SPEC CPU®2017 Floating Point Rate Result

Copyright 2017-2023 Standard Performance Evaluation Corporation

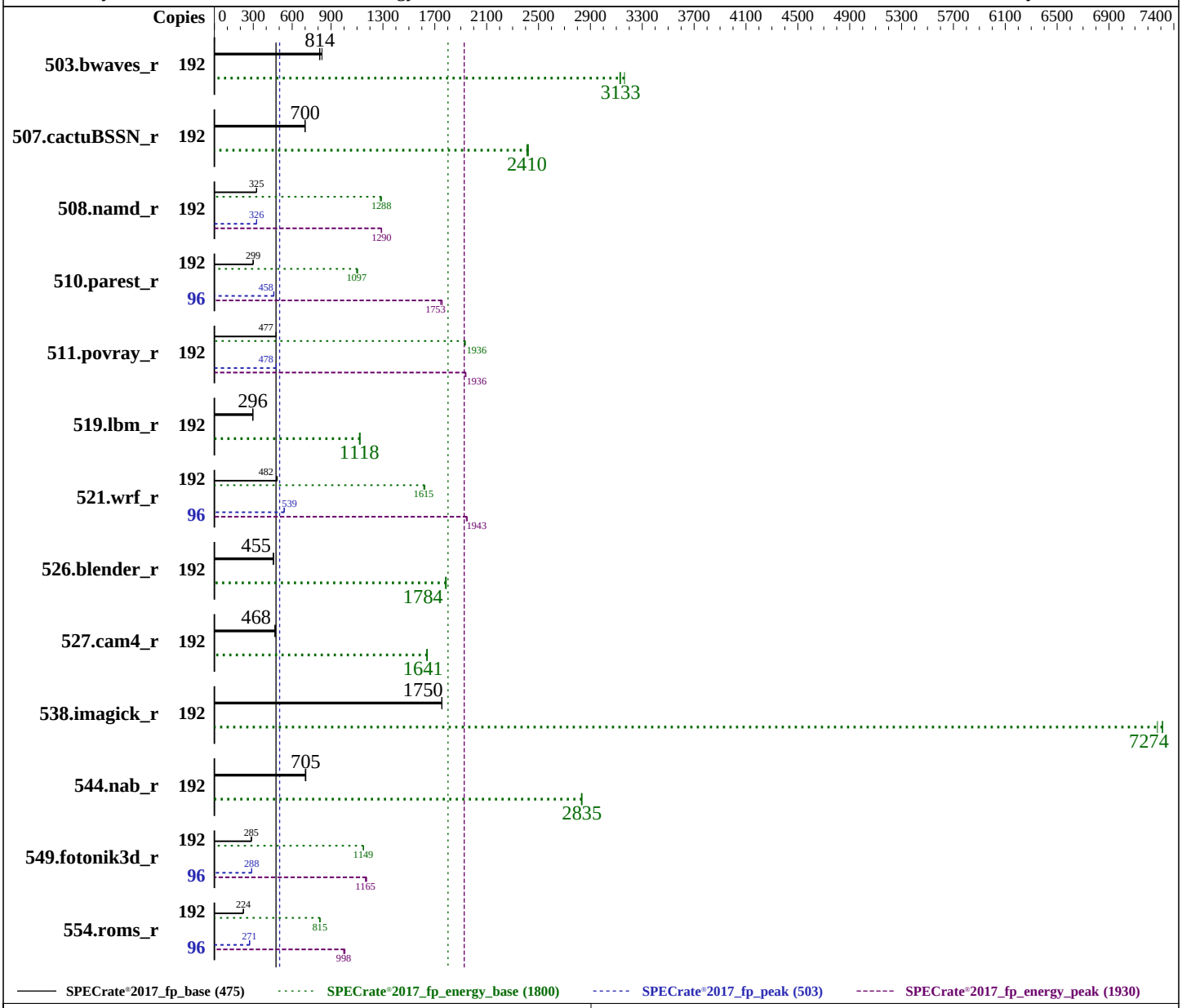
Lenovo Global Technology

ThinkSystem SR655 V3
2.40 GHz, AMD EPYC 9654

SPECrate®2017_fp_base =	475
SPECrate®2017_fp_energy_base =	1800
SPECrate®2017_fp_peak =	503
SPECrate®2017_fp_energy_peak =	1930

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

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



Hardware

CPU Name: AMD EPYC 9654
Max MHz: 3700
Nominal: 2400
Enabled: 96 cores, 1 chip, 2 threads/core
Orderable: 1 chip

(Continued on next page)

