Lenovo Global Technology
ThinkSystem SR645 V3
(2.50 GHz, AMD EPYC 9224)

SPECrate®2017_int_base = 509
SPECrate®2017_int_peak = 532

Hardware
- **CPU Name:** AMD EPYC 9224
- **Max MHz:** 3700
- **Nominal:** 2500
- **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:** 1 MB I+D on chip per core
- **L3:** 64 MB I+D on chip per chip, 16 MB shared / 6 cores
- **Other:** None
- **Memory:** 768 GB (24 x 32 GB 2Rx8 PC5-4800B-R)
- **Storage:** 1 x 480 GB SATA SSD
- **Other:** None

Software
- **OS:** SUSE Linux Enterprise Server 15 SP4 (x86_64)
- **Kernel:** 5.14.21-150400.22-default
- **Compiler:** C/C++/Fortran: Version 4.0.0 of AOCC
- **Parallel:** No
- **Firmware:** Lenovo BIOS Version KAE105L 1.20 released Dec-2022
- **File System:** xfs
- **System State:** Run level 3 (multi-user)
- **Base Pointers:** 64-bit
- **Peak Pointers:** 32/64-bit
- **Other:** None
- **Power Management:** BIOS and OS set to prefer performance at the cost of additional power usage
## Lenovo Global Technology

**ThinkSystem SR645 V3**  
(2.50 GHz, AMD EPYC 9224)

### SPEC CPU®2017 Integer Rate Result

**Copyright 2017-2023 Standard Performance Evaluation Corporation**  
**Lenovo Global Technology**  
**Test Date:** Jan-2023  
**Hardware Availability:** Feb-2023  
**Software Availability:** Nov-2022

---

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

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### Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
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<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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<td>502.gcc_r</td>
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<td>520.omnetpp_r</td>
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<td>264</td>
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<td>523.xalancbmk_r</td>
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<td>555</td>
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<td>416</td>
<td>382</td>
<td>416</td>
<td>382</td>
<td>416</td>
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<td>548.exchange2_r</td>
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<td>207</td>
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<td>1220</td>
<td>205</td>
<td>1230</td>
<td>206</td>
<td>1220</td>
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<tr>
<td>557.xz_r</td>
<td>96</td>
<td>421</td>
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<td>421</td>
<td>246</td>
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<td>96</td>
<td>420</td>
<td>247</td>
<td>421</td>
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<td>421</td>
<td>246</td>
</tr>
</tbody>
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**SPECrate®2017_int_base = 509**  
**SPECrate®2017_int_peak = 532**

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.

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

**Lenovo Global Technology**

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<tr>
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<td>Test Sponsor: Lenovo Global Technology</td>
<td>Hardware Availability: Feb-2023</td>
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<tr>
<td>Tested by: Lenovo Global Technology</td>
<td>Software Availability: Nov-2022</td>
</tr>
</tbody>
</table>

---

**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-aocc400-genoa-B1b/amd_rate_aocc400_genoa_B_lib/
lib:/home/cpu2017-1.1.8-amd-aocc400-genoa-B1b/amd_rate_aocc400_genoa_B_l
ib/lib32:"
```

```
MALLOC_CONF = "retain:true"
```

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

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

---

**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/cpu2017-1.1.8-amd-aocc400-genoa-B1b/bin/sysinfo

Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acafc64d

running on localhost Thu Jan 19 19:41:49 2023

SUT (System Under Test) info as seen by some common utilities.
For more information on this section, see

---

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<table>
<thead>
<tr>
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**Platform Notes (Continued)**

From /proc/cpuinfo

```
model name : AMD EPYC 9224 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 3 4 5 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29
physical 1: cores 0 1 2 3 4 5 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29
```

From lscpu from util-linux 2.37.2:

