# SPEC CPU®2017 Integer Speed Result

**Lenovo Global Technology**  
ThinkSystem SR655  
3.20 GHz, AMD EPYC 74F3

### Hardware

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</table>

### 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 CFE125U 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

- CPU2017 License: 9017  
- Test Sponsor: Lenovo Global Technology  
- Tested by: Lenovo Global Technology  
- Test Date: Jul-2021  
- Hardware Availability: Jun-2021  
- Software Availability: Mar-2021  
- CPU Name: AMD EPYC 74F3  
- Max MHz: 4000  
- Nominal: 3200  
- Enabled: 24 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 / 3 cores  
- Other: None  
- Memory: 256 GB (8 x 32 GB 2Rx4 PC4-3200AA-R)  
- Storage: 1 x 960 GB SATA SSD  
- Other: None  

**SPECspeed®2017_int_base = 13.5**  
**SPECspeed®2017_int_peak = 13.5**
SPEC CPU®2017 Integer Speed Result

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ThinkSystem SR655
3.20 GHz, AMD EPYC 74F3

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SPECspeed®2017_int_base = 13.5
SPECspeed®2017_int_peak = 13.5

Results Table

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<td>235</td>
<td>26.4</td>
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</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 numacl 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.
To enable Transparent Hugepages (THP) for all allocations,
'echo always > /sys/kernel/mm/transparent_hugepage/enable' and

(Continued on next page)
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Operating System Notes (Continued)
'echo always > /sys/kernel/mm/transparent_hugepage/defrag' run as root.

Environment Variables Notes
Environment variables set by runcpu before the start of the run:
GOMP_CPU_AFFINITY = "0-47"
LD_LIBRARY_PATH = "/home/cpu2017-1.1.8-amd-aocc300-milan-B1/amd_speed_aocc300_milan_B_lib/64:/home/cpu2017-1.1.8-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 = "48"

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 625.x264_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:
GOMP_CPU_AFFINITY = "0"

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:
Choose Operating Mode set to Maximum Performance
NUMA nodes per socket set to NPS2
SOC P-states set to P0

Sysinfo program /home/cpu2017-1.1.8-amd-aocc300-milan-B1/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16aca64d
running on localhost Fri Apr 17 21:48:02 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 74F3 24-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 : 24
siblings : 48
  physical 0: cores 0 1 2 4 5 6 8 9 10 12 13 14 16 17 18 20 21 22 24 25 26 28 29 30

From lscpu from util-linux 2.33.1:
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): 48
On-line CPU(s) list: 0-47
Thread(s) per core: 2
Core(s) per socket: 24
Socket(s): 1
NUMA node(s): 2
Vendor ID: AuthenticAMD
CPU family: 25
Model: 1
Model name: AMD EPYC 74F3 24-Core Processor
Stepping: 1
CPU MHz: 1775.316
CPU max MHz: 3200.0000
CPU min MHz: 1500.0000
BogoMIPS: 6387.85
Virtualization: AMD-V
L1d cache: 32K
L1i cache: 32K
L2 cache: 512K

(Continued on next page)
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Tested by: Lenovo Global Technology
Test Date: Jul-2021
Hardware Availability: Jun-2021
Software Availability: Mar-2021

SPECspeed®2017_int_base = 13.5
SPECspeed®2017_int_peak = 13.5

Platform Notes (Continued)

L3 cache: 32768K
NUMA node0 CPU(s): 0-11,24-35
NUMA node1 CPU(s): 12-23,36-47
Flags: fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov
pat pse36 clflush mmx pmxs ext 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 pcm sse4_1 sse4_2 movbe popcnt aes xsave avx f16c rdrand
lahf_lm cmp_legacy svm extapic cr8_legacy abm sse4a misalignsse 3dmovprefetch osuw
ibs skinit wdt tce topoext perfctr_core perfctr_nb bperf perfctr_llc mwai tx cbp
cat_13 cdp_13 invpcid_single hw_pstate ssbd mba ibrs ibpb stibp vmmcall fsgsbase
bm1 axv2 smep bmi2 erms invpcid cqm rdt_a rdseed adx smap clflushopt clwb sha ni
xsavexp opt xsavexg xgetbv xsavec xsave ecx cmq cmq_tcm qm cmq_mbm_total cmq_mbm_local
clzero irperf xsaveerptr wboinvcx arat npt lbv svm_lock nrp_save tsc_scale
vmcb_clean flushbyasid decodeassists pausefilter pfthreshold v_vmsave_vmload vgif
umpk pukspace vaes vpclmulqdql rdpid overflow_recoev succor smca

