# SPEC CPU®2017 Floating Point Rate Result

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## Lenovo Global Technology

ThinkSystem SR665 V3
2.40 GHz, AMD EPYC 9654

SPECrate®2017_fp_base = 1410
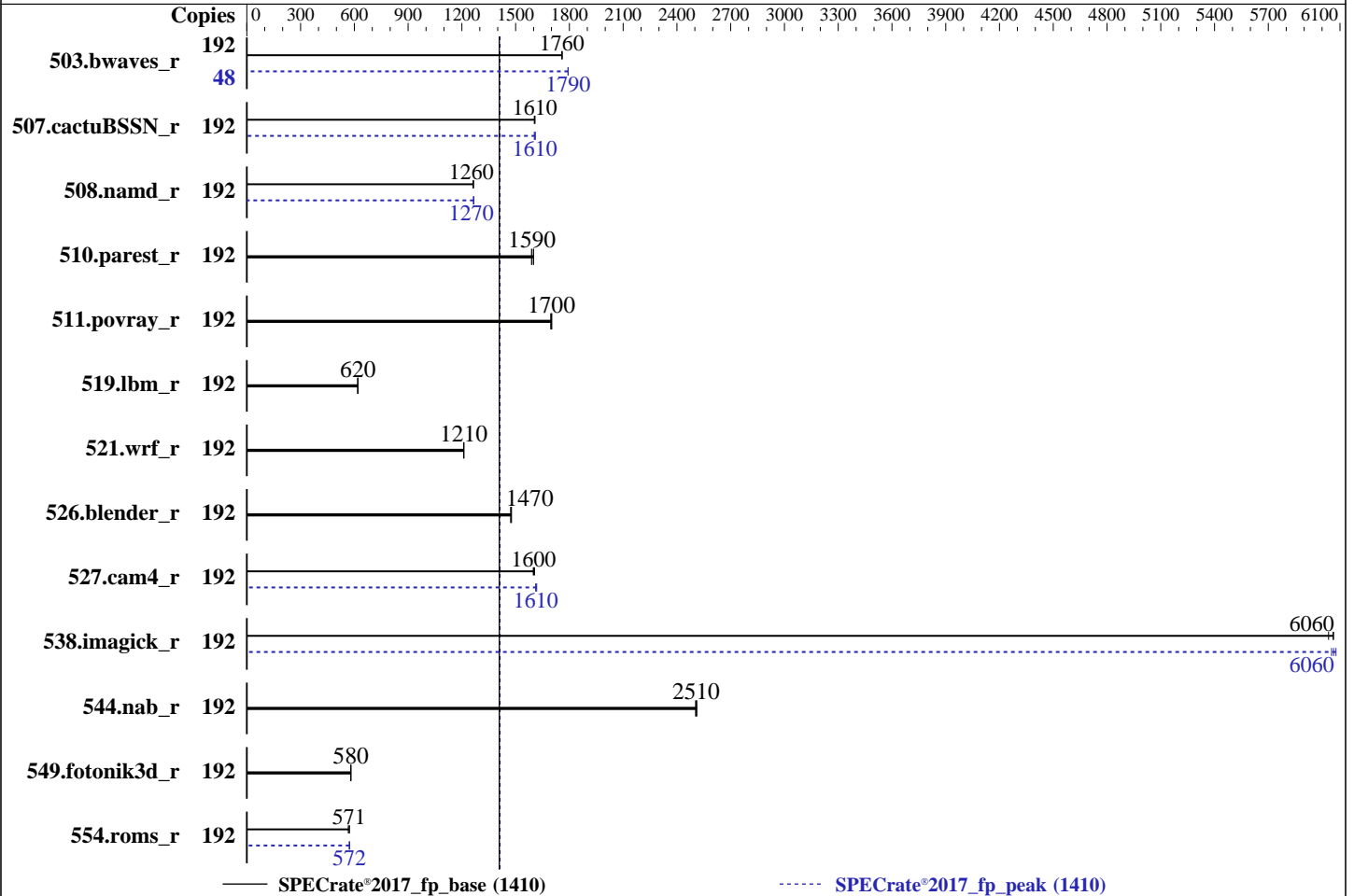
SPECrate®2017_fp_peak = 1410

