



# SPEC CPU®2017 Integer Speed Result

Copyright 2017-2024 Standard Performance Evaluation Corporation

## Lenovo Global Technology

ThinkSystem SD535 V3  
(2.25 GHz, AMD EPYC 9634)

SPECspeed®2017\_int\_base = 13.9

SPECspeed®2017\_int\_peak = 14.1

CPU2017 License: 9017

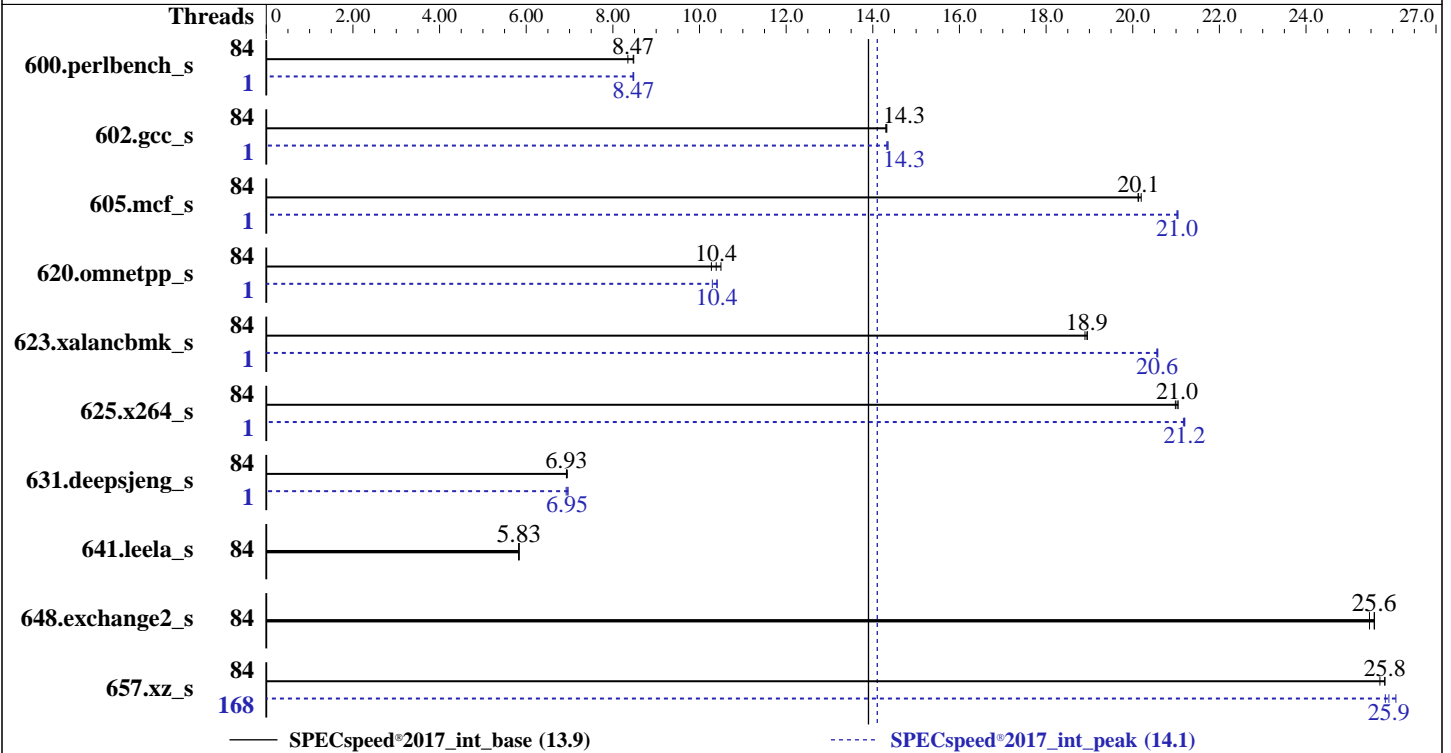
Test Sponsor: Lenovo Global Technology

Tested by: Lenovo Global Technology

Test Date: May-2024

Hardware Availability: May-2024

Software Availability: Jun-2023



### Hardware

CPU Name: AMD EPYC 9634  
 Max MHz: 3700  
 Nominal: 2250  
 Enabled: 84 cores, 1 chip, 2 threads/core  
 Orderable: 1 chip  
 Cache L1: 32 KB I + 32 KB D on chip per core  
 L2: 1 MB I+D on chip per core  
 L3: 384 MB I+D on chip per chip,  
 32 MB shared / 7 cores  
 Other: None  
 Memory: 384 GB (12 x 32 GB 2Rx8 PC5-4800B-R)  
 Storage: 1 x 960 GB M.2 SATA SSD  
 Other: CPU Cooling: Air

### Software

OS: SUSE Linux Enterprise Server 15 SP5  
 Kernel 5.14.21-150500.53-default  
 Compiler: C/C++/Fortran: Version 4.0.0 of AOCC  
 Parallel: Yes  
 Firmware: Lenovo BIOS Version GPE103H 1.10 released Mar-2024  
 File System: xfs  
 System State: Run level 3 (multi-user)  
 Base Pointers: 64-bit  
 Peak Pointers: 64-bit  
 Other: None  
 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						
	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
600.perlbench_s	84	209	8.48	<b><u>210</u></b>	<b><u>8.47</u></b>	213	8.35	1	209	8.48	<b><u>209</u></b>	<b><u>8.47</u></b>	210	8.47
