SPEC CPU®2017 Floating Point Rate Result

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Cisco Systems

Cisco UCS C245 M6 (AMD EPYC 7773X 64-Core)

$SPECrate^{®}2017\_fp\_base = 717$

$SPECrate^{®}2017\_fp\_peak = 747$

CPU2017 License: 9019
Test Sponsor: Cisco Systems
Tested by: Cisco Systems

Test Date: Feb-2022
Hardware Availability: Mar-2022
Software Availability: Dec-2021

Benchmark	Copies	base	peak
503.bwaves_r	256	800	
507.cactuBSSN_r	256	785	
508.namd_r	256	605	607
510.parest_r	256	1010	
511.povray_r	256	914	
519.lbm_r	256 / 128	192	193
521.wrf_r	256 / 128	628	843
526.blender_r	256	988	1000
527.cam4_r	256	886	888
538.imagick_r	256	3250	3310
544.nab_r	256	1280	
549.fotonik3d_r	256	266	
554.roms_r	256 / 64	320	391

SPECrate®2017_fp_base (717)   SPECrate®2017_fp_peak (747)

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 (16 x 128 GB 4Rx4 PC4-3200V-L)
Storage: 1 x 240 GB SSD SATA
Other: None

Software

OS: SUSE Linux Enterprise Server 15 SP2 (x86_64)
 kernel version
 5.3.18-22-default
Compiler: C/C++/Fortran: Version 3.2.0 of AOCC
Parallel: No
Firmware: Version 4.2.1.26 released Jan-2022
File System: btrfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: 64-bit
Other: jemalloc: jemalloc memory allocator library v5.1.0
Power Management: BIOS and OS set to prefer performance at the cost of additional power usage

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SPECrate®2017_fp_base = 717

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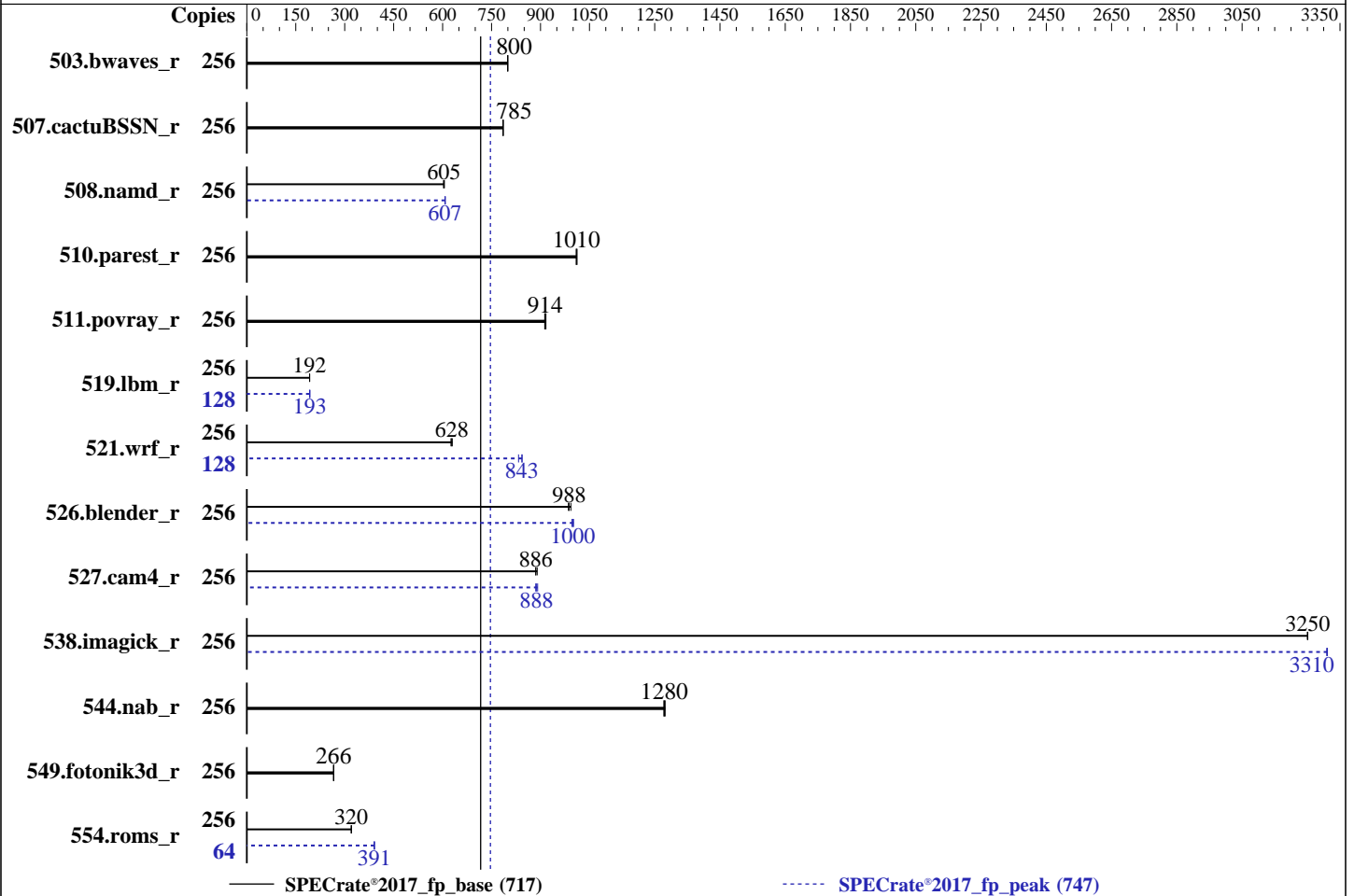
SPECrate®2017_fp_peak = 747

