# Spec CPU®2017 Integer Rate Result

## Lenovo Global Technology

**ThinkSystem SR645**  
2.20 GHz, AMD EPYC 7773X

**CPU2017 License:** 9017  
**Test Date:** Feb-2022

**Test Sponsor:** Lenovo Global Technology  
**Hardware Availability:** May-2022

**Tested by:** Lenovo Global Technology  
**Software Availability:** Feb-2022

---

### SPECrate®2017

<table>
<thead>
<tr>
<th>SPECrate®2017 int_base = 828</th>
<th>SPECrate®2017 int_peak = 895</th>
</tr>
</thead>
</table>

---

### Hardware

- **CPU Name:** AMD EPYC 7773X  
  - **Max MHz:** 3500  
  - **Nominal:** 2200  
  - **Enabled:** 128 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 / 8 cores  
  - **Other:** None  
  - **Memory:** 2 TB (32 x 64 GB 2Rx4 PC4-3200AA-R)  
  - **Storage:** 1 x 960 GB SATA SSD  
  - **Other:** None

### Software

- **OS:** Red Hat Enterprise Linux release 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 D8E125A 2.40 released Jan-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 set to prefer performance at the cost of additional power usage

---

### SPECrate®2017 Integrate Results

<table>
<thead>
<tr>
<th>SPECrate®2017_int_base</th>
<th>SPECrate®2017_int_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>828</td>
<td>895</td>
</tr>
</tbody>
</table>

---

### SPECrate®2017 for Integer Workloads

- **500.perlbench_r:** 256  
  - **502.gcc_r:** 256  
  - **505.mcf_r:** 256  
  - **520.omnetpp_r:** 256  
  - **523.xalancbmk_r:** 256  
  - **525.x264_r:** 256  
  - **531.deepsjeng_r:** 256  
  - **541.leela_r:** 256  
  - **548.exchange2_r:** 256  
  - **557.xz_r:** 256  

---

### SPECrate®2017 Integrate Graph

![SPECrate®2017 Integrate Graph](image-url)
Lenovo Global Technology
ThinkSystem SR645
2.20 GHz, AMD EPYC 7773X