Software

OS: Red Hat Enterprise Linux 9.0 (Plow)
Kernel 5.14.0-70.22.1.el9_0.x86_64
Compiler: C/C++/Fortran: Version 4.0.0 of AOCC
Parallel: No
Firmware: Lenovo BIOS Version KAE105L 1.20 released Dec-2022

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Hardware (Continued)

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: 384 GB (12 x 32 GB 2Rx8 PC5-4800B-R)
Storage: 1 x 480 GB SATA SSD
Other: None

Software (Continued)

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 balance power and performance

Power

Max. Power (W): 338.9
Idle Power (W): 86.91
Min. Temperature (C): 21.31
Elevation (m): 43
Line Standard: 220 V / 50 Hz / 1 phase / 3 wires
Provisioning: Line-powered

Power Settings

Management FW: Version 1.30 of KAX311A
Memory Mode: Normal

Power-Relevant Hardware

Power Supply: 1 x 1800 W (non-redundant)
Details: 4P57A78359
Backplane: 8 x 2.5-inch HDD back plane
Other Storage: None
Storage Model #s: 4XB7A17107
NICs Installed: 1 x ThinkSystem Ethernet 4-port Adaptor @ 1 Gb
NICs Enabled (FW/OS): 4 / 1
NICs Connected/Speed: 1 @ 1 Gb
Other HW Model #s: 6 x Performance fans

Power Analyzer

Power Analyzer: WIN:9888
Hardware Vendor: YOKOGAWA, Inc.
Model: YokogawaWT310E
Serial Number: C3UG05013E
Input Connection: Default
Metrology Institute: CNAS
Calibration By: GRG METROLOGY & TEST (BEIJING) CO., LTD.
Calibration Label: J202210116758A-0007
Calibration Date: 19-Oct-2022
PTDaemon® Version: 1.9.2 (3976349f; 2020-12-08)
Setup Description: Connected to PSU1
Current Ranges Used: 5A
Voltage Range Used: 300V

Temperature Meter

Temperature Meter: WIN:9889
Hardware Vendor: Digi International, Inc.
Model: DigiWATCHPORT_H
Serial Number: W63390099
Input Connection: USB
PTDaemon Version: 1.9.2 (3976349f; 2020-12-08)
Setup Description: 50 mm in front of SUT main intake

Base Results Table

Benchmark	Copies	Seconds	Ratio	Energy (kJ)	Energy Ratio	Average Power	Maximum Power	Seconds	Ratio	Energy (kJ)	Energy Ratio	Average Power	Maximum Power	Seconds	Ratio	Energy (kJ)	Energy Ratio	Average Power	Maximum Power
503.bwaves_r	192	2321	830	663	3160	286	292	2373	811	671	3130	283	292	**2365**	**814**	**670**	**3130**	**283**	**292**

Table continues on next page. Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

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Test Date: Jan-2023
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Base Results Table (Continued)

Benchmark	Copies	Seconds	Ratio	Energy (kJ)	Energy Ratio	Average Power	Maximum Power	Seconds	Ratio	Energy (kJ)	Energy Ratio	Average Power	Maximum Power	Seconds	Ratio	Energy (kJ)	Energy Ratio	Average Power	Maximum Power
507.cactuBSSN_r	192	**347**	**700**	**111**	**2410**	**319**	**323**	347	700	110	2420	318	321	348	699	111	2420	318	322
508.namd_r	192	561	325	155	1280	277	286	560	326	155	1290	276	285	**561**	**325**	**154**	**1290**	**275**	**285**
510.parest_r	192	**1680**	**299**	**498**	**1100**	**297**	**322**	1685	298	496	1100	294	319	1673	300	495	1100	296	320
511.povray_r	192	940	477	252	1930	268	271	943	476	252	1930	267	270	**941**	**477**	**251**	**1940**	**267**	**270**
519.lbm_r	192	**683**	**296**	**206**	**1120**	**301**	**307**	681	297	205	1120	300	306	683	296	205	1120	300	307
521.wrf_r	192	887	485	290	1620	327	339	896	480	289	1620	323	335	**893**	**482**	**291**	**1610**	**326**	**336**
526.blender_r	192	**643**	**455**	**177**	**1780**	**276**	**308**	643	454	178	1780	276	305	641	456	177	1790	276	304
527.cam4_r	192	**718**	**468**	**223**	**1640**	**310**	**339**	719	467	223	1640	311	338	716	469	223	1640	311	338
538.imagick_r	192	**272**	**1750**	**71.1**	**7270**	**261**	**302**	272	1760	70.7	7310	260	304	272	1750	70.7	7310	260	301
544.nab_r	192	458	705	124	2830	270	288	**459**	**705**	**124**	**2840**	**269**	**287**	461	701	124	2830	268	286
549.fotonik3d_r	192	**2625**	**285**	**725**	**1150**	**276**	**282**	2616	286	725	1150	277	282	2626	285	725	1150	276	282
554.roms_r	192	**1364**	**224**	**413**	**815**	**303**	**317**	1366	223	414	813	303	315	1361	224	413	815	303	315

