



SPEC CPU®2017 Integer Rate Result

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Lenovo Global Technology

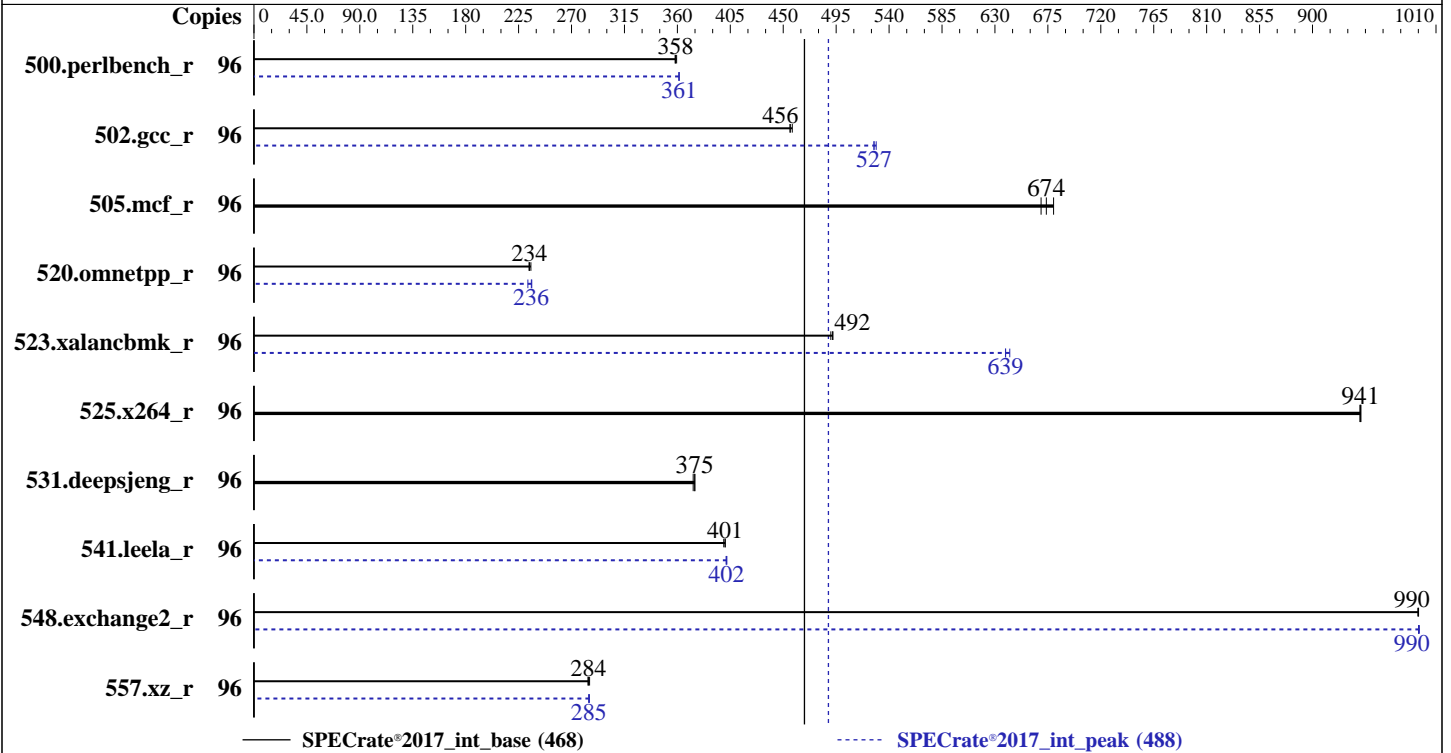
ThinkSystem SR665
2.80 GHz, AMD EPYC 7473X

SPECrate®2017_int_base = 468

SPECrate®2017_int_peak = 488

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

Test Date: Aug-2022
Hardware Availability: Aug-2022
Software Availability: Feb-2022



Hardware

CPU Name: AMD EPYC 7473X
 Max MHz: 3700
 Nominal: 2800
 Enabled: 48 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: 768 MB I+D on chip per chip,
 96 MB shared / 3 cores
 Other: None
 Memory: 512 GB (16 x 32 GB 2Rx4 PC4-3200AA-R)
 Storage: 1 x 960 GB SATA SSD
 Other: None