SPEC CPU®2017 Integer Rate Result

Copyright 2017-2022 Standard Performance Evaluation Corporation

Lenovo Global Technology

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

Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Copies</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>500.perlbench_r</td>
<td>256</td>
<td>617</td>
<td>660</td>
<td>619</td>
<td>658</td>
<td>620</td>
<td>658</td>
<td>256</td>
<td>617</td>
<td>661</td>
<td>617</td>
<td>661</td>
<td>618</td>
<td>659</td>
</tr>
<tr>
<td>502.gcc_r</td>
<td>256</td>
<td>530</td>
<td>685</td>
<td>530</td>
<td>684</td>
<td>530</td>
<td>684</td>
<td>256</td>
<td>415</td>
<td>874</td>
<td>416</td>
<td>870</td>
<td>414</td>
<td>875</td>
</tr>
<tr>
<td>505.mcf_r</td>
<td>256</td>
<td>441</td>
<td>938</td>
<td>445</td>
<td>931</td>
<td>444</td>
<td>933</td>
<td>256</td>
<td>375</td>
<td>1100</td>
<td>377</td>
<td>1100</td>
<td>374</td>
<td>1110</td>
</tr>
<tr>
<td>520.omnetpp_r</td>
<td>256</td>
<td>949</td>
<td>354</td>
<td>943</td>
<td>356</td>
<td>932</td>
<td>360</td>
<td>256</td>
<td>949</td>
<td>354</td>
<td>943</td>
<td>356</td>
<td>932</td>
<td>360</td>
</tr>
<tr>
<td>523.xalancbmk_r</td>
<td>256</td>
<td>317</td>
<td>852</td>
<td>314</td>
<td>860</td>
<td>314</td>
<td>861</td>
<td>256</td>
<td>219</td>
<td>1230</td>
<td>220</td>
<td>1230</td>
<td>219</td>
<td>1230</td>
</tr>
<tr>
<td>525.x264_r</td>
<td>256</td>
<td>255</td>
<td>1760</td>
<td>251</td>
<td>1780</td>
<td>252</td>
<td>1780</td>
<td>256</td>
<td>255</td>
<td>1760</td>
<td>251</td>
<td>1780</td>
<td>252</td>
<td>1780</td>
</tr>
<tr>
<td>531.deepsjeng_r</td>
<td>256</td>
<td>381</td>
<td>770</td>
<td>382</td>
<td>769</td>
<td>382</td>
<td>769</td>
<td>256</td>
<td>381</td>
<td>769</td>
<td>382</td>
<td>767</td>
<td>382</td>
<td>769</td>
</tr>
<tr>
<td>541.leela_r</td>
<td>256</td>
<td>506</td>
<td>838</td>
<td>512</td>
<td>828</td>
<td>509</td>
<td>833</td>
<td>256</td>
<td>509</td>
<td>833</td>
<td>505</td>
<td>840</td>
<td>508</td>
<td>834</td>
</tr>
<tr>
<td>548.exchange2_r</td>
<td>256</td>
<td>330</td>
<td>2030</td>
<td>330</td>
<td>2030</td>
<td>331</td>
<td>2030</td>
<td>256</td>
<td>330</td>
<td>2030</td>
<td>330</td>
<td>2030</td>
<td>330</td>
<td>2030</td>
</tr>
<tr>
<td>557.xz_r</td>
<td>256</td>
<td>543</td>
<td>509</td>
<td>545</td>
<td>508</td>
<td>544</td>
<td>509</td>
<td>256</td>
<td>543</td>
<td>509</td>
<td>545</td>
<td>508</td>
<td>544</td>
<td>509</td>
</tr>
</tbody>
</table>

SPECrate®2017_int_base = 828
SPECrate®2017_int_peak = 895

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)
Lenovo Global Technology
ThinkSystem SR645
2.20 GHz, AMD EPYC 7773X

SPECrate®2017_int_base = 828
SPECrate®2017_int_peak = 895

Operating System Notes (Continued)

echo 0 > /proc/sys/kernel/numa_balancing
cpupower set to performance mode
cpupower frequency-set -r -g performance
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.xalancbmk_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.

templalloc: configured and built with GCC v4.8.2 in RHEL 7.4 (No options specified)
templalloc 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 and then set it to Custom Mode
NUMA Nodes per Socket set to NPS4

(Continued on next page)
Lenovo Global Technology
ThinkSystem SR645
2.20 GHz, AMD EPYC 7773X

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

SPECrate®2017_int_base = 828
SPECrate®2017_int_peak = 895

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

Platform Notes (Continued)

ACPI SRAT L3 Cache as NUMA Domain set to Enable
L2 Stream HW Prefetcher set to Disable
Memory interleaving set to Disabled
System date/time for this result was not updated to right time
and actual testing date can be referred to "spec.cpu2017.test_date"

Sysinfo program /home/cpu2017-1.1.8-amd-milanx-aocc320-A1/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16aacfc64d
running on localhost.localdomain Fri Jun 22 19:12:52 2018

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 7773X 64-Core Processor
  2 "physical id"s (chips)
  256 "processors"
cores, siblings (Caution: counting these is hw and system dependent. The following
excerpts from /proc/cpuinfo might not be reliable. Use with caution.)
  cpu cores : 64
  siblings : 128
  physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
  25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52
  53 54 55 56 57 58 59 60 61 62 63
  physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
  25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52
  53 54 55 56 57 58 59 60 61 62 63

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): 256
  On-line CPU(s) list: 0-255
  Thread(s) per core: 2
  Core(s) per socket: 64
  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 7773X 64-Core Processor
  BIOS Model name: AMD EPYC 7773X 64-Core Processor
  Stepping: 2
  CPU MHz: 2200.000

(Continued on next page)
Lenovo Global Technology
ThinkSystem SR645
2.20 GHz, AMD EPYC 7773X