SPECrate®2017_fp_base = 475

SPECrate®2017_fp_energy_base = 1800

Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

Peak Results Table

Benchmark	Copies	Seconds	Ratio	Energy (kJ)	Energy Ratio	Average Power	Maximum Power	Seconds	Ratio	Energy (kJ)	Energy Ratio	Average Power	Maximum Power	Seconds	Ratio	Energy (kJ)	Energy Ratio	Average Power	Maximum Power
503.bwaves_r	192	2321	830	663	3160	286	292	2373	811	671	3130	283	292	**2365**	**814**	**670**	**3130**	**283**	**292**
507.cactuBSSN_r	192	**347**	**700**	**111**	**2410**	**319**	**323**	347	700	110	2420	318	321	348	699	111	2420	318	322
508.namd_r	192	560	326	154	1290	276	301	**560**	**326**	**154**	**1290**	**275**	**284**	559	326	154	1290	276	286
510.parest_r	96	549	458	157	1750	285	319	**548**	**458**	**156**	**1750**	**284**	**318**	546	460	155	1760	285	318
511.povray_r	192	941	476	251	1940	267	271	**938**	**478**	**251**	**1940**	**268**	**271**	938	478	251	1940	267	270
519.lbm_r	192	**683**	**296**	**206**	**1120**	**301**	**307**	681	297	205	1120	300	306	683	296	205	1120	300	307
521.wrf_r	96	400	538	120	1950	301	307	399	539	120	1950	302	309	**399**	**539**	**121**	**1940**	**303**	**309**
526.blender_r	192	**643**	**455**	**177**	**1780**	**276**	**308**	643	454	178	1780	276	305	641	456	177	1790	276	304
527.cam4_r	192	**718**	**468**	**223**	**1640**	**310**	**339**	719	467	223	1640	311	338	716	469	223	1640	311	338
538.imagick_r	192	**272**	**1750**	**71.1**	**7270**	**261**	**302**	272	1760	70.7	7310	260	304	272	1750	70.7	7310	260	301
544.nab_r	192	458	705	124	2830	270	288	**459**	**705**	**124**	**2840**	**269**	**287**	461	701	124	2830	268	286
549.fotonik3d_r	96	1299	288	355	1170	273	277	**1299**	**288**	**358**	**1170**	**275**	**279**	1302	287	356	1170	274	278
554.roms_r	96	565	270	168	1000	298	305	559	273	167	1010	299	304	**564**	**271**	**169**	**998**	**299**	**305**

SPECrate®2017_fp_peak = 503

SPECrate®2017_fp_energy_peak = 1930

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.

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 Custom Mode
Core Performance Boost set to Disabled
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.localdomain Tue Jan 24 10:20:51 2023

 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 9654 96-Core Processor
       1  "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  : 192
       physical 0: cores 0 1 2 3 4 5 6 7 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 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81
       82 83 84 85 86 87 88 89 90 91 92 93 94 95

 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):                          192
      On-line CPU(s) list:             0-191
      Vendor ID:                       AuthenticAMD
      BIOS Vendor ID:                  Advanced Micro Devices, Inc.
      Model name:                      AMD EPYC 9654 96-Core Processor
      BIOS Model name:                 AMD EPYC 9654 96-Core Processor
      CPU family:                      25
      Model:                           17
      Thread(s) per core:              2
      Core(s) per socket:              96
      Socket(s):                       1
      Stepping:                        1
      Frequency boost:                 disabled
      CPU max MHz:                     3707.8120
```

(Continued on next page)

Platform Notes (Continued)

```
      CPU min MHz:                     1500.0000
      BogoMIPS:                        4793.04
      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 rapl 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 rdpru 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
      Virtualization:                  AMD-V
      L1d cache:                       3 MiB (96 instances)
      L1i cache:                       3 MiB (96 instances)
      L2 cache:                        96 MiB (96 instances)
      L3 cache:                        384 MiB (12 instances)
      NUMA node(s):                    4
      NUMA node0 CPU(s):               0-23,96-119
      NUMA node1 CPU(s):               24-47,120-143
      NUMA node2 CPU(s):               48-71,144-167
      NUMA node3 CPU(s):               72-95,168-191
      Vulnerability Itlb multihit:     Not affected
      Vulnerability L1tf:              Not affected
      Vulnerability Mds:               Not affected
      Vulnerability Meltdown:          Not affected
      Vulnerability Spec store bypass: Mitigation; Speculative Store Bypass disabled via
      prctl
      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
      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       3M    8 Data            1    64        1             64
      L1i       32K       3M    8 Instruction     1    64        1             64
      L2         1M      96M    8 Unified         2  2048        1             64
```

(Continued on next page)

Platform Notes (Continued)