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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	256	**3211**	**800**	3211	799	3211	800	256	**3211**	**800**	3211	799	3211	800
507.cactuBSSN_r	256	**413**	**785**	413	785	413	786	256	**413**	**785**	413	785	413	786
508.namd_r	256	404	603	**402**	**605**	402	605	256	400	607	**400**	**607**	400	608
510.parest_r	256	662	1010	663	1010	**663**	**1010**	256	662	1010	663	1010	**663**	**1010**
511.povray_r	256	655	913	652	917	**654**	**914**	256	655	913	652	917	**654**	**914**
519.lbm_r	256	1402	192	**1402**	**192**	1403	192	128	700	193	**700**	**193**	700	193
521.wrf_r	256	917	626	**914**	**628**	911	630	128	**340**	**843**	340	844	344	833
526.blender_r	256	393	993	396	986	**395**	**988**	256	389	1000	391	997	**390**	**1000**
527.cam4_r	256	506	885	503	890	**505**	**886**	256	**504**	**888**	506	885	502	891
538.imagick_r	256	196	3250	196	3250	**196**	**3250**	256	192	3310	192	3310	**192**	**3310**
544.nab_r	256	**337**	**1280**	337	1280	336	1280	256	**337**	**1280**	337	1280	336	1280
549.fotonik3d_r	256	3749	266	**3750**	**266**	3750	266	256	3749	266	**3750**	**266**	3750	266
554.roms_r	256	1269	321	**1270**	**320**	1271	320	64	260	391	**260**	**391**	260	390
SPECrate®2017_fp_base =		**717**												
SPECrate®2017_fp_peak =		**747**												

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

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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/amd_rate_aocc320_milanx_A_lib/lib;/home/cpu2017/amd_rate_
     aocc320_milanx_A_lib/lib32:"
MALLOC_CONF = "retain:true"
```

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.

jemalloc: configured and built with GCC v4.8.2 in RHEL 7.4 (No options specified)
jemalloc 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
 SMT Mode set to Auto
 NUMA nodes per socket set to NPS4
 ACPI SRAT L3 Cache As NUMA Domain set to Enabled
 DRAM Scrub Time set to Disabled
 Determinism Slider set to Power
 Memory Interleaving set to Disabledd
 APBDIS set to 1

 Sysinfo program /home/cpu2017/bin/sysinfo
```

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Platform Notes (Continued)

```
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acafc64d
running on install Tue Feb  8 06:13:37 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

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 2.33.1:
      Architecture:        x86_64
      CPU op-mode(s):      32-bit, 64-bit
      Byte Order:          Little Endian
      Address sizes:       48 bits physical, 48 bits virtual
      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
      CPU family:          25
      Model:               1
      Model name:          AMD EPYC 7773X 64-Core Processor
      Stepping:            2
      CPU MHz:             1655.540
      CPU max MHz:         2200.0000
      CPU min MHz:         1500.0000
      BogoMIPS:            4391.69
      Virtualization:      AMD-V
      L1d cache:           32K
      L1i cache:           32K
      L2 cache:            512K
      L3 cache:            98304K
```