602.gcc_s	84	<b><u>278</u></b>	<b><u>14.3</u></b>	278	14.3	278	14.3	1	278	14.3	278	14.3	<b><u>278</u></b>	<b><u>14.3</u></b>
605.mcf_s	84	235	20.1	234	20.2	<b><u>234</u></b>	<b><u>20.1</u></b>	1	224	21.0	225	21.0	<b><u>225</u></b>	<b><u>21.0</u></b>
620.omnetpp_s	84	<b><u>157</u></b>	<b><u>10.4</u></b>	155	10.5	159	10.3	1	158	10.3	<b><u>157</u></b>	<b><u>10.4</u></b>	157	10.4
623.xalancbmk_s	84	<b><u>74.8</u></b>	<b><u>18.9</u></b>	75.0	18.9	74.8	19.0	1	<b><u>68.9</u></b>	<b><u>20.6</u></b>	68.9	20.6	68.9	20.6
625.x264_s	84	84.1	21.0	<b><u>83.9</u></b>	<b><u>21.0</u></b>	83.8	21.0	1	<b><u>83.2</u></b>	<b><u>21.2</u></b>	83.2	21.2	83.3	21.2
631.deepsjeng_s	84	<b><u>207</u></b>	<b><u>6.93</u></b>	206	6.95	207	6.93	1	206	6.97	<b><u>206</u></b>	<b><u>6.95</u></b>	207	6.92
641.leela_s	84	292	5.84	293	5.82	<b><u>292</u></b>	<b><u>5.83</u></b>	84	292	5.84	293	5.82	<b><u>292</u></b>	<b><u>5.83</u></b>
648.exchange2_s	84	115	25.6	115	25.5	<b><u>115</u></b>	<b><u>25.6</u></b>	84	115	25.6	115	25.5	<b><u>115</u></b>	<b><u>25.6</u></b>
657.xz_s	84	239	25.8	240	25.7	<b><u>239</u></b>	<b><u>25.8</u></b>	168	<b><u>239</u></b>	<b><u>25.9</u></b>	237	26.1	239	25.8

SPECspeed®2017\_int\_base = **13.9**

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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.

cpupower set to performance mode  
cpupower frequency-set -r -g performance  
To enable Transparent Hugepages (THP) for all allocations,  
'echo always > /sys/kernel/mm/transparent\_hugepage/enabled' and  
'echo always > /sys/kernel/mm/transparent\_hugepage/defrag' run as root.