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

**Test Date:** Oct-2022
**Hardware Availability:** Dec-2022
**Software Availability:** Nov-2022



| Benchmark | Copies | Base | Peak |
|---|---|---|---|
| 503.bwaves_r | 192 / 48 | 1760 | 1790 |
| 507.cactuBSSN_r | 192 | 1610 | 1610 |
| 508.namd_r | 192 | 1260 | 1270 |
| 510.parest_r | 192 | 1590 | |
| 511.povray_r | 192 | 1700 | |
| 519.lbm_r | 192 | 620 | |
| 521.wrf_r | 192 | 1210 | |
| 526.blender_r | 192 | 1470 | |
| 527.cam4_r | 192 | 1600 | 1610 |
| 538.imagick_r | 192 | 6060 | 6060 |
| 544.nab_r | 192 | 2510 | |
| 549.fotonik3d_r | 192 | 580 | |
| 554.roms_r | 192 | 571 | 572 |

—— SPECrate®2017_fp_base (1410)      ---- SPECrate®2017_fp_peak (1410)

## Hardware

CPU Name: AMD EPYC 9654
 Max MHz: 3700
 Nominal: 2400
Enabled: 192 cores, 2 chips
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: 384 MB I+D on chip per chip,
  32 MB shared / 8 cores
 Other: None
Memory: 768 GB (24 x 32 GB 2Rx4 PC5-4800B-R)
Storage: 1 x 480 GB SATA SSD
Other: None

## Software

OS: Red Hat Enterprise Linux 8.6 (Ootpa)
  Kernel 4.18.0-372.9.1.el8.x86_64
Compiler: C/C++/Fortran: Version 4.0.0 of AOCC
Parallel: No
Firmware: Lenovo BIOS Version KAE103A 1.10 released Sep-2022
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

Standard Performance Evaluation Corporation (info@spec.org)      https://www.spec.org/

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| | |
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## Results Table

| Benchmark | Base | | | | | | Peak | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Copies | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio | Copies | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio |
| 503.bwaves_r | 192 | **1095** | **1760** | 1094 | 1760 | 1095 | 1760 | 48 | 268 | 1790 | **268** | **1790** | 269 | 1790 |
| 507.cactuBSSN_r | 192 | 151 | 1610 | **151** | **1610** | 152 | 1600 | 192 | 152 | 1600 | 151 | 1610 | **151** | **1610** |
| 508.namd_r | 192 | 144 | 1260 | 144 | 1260 | **144** | **1260** | 192 | **144** | **1270** | 144 | 1270 | 144 | 1270 |
| 510.parest_r | 192 | 316 | 1590 | **316** | **1590** | 314 | 1600 | 192 | 316 | 1590 | **316** | **1590** | 314 | 1600 |
| 511.povray_r | 192 | **264** | **1700** | 263 | 1700 | 264 | 1700 | 192 | **264** | **1700** | 263 | 1700 | 264 | 1700 |
| 519.lbm_r | 192 | 328 | 618 | 326 | 621 | **326** | **620** | 192 | 328 | 618 | 326 | 621 | **326** | **620** |
| 521.wrf_r | 192 | **355** | **1210** | 355 | 1210 | 355 | 1210 | 192 | **355** | **1210** | 355 | 1210 | 355 | 1210 |
| 526.blender_r | 192 | 199 | 1470 | **198** | **1470** | 198 | 1480 | 192 | 199 | 1470 | **198** | **1470** | 198 | 1480 |
| 527.cam4_r | 192 | 209 | 1610 | 210 | 1600 | **210** | **1600** | 192 | **208** | **1610** | 208 | 1620 | 208 | 1610 |
| 538.imagick_r | 192 | 78.7 | 6060 | 79.1 | 6040 | **78.8** | **6060** | 192 | 78.6 | 6080 | 78.9 | 6050 | **78.7** | **6060** |
| 544.nab_r | 192 | 129 | 2510 | **129** | **2510** | 129 | 2500 | 192 | 129 | 2510 | **129** | **2510** | 129 | 2500 |
| 549.fotonik3d_r | 192 | 1289 | 581 | 1289 | 580 | **1289** | **580** | 192 | 1289 | 581 | 1289 | 580 | **1289** | **580** |
| 554.roms_r | 192 | 533 | 572 | 539 | 566 | **534** | **571** | 192 | **533** | **572** | 533 | 572 | 532 | 573 |

| SPECrate®2017_fp_base = | **1410** |
|---|---|
| SPECrate®2017_fp_peak = | **1410** |

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.
```

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## Operating System Notes (Continued)

```
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.