```
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):                          96
On-line CPU(s) list:             0-95
Vendor ID:                       AuthenticAMD
Model name:                      AMD EPYC 9224 24-Core Processor
CPU family:                      25
Model:                           17
Thread(s) per core:              2
Core(s) per socket:              24
Socket(s):                       2
Stepping:                        1
Frequency boost:                 enabled
CPU max MHz:                     3706.0540
CPU min MHz:                     1500.0000
BogoMIPS:                        4992.23
```

<table>
<thead>
<tr>
<th>Flags:</th>
<th>fpu vme de pse tsc msr pae mce cx8 apic sep mtrr</th>
</tr>
</thead>
<tbody>
<tr>
<td>pge mca cmov pat pse36 clflush mmx fxsr sse sse2 ht syscall nx mmxext fxsr_opt</td>
<td></td>
</tr>
<tr>
<td>pdpe1gb rdtsc lp tol_rep_good nof dnonstop tsc cpuid extd_apicid</td>
<td></td>
</tr>
<tr>
<td>aperfmperf rapi pni pclmulqdq monitor ssse3 fma cx16 pcid sse4_1 sse4_2 x2apic movbe</td>
<td></td>
</tr>
<tr>
<td>popcnt aes xsave avx f16c rdrand lahf_lm cmp_legacy svm extapic cr8_legacy abm sse4a</td>
<td></td>
</tr>
<tr>
<td>misalignsse 3dnowprefetch osvw ibs skinit wdt tce topoext perfctr_core perfctr_nb</td>
<td></td>
</tr>
<tr>
<td>bpxext perfctr_llc mwaitx cbp cat_l3 cd_l3 invpcid_single hw_pstate ssbd mba ibrs</td>
<td></td>
</tr>
<tr>
<td>ibpb stibp vmmcall fsgsbse bml1 avx2 smep bml2 erms invpcid cmq rdt_a avx512f</td>
<td></td>
</tr>
<tr>
<td>avx512fd rdseed adx smap avx512ifma clflushopt clwb avx512cd sha ni avx512bw</td>
<td></td>
</tr>
<tr>
<td>avx512vl xsaveopt xsave xevtb1 xsaves cmq llc cmq_occup llc cmq_mbm_total</td>
<td></td>
</tr>
<tr>
<td>cmq_mbm_local avx512_bf16 clzero irperf xsaveerpr rdpru wboinvmd amd_ppin arat npt</td>
<td></td>
</tr>
<tr>
<td>lvbr svm_lock nrip_save tsc_scale vmbc_clean flushbyasid decodeaissits pausefilter</td>
<td></td>
</tr>
<tr>
<td>pthreshold avic v_vmsave_vmload vgif v_spec_ctrl avx512vbmi umip pkv ospe</td>
<td></td>
</tr>
<tr>
<td>avx512_vbmi2 gfni vaes vpclmulqdq avx512_vnni avx512_bitalg avx512_vpopcntdq la57</td>
<td></td>
</tr>
<tr>
<td>rdpid overflow_recov succor smca fsrm flush lids</td>
<td></td>
</tr>
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</table>

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Lenovo Global Technology
ThinkSystem SR645 V3
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<thead>
<tr>
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**Platform Notes (Continued)**

<table>
<thead>
<tr>
<th>Virtualization:</th>
<th>AMD-V</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1d cache:</td>
<td>1.5 MiB (48 instances)</td>
</tr>
<tr>
<td>L1i cache:</td>
<td>1.5 MiB (48 instances)</td>
</tr>
<tr>
<td>L2 cache:</td>
<td>48 MiB (48 instances)</td>
</tr>
<tr>
<td>L3 cache:</td>
<td>128 MiB (8 instances)</td>
</tr>
<tr>
<td>NUMA node(s):</td>
<td>8</td>
</tr>
<tr>
<td>NUMA node0 CPU(s):</td>
<td>0-5, 48-53</td>
</tr>
<tr>
<td>NUMA node1 CPU(s):</td>
<td>6-11, 54-59</td>
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<tr>
<td>NUMA node2 CPU(s):</td>
<td>12-17, 60-65</td>
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<td>NUMA node3 CPU(s):</td>
<td>18-23, 66-71</td>
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<td>NUMA node4 CPU(s):</td>