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## Environment Variables Notes

Environment variables set by runcpu before the start of the run:

```
GOMP_CPU_AFFINITY = "0-167"
LD_LIBRARY_PATH = "/home/cpu2017-1.1.9-amd-aocc400-znver4-A1.2/amd_speed_aocc400_znver4_A_lib/lib:"
LIBOMP_NUM_HIDDEN_HELPER_THREADS = "0"
MALLOC_CONF = "oversize_threshold:0,retain:true"
OMP_DYNAMIC = "false"
OMP_SCHEDULE = "static"
OMP_STACKSIZE = "128M"
OMP_THREAD_LIMIT = "168"
```

Environment variables set by runcpu during the 600.perlbench\_s peak run:

```
GOMP_CPU_AFFINITY = "15"
```

Environment variables set by runcpu during the 602.gcc\_s peak run:

```
GOMP_CPU_AFFINITY = "15"
```

Environment variables set by runcpu during the 605.mcf\_s peak run:

```
GOMP_CPU_AFFINITY = "15"
```

Environment variables set by runcpu during the 620.omnetpp\_s peak run:

```
GOMP_CPU_AFFINITY = "15"
```

Environment variables set by runcpu during the 623.xalancbmk\_s peak run:

```
GOMP_CPU_AFFINITY = "15"
```

Environment variables set by runcpu during the 625.x264\_s peak run:

```
GOMP_CPU_AFFINITY = "15"
```

Environment variables set by runcpu during the 631.deepsjeng\_s peak run:

```
GOMP_CPU_AFFINITY = "15"
```

Environment variables set by runcpu during the 657.xz\_s peak run:

```
GOMP_CPU_AFFINITY = "0-167"
LIBOMP_NUM_HIDDEN_HELPER_THREADS = "8"
```

## General Notes

Binaries were compiled on a system with 2x AMD EPYC 9174F CPU + 1.5TiB Memory using RHEL 8.6

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.

## Platform Notes

BIOS configuration:

Operating Mode set to Maximum Performance and then set it to Custom Mode  
NUMA Nodes per Socket set to NPS4

```
Sysinfo program /home/cpu2017-1.1.9-amd-aocc400-znver4-A1.2/bin/sysinfo
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
running on localhost Tue May 7 16:58:58 2024
```

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### Platform Notes (Continued)

SUT (System Under Test) info as seen by some common utilities.

#### Table of contents

- 1. uname -a
- 2. w
- 3. Username
- 4. ulimit -a
- 5. sysinfo process ancestry
- 6. /proc/cpuinfo
- 7. lscpu
- 8. numactl --hardware
- 9. /proc/meminfo
- 10. who -r
- 11. Systemd service manager version: systemd 249 (249.16+suse.171.gdad0071f15)
- 12. Failed units, from systemctl list-units --state=failed
- 13. Services, from systemctl list-unit-files
- 14. Linux kernel boot-time arguments, from /proc/cmdline
- 15. cpupower frequency-info
- 16. sysctl
- 17. /sys/kernel/mm/transparent\_hugepage
- 18. /sys/kernel/mm/transparent\_hugepage/khugepaged
- 19. OS release
- 20. Disk information
- 21. /sys/devices/virtual/dmi/id
- 22. dmidecode
- 23. BIOS

```
1. uname -a
Linux localhost 5.14.21-150500.53-default #1 SMP PREEMPT_DYNAMIC Wed May 10 07:56:26 UTC 2023 (b630043)
x86_64 x86_64 x86_64 GNU/Linux
```

```
2. w
16:58:58 up 7:27, 1 user, load average: 0.10, 0.03, 0.01
USER      TTY      FROM          LOGIN@   IDLE   JCPU   PCPU WHAT
root     tty1      -             09:33   10.00s 1.03s  0.05s /bin/bash ./amd_speed_aocc400_znver4_A1.sh
```

```
3. Username
From environment variable $USER: root
```

```
4. ulimit -a
core file size          (blocks, -c) unlimited
data seg size           (kbytes, -d) unlimited
scheduling priority     (-e) 0
file size               (blocks, -f) unlimited
pending signals         (-i) 1546337
max locked memory       (kbytes, -l) 2097152
max memory size         (kbytes, -m) unlimited
open files              (-n) 1024
pipe size               (512 bytes, -p) 8
POSIX message queues    (bytes, -q) 819200
real-time priority      (-r) 0
stack size              (kbytes, -s) unlimited
cpu time                (seconds, -t) unlimited
```