Software

OS: Red Hat Enterprise Linux 8.5 (Ootpa)
 Kernel 4.18.0-348.el8.x86_64
 Compiler: C/C++/Fortran: Version 3.2.0 of AOCC
 Parallel: No
 Firmware: Lenovo BIOS Version D8E125H 2.41 released Aug-2022
 File System: xfs
 System State: Run level 3 (multi-user)
 Base Pointers: 64-bit
 Peak Pointers: 32/64-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



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Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
500.perlbench_r	96	425	359	426	358	427	358	96	423	361	423	361	423	361
502.gcc_r	96	298	456	298	456	297	458	96	258	527	257	529	258	527
505.mcf_r	96	228	680	232	669	230	674	96	228	680	232	669	230	674
520.omnetpp_r	96	535	235	539	234	538	234	96	534	236	541	233	533	236
523.xalancbmk_r	96	206	492	206	492	207	490	96	159	639	158	643	159	639
525.x264_r	96	179	941	179	941	179	940	96	179	941	179	941	179	940
531.deepsjeng_r	96	295	373	294	375	293	375	96	295	373	294	375	293	375
541.leela_r	96	397	401	397	401	398	399	96	395	402	396	402	396	402
548.exchange2_r	96	254	990	254	990	254	990	96	254	991	254	990	254	990
557.xz_r	96	363	285	365	284	365	284	96	364	285	364	285	364	285

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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 limit
'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>

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

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Operating System Notes (Continued)

To enable Transparent Hugepages (THP) only on request for base runs,
'echo madvise > /sys/kernel/mm/transparent_hugepage/enabled' run as root.
To enable THP for all allocations for peak runs,
'echo always > /sys/kernel/mm/transparent_hugepage/enabled' and
'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:

```
LD_LIBRARY_PATH =  
    "/home/cpu2017-1.1.8-amd-milanx-aocc320-A1/amd_rate_aocc320_milanx_A_lib  
    /lib;/home/cpu2017-1.1.8-amd-milanx-aocc320-A1/amd_rate_aocc320_milanx_A  
    _lib/lib32:"  
MALLOC_CONF = "retain:true"
```

Environment variables set by runcpu during the 523.xalanxbmk_r peak run:

```
MALLOC_CONF = "thp:never"
```

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:

Operating Mode set to Maximum Performance and then set it to Custom Mode

NUMA Nodes per Socket set to NPS4

ACPI SRAT L3 Cache as NUMA Domain set to Enable

Memory interleaving set to Disabled

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Platform Notes (Continued)

sysinfo program /home/cpu2017-1.1.8-amd-milanx-aocc320-A1/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acafc64d
running on localhost.localdomain Tue Aug 30 11:02:05 2022

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 7473X 24-Core Processor

2 "physical id"s (chips)

96 "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

physical 1: 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 2.32.1:

Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 96
On-line CPU(s) list: 0-95
Thread(s) per core: 2
Core(s) per socket: 24
Socket(s): 2
NUMA node(s): 16
Vendor ID: AuthenticAMD
BIOS Vendor ID: Advanced Micro Devices, Inc.
CPU family: 25
Model: 1
Model name: AMD EPYC 7473X 24-Core Processor
BIOS Model name: AMD EPYC 7473X 24-Core Processor
Stepping: 2
CPU MHz: 2800.000
CPU max MHz: 3737.8899
CPU min MHz: 1500.0000
BogoMIPS: 5589.27
Virtualization: AMD-V
L1d cache: 32K
L1i cache: 32K
L2 cache: 512K
L3 cache: 98304K
NUMA node0 CPU(s): 0-2,48-50
NUMA node1 CPU(s): 3-5,51-53

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Platform Notes (Continued)

```

NUMA node2 CPU(s): 6-8,54-56
NUMA node3 CPU(s): 9-11,57-59
NUMA node4 CPU(s): 12-14,60-62
NUMA node5 CPU(s): 15-17,63-65
NUMA node6 CPU(s): 18-20,66-68
NUMA node7 CPU(s): 21-23,69-71
NUMA node8 CPU(s): 24-26,72-74
NUMA node9 CPU(s): 27-29,75-77
NUMA node10 CPU(s): 30-32,78-80
NUMA node11 CPU(s): 33-35,81-83
NUMA node12 CPU(s): 36-38,84-86
NUMA node13 CPU(s): 39-41,87-89
NUMA node14 CPU(s): 42-44,90-92
NUMA node15 CPU(s): 45-47,93-95