SPEC CPU®2017 Integer Rate Result

SPECrare®2017_int_base = 828
SPECrare®2017_int_peak = 895

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

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

Platform Notes (Continued)

CPU max MHz: 3527.7339
CPU min MHz: 1500.0000
BogoMIPS: 4392.17
Virtualization: AMD-V
L1d cache: 32K
L1i cache: 32K
L2 cache: 512K
L3 cache: 98304K
NUMA node0 CPU(s): 0-7,128-135
NUMA node1 CPU(s): 8-15,136-143
NUMA node2 CPU(s): 16-23,144-151
NUMA node3 CPU(s): 24-31,152-159
NUMA node4 CPU(s): 32-39,160-167
NUMA node5 CPU(s): 40-47,168-175
NUMA node6 CPU(s): 48-55,176-183
NUMA node7 CPU(s): 56-63,184-191
NUMA node8 CPU(s): 64-71,192-199
NUMA node9 CPU(s): 72-79,200-207
NUMA node10 CPU(s): 80-87,208-215
NUMA node11 CPU(s): 88-95,216-223
NUMA node12 CPU(s): 96-103,224-231
NUMA node13 CPU(s): 104-111,232-239
NUMA node14 CPU(s): 112-119,240-247
NUMA node15 CPU(s): 120-127,248-255

Flags: fpu vme de pse tsc msr pae mce cmov
pat pse36 clflush mmx fxsr sse sse2 ht syscall nx mmxext fxsr_opt pdpe1gb rdtsscp lm
constant_tsc rep_good nolock popcnt tsc_deadline monotonic msr pae mce cx8
apei msr pae mce cx8

From numactl --hardware
WARNING: a numactl 'node' might or might not correspond to a physical chip.

(Continued on next page)
Lenovo Global Technology
ThinkSystem SR645
2.20 GHz, AMD EPYC 7773X

SPEC CPU®2017 Integer Rate Result

Copyright 2017-2022 Standard Performance Evaluation Corporation

SPECrater®2017_int_base = 828
SPECrater®2017_int_peak = 895

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

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

Platform Notes (Continued)

node 1 cpus: 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
node 1 size: 129018 MB
node 1 free: 128695 MB
node 2 cpus: 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39
node 2 size: 129019 MB
node 2 free: 128805 MB
node 3 cpus: 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55
node 3 size: 129019 MB
node 3 free: 128812 MB
node 4 cpus: 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79
node 4 size: 129020 MB
node 4 free: 128803 MB
node 5 cpus: 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95
node 5 size: 129020 MB
node 5 free: 128808 MB
node 6 cpus: 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118
node 6 size: 128983 MB
node 6 free: 128794 MB
node 7 cpus: 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134
node 7 size: 129016 MB
node 7 free: 128796 MB
node 8 cpus: 136 137 138 139 140 141 142 143 144 145 146 147 148 149 150
node 8 size: 129020 MB
node 8 free: 128779 MB
node 9 cpus: 152 153 154 155 156 157 158 159 160 161 162 163 164 165 166
node 9 size: 129019 MB
node 9 free: 128774 MB
node 10 cpus: 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182
node 10 size: 129017 MB
node 10 free: 128740 MB
node 11 cpus: 184 185 186 187 188 189 190 191 192 193 194 195 196 197 198
node 11 size: 129016 MB
node 11 free: 128794 MB
node 12 cpus: 199 200 201 202 203 204 205 206 207 208 209 210 211 212 213
node 12 size: 129020 MB
node 12 free: 128783 MB
node 13 cpus: 216 217 218 219 220 221 222 223 224 225 226 227 228 229 230
node 13 size: 129017 MB
node 13 free: 128983 MB
node 14 cpus: 232 233 234 235 236 237 238 239 240 241 242 243 244 245 246
node 14 size: 128983 MB
node 14 free: 128774 MB
node 15 cpus: 248 249 250 251 252 253 254 255 256 257 258 259 260 261 262
node 15 size: 129016 MB
node 15 free: 128796 MB
node distances:
node 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