```
      L3        32M     384M   16 Unified         3 32768        1             64

 /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: 4 nodes (0-3)
   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 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 0 size: 96558 MB
   node 0 free: 95270 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
   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 1 size: 96741 MB
   node 1 free: 95675 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
   144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161 162 163 164 165
   166 167
   node 2 size: 96741 MB
   node 2 free: 95591 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
   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 3 size: 96636 MB
   node 3 free: 95482 MB
   node distances:
   node   0   1   2   3
     0:  10  12  12  12
     1:  12  10  12  12
     2:  12  12  10  12
     3:  12  12  12  10

 From /proc/meminfo
    MemTotal:       395957248 kB
    HugePages_Total:       0
    Hugepagesize:       2048 kB

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

 From /etc/*release* /etc/*version*
    os-release:
       NAME="Red Hat Enterprise Linux"
```

(Continued on next page)

Platform Notes (Continued)

```
      VERSION="9.0 (Plow)"
      ID="rhel"
      ID_LIKE="fedora"
      VERSION_ID="9.0"
      PLATFORM_ID="platform:el9"
      PRETTY_NAME="Red Hat Enterprise Linux 9.0 (Plow)"
      ANSI_COLOR="0;31"
   redhat-release: Red Hat Enterprise Linux release 9.0 (Plow)
   system-release: Red Hat Enterprise Linux release 9.0 (Plow)
   system-release-cpe: cpe:/o:redhat:enterprise_linux:9::baseos

uname -a:
   Linux localhost.localdomain 5.14.0-70.22.1.el9_0.x86_64 #1 SMP PREEMPT Tue Aug 2
   10:02:12 EDT 2022 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
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:
                                                       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 23 09:59

SPEC is set to: /home/cpu2017-1.1.8-amd-aocc400-genoa-B1b
   Filesystem     Type  Size  Used Avail Use% Mounted on
   /dev/sda4      xfs   372G   18G  354G   5% /home

From /sys/devices/virtual/dmi/id
    Vendor:          Lenovo
    Product:         ThinkSystem SR655V3
    Product Family: ThinkSystem
    Serial:          1234567890

Additional information from dmidecode 3.3 follows.  WARNING: Use caution when you
```

(Continued on next page)

Platform Notes (Continued)

```
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
    6x 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
   Firmware Revision: 1.30

(End of data from sysinfo program)
```

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)
```

(Continued on next page)

Compiler Version Notes (Continued)

```
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
------------------------------------------------------------------------------

==============================================================================
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
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
```

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Compiler Version Notes (Continued)

```
  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`

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`

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Base Portability Flags (Continued)

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
-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
```

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Base Optimization Flags (Continued)

Benchmarks using both Fortran and C (continued):
-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

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

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Base 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`

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`

Peak Optimization Flags

C benchmarks:

519.lbm_r: `basepeak = yes`

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Peak Optimization Flags (Continued)

538.imagick_r: `basepeak = yes`

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: `-m64 -flto -Wl,-mllvm -Wl,-suppress-fmas -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`

Fortran benchmarks:

503.bwaves_r: `basepeak = yes`

549.fotonik3d_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 -Kieee -Mrecursive -mllvm -reduce-array-computations=3 -fepilog-vectorization-of-inductions -fvector-transform -fscalar-transform -lamdlibm -lamdalloc -lflang`

554.roms_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`

Benchmarks using both Fortran and C:

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Peak Optimization Flags (Continued)

521.wrf_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
-fstruct-layout=7 -mllvm -unroll-threshold=50
-fremap-arrays -fstrip-mining
-mllvm -inline-threshold=1000
-mllvm -reduce-array-computations=3 -zopt -Mrecursive
-fepilog-vectorization-of-inductions -lamdlibm -lamdalloc
-lflang

527.cam4_r: basepeak = yes

Benchmarks using both C and C++:

511.povray_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 -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
-mllvm -unroll-threshold=100 -finline-aggressive
-mllvm -loop-unswitch-threshold=200000 -lamdlibm
-lamdalloc

526.blender_r: basepeak = yes

Benchmarks using Fortran, C, and C++:

507.cactuBSSN_r: basepeak = yes

Peak Other Flags

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

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

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

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Peak Other Flags (Continued)

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`

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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