```

```

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 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
ibs skinit wdt tce topoext perfctr_core perfctr_nb bpext perfctr_llc mwaitx cpb
cat_l3 cdp_l3 invpcid_single hw_pstate ssbd mba ibrs ibpb stibp vmmcall fsgsbase
bmi1 avx2 smep bmi2 erms invpcid 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 xsaveerptr wbnoinvd amd_ppin arat npt lbrv svm_lock nrip_save
tsc_scale vmcb_clean flushbyasid decodeassists pausefilter pfthreshold
v_vmsave_vmload vgif v_spec_ctrl umip pku ospke vaes vpclmulqdq rdpid overflow_recov
succor smca fsrm sme sev sev_es

```

```

/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: 16 nodes (0-15)
node 0 cpus: 0 1 2 48 49 50
node 0 size: 32006 MB
node 0 free: 31895 MB
node 1 cpus: 3 4 5 51 52 53
node 1 size: 32252 MB
node 1 free: 32154 MB
node 2 cpus: 6 7 8 54 55 56
node 2 size: 32254 MB
node 2 free: 32122 MB
node 3 cpus: 9 10 11 57 58 59
node 3 size: 32253 MB
node 3 free: 32108 MB
node 4 cpus: 12 13 14 60 61 62

```

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Platform Notes (Continued)

```

node 4 size: 32254 MB
node 4 free: 32147 MB
node 5 cpus: 15 16 17 63 64 65
node 5 size: 32253 MB
node 5 free: 32151 MB
node 6 cpus: 18 19 20 66 67 68
node 6 size: 32254 MB
node 6 free: 32161 MB
node 7 cpus: 21 22 23 69 70 71
node 7 size: 32241 MB
node 7 free: 32147 MB
node 8 cpus: 24 25 26 72 73 74
node 8 size: 32254 MB
node 8 free: 32166 MB
node 9 cpus: 27 28 29 75 76 77
node 9 size: 32253 MB
node 9 free: 32165 MB
node 10 cpus: 30 31 32 78 79 80
node 10 size: 32217 MB
node 10 free: 32125 MB
node 11 cpus: 33 34 35 81 82 83
node 11 size: 32253 MB
node 11 free: 32153 MB
node 12 cpus: 36 37 38 84 85 86
node 12 size: 32254 MB
node 12 free: 32087 MB
node 13 cpus: 39 40 41 87 88 89
node 13 size: 32253 MB
node 13 free: 32153 MB
node 14 cpus: 42 43 44 90 91 92
node 14 size: 32254 MB
node 14 free: 32144 MB
node 15 cpus: 45 46 47 93 94 95
node 15 size: 32253 MB
node 15 free: 32162 MB
node distances:
node  0  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15
 0: 10 11 12 12 12 12 12 12 32 32 32 32 32 32 32 32
 1: 11 10 12 12 12 12 12 12 32 32 32 32 32 32 32 32
 2: 12 12 10 11 12 12 12 12 32 32 32 32 32 32 32 32
 3: 12 12 11 10 12 12 12 12 32 32 32 32 32 32 32 32
 4: 12 12 12 12 10 11 12 12 32 32 32 32 32 32 32 32
 5: 12 12 12 12 11 10 12 12 32 32 32 32 32 32 32 32
 6: 12 12 12 12 12 10 11 12 32 32 32 32 32 32 32 32
 7: 12 12 12 12 12 12 11 10 32 32 32 32 32 32 32 32
 8: 32 32 32 32 32 32 32 32 10 11 12 12 12 12 12 12
 9: 32 32 32 32 32 32 32 32 11 10 12 12 12 12 12 12

```

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Platform Notes (Continued)

