_local czero irperf xsaveerpr wbnoinvd arat npt lbv svm_lock nrip_save tsc_scale vmcb_clean flushbyasid decodeassists pausefilter pthreshold v_mmsaveVmload vgif umip pkup oskpe vaes vpclmulqdq rdpid overflow_recoev 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)

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

```plaintext
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 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125 126 127
node 0 size: 515631 MB
node 0 free: 514304 MB
node distances:
node 0
0: 10
```

From `/proc/meminfo`

- MemTotal: 528006356 kB
- HugePages_Total: 0
- Hugepagesize: 2048 kB

From `/etc/*release* /etc/*version*`

- os-release:
  - NAME="SLES"
  - VERSION="15-SP2"
  - VERSION_ID="15.2"
  - PRETTY_NAME="SUSE Linux Enterprise Server 15 SP2"
  - ID="sles"
  - ID_LIKE="suse"
  - ANSI_COLOR="0;32"
  - CPE_NAME="cpe:/o:suse:sles:15:sp2"

`uname -a`:

```
Linux localhost 5.3.18-22-default #1 SMP Wed Jun 3 12:16:43 UTC 2020 (720aeba) x86_64
x86_64 x86_64 GNU/Linux
```

Kernel self-reported vulnerability status:

- **CVE-2018-12207 (iTLB Multihit):** Not affected
- **CVE-2018-3620 (L1 Terminal Fault):** Not affected
- Microarchitectural Data Sampling: Not affected
- **CVE-2017-5754 (Meltdown):** Mitigation: Speculative Store Bypass disabled via prctl and seccomp
- **CVE-2018-3639 (Speculative Store Bypass):** Mitigation: usercopy/swapsgs barriers and __user pointer sanitization
- **CVE-2017-5753 (Spectre variant 1):** Mitigation: Full AMD retpoline,
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Platform Notes (Continued)

IBPB: conditional, IBRS_FW, STIBP: always-on, RSB filling

CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
CVE-2019-11135 (TSX Asynchronous Abort): Not affected

run-level 3 May 24 11:27

SPEC is set to: /home/cpu2017-1.1.7-amd-aocc300-milan-B1

Filesystem Type Size Used Avail Use% Mounted on
/dev/sda3 xfs 889G 153G 736G 18% /

From /sys/devices/virtual/dmi/id
Vendor: Lenovo
Product: ThinkSystem SR655 -[7Y9825Z000]-
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 M393A8G40AB2-CWE 64 GB 2 rank 3200
8x Unknown Unknown

BIOS:
BIOS Vendor: Lenovo
BIOS Version: CFE125S
BIOS Date: 05/11/2021
BIOS Revision: 6.0

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
C 600.perlbench_s(base, peak) 602.gcc_s(base, peak) 605.mcf_s(base, peak) 625.x264_s(base, peak) 657.xz_s(base, peak)
==============================================================================

AMD clang version 12.0.0 (CLANG: AOCC_3.0.0-Build#78 2020_12_10) (based on LLVM Mirror.Version.12.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.0.0/bin

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**CPU2017 License:** 9017

**Test Sponsor:** Lenovo Global Technology

**Test Date:** May-2021

**Hardware Availability:** Jun-2021

**Tested by:** Lenovo Global Technology

**Software Availability:** Mar-2021

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**Compiler Version Notes (Continued)**

C++

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<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>omnetpp_s</td>
<td>(base, peak)</td>
</tr>
<tr>
<td>xalancbmk_s</td>
<td>(base, peak)</td>
</tr>
<tr>
<td>deepsjeng_s</td>
<td>(base, peak)</td>
</tr>
<tr>
<td>leela_s</td>
<td>(base, peak)</td>
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Fortran

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<table>
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<tr>
<th>Benchmark</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>exchange2_s</td>
<td>(base, peak)</td>
</tr>
</tbody>
</table>

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**Base Compiler Invocation**