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### Platform Notes (Continued)

```
max user processes      (-u) 1546337
virtual memory          (kbytes, -v) unlimited
file locks              (-x) unlimited
```

```
-----
5. sysinfo process ancestry
/usr/lib/systemd/systemd --switched-root --system --deserialize 30
login -- root
-bash
/bin/bash ./run_SD535V3_genoa-X_1.03.sh
/bin/bash ./Run035-compliant-amd-speedint.sh
python3 ./run_amd_speed_aocc400_znver4_A1.py
/bin/bash ./amd_speed_aocc400_znver4_A1.sh
runcpu --config amd_speed_aocc400_znver4_A1.cfg --tune all --reportable --iterations 3 intspeerd
runcpu --configfile amd_speed_aocc400_znver4_A1.cfg --tune all --reportable --iterations 3 --nopower
--runmode speed --tune base:peak --size test:train:refspeed intspeerd --nopreenv --note-preenv --logfile
$SPEC/tmp/CPU2017.257/templogs/preenv.intspeerd.257.0.log --lognum 257.0 --from_runcpu 2
specperl $SPEC/bin/sysinfo
$SPEC = /home/cpu2017-1.1.9-amd-aocc400-znver4-A1.2
-----
```

```
-----
6. /proc/cpuinfo
model name      : AMD EPYC 9634 84-Core Processor
vendor_id      : AuthenticAMD
cpu family     : 25
model          : 17
stepping       : 1
microcode      : 0xa101144
bugs           : sysret_ss_attrs spectre_v1 spectre_v2 spec_store_bypass
TLB size      : 3584 4K pages
cpu cores     : 84
siblings      : 168
1 physical ids (chips)
168 processors (hardware threads)
physical id 0: core ids 0-6,8-14,16-22,24-30,32-38,40-46,48-54,56-62,64-70,72-78,80-86,88-94
physical id 0: apicids 0-13,16-29,32-45,48-61,64-77,80-93,96-109,112-125,128-141,144-157,160-173,176-189
Caution: /proc/cpuinfo data regarding chips, cores, and threads is not necessarily reliable, especially for
virtualized systems. Use the above data carefully.
-----
```

```
-----
7. lscpu

From lscpu from util-linux 2.37.4:
Architecture:          x86_64
CPU op-mode(s):        32-bit, 64-bit
Address sizes:         52 bits physical, 57 bits virtual
Byte Order:            Little Endian
CPU(s):                168
On-line CPU(s) list:   0-167
Vendor ID:             AuthenticAMD
Model name:            AMD EPYC 9634 84-Core Processor
CPU family:            25
Model:                 17
Thread(s) per core:    2
Core(s) per socket:    84
Socket(s):              1
Stepping:              1
Frequency boost:       enabled
CPU max MHz:           3700.1951
CPU min MHz:           1500.0000
-----
```