From numactl --hardware
WARNING: a numactl 'node' might or might not correspond to a physical chip.
available: 2 nodes (0-1)
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
node 1 cpus: 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35
node 0 size: 128796 MB
node 1 size: 128435 MB
node distances:
node 0 1
0: 10 12
1: 12 10

From /proc/meminfo
MemTotal: 263987392 kB
HugePages_Total: 0
Huge pagesize: 2048 kB

From /proc/meminfo
MemTotal: 263987392 kB
HugePages_Total: 0
Huge pagesize: 2048 kB

From /sys/devices/system/cpu/cpu*/cpufreq/scaling_governer has performance

From /usr/bin/lsb_release -d
SUSE Linux Enterprise Server 15 SP2

From /etc/*release* /etc/*version*
os-release:
NAME="SLES"

(Continued on next page)
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SPECspeed®2017_int_base = 13.5
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CPU2017 License: 9017
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Test Date: Jul-2021
CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Test Date: Jul-2021

Platform Notes (Continued)

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
CVE-2018-3639 (Speculative Store Bypass): 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 retropoline,
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 Apr 17 21:13
SPEC is set to: /home/cpu2017-1.1.8-amd-aocc300-milan-B1
Filesyste Type Size Used Avail Use% Mounted on
/dev/md126p3 xfs 892G 85G 808G 10% /

From /sys/devices/virtual/dmi/id
Vendor: Lenovo
Product: ThinkSystem SR655 -[7Y00000000]-
Product Family: ThinkSystem
Serial: 0123456789

Additional information from dmiDecode 3.2 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:
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SPECspeed®2017_int_base = 13.5
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Platform Notes (Continued)

8x Samsung M393A4K40DB3-CWE 32 GB 2 rank 3200
8x Unknown Unknown

BIOS:
  BIOS Vendor: Lenovo
  BIOS Version: CFE125U
  BIOS Date: 05/28/2021
  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

==============================================================================
C++     | 620.omnetpp_s(base, peak) 623.xalancbmk_s(base, peak) 631.deepsjeng_s(base, peak) 641.leela_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

==============================================================================
Fortran | 648.exchange2_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
### Lenovo Global Technology

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<td>Software Availability:</td>
<td>Mar-2021</td>
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### Base Compiler Invocation

C benchmarks:  
clang

C++ benchmarks:  
clang++

Fortran benchmarks:  
flang

### Base Portability Flags

<table>
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<th>Benchmark</th>
<th>Base Portability Flags</th>
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<td>gcc_s</td>
<td>-DSPEC_LP64</td>
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<td>-DSPEC_LP64</td>
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<td>omnetpp_s</td>
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<td>xalancbmk_s</td>
<td>-DSPEC_LINUX -DSPEC_LP64</td>
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<td>xz_s</td>
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</table>

### Base Optimization Flags

C benchmarks:

- `-m64`  
- `-mno-adx`  
- `-mno-sse4a`  
- `-W1,-allow-multiple-definition`  
- `-W1,-mllvm -W1,-enable-licm-vrp -W1,-mllvm -W1,-region-vectorize`  
- `-W1,-mllvm -W1,-function-specialize`  
- `-W1,-mllvm -W1,-align-all-nofallthru-blocks=6`  
- `-W1,-mllvm -W1,-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 -lamdlibm -ljemalloc -lflang -lflangrti`  

C++ benchmarks:

- `-m64`  
- `-std=c++98`  
- `-mno-adx`  
- `-mno-sse4a`  
- `-W1,-mllvm -W1,-do-block-reorder=aggressive`  
- `-W1,-mllvm -W1,-region-vectorize -W1,-mllvm -W1,-function-specialize`

(Continued on next page)
SPEC CPU®2017 Integer Speed Result

Lenovo Global Technology
ThinkSystem SR655
3.20 GHz, AMD EPYC 74F3

SPECspeed®2017_int_base = 13.5
SPECspeed®2017_int_peak = 13.5

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

Test Date: Jul-2021
Hardware Availability: Jun-2021
Software Availability: Mar-2021