(Continued on next page)
Lenovo Global Technology
ThinkSystem SR645
2.20 GHz, AMD EPYC 7773X

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

SPECrate®2017_int_base = 828
SPECrate®2017_int_peak = 895

Platform Notes (Continued)

From /proc/meminfo
MemTotal: 2113553152 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

/usr/bin/lsb_release -d
   Red Hat Enterprise Linux release 8.5 (Ootpa)

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

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

Copyright 2017-2022 Standard Performance Evaluation Corporation

Lenovo Global Technology
ThinkSystem SR645
2.20 GHz, AMD EPYC 7773X

SPECrate®2017_int_base = 828
SPECrate®2017_int_peak = 895

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

Platform Notes (Continued)

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/swaps barriers and __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): 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 Jun 22 19:12

SPEC is set to: /home/cpu2017-1.1.8-amd-milanx-aocc320-A1
Filesystem Type Size Used Avail Use% Mounted on
/dev/sdb4 xfs 819G 139G 680G 17% /home

From /sys/devices/virtual/dmi/id
Vendor: Lenovo
Product: ThinkSystem SR645 MB
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:
32x Samsung M393A8G40AB2-CWE 64 GB 2 rank 3200

BIOS:
BIOS Vendor: Lenovo
BIOS Version: D8E125A-2.40
BIOS Date: 01/12/2022
BIOS Revision: 2.40
Firmware Revision: 3.80

(End of data from sysinfo program)
Lenovo Global Technology
ThinkSystem SR645
2.20 GHz, AMD EPYC 7773X

SPECrates® 2017_int_base = 828
SPECrates® 2017_int_peak = 895

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

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

==============================================================================
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)
Target: i386-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.2.0/bin

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

(Continued on next page)
Lenovo Global Technology
ThinkSystem SR645
2.20 GHz, AMD EPYC 7773X

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

Compiler Version Notes (Continued)

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)

-----------------------------------------------
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++ | 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)

-----------------------------------------------
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
# SPEC CPU®2017 Integer Rate Result

## Lenovo Global Technology

**ThinkSystem SR645**  
2.20 GHz, AMD EPYC 7773X

<table>
<thead>
<tr>
<th>SPECrate®2017_int_base</th>
<th>828</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECrate®2017_int_peak</td>
<td>895</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CPU2017 License</th>
<th>Lenovo Global Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lenovo Global Technology</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test Sponsor</th>
<th>Lenovo Global Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lenovo Global Technology</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Tested by</th>
<th>Lenovo Global Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lenovo Global Technology</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Test Date</th>
<th>Feb-2022</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware Availability</td>
<td>May-2022</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Software Availability</th>
<th>Feb-2022</th>
</tr>
</thead>
</table>