10:	32	32	32	32	32	32	32	32	32	12	12	10	11	12	12	12	12
11:	32	32	32	32	32	32	32	32	32	12	12	11	10	12	12	12	12
12:	32	32	32	32	32	32	32	32	32	12	12	12	12	10	11	12	12
13:	32	32	32	32	32	32	32	32	32	12	12	12	12	11	10	12	12
14:	32	32	32	32	32	32	32	32	32	12	12	12	12	12	12	10	11
15:	32	32	32	32	32	32	32	32	32	12	12	12	12	12	12	11	10

From /proc/meminfo

```
MemTotal:      528143984 kB
HugePages_Total:      0
Hugepagesize:    2048 kB
```

/sbin/tuned-adm active

Current active profile: throughput-performance

/sys/devices/system/cpu/cpu*/cpufreq/scaling_governor has performance

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

```
os-release:
NAME="Red Hat Enterprise Linux"
VERSION="8.5 (Ootpa)"
ID="rhel"
ID_LIKE="fedora"
VERSION_ID="8.5"
PLATFORM_ID="platform:el8"
PRETTY_NAME="Red Hat Enterprise Linux 8.5 (Ootpa)"
ANSI_COLOR="0;31"
redhat-release: Red Hat Enterprise Linux release 8.5 (Ootpa)
system-release: Red Hat Enterprise Linux release 8.5 (Ootpa)
system-release-cpe: cpe:/o:redhat:enterprise_linux:8::baseos
```

uname -a:

```
Linux localhost.localdomain 4.18.0-348.el8.x86_64 #1 SMP Mon Oct 4 12:17:22 EDT 2021
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):	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

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Platform Notes (Continued)

```

CVE-2017-5715 (Spectre variant 2): sanitization
Mitigation: Full AMD retpoline,
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 Aug 30 09:44

```

SPEC is set to: /home/cpu2017-1.1.8-amd-milanx-aocc320-A1
Filesystem      Type  Size  Used Avail Use% Mounted on
/dev/sda4       xfs   819G  351G  468G  43% /home

```

```

From /sys/devices/virtual/dmi/id
Vendor:          Lenovo
Product:         ThinkSystem SR665-2S
Product Family: ThinkSystem
Serial:          1234567890

```

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:
  16x Samsung M393A4K40DB3-CWE 32 GB 2 rank 3200

```

```

BIOS:
  BIOS Vendor:      Lenovo
  BIOS Version:     D8E125H-2.41
  BIOS Date:        07/08/2022
  BIOS Revision:    2.41
  Firmware Revision: 4.12

```

(End of data from sysinfo program)

Compiler Version Notes

```

=====
C      | 502.gcc_r(peak)
=====

```

```

AMD clang version 13.0.0 (CLANG: AOCC_3.2.0-Build#128 2021_11_12) (based on
  LLVM Mirror.Version.13.0.0)
Target: i386-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.2.0/bin
=====

```

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Compiler Version Notes (Continued)

=====
C | 500.perlbench_r(base, peak) 502.gcc_r(base) 505.mcf_r(base, peak)
| 525.x264_r(base, peak) 557.xz_r(base, peak)
=====

AMD clang version 13.0.0 (CLANG: AOCC_3.2.0-Build#128 2021_11_12) (based on LLVM Mirror.Version.13.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.2.0/bin
=====

=====
C | 502.gcc_r(peak)
=====

AMD clang version 13.0.0 (CLANG: AOCC_3.2.0-Build#128 2021_11_12) (based on LLVM Mirror.Version.13.0.0)
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Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.2.0/bin
=====

=====
C++ | 523.xalancbmk_r(peak)
=====

AMD clang version 13.0.0 (CLANG: AOCC_3.2.0-Build#128 2021_11_12) (based on LLVM Mirror.Version.13.0.0)
Target: i386-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.2.0/bin
=====

=====
C++ | 520.omnetpp_r(base, peak) 523.xalancbmk_r(base)
| 531.deepsjeng_r(base, peak) 541.leela_r(base, peak)
=====

(Continued on next page)



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Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.2.0/bin

=====
C++ | 523.xalanbmk_r(peak)

AMD clang version 13.0.0 (CLANG: AOCC_3.2.0-Build#128 2021_11_12) (based on LLVM Mirror.Version.13.0.0)
Target: i386-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.2.0/bin

=====
C++ | 520.omnetpp_r(base, peak) 523.xalanbmk_r(base)
| 531.deepsjeng_r(base, peak) 541.leela_r(base, peak)

AMD clang version 13.0.0 (CLANG: AOCC_3.2.0-Build#128 2021_11_12) (based on LLVM Mirror.Version.13.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.2.0/bin

=====
Fortran | 548.exchange2_r(base, peak)

AMD clang version 13.0.0 (CLANG: AOCC_3.2.0-Build#128 2021_11_12) (based on LLVM Mirror.Version.13.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.2.0/bin

Base Compiler Invocation

C benchmarks:
clang

C++ benchmarks:
clang++

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Base Compiler Invocation (Continued)

Fortran benchmarks:

flang

Base Portability Flags