**C benchmarks:**

- clang

**C++ benchmarks:**

- clang++

**Fortran benchmarks:**

- flang

---

**Base Portability Flags**

- perlbench_s: -DSPEC_LINUX_X64 -DSPEC_LP64
- gcc_s: -DSPEC_LP64
- mcf_s: -DSPEC_LP64
- omnetpp_s: -DSPEC_LP64
- xalancbmk_s: -DSPEC_LINUX -DSPEC_LP64
- x264_s: -DSPEC_LP64
- deepsjeng_s: -DSPEC_LP64
- leela_s: -DSPEC_LP64
- exchange2_s: -DSPEC_LP64

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(Continued on next page)
CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
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Base Portability Flags (Continued)

657.xz_s: -DSPEC_LP64

Base Optimization Flags

C benchmarks:
- -m64 -mno-adx -mno-sse4a -Wl,-allow-multiple-definition
- -Wl,-mllvm -Wl,-enable-licm-vrp -Wl,-mllvm -Wl,-region-vectorize
- -Wl,-mllvm -Wl,-function-specialize
- -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
- -Wl,-mllvm -Wl,-reduce-array-computations=3 -03 -march=znver3
- -fveclib=AMDLIBM -ffast-math -flto -fstruct-layout=5
- -mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
- -fremap-arrays -mllvm -function-specialize -flv-function-specialization
- -mllvm -enable-gvn-hoist -mllvm -global-vectorize-slp=true
- -mllvm -enable-licm-vrp -mllvm -reduce-array-computations=3 -z muldefs
- -DSPEC_OPENMP -fopenmp -fopenmp=libomp -lomp -lamilibm -ljemalloc
- -lflang -lflangrti

C++ benchmarks:
- -m64 -std=c++98 -mno-adx -mno-sse4a
- -Wl,-mllvm -Wl,-do-block-reorder-aggressive
- -Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-function-specialize
- -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
- -Wl,-mllvm -Wl,-reduce-array-computations=3 -03 -march=znver3
- -fveclib=AMDLIBM -ffast-math -flto -mllvm -enable-partial-unswitch
- -mllvm -unroll-threshold=100 -finline-aggressive
- -flv-function-specialization -mllvm -loop-unswitch-threshold=200000
- -mllvm -reroll-loops -mllvm -aggressive-loop-unswitch
- -mllvm -extra-vectorizer-passes -mllvm -reduce-array-computations=3
- -mllvm -global-vectorize-slp=true -mllvm -convert-pow-exp-to-int=false
- -z muldefs -mllvm -do-block-reorder-aggressive
- -fvirtual-function-elimination -fvisibility=hidden -DSPEC_OPENMP
- -fopenmp -fopenmp=libomp -lomp -lamilibm -ljemalloc -lflang
- -lflangrti

Fortran benchmarks:
- -m64 -mno-adx -mno-sse4a -Wl,-mllvm -Wl,-inline-recursion=4
- -Wl,-mllvm -Wl,-lsr-in-nested-loop -Wl,-mllvm -Wl,-enable-iv-split
- -Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-function-specialize
- -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
- -Wl,-mllvm -Wl,-reduce-array-computations=3 -03 -march=znver3
- -fveclib=AMDLIBM -ffast-math -flto -z muldefs
- -mllvm -unroll-aggressive -mllvm -unroll-threshold=150 -DSPEC_OPENMP
- -fopenmp -fopenmp=libomp -lomp -lamilibm -ljemalloc -lflang

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### Lenovo Global Technology

**ThinkSystem SR655**  
2.45 GHz, AMD EPYC 7763

| SPECspeed®2017_int_base | 11.9 |
| SPECspeed®2017_int_peak | 11.9 |

**CPU2017 License:** 9017  
**Test Sponsor:** Lenovo Global Technology  
**Tested by:** Lenovo Global Technology  
**Test Date:** May-2021  
**Hardware Availability:** Jun-2021  
**Software Availability:** Mar-2021

---

#### Base Optimization Flags (Continued)

Fortran benchmarks (continued):