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.
```

## 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"
```

## 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
SMT Mode set to Disabled

 Sysinfo program /home/cpu2017-1.1.8-amd-aocc400-genoa-B1b/bin/sysinfo
 Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acafc64d
 running on localhost.localdomain Fri Oct 21 20:17:01 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
```

**(Continued on next page)**

## Lenovo Global Technology

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## Platform Notes (Continued)

```
From /proc/cpuinfo
   model name : AMD EPYC 9654 96-Core Processor
      2  "physical id"s (chips)
      192 "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 : 96
      siblings  : 96
      physical 0: cores 0 1 2 3 4 5 6 7 16 17 18 19 20 21 22 23 36 37 38 39 52 53 54 55
      64 65 66 67 68 69 70 71 80 81 82 83 84 85 86 87 96 97 98 99 100 101 102 103 112 113
      114 115 116 117 118 119 128 129 130 131 132 133 134 135 144 145 146 147 148 149 150
      151 160 161 162 163 164 165 166 167 176 177 178 179 180 181 182 183
      physical 1: cores 0 1 2 3 4 5 6 7 16 17 18 19 20 21 22 23 36 37 38 39 52 53 54 55
      64 65 66 67 68 69 70 71 80 81 82 83 84 85 86 87 96 97 98 99 100 101 102 103 112 113
      114 115 116 117 118 119 128 129 130 131 132 133 134 135 144 145 146 147 148 149 150
      151 160 161 162 163 164 165 166 167 176 177 178 179 180 181 182 183

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):              192
      On-line CPU(s) list: 0-191
      Thread(s) per core:  1
      Core(s) per socket:  96
      Socket(s):           2
      NUMA node(s):        8
      Vendor ID:           AuthenticAMD
      BIOS Vendor ID:      Advanced Micro Devices, Inc.
      CPU family:          25
      Model:               17
      Model name:          AMD EPYC 9654 96-Core Processor
      BIOS Model name:     AMD EPYC 9654 96-Core Processor
      Stepping:            1
      CPU MHz:             2400.000
      CPU max MHz:         3707.8120
      CPU min MHz:         1500.0000
      BogoMIPS:            4793.02
      Virtualization:      AMD-V
      L1d cache:           32K
      L1i cache:           32K
      L2 cache:            1024K
      L3 cache:            32768K
      NUMA node0 CPU(s):   0-23
      NUMA node1 CPU(s):   24-47
      NUMA node2 CPU(s):   48-71
```

**(Continued on next page)**

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## Platform Notes (Continued)

```
        NUMA node3 CPU(s):      72-95
        NUMA node4 CPU(s):      96-119
        NUMA node5 CPU(s):      120-143
        NUMA node6 CPU(s):      144-167
        NUMA node7 CPU(s):      168-191
        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 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 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 wbnoinvd amd_ppin arat npt lbrv svm_lock nrip_save tsc_scale vmcb_clean
    flushbyasid decodeassists pausefilter pfthreshold avic v_vmsave_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_l1d


 /proc/cpuinfo cache data
    cache size : 1024 KB


 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 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
   node 0 size: 96378 MB
   node 0 free: 95940 MB
   node 1 cpus: 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
   node 1 size: 96754 MB
   node 1 free: 96417 MB
   node 2 cpus: 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71
   node 2 size: 96712 MB
   node 2 free: 96378 MB
   node 3 cpus: 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95
   node 3 size: 96754 MB
   node 3 free: 96396 MB
   node 4 cpus: 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114
   115 116 117 118 119
   node 4 size: 96754 MB
   node 4 free: 96187 MB
   node 5 cpus: 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137
   138 139 140 141 142 143
   node 5 size: 96685 MB
   node 5 free: 96344 MB
   node 6 cpus: 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161
```

**(Continued on next page)**

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## Platform Notes (Continued)