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### Platform Notes (Continued)

```

BogoMIPS:          4492.93
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 amd_lbr_v2 nopl nonstop_tsc cpuid extd_apicid
                  aperfmpperf rapl pni pclmulqdq monitor sse3 fma cx16 pcid sse4_1 sse4_2
                  x2apic 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 perfmon_v2 ibrs ibpb stibp
                  vmmcall fsgsbase bmi1 avx2 smep bmi2 erms invpcid cqm rdt_a avx512f
                  avx512dq rdseed adx smap avx512ifma clflushopt clwb avx512cd sha_ni
                  avx512bw avx512vl xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc
                  cqm_mbm_total cqm_mbm_local avx512_bf16 clzero irperf xsaveerptr rdpru
                  wbnoinvd amd_ppin cpcp arat npt lbrv svm_lock nrip_save tsc_scale
                  vmcb_clean flushbyasid decodeassists pausefilter pfthreshold avic
                  v_omsave_vmload vgif v_spec_ctrl avx512vbmi umip pku ospke avx512_vbmi2
                  gfni vaes vpclmulqdq avx512_vnni avx512_bitalg avx512_vpopcntdq la57 rdpid
                  overflow_recov succor smca fsrm flush_lld
Virtualization:   AMD-V
L1d cache:       2.6 MiB (84 instances)
L1i cache:       2.6 MiB (84 instances)
L2 cache:        84 MiB (84 instances)
L3 cache:        384 MiB (12 instances)
NUMA node(s):    4
NUMA node0 CPU(s): 0-20,84-104
NUMA node1 CPU(s): 21-41,105-125
NUMA node2 CPU(s): 42-62,126-146
NUMA node3 CPU(s): 63-83,147-167
Vulnerability Itlb multihit: Not affected
Vulnerability L1tf:       Not affected
Vulnerability Mds:        Not affected
Vulnerability Meltdown:   Not affected
Vulnerability Mmio stale data: Not affected
Vulnerability Retbleed:   Not affected
Vulnerability Spec store bypass: Mitigation; Speculative Store Bypass disabled via prctl and seccomp
Vulnerability Spectre v1: Mitigation; usercopy/swapgs barriers and __user pointer sanitization
Vulnerability Spectre v2: Mitigation; Retpolines, IBPB conditional, IBRS_FW, STIBP always-on, RSB
                          filling, PBRSE-eIBRS Not affected
Vulnerability Srbds:      Not affected
Vulnerability Tsx async abort: Not affected

```

```

From lscpu --cache:
NAME ONE-SIZE ALL-SIZE WAYS TYPE          LEVEL SETS PHY-LINE COHERENCY-SIZE
L1d   32K    2.6M    8 Data          1     64     1           64
L1i   32K    2.6M    8 Instruction    1     64     1           64
L2    1M     84M     8 Unified        2   2048     1           64
L3    32M   384M   16 Unified        3  32768     1           64

```

```

-----
8. numactl --hardware
NOTE: a numactl 'node' might or might not correspond to a physical chip.
available: 4 nodes (0-3)
node 0 cpus: 0-20,84-104
node 0 size: 96455 MB
node 0 free: 95902 MB
node 1 cpus: 21-41,105-125
node 1 size: 96757 MB
node 1 free: 96232 MB
node 2 cpus: 42-62,126-146
node 2 size: 96757 MB