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<td>NUMA node5 CPU(s):</td>
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<td>NUMA node6 CPU(s):</td>
<td>36-41, 84-89</td>
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<td>NUMA node7 CPU(s):</td>
<td>42-47, 90-95</td>
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<tr>
<td>Vulnerability Itlb multihit:</td>
<td>Not affected</td>
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<tr>
<td>Vulnerability L1tf:</td>
<td>Not affected</td>
</tr>
<tr>
<td>Vulnerability Mds:</td>
<td>Not affected</td>
</tr>
<tr>
<td>Vulnerability Meltdown:</td>
<td>Not affected</td>
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<tr>
<td>Vulnerability Spec store bypass:</td>
<td>Mitigation; Speculative Store Bypass disabled via prctl and seccomp</td>
</tr>
<tr>
<td>Vulnerability Spectre v1:</td>
<td>Mitigation; usercopy/swapgs barriers and __user pointer sanitization</td>
</tr>
<tr>
<td>Vulnerability Spectre v2:</td>
<td>Mitigation; Retpolines, IBPB conditional, IBRS_FW, STIBP always-on, RSB filling</td>
</tr>
<tr>
<td>Vulnerability Srbds:</td>
<td>Not affected</td>
</tr>
<tr>
<td>Vulnerability Tsx async abort:</td>
<td>Not affected</td>
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From lscpu --cache:

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<tr>
<th>NAME</th>
<th>ONE-SIZE</th>
<th>ALL-SIZE</th>
<th>WAYS</th>
<th>TYPE</th>
<th>LEVEL</th>
<th>SETS</th>
<th>PHY-LINE</th>
<th>COHERENCY-SIZE</th>
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<tbody>
<tr>
<td>L1d</td>
<td>32K</td>
<td>1.5M</td>
<td>8</td>
<td>Data</td>
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<td>64</td>
<td>1</td>
<td>64</td>
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<tr>
<td>L1i</td>
<td>32K</td>
<td>1.5M</td>
<td>8</td>
<td>Instruction</td>
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<td>64</td>
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<td>64</td>
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<tr>
<td>L2</td>
<td>1M</td>
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<td>2</td>
<td>2048</td>
<td>1</td>
<td>64</td>
</tr>
<tr>
<td>L3</td>
<td>16M</td>
<td>128M</td>
<td>16</td>
<td>Unified</td>
<td>3</td>
<td>16384</td>
<td>1</td>
<td>64</td>
</tr>
</tbody>
</table>

From numactl --hardware

| WARNING: a numactl 'node' might or might not correspond to a physical chip.
| available: 8 nodes (0-7) |
| node 0 cpus: 0 1 2 3 4 5 48 49 50 51 52 53 |
| node 0 size: 96505 MB |
| node 0 free: 95287 MB |
| node 1 cpus: 6 7 8 9 10 11 54 55 56 57 58 59 |
| node 1 size: 96752 MB |
| node 1 free: 96420 MB |
| node 2 cpus: 12 13 14 15 16 17 60 61 62 63 64 65 |

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

node 2 size: 96752 MB
node 2 free: 96428 MB
node 3 cpus: 18 19 20 21 22 23 66 67 68 69 70 71
node 3 size: 96717 MB
node 3 free: 96236 MB
node 4 cpus: 24 25 26 27 28 29 72 73 74 75 76 77
node 4 size: 96752 MB
node 4 free: 96437 MB
node 5 cpus: 30 31 32 33 34 35 78 79 80 81 82 83
node 5 size: 96752 MB
node 5 free: 96452 MB
node 6 cpus: 36 37 38 39 40 41 84 85 86 87 88 89
node 6 size: 96752 MB
node 6 free: 96480 MB
node 7 cpus: 42 43 44 45 46 47 90 91 92 93 94 95
node 7 size: 96557 MB
node 7 free: 96226 MB
node distances:

```
node  0  1  2  3  4  5  6  7
0:   10 12 12 12 32 32 32 32
1:   12 10 12 12 32 32 32 32
2:   12 12 10 12 32 32 32 32
3:   12 12 12 10 32 32 32 32
4:   32 32 32 32 12 12 12 12
5:   32 32 32 32 12 12 12 12
6:   32 32 32 32 12 12 12 12
7:   32 32 32 32 12 12 12 12
```

From /proc/meminfo
- MemTotal: 792105848 kB
- HugePages_Total: 0
- Hugepagesize: 2048 kB

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

From /etc/*release* /etc/*version*
- NAME="SLES"
- VERSION="15-SP4"
- VERSION_ID="15.4"
- PRETTY_NAME="SUSE Linux Enterprise Server 15 SP4"
- ID="sles"
- ID_LIKE="suse"
- ANSI_COLOR="0;32"
- CPE_NAME="cpe:/o:suse:sles:15:sp4"

(Continued on next page)
Platform Notes (Continued)

uname -a:
   Linux localhost 5.14.21-150400.22-default #1 SMP PREEMPT_DYNAMIC Wed May 11 06:57:18
   UTC 2022 (49db222) 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 sanitation
CVE-2017-5715 (Spectre variant 2):
   Mitigation: Retpolines, 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 Jan 19 19:39

SPEC is set to: /home/cpu2017-1.1.8-amd-aocc400-genoa-B1b
From /sys/devices/virtual/dmi/id
   Vendor: Lenovo
   Product: ThinkSystem SR645 V3 MB,Genoa,DDR5,Oahu,1U
   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:
   7x SK Hynix HMCG88AEBRA115N 32 GB 2 rank 4800
   17x SK Hynix HMCG88AEBRA168N 32 GB 2 rank 4800

BIOS:
   BIOS Vendor: Lenovo
   BIOS Version: KAE105L-1.20
   BIOS Date: 12/29/2022
   BIOS Revision: 1.20

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CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Test Date: Jan-2023
Tested by: Lenovo Global Technology
Hardware Availability: Feb-2023
Software Availability: Nov-2022

Platform Notes (Continued)

Firmware Revision: 1.20
(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
| 502.gcc_r(peak) |
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on LLVM Mirror.Version.14.0.6)
Target: i386-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin

==============================================================================
| 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 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin

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(Continued on next page)
Lenovo Global Technology
ThinkSystem SR645 V3
(2.50 GHz, AMD EPYC 9224)

<table>
<thead>
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<th>SPECrate®2017_int_base = 509</th>
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<td>SPECrate®2017_int_peak = 532</td>
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CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Tested by: Lenovo Global Technology

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### Compiler Version Notes (Continued)

<table>
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C++ | 523.xalancbmk_r(peak)

AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on LLVM Mirror.Version.14.0.6)
Target: i386-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin

---

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

AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin

---

C++ | 523.xalancbmk_r(peak)

AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on LLVM Mirror.Version.14.0.6)
Target: i386-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin

---

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

AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin

---

Fortran | 548.exchange2_r(base, peak)

---

(Continued on next page)
Lenovo Global Technology
ThinkSystem SR645 V3
(2.50 GHz, AMD EPYC 9224)

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SPECrater®2017_int_base = 509
SPECrater®2017_int_peak = 532

Test Date: Jan-2023
Hardware Availability: Feb-2023
Software Availability: Nov-2022

Compiler Version Notes (Continued)
AMD clang version 14.0.6 (CLANG: AOCC_4.0.0-Build#389 2022_10_07) (based on LLVM Mirror.Version.14.0.6)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin

Base Compiler Invocation
C benchmarks:
clang

C++ benchmarks:
clang++

Fortran benchmarks:
flang

Base Portability Flags
500.perlbanch_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 -flto -Wl,-ml1vm -Wl,-align-all-nofallthru-blocks=6
-Wl,-ml1vm -Wl,-reduce-array-computations=3