```
500.perlbench_r: -DSPEC_LINUX_X64 -DSPEC_LP64
502.gcc_r: -DSPEC_LP64
505.mcf_r: -DSPEC_LP64
520.omnetpp_r: -DSPEC_LP64
523.xalancbmk_r: -DSPEC_LINUX -DSPEC_LP64
525.x264_r: -DSPEC_LP64
531.deepsjeng_r: -DSPEC_LP64
541.leela_r: -DSPEC_LP64
548.exchange2_r: -DSPEC_LP64
557.xz_r: -DSPEC_LP64
```

Base Optimization Flags

C benchmarks:

```
-m64 -Wl,-allow-multiple-definition -Wl,-mllvm -Wl,-enable-licm-vrp
-flto -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
-Wl,-mllvm -Wl,-enable-loop-fusion -O3 -march=znver3 -fveclib=AMDLIBM
-ffast-math -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
-mllvm -enable-loop-fusion -z muldefs -lamdlibm -ljemalloc -lflang
```

C++ benchmarks:

```
-m64 -std=c++98 -flto -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
-Wl,-mllvm -Wl,-enable-loop-fusion -O3 -march=znver3 -fveclib=AMDLIBM
-ffast-math -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
```

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SPEC CPU®2017 Integer Rate Result

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Lenovo Global Technology

ThinkSystem SR665
2.80 GHz, AMD EPYC 7473X

SPECrate®2017_int_base = 468

SPECrate®2017_int_peak = 488

CPU2017 License: 9017

Test Sponsor: Lenovo Global Technology

Tested by: Lenovo Global Technology

Test Date: Aug-2022

Hardware Availability: Aug-2022

Software Availability: Feb-2022

Base Optimization Flags (Continued)

C++ benchmarks (continued):

```
-mllvm -extra-vectorizer-passes -mllvm -reduce-array-computations=3
-mllvm -global-vectorize-slp=true -mllvm -convert-pow-exp-to-int=false
-mllvm -enable-loop-fusion -z muldefs -fvirtual-function-elimination
-fvisibility=hidden -lamdlibm -ljemalloc -lflang
```

Fortran benchmarks:

```
-m64 -Wl,-mllvm -Wl,-inline-recursion=4
-Wl,-mllvm -Wl,-lsr-in-nested-loop -Wl,-mllvm -Wl,-enable-iv-split
-flto -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
-Wl,-mllvm -Wl,-enable-loop-fusion -O3 -march=znver3 -fveclib=AMDLIBM
-ffast-math -z muldefs -mllvm -unroll-aggressive
-mllvm -unroll-threshold=500 -lamdlibm -ljemalloc -lflang
```

Base Other Flags

C benchmarks:

```
-Wno-unused-command-line-argument
```

C++ benchmarks:

```
-Wno-unused-command-line-argument
```

Peak Compiler Invocation

C benchmarks:

```
clang
```

C++ benchmarks:

```
clang++
```

Fortran benchmarks:

```
flang
```

Peak Portability Flags

```
500.perlbench_r: -DSPEC_LINUX_X64 -DSPEC_LP64
```

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Peak Portability Flags (Continued)

```

502.gcc_r: -D_FILE_OFFSET_BITS=64
505.mcf_r: -DSPEC_LP64
520.omnetpp_r: -DSPEC_LP64
523.xalancbmk_r: -DSPEC_LINUX -DSPEC_LP64
525.x264_r: -DSPEC_LP64
531.deepsjeng_r: -DSPEC_LP64
541.leela_r: -DSPEC_LP64
548.exchange2_r: -DSPEC_LP64
557.xz_r: -DSPEC_LP64

```

Peak Optimization Flags

C benchmarks:

```

500.perlbench_r: -m64 -Wl,-allow-multiple-definition
-Wl,-mllvm -Wl,-enable-licm-vrp -flto
-Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-fprofile-instr-generate(pass 1)
-fprofile-instr-use(pass 2) -Ofast -march=znver3
-fveclib=AMDLIBM -ffast-math -fstruct-layout=7
-mllvm -unroll-threshold=50 -fremap-arrays
-flv-function-specialization -mllvm -inline-threshold=1000
-mllvm -enable-gvn-hoist -mllvm -global-vectorize-slp=false
-mllvm -function-specialize -mllvm -enable-licm-vrp
-mllvm -reduce-array-computations=3 -lamdlibm -ljemalloc

502.gcc_r: -m32 -Wl,-allow-multiple-definition
-Wl,-mllvm -Wl,-enable-licm-vrp -flto
-Wl,-mllvm -Wl,-function-specialize -Ofast -march=znver3
-fveclib=AMDLIBM -ffast-math -fstruct-layout=7
-mllvm -unroll-threshold=50 -fremap-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 -fgnu89-inline
-ljemalloc

505.mcf_r: basepeak = yes

525.x264_r: basepeak = yes

```

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Peak Optimization Flags (Continued)

```
557.xz_r: -m64 -Wl,-allow-multiple-definition
-Wl,-mllvm -Wl,-enable-licm-vrp -flto
-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
-fstruct-layout=7 -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 -lamdlibm -ljemalloc
```

C++ benchmarks:

```
520.omnetpp_r: -m64 -std=c++98 -flto -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
-finline-aggressive -mllvm -unroll-threshold=100
-flv-function-specialization -mllvm -enable-licm-vrp
-mllvm -reroll-loops -mllvm -aggressive-loop-unswitch
-mllvm -reduce-array-computations=3
-mllvm -global-vectorize-slp=true
-fvirtual-function-elimination -fvisibility=hidden
-lamdlibm -ljemalloc
```

```
523.xalancbmk_r: -m32 -Wl,-mllvm -Wl,-do-block-reorder=aggressive -flto
-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
-finline-aggressive -mllvm -unroll-threshold=100
-flv-function-specialization -mllvm -enable-licm-vrp
-mllvm -reroll-loops -mllvm -aggressive-loop-unswitch
-mllvm -reduce-array-computations=3
-mllvm -global-vectorize-slp=true
-mllvm -do-block-reorder=aggressive
-fvirtual-function-elimination -fvisibility=hidden
-ljemalloc
```

531.deepsjeng_r: basepeak = yes

541.leela_r: Same as 520.omnetpp_r

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Peak Optimization Flags (Continued)

Fortran benchmarks:

```
-m64 -Wl,-mllvm -Wl,-inline-recursion=4  
-Wl,-mllvm -Wl,-lsr-in-nested-loop -Wl,-mllvm -Wl,-enable-iv-split  
-flto -Wl,-mllvm -Wl,-function-specialize  
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6  
-Wl,-mllvm -Wl,-reduce-array-computations=3 -O3 -march=znver3  
-fveclib=AMDLIBM -ffast-math -mllvm -unroll-aggressive  
-mllvm -unroll-threshold=500 -lamdlibm -ljemalloc -lflang
```

Peak Other Flags

C benchmarks (except as noted below):

```
-Wno-unused-command-line-argument
```

```
502.gcc_r: -L/usr/lib -Wno-unused-command-line-argument
```

```
-L/sppo/bin/cpu2017v118-aocc3-milanX/amd_rate_aocc320_milanx_A_lib/lib32
```

C++ benchmarks (except as noted below):

```
-Wno-unused-command-line-argument
```

```
523.xalancbmk_r: -L/usr/lib -Wno-unused-command-line-argument
```

```
-L/sppo/bin/cpu2017v118-aocc3-milanX/amd_rate_aocc320_milanx_A_lib/lib32
```

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-MilanX-L.html>

<http://www.spec.org/cpu2017/flags/aocc320-flags-A1.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-MilanX-L.xml>

<http://www.spec.org/cpu2017/flags/aocc320-flags-A1.xml>

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