Base Optimization Flags (Continued)

C++ benchmarks (continued):
-W1,-mllvm -W1,-align-all-nofallthru-blocks=6
-W1,-mllvm -W1,-reduce-array-computations=3 -O3 -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 -lamdlibm -ljemalloc -lflangrti

Fortran benchmarks:
-m64 -mno-adx -mno-sse4a -W1,-mllvm -W1,-inline-recursion=4
-W1,-mllvm -W1,-lsr-in-nested-loop -W1,-mllvm -W1,-enable-iv-split
-W1,-mllvm -W1,-region-vectorize -W1,-mllvm -W1,-function-specialize
-W1,-mllvm -W1,-align-all-nofallthru-blocks=6
-W1,-mllvm -W1,-reduce-array-computations=3 -O3 -march=znver3
-fveclib=AMDLIBM -ffast-math -flto -z muldefs
-mllvm -unroll-aggressive -mllvm -unroll-threshold=150 -DSPEC_OPENMP
-fopenmp -fopenmp=libomp -lomp -lamdlibm -ljemalloc -lflangrti

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

(Continued on next page)
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Peak Compiler Invocation (Continued)

C++ benchmarks:
clang+

Fortran benchmarks:
flang

Peak Portability Flags
Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:
600.perlbench_s: -m64 -mno-adx -mno-sse4a -Wl,-allow-multiple-definition
-Wl,-mllvm -Wl,-enable-licm-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 -mllvm -unroll-threshold=50
-freemap-arrays -flv-function-specialization
-mllvm -inline-threshold=1000 -mllvm -enable-gvn-hoist
-mllvm -global-vectorize-slp=true
-mllvm -function-specialize -mllvm -enable-licm-vrp
-mllvm -reduce-array-computations=3 -DSPEC_OPENMP -fopenmp
-fopenmp=libomp -lomp -lamlibm -ljemalloc -lflang

602.gcc_s: Same as 600.perlbench_s

605.mcf_s: basepeak = yes

625.x264_s: Same as 600.perlbench_s

657.xz_s: basepeak = yes

C++ benchmarks:
620.omnetpp_s: basepeak = yes

623.xalancbmk_s: basepeak = yes

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

631.deepsjeng_s: basepeak = yes
641.leela_s: -m64 -std=c++98 -mno-adx -mno-sse4a
-W1,-mlsvm -W1,-do-block-reorder=aggressive
-W1,-mlsvm -W1,-function-specialize
-W1,-mlsvm -W1,-align-all-nofallthru-blocks=6
-W1,-mlsvm -W1,-reduce-array-computations=3 -Ofast
-march=znver3 -fveclib=AMDLIBM -ffast-math -flto
-finline-aggressive -mlsvm -unroll-threshold=100
-flv-function-specialization -mlsvm -enable-licm-vrp
-mlsvm -reroll-loops -mlsvm -aggressive-loop-unswitch
-mlsvm -reduce-array-computations=3
-mlsvm -global-vectorize-slp=true
-mlsvm -do-block-reorder=aggressive
-fvirtual-function-elimination -fvisibility=hidden
-DSPEC_OPENMP -fopenmp -fopenmp=libomp -lomp -lamdlibm
-ljemalloc -lflang

Fortran benchmarks:
-m64 -mno-adx -mno-sse4a -W1,-mlsvm -W1,-inline-recursion=4
-W1,-mlsvm -W1,-lsr-in-nested-loop -W1,-mlsvm -W1,-enable-iv-split
-W1,-mlsvm -W1,-function-specialize
-W1,-mlsvm -W1,-align-all-nofallthru-blocks=6
-W1,-mlsvm -W1,-reduce-array-computations=3 -O3 -march=znver3
-fveclib=AMDLIBM -ffast-math -flto -mlsvm -unroll-aggressive
-mlsvm -unroll-threshold=150 -DSPEC_OPENMP -fopenmp -fopenmp=libomp
-lomp -lamdlibm -ljemalloc -lflang

Peak 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

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-Milan1P-G.html
**SPEC CPU®2017 Integer Speed Result**

**Lenovo Global Technology**

ThinkSystem SR655  
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<table>
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You can also download the XML flags sources by saving the following links:


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