```

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### Platform Notes (Continued)

```
node 2 free: 96040 MB
node 3 cpus: 63-83,147-167
node 3 size: 96643 MB
node 3 free: 95917 MB
node distances:
node 0 1 2 3
0: 10 20 20 20
1: 20 10 20 20
2: 20 20 10 20
3: 20 20 20 10
```

```
9. /proc/meminfo
MemTotal: 395892996 kB
```

```
10. who -r
run-level 3 May 7 09:31
```

```
11. Systemd service manager version: systemd 249 (249.16+suse.171.gdad0071f15)
Default Target Status
multi-user degraded
```

```
12. Failed units, from systemctl list-units --state=failed
UNIT LOAD ACTIVE SUB DESCRIPTION
* ntp_sync.service loaded failed failed ntp_sync.service
```

```
13. Services, from systemctl list-unit-files
STATE UNIT FILES
enabled YaST2-Firstboot YaST2-Second-Stage apparmor auditd cron getty@ irqbalance issue-generator
kbdsettings klog lvm2-monitor nscd postfix purge-kernels rollback rsyslog smartd sshd
systemd-pstore wicked wickedd-auto4 wickedd-dhcp4 wickedd-dhcp6 wickedd-nanny
enabled-runtime systemd-remount-fs
disabled autofsd autoyast-initscripts blk-availability boot-sysctl ca-certificates chrony-wait
chronyd console-getty cups cups-browsed debug-shell ebttables exchange-bmc-os-info
firewalld gpm grub2-once haveged haveged-switch-root hwloc-dump-hwdata ipmi ipmievd
issue-add-ssh-keys kexec-load lunmask man-db-create multipathd nfs nfs-blkmap rpcbind
rpmconfigcheck rsyncd serial-getty@ smartd_generate_opts snmpd snmptrapd
systemd-boot-check-no-failures systemd-network-generator systemd-sysext
systemd-time-wait-sync systemd-timesyncd
generated ntp_sync
indirect wickedd
```

```
14. Linux kernel boot-time arguments, from /proc/cmdline
BOOT_IMAGE=/boot/vmlinuz-5.14.21-150500.53-default
root=UUID=2b8d3d82-44aa-4750-bc54-9d507d1ea188
splash=silent
mitigations=auto
quiet
security=apparmor
```

```
15. cpupower frequency-info
analyzing CPU 0:
current policy: frequency should be within 1.50 GHz and 2.25 GHz.
The governor "performance" may decide which speed to use
```

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### Platform Notes (Continued)

within this range.

boost state support:

Supported: yes

Active: yes

-----  
16. sysctl

kernel.numa_balancing	1
kernel.randomize_va_space	0
vm.compaction_proactiveness	20
vm.dirty_background_bytes	0
vm.dirty_background_ratio	10
vm.dirty_bytes	0
vm.dirty_expire_centisecs	3000
vm.dirty_ratio	8
vm.dirty_writeback_centisecs	500
vm.dirtytime_expire_seconds	43200
vm.extfrag_threshold	500
vm.min_unmapped_ratio	1
vm.nr_hugepages	0
vm.nr_hugepages_mempolicy	0
vm.nr_overcommit_hugepages	0
vm.swappiness	1
vm.watermark_boost_factor	15000
vm.watermark_scale_factor	10
vm.zone_reclaim_mode	1

-----  
17. /sys/kernel/mm/transparent\_hugepage

defrag	[always]	defer	defer+madvise	madvise	never
enabled	[always]	madvise	never		
hpage_pmd_size	2097152				
shmem_enabled	always	within_size	advise	[never]	deny force

-----  
18. /sys/kernel/mm/transparent\_hugepage/khugepaged

alloc_sleep_millisecs	60000
defrag	1
max_ptes_none	511
max_ptes_shared	256
max_ptes_swap	64
pages_to_scan	4096
scan_sleep_millisecs	10000

-----  
19. OS release

```
From /etc/*-release /etc/*-version
os-release SUSE Linux Enterprise Server 15 SP5
```

-----  
20. Disk information

```
SPEC is set to: /home/cpu2017-1.1.9-amd-aocc400-znver4-A1.2
Filesystem      Type  Size  Used Avail Use% Mounted on
/dev/sda3       xfs   890G  28G  863G  4% /
```

-----  
21. /sys/devices/virtual/dmi/id

```
Vendor:      Lenovo
Product:     ThinkSystem SD535V3 MB
Product Family: ThinkSystem
```

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SPECspeed®2017\_int\_base = 13.9

SPECspeed®2017\_int\_peak = 14.1

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

**Test Date:** May-2024  
**Hardware Availability:** May-2024  
**Software Availability:** Jun-2023

### Platform Notes (Continued)

Serial: 1234567890

#### 22. dmidecode

Additional information from dmidecode 3.4 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 SK Hynix HMC88AE88A168N 32 GB 2 rank 4800  
4x SK Hynix HMC88AE88A173N 32 GB 2 rank 4800

#### 23. BIOS

(This section combines info from /sys/devices and dmidecode.)