```
   162 163 164 165 166 167
   node 6 size: 96754 MB
   node 6 free: 96417 MB
   node 7 cpus: 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185
   186 187 188 189 190 191
   node 7 size: 96754 MB
   node 7 free: 96420 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  10  12  12  12
     5:  32  32  32  32  12  10  12  12
     6:  32  32  32  32  12  12  10  12
     7:  32  32  32  32  12  12  12  10

 From /proc/meminfo
    MemTotal:       792111308 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="8.6 (Ootpa)"
       ID="rhel"
       ID_LIKE="fedora"
       VERSION_ID="8.6"
       PLATFORM_ID="platform:el8"
       PRETTY_NAME="Red Hat Enterprise Linux 8.6 (Ootpa)"
       ANSI_COLOR="0;31"
    redhat-release: Red Hat Enterprise Linux release 8.6 (Ootpa)
    system-release: Red Hat Enterprise Linux release 8.6 (Ootpa)
    system-release-cpe: cpe:/o:redhat:enterprise_linux:8::baseos

 uname -a:
    Linux localhost.localdomain 4.18.0-372.9.1.el8.x86_64 #1 SMP Fri Apr 15 22:12:19 EDT
    2022 x86_64 x86_64 x86_64 GNU/Linux
```

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### Platform Notes (Continued)

```
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
                                              sanitization
CVE-2017-5715 (Spectre variant 2):            Mitigation: Retpolines, IBPB:
                                              conditional, IBRS_FW, STIBP:
                                              disabled, RSB filling
CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
CVE-2019-11135 (TSX Asynchronous Abort):      Not affected

run-level 3 Oct 21 20:12

SPEC is set to: /home/cpu2017-1.1.8-amd-aocc400-genoa-B1b
   Filesystem      Type   Size  Used Avail Use% Mounted on
   /dev/sda4       xfs    373G  113G  260G  31% /home

From /sys/devices/virtual/dmi/id
   Vendor:          Lenovo
   Product:         ThinkSystem SR665 V3 MB,Genoa,Kauai,DDR5,Kauai,2U
   Product Family:  ThinkSystem
   Serial:          1234567890

Additional information from dmidecode 3.3 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:
      6x SK Hynix HMCG88AEBRA115N 32 GB 2 rank 4800
      18x SK Hynix HMCG88AEBRA168N 32 GB 2 rank 4800

BIOS:
   BIOS Vendor:      Lenovo
   BIOS Version:     KAE103A-1.10
   BIOS Date:        09/26/2022
   BIOS Revision:    1.10
   Firmware Revision: 1.0

(End of data from sysinfo program)
```

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## Compiler Version Notes

```
==============================================================================
C                    | 519.lbm_r(base, peak) 538.imagick_r(base, peak)
                     | 544.nab_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++                  | 508.namd_r(base, peak) 510.parest_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++, C               | 511.povray_r(base, peak) 526.blender_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
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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++, C, Fortran | 507.cactuBSSN_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
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
```

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## Compiler Version Notes (Continued)

```
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-4.0-3206-389/bin
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          | 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak)
                 | 554.roms_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, C       | 521.wrf_r(base, peak) 527.cam4_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
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

**(Continued on next page)**

Standard Performance Evaluation Corporation (info@spec.org)    https://www.spec.org/

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| | | | |
|---|---|---|---|
| **CPU2017 License:** 9017 | | **Test Date:** | Oct-2022 |
| **Test Sponsor:** | Lenovo Global Technology | **Hardware Availability:** | Dec-2022 |
| **Tested by:** | Lenovo Global Technology | **Software Availability:** | Nov-2022 |