-Wl,-ml1vm -Wl,-ldist-scalar-expand -fenable-aggressive-gather
-z muldefs -O3 -march=znver4 -fveclib=AMDLIBM -ffast-math
-fstruct-layout=7 -ml1vm -unroll-threshold=50
-ml1vm -inline-threshold=1000 -fremap-arrays -fstrip-mining
-ml1vm -reduce-array-computations=3 -zopt -lamdlibm -flang

(Continued on next page)
Lenovo Global Technology
ThinkSystem SR645 V3
(2.50 GHz, AMD EPYC 9224)

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

SPEC CPU®2017 Integer Rate Result
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Test Date: Jan-2023
Hardware Availability: Feb-2023
Software Availability: Nov-2022

Base Optimization Flags (Continued)

C benchmarks (continued):
- lamdalloc

C++ benchmarks:
- m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
- Wl,-mllvm -Wl,-reduce-array-computations=3 -z muldefs -O3
- march=znver4 -fveclib=AMDLIBM -ffast-math
- mllvm -unroll-threshold=100 -finline-aggressive
- mllvm -loop-unswitch-threshold=200000
- mllvm -reduce-array-computations=3 -zopt
- fvirtual-function-elimination -fvisibility=hidden -lamdlibm -lflang
- lamdalloc-ext

Fortran benchmarks:
- m64 -flto -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 -z muldefs -O3 -march=znver4
- fveclib=AMDLIBM -ffast-math -fepilog-vectorization-of- inductions
- mllvm -optimize-strided-mem-cost -floop-transform
- mllvm -unroll-aggressive -mllvm -unroll-threshold=500 -lamdlibm
- lflang -lamdalloc

Base Other Flags

C benchmarks:
-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++

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Peak Compiler Invocation (Continued)

Fortran benchmarks:
flang

Peak Portability Flags

500.perlbench_r: -DSPEC_LINUX_X64 -DSPEC_LP64
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: basepeak = yes
502.gcc_r: -m32 -flto -z muldefs -Ofast -march=znver4
-fveclib=AMDLIBM -ffast-math -fstruct-layout=7
-mlllvm -unroll-threshold=50 -fremap-arrays -fstrip-mining
-mlllvm -inline-threshold=1000
-mlllvm -reduce-array-computations=3 -zopt -fgnu89-inline
-lamdaloc

505.mcf_r: basepeak = yes
525.x264_r: basepeak = yes
557.xz_r: -m64 -flto -Wl,-align-all-nofallback-thr-blocks=6
-Wl,-mlllvm -Wl,-reduce-array-computations=3 -Ofast
-march=znver4 -fveclib=AMDLIBM -ffast-math
-fstruct-layout=7 -mlllvm -unroll-threshold=50
-fremap-arrays -fstrip-mining
-mlllvm -inline-threshold=1000
-mlllvm -reduce-array-computations=3 -zopt -lamdlibm
-llang -lamdaloc

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

C++ benchmarks:

520.omnetpp_r: basepeak = yes

523.xalancbmk_r: -m32 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
- Wl,-mllvm -Wl,-reduce-array-computations=3
- Wl,-mllvm -Wl,-do-block-reorder=aggressive
- fno-loop-reroll -Ofast -march=znver4 -fveclib=AMDLIBM
- fffast-math -finline-aggressive
- mllvm -unroll-threshold=100
- mllvm -reduce-array-computations=3 -zopt
- mllvm -do-block-reorder=aggressive
- fvirtual-function-elimination -fvisibility=hidden
- lamdalloc-ext

531.deepsjeng_r: basepeak = yes

541.leela_r: basepeak = yes

Fortran benchmarks:

-m64 -flto -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
- fffast-math -fepilog-vectorization-of-inductions
- mllvm -optimize-strided-mem-cost -floop-transform
- mllvm -unroll-aggressive -mllvm -unroll-threshold=500 -lamdlibm
- llflang -lamdalloc

Peak Other Flags

C benchmarks (except as noted below):

- Wno-unused-command-line-argument

502.gcc_r: -L/usr/lib32 -Wno-unused-command-line-argument
- L/home/work/cpu2017/v118/aocc4/b1/rate/amd_rate_aocc400_genoa_B_lib/lib32

C++ benchmarks (except as noted below):

- Wno-unused-command-line-argument

523.xalancbmk_r: -L/usr/lib32 -Wno-unused-command-line-argument
- L/home/work/cpu2017/v118/aocc4/b1/rate/amd_rate_aocc400_genoa_B_lib/lib32

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Peak Other Flags (Continued)

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-Q.html
http://www.spec.org/cpu2017/flags/aocc400-flags.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-Q.xml
http://www.spec.org/cpu2017/flags/aocc400-flags.xml

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For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

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