BIOS Vendor: Lenovo  
BIOS Version: GPE103H-1.10  
BIOS Date: 03/12/2024  
BIOS Revision: 1.10  
Firmware Revision: 0.50

### 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 14.0.6 (CLANG: AOCC\_4.0.0-Build#434 2022\_10\_28) (based on LLVM Mirror.Version.14.0.6)  
Target: x86\_64-unknown-linux-gnu  
Thread model: posix  
InstalledDir: /opt/AMD/aocc/aocc-compiler-4.0.0/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 14.0.6 (CLANG: AOCC\_4.0.0-Build#434 2022\_10\_28) (based on LLVM Mirror.Version.14.0.6)  
Target: x86\_64-unknown-linux-gnu  
Thread model: posix  
InstalledDir: /opt/AMD/aocc/aocc-compiler-4.0.0/bin

Fortran | 648.exchange2\_s(base, peak)

AMD clang version 14.0.6 (CLANG: AOCC\_4.0.0-Build#434 2022\_10\_28) (based on LLVM Mirror.Version.14.0.6)  
Target: x86\_64-unknown-linux-gnu  
Thread model: posix  
InstalledDir: /opt/AMD/aocc/aocc-compiler-4.0.0/bin



# SPEC CPU®2017 Integer Speed Result

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## Base Compiler Invocation

C benchmarks:

clang

C++ benchmarks:

clang++

Fortran benchmarks:

flang

## Base Portability Flags

```
600.perlbench_s: -DSPEC_LINUX_X64 -DSPEC_LP64
602.gcc_s: -DSPEC_LP64
605.mcf_s: -DSPEC_LP64
620.omnetpp_s: -DSPEC_LP64
623.xalancbmk_s: -DSPEC_LINUX -DSPEC_LP64
625.x264_s: -DSPEC_LP64
631.deepsjeng_s: -DSPEC_LP64
641.leela_s: -DSPEC_LP64
648.exchange2_s: -DSPEC_LP64
657.xz_s: -DSPEC_LP64
```

## Base Optimization Flags

C benchmarks:

```
-m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-allow-multiple-definition -O3 -march=znver4 -fveclib=AMDLIBM
-ffast-math -fopenmp -flto -fstruct-layout=7
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-fremap-arrays -fstrip-mining -mllvm -reduce-array-computations=3
-DSPEC_OPENMP -zopt -fopenmp=libomp -lomp -lamdlibm -lflang
-lamdalloc
```

C++ benchmarks:

```
-m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -fopenmp -flto
-mllvm -unroll-threshold=100 -finline-aggressive
-mllvm -loop-unswitch-threshold=200000
-mllvm -reduce-array-computations=3 -DSPEC_OPENMP -zopt
-fvirtual-function-elimination -fvisibility=hidden -fopenmp=libomp
```

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## Base Optimization Flags (Continued)

C++ benchmarks (continued):

-lomp -lamdlibm -lflang -lamdalloc-ext

Fortran benchmarks:

-m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6  
-Wl,-mllvm -Wl,-reduce-array-computations=3  
-Wl,-mllvm -Wl,-inline-recursion=4 -Wl,-mllvm -Wl,-lsr-in-nested-loop  
-Wl,-mllvm -Wl,-enable-iv-split -O3 -march=znver4 -fveclib=AMDLIBM  
-ffast-math -fopenmp -flto -mllvm -optimize-strided-mem-cost  
-mllvm -unroll-aggressive -mllvm -unroll-threshold=150 -fopenmp=libomp  
-lomp -lamdlibm -lflang -lamdalloc