- -lfangrtni

---

#### Base Other Flags

- C benchmarks:
  - -Wno-unused-command-line-argument -Wno-return-type

- C++ benchmarks:
  - -Wno-unused-command-line-argument -Wno-return-type

- Fortran benchmarks:
  - -Wno-return-type

---

#### Peak Compiler Invocation

- C benchmarks:
  - clang

- C++ benchmarks:
  - clang++

- Fortran benchmarks:
  - flang

---

#### Peak Portability Flags

Same as Base Portability Flags

---

#### Peak Optimization Flags

- C benchmarks:
  - -m64 -mno-adx -mno-sse4a -Wl,-allow-multiple-definition
  - -Wl,-mllvm -Wl,-enable-lcvm-vrp -Wl,-mllvm -Wl,-function-specialize
  - -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
  - -Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast -march=znver3
  - -fveclib=AMDLIBM -ffast-math -flto -fstruct-layout=5

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

C benchmarks (continued):
-mlirv -unroll-threshold=50 -fremap-arrays -flv-function-specialization
-mlirv -inline-threshold=1000 -mlirv -enable-gvn-hoist
-mlirv -global-vectorize-slp=true -mlirv -function-specialize
-mlirv -enable-licm-vrp -mlirv -reduce-array-computations=3
-DSPEC_OPENMP -fopenmp -fopenmp=libomp -lomp -ldamlibm -ljemalloc
-lflang

C++ benchmarks:
-m64 -std=c++98 -mno-adx -mno-sse4a
-Wl,-mlirv -Wl,-do-block-reorder=aggressive
-Wl,-mlirv -Wl,-function-specialize
-Wl,-mlirv -Wl,-align-all-nofallback-blocks=6
-Wl,-mlirv -Wl,-reduce-array-computations=3 -Ofast -march=znver3
-fveclib=AMDLIBM -ffast-math -flto -finline-aggressive
-mlirv -unroll-threshold=100 -flv-function-specialization
-mlirv -enable-licm-vrp -mlirv -reroll-loops
-mlirv -aggressive-loop-unswitch -mlirv -reduce-array-computations=3
-mlirv -global-vectorize-slp=true -mlirv -do-block-reorder=aggressive
-fvirtual-function-elimination -fvisibility=hidden -DSPEC_OPENMP
-fopenmp -fopenmp=libomp -lomp -ldamlibm -ljemalloc -lflang

Fortran benchmarks:
-m64 -mno-adx -mno-sse4a -Wl,-mlirv -Wl,-align-recursion=4
-Wl,-mlirv -Wl,-lsr-in-nested-loop -Wl,-mlirv -Wl,-enable-iv-split
-Wl,-mlirv -Wl,-function-specialize
-Wl,-mlirv -Wl,-align-all-nofallback-blocks=6
-Wl,-mlirv -Wl,-reduce-array-computations=3 -O3 -march=znver3
-fveclib=AMDLIBM -ffast-math -flto -mlirv -unroll-aggressive
-mlirv -unroll-threshold=150 -DSPEC_OPENMP -fopenmp -fopenmp=libomp
-lomp -ldamlibm -ljemalloc -lflang

Peak Other Flags

C benchmarks:
-#no-unused-command-line-argument -#no-return-type

C++ benchmarks:
-#no-unused-command-line-argument -#no-return-type

Fortran benchmarks:
-#no-return-type
**SPEC CPU®2017 Integer Speed Result**

### Lenovo Global Technology

**ThinkSystem SR655**  
**2.45 GHz, AMD EPYC 7763**

<table>
<thead>
<tr>
<th>SPECspeed®2017_int_base</th>
<th>SPECspeed®2017_int_peak</th>
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<tr>
<td>11.9</td>
<td>11.9</td>
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</table>

**CPU2017 License:** 9017  
**Test Sponsor:** Lenovo Global Technology  
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**Test Date:** May-2021  
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The flags files that were used to format this result can be browsed at:


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


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Tested with SPEC CPU®2017 v1.1.7 on 2021-05-23 23:40:43-0400.  
Report generated on 2021-06-08 20:08:24 by CPU2017 PDF formatter v6442.  
Originally published on 2021-06-08.