## Base Compiler Invocation (Continued)

Benchmarks using both Fortran and C:
```
flang clang
```

Benchmarks using both C and C++:
```
clang++ clang
```

Benchmarks using Fortran, C, and C++:
```
clang++ clang flang
```

## Base Portability Flags

503.bwaves_r: `-DSPEC_LP64`
507.cactuBSSN_r: `-DSPEC_LP64`
508.namd_r: `-DSPEC_LP64`
510.parest_r: `-DSPEC_LP64`
511.povray_r: `-DSPEC_LP64`
519.lbm_r: `-DSPEC_LP64`
521.wrf_r: `-DSPEC_CASE_FLAG -Mbyteswapio -DSPEC_LP64`
526.blender_r: `-funsigned-char -DSPEC_LP64`
527.cam4_r: `-DSPEC_CASE_FLAG -DSPEC_LP64`
538.imagick_r: `-DSPEC_LP64`
544.nab_r: `-DSPEC_LP64`
549.fotonik3d_r: `-DSPEC_LP64`
554.roms_r: `-DSPEC_LP64`

## Base Optimization Flags

C benchmarks:
```
-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-ldist-scalar-expand -fenable-aggressive-gather -O3
-march=znver4 -fveclib=AMDLIBM -ffast-math -fstruct-layout=7
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-fremap-arrays -fstrip-mining -mllvm -reduce-array-computations=3
-zopt -lamdlibm -lamdalloc -lflang
```

C++ benchmarks:
```
-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -mllvm -unroll-threshold=100
-finline-aggressive -mllvm -loop-unswitch-threshold=200000
```

**(Continued on next page)**

## Lenovo Global Technology

SPECrate®2017_fp_base = 1410

ThinkSystem SR665 V3
2.40 GHz, AMD EPYC 9654

SPECrate®2017_fp_peak = 1410

| | | | |
|---|---|---|---|
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# Base Optimization Flags (Continued)

C++ benchmarks (continued):
```
-mllvm -reduce-array-computations=3 -zopt -lamdlibm -lamdalloc
-lflang
```

Fortran benchmarks:
```
-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-enable-X86-prefetching -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -Kieee -Mrecursive -funroll-loops
-mllvm -lsr-in-nested-loop -mllvm -reduce-array-computations=3
-fepilog-vectorization-of-inductions -zopt -lamdlibm -lamdalloc
-lflang
```

Benchmarks using both Fortran and C:
```
-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-enable-X86-prefetching -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -fstruct-layout=7
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-fremap-arrays -fstrip-mining -mllvm -reduce-array-computations=3
-zopt -Kieee -Mrecursive -funroll-loops -mllvm -lsr-in-nested-loop
-fepilog-vectorization-of-inductions -lamdlibm -lamdalloc -lflang
```

Benchmarks using both C and C++:
```
-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -fstruct-layout=7
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-fremap-arrays -fstrip-mining -mllvm -reduce-array-computations=3
-zopt -mllvm -unroll-threshold=100 -finline-aggressive
-mllvm -loop-unswitch-threshold=200000 -lamdlibm -lamdalloc -lflang
```

Benchmarks using Fortran, C, and C++:
```
-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -fstruct-layout=7
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-fremap-arrays -fstrip-mining -mllvm -reduce-array-computations=3
-zopt -mllvm -unroll-threshold=100 -finline-aggressive
-mllvm -loop-unswitch-threshold=200000 -Kieee -Mrecursive
-funroll-loops -mllvm -lsr-in-nested-loop
-fepilog-vectorization-of-inductions -lamdlibm -lamdalloc -lflang
```

# SPEC CPU®2017 Floating Point Rate Result

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## Lenovo Global Technology

ThinkSystem SR665 V3
2.40 GHz, AMD EPYC 9654

SPECrate®2017_fp_base = 1410

SPECrate®2017_fp_peak = 1410

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**Tested by:** Lenovo Global Technology

**Test Date:** Oct-2022
**Hardware Availability:** Dec-2022
**Software Availability:** Nov-2022

# Base Other Flags

C benchmarks:
`-Wno-unused-command-line-argument`

C++ benchmarks:
`-Wno-unused-command-line-argument`

Fortran benchmarks:
`-Wno-unused-command-line-argument`

Benchmarks using both Fortran and C:
`-Wno-unused-command-line-argument`

Benchmarks using both C and C++:
`-Wno-unused-command-line-argument`

Benchmarks using Fortran, C, and C++:
`-Wno-unused-command-line-argument`

# Peak Compiler Invocation

C benchmarks:
`clang`

C++ benchmarks:
`clang++`

Fortran benchmarks:
`flang`

Benchmarks using both Fortran and C:
`flang clang`

Benchmarks using both C and C++:
`clang++ clang`

Benchmarks using Fortran, C, and C++:
`clang++ clang flang`

# Peak Portability Flags

`Same as Base Portability Flags`

Standard Performance Evaluation Corporation (info@spec.org)          https://www.spec.org/