## Base Other Flags

C benchmarks:

-Wno-return-type -Wno-unused-command-line-argument

C++ benchmarks:

-Wno-unused-command-line-argument

Fortran benchmarks:

-Wno-unused-command-line-argument

## Peak Compiler Invocation

C benchmarks:

clang

C++ benchmarks:

clang++

Fortran benchmarks:

flang

## Peak Portability Flags

Same as Base Portability Flags



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**Test Sponsor:** Lenovo Global Technology

**Tested by:** Lenovo Global Technology

**Test Date:** May-2024

**Hardware Availability:** May-2024

**Software Availability:** Jun-2023

## Peak Optimization Flags

C benchmarks:

```
600.perlbench_s: -m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-allow-multiple-definition -Ofast -march=znver4
-fveclib=AMDLIBM -ffast-math -fopenmp -flto
-fstruct-layout=9 -mllvm -unroll-threshold=50
-freemap-arrays -fstrip-mining
-mllvm -inline-threshold=1000
-mllvm -reduce-array-computations=3 -DSPEC_OPENMP -zopt
-fopenmp=libomp -lomp -lamdlibm -lamdalloc -lflang
```

```
602.gcc_s: -m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-allow-multiple-definition -z muldefs -Ofast
-march=znver4 -fveclib=AMDLIBM -ffast-math -fopenmp
-flto -fstruct-layout=9 -mllvm -unroll-threshold=50
-freemap-arrays -fstrip-mining
-mllvm -inline-threshold=1000
-mllvm -reduce-array-computations=3 -DSPEC_OPENMP -zopt
-fopenmp=libomp -lomp -lamdlibm -lamdalloc -lflang
```

605.mcf\_s: Same as 600.perlbench\_s

625.x264\_s: Same as 600.perlbench\_s

657.xz\_s: Same as 600.perlbench\_s

C++ benchmarks:

```
620.omnetpp_s: -m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast
-march=znver4 -fveclib=AMDLIBM -ffast-math -fopenmp
-flto -finline-aggressive -mllvm -unroll-threshold=100
-mllvm -reduce-array-computations=3 -DSPEC_OPENMP -zopt
-fvirtual-function-elimination -fvisibility=hidden
-fopenmp=libomp -lomp -lamdlibm -lamdalloc-ext -lflang
```

```
623.xalancbmk_s: -m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-do-block-reorder=aggressive -Ofast
-march=znver4 -fveclib=AMDLIBM -ffast-math -fopenmp
-flto -finline-aggressive -mllvm -unroll-threshold=100
-mllvm -reduce-array-computations=3 -DSPEC_OPENMP -zopt
-mllvm -do-block-reorder=aggressive
-fvirtual-function-elimination -fvisibility=hidden
```

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## Peak Optimization Flags (Continued)

623.xalancbmk\_s (continued):

```
-fopenmp=libomp -lomp -lamdlibm -lamdalloc-ext -lflang
```

631.deepsjeng\_s: -m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6

```
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast
-march=znver4 -fveclib=AMDLIBM -ffast-math -fopenmp
-flto -finline-aggressive -mllvm -unroll-threshold=100
-mllvm -reduce-array-computations=3 -DSPEC_OPENMP -zopt
-fvirtual-function-elimination -fvisibility=hidden
-fopenmp=libomp -lomp -lamdlibm -lamdalloc -lflang
```

641.leela\_s: basepeak = yes

Fortran benchmarks:

648.exchange2\_s: basepeak = yes

## Peak Other Flags

C benchmarks:

```
-Wno-return-type -Wno-unused-command-line-argument
```

C++ benchmarks:

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

Fortran benchmarks:

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

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-Genoa-U.html>

<http://www.spec.org/cpu2017/flags/aocc400-flags.2023-09-13.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-Genoa-U.xml>

<http://www.spec.org/cpu2017/flags/aocc400-flags.2023-09-13.xml>

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