## Base Compiler Invocation

**C benchmarks:**

```bash
clang
```

**C++ benchmarks:**

```bash
clang++
```

**Fortran benchmarks:**

```bash
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`

(Continued on next page)
### Lenovo Global Technology

**ThinkSystem SR645**  
2.20 GHz, AMD EPYC 7773X

<table>
<thead>
<tr>
<th>SPECrate®2017_int_base = 828</th>
<th>CPU2017 License: 9017</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Sponsor: Lenovo Global Technology</td>
<td>Test Sponsor: Lenovo Global Technology</td>
</tr>
<tr>
<td>Tested by: Lenovo Global Technology</td>
<td>Tested by: Lenovo Global Technology</td>
</tr>
<tr>
<td>SPECrate®2017_int_peak = 895</td>
<td>Test Date: Feb-2022</td>
</tr>
<tr>
<td>Hardware Availability: May-2022</td>
<td>Software Availability: Feb-2022</td>
</tr>
</tbody>
</table>

### Base Optimization Flags (Continued)

C++ benchmarks (continued):
- `-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`
- `-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 -lamlibm -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 -lamlibm -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`
**SPEC CPU®2017 Integer Rate Result**

Lenovo Global Technology
ThinkSystem SR645
2.20 GHz, AMD EPYC 7773X

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

**SPECrat®2017 int_base = 828**  
**SPECrat®2017 int_peak = 895**  
**Test Date:** Feb-2022  
**Hardware Availability:** May-2022  
**Software Availability:** Feb-2022

### 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: -m64 -Wl,-allow-multiple-definition -Wl,-mllvm -Wl,-enable-lcim-vrp -flio  
- 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  
- fvecclib=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-lcim-vrp  
- mllvm -reduce-array-computations=3 -lamdllibm -ljemalloc

- 502.gcc_r: -m32 -Wl,-allow-multiple-definition -Wl,-mllvm -Wl,-enable-lcim-vrp -flio  
- Wl,-mllvm -Wl,-function-specialize -Ofast -march=znver3  
- fvecclib=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-lcim-vrp  
- mllvm -reduce-array-computations=3 -fgnu89-inline  
- ljemalloc

- 505.mcf_r: -m64 -Wl,-allow-multiple-definition -Wl,-mllvm -Wl,-enable-lcim-vrp -flio  
- Wl,-mllvm -Wl,-function-specialize -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6

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

505.mcf_r (continued):
-\W1,-mllvm -W1,-reduce-array-computations=3 -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-lcm-vrp
-\mllvm -reduce-array-computations=3 -lamdlibm -ljemalloc
525.x264_r: basepeak = yes
557.xz_r: basepeak = yes

C++ benchmarks:

520.omnetpp_r: basepeak = yes

523.xalancbmk_r: -m32 -W1,-mllvm -W1,-do-block-reorder=aggressive -flto
-W1,-mllvm -W1,-function-specialize
-W1,-mllvm -W1,-align-all-nofallthru-blocks=6
-W1,-mllvm -W1,-reduce-array-computations=3 -Ofast
-\march=znver3 -fveclib=AMDLIBM -ffast-math
-\finline-aggressive -mllvm -unroll-threshold=100
-\flv-function-specialization -mllvm -enable-lcm-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: -m64 -std=c++98 -flto -W1,-mllvm -W1,-function-specialize
-W1,-mllvm -W1,-align-all-nofallthru-blocks=6
-W1,-mllvm -W1,-reduce-array-computations=3 -Ofast
-\march=znver3 -fveclib=AMDLIBM -ffast-math
-\finline-aggressive -mllvm -unroll-threshold=100
-\flv-function-specialization -mllvm -enable-lcm-vrp
-\mllvm -reroll-loops -mllvm -aggressive-loop-unswitch
-\mllvm -reduce-array-computations=3
-\mllvm -global-vectorize-slp=true
-\fvirtual-function-elimination -fvisibility=hidden
-\ljemalloc

541.leela_r: Same as 531.deepsjeng_r
Lenovo Global Technology
ThinkSystem SR645
2.20 GHz, AMD EPYC 7773X

**SPEC CPU®2017 Integer Rate Result**

**Lenovo Global Technology**
ThinkSystem SR645
2.20 GHz, AMD EPYC 7773X

**SPECrate®2017_int_base = 828**
**SPECrate®2017_int_peak = 895**

**CPU2017 License:** 9017  
**Test Date:** Feb-2022
**Test Sponsor:** Lenovo Global Technology
**Hardware Availability:** May-2022
**Tested by:** Lenovo Global Technology  
**Software Availability:** Feb-2022

### 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 `-Wl,-unroll-aggressive`  
- `-Wl,-mllvm` `-Wl,-unroll-threshold=500` `1` `-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

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-J.xml](http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-MilanX-J.xml)

SPEC CPU and SPECrate are registered trademarks of the Standard Performance Evaluation Corporation. All other brand and product names appearing in this result are trademarks or registered trademarks of their respective holders.

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

Tested with SPEC CPU®2017 v1.1.8 on 2018-06-22 07:12:52-0400.
Originally published on 2022-03-21.