## Lenovo Global Technology

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**Tested by:** Lenovo Global Technology

**Test Date:** Oct-2022

**Hardware Availability:** Dec-2022

**Software Availability:** Nov-2022

# Peak Optimization Flags

C benchmarks:

519.lbm_r: basepeak = yes

538.imagick_r: `-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6 -Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast -march=znver4 -fveclib=AMDLIBM -ffast-math -fstruct-layout=7 -mllvm -unroll-threshold=50 -fremap-arrays -fstrip-mining -mllvm -inline-threshold=1000 -mllvm -reduce-array-computations=3 -zopt -lamdlibm -lamdalloc`

544.nab_r: basepeak = yes

C++ benchmarks:

508.namd_r: `-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6 -Wl,-mllvm -Wl,-reduce-array-computations=3 -Wl,-mllvm -Wl,-x86-use-vzeroupper=false -Ofast -march=znver4 -fveclib=AMDLIBM -ffast-math -finline-aggressive -mllvm -unroll-threshold=100 -mllvm -reduce-array-computations=3 -zopt -lamdlibm -lamdalloc`

510.parest_r: basepeak = yes

Fortran benchmarks:

503.bwaves_r: `-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6 -Wl,-mllvm -Wl,-reduce-array-computations=3 -Wl,-mllvm -Wl,-enable-X86-prefetching -Ofast -march=znver4 -fveclib=AMDLIBM -ffast-math -Mrecursive -mllvm -reduce-array-computations=3 -fepilog-vectorization-of-inductions -zopt -lamdlibm -lamdalloc -lflang`

549.fotonik3d_r: basepeak = yes

554.roms_r: `Same as 503.bwaves_r`

Benchmarks using both Fortran and C:

521.wrf_r: basepeak = yes

**(Continued on next page)**

## Lenovo Global Technology

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**Tested by:** Lenovo Global Technology

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**Software Availability:** Nov-2022

# Peak Optimization Flags (Continued)

```
527.cam4_r: -m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-enable-X86-prefetching -O3 -march=znver4
-fveclib=AMDLIBM -ffast-math -fstruct-layout=7
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-fremap-arrays -mllvm -reduce-array-computations=3 -zopt
-Kieee -Mrecursive -funroll-loops
-mllvm -lsr-in-nested-loop
-fepilog-vectorization-of-inductions -lamdlibm -lamdalloc
-lflang
```

Benchmarks using both C and C++:

```
511.povray_r: basepeak = yes
```

```
526.blender_r: basepeak = yes
```

Benchmarks using Fortran, C, and C++:
```
-m64 -flto -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -Ofast -march=znver4
-fveclib=AMDLIBM -ffast-math -fstruct-layout=7
-mllvm -unroll-threshold=50 -fremap-arrays -fstrip-mining
-mllvm -inline-threshold=1000 -mllvm -reduce-array-computations=3 -zopt
-mllvm -unroll-threshold=100 -mllvm -loop-unswitch-threshold=200000
-finline-aggressive -faggressive-loop-transform -fvector-transform
-fscalar-transform -Mrecursive -fepilog-vectorization-of-inductions
-lamdlibm -lamdalloc -lflang
```

# Peak Other Flags

C benchmarks:
```
-Wno-unused-command-line-argument
```

C++ benchmarks:
```
-Wno-unused-command-line-argument
```

Fortran benchmarks:
```
-Wno-unused-command-line-argument
```

Benchmarks using both Fortran and C:
```
-Wno-unused-command-line-argument
```

## Lenovo Global Technology

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| | | | |
|---|---|---|---|
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# Peak Other Flags (Continued)

Benchmarks using both C and C++:
```
-Wno-unused-command-line-argument
```

Benchmarks using Fortran, C, and C++:
```
-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/aocc400-flags.html
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-Genoa-N.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/aocc400-flags.xml
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-Genoa-N.xml

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

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