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Platform Notes (Continued)

```
        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 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 rdseed adx smap clflushopt clwb sha_ni
    xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local
    clzero irperf xsaveerptr wbnoinvd arat npt lbrv svm_lock nrip_save tsc_scale
    vmcb_clean flushbyasid decodeassists pausefilter pfthreshold v_vmsave_vmload vgif
    umip pku ospke vaes vpclmulqdq rdpid overflow_recov succor smca

 /proc/cpuinfo cache data
    cache size : 512 KB

 From numactl --hardware
 WARNING: a numactl 'node' might or might not correspond to a physical chip.
   available: 16 nodes (0-15)
   node 0 cpus: 0 1 2 3 4 5 6 7 128 129 130 131 132 133 134 135
   node 0 size: 128833 MB
   node 0 free: 128592 MB
   node 1 cpus: 8 9 10 11 12 13 14 15 136 137 138 139 140 141 142 143
   node 1 size: 129018 MB
   node 1 free: 128814 MB
   node 2 cpus: 16 17 18 19 20 21 22 23 144 145 146 147 148 149 150 151
   node 2 size: 129020 MB
   node 2 free: 128808 MB
   node 3 cpus: 24 25 26 27 28 29 30 31 152 153 154 155 156 157 158 159
   node 3 size: 129018 MB
   node 3 free: 128769 MB
```

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Platform Notes (Continued)

```
    node 4 cpus: 32 33 34 35 36 37 38 39 160 161 162 163 164 165 166 167
    node 4 size: 129020 MB
    node 4 free: 128831 MB
    node 5 cpus: 40 41 42 43 44 45 46 47 168 169 170 171 172 173 174 175
    node 5 size: 129018 MB
    node 5 free: 128812 MB
    node 6 cpus: 48 49 50 51 52 53 54 55 176 177 178 179 180 181 182 183
    node 6 size: 129020 MB
    node 6 free: 128818 MB
    node 7 cpus: 56 57 58 59 60 61 62 63 184 185 186 187 188 189 190 191
    node 7 size: 129006 MB
    node 7 free: 128806 MB
    node 8 cpus: 64 65 66 67 68 69 70 71 192 193 194 195 196 197 198 199
    node 8 size: 129020 MB
    node 8 free: 128819 MB
    node 9 cpus: 72 73 74 75 76 77 78 79 200 201 202 203 204 205 206 207
    node 9 size: 129018 MB
    node 9 free: 128819 MB
    node 10 cpus: 80 81 82 83 84 85 86 87 208 209 210 211 212 213 214 215
    node 10 size: 129020 MB
    node 10 free: 128821 MB
    node 11 cpus: 88 89 90 91 92 93 94 95 216 217 218 219 220 221 222 223
    node 11 size: 129018 MB
    node 11 free: 128762 MB
    node 12 cpus: 96 97 98 99 100 101 102 103 224 225 226 227 228 229 230 231
    node 12 size: 128986 MB
    node 12 free: 128769 MB
    node 13 cpus: 104 105 106 107 108 109 110 111 232 233 234 235 236 237 238 239
    node 13 size: 129018 MB
    node 13 free: 128824 MB
    node 14 cpus: 112 113 114 115 116 117 118 119 240 241 242 243 244 245 246 247
    node 14 size: 129020 MB
    node 14 free: 128827 MB
    node 15 cpus: 120 121 122 123 124 125 126 127 248 249 250 251 252 253 254 255
    node 15 size: 129016 MB
    node 15 free: 128817 MB
    node distances:
    node   0    1    2    3    4    5    6    7    8    9   10   11   12   13   14   15
      0:  10   11   12   12   12   12   12   12   32   32   32   32   32   32   32   32
      1:  11   10   12   12   12   12   12   12   32   32   32   32   32   32   32   32
      2:  12   12   10   11   12   12   12   12   32   32   32   32   32   32   32   32
      3:  12   12   11   10   12   12   12   12   32   32   32   32   32   32   32   32
      4:  12   12   12   12   10   11   12   12   32   32   32   32   32   32   32   32
      5:  12   12   12   12   11   10   12   12   32   32   32   32   32   32   32   32
      6:  12   12   12   12   12   12   10   11   32   32   32   32   32   32   32   32
      7:  12   12   12   12   12   12   11   10   32   32   32   32   32   32   32   32
      8:  32   32   32   32   32   32   32   32   10   11   12   12   12   12   12   12
```

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Platform Notes (Continued)

```
    9:  32  32  32  32  32  32  32  32  11  10  12  12  12  12  12  12
   10:  32  32  32  32  32  32  32  32  12  12  10  11  12  12  12  12
   11:  32  32  32  32  32  32  32  32  12  12  11  10  12  12  12  12
   12:  32  32  32  32  32  32  32  32  12  12  12  12  10  11  12  12
   13:  32  32  32  32  32  32  32  32  12  12  12  12  11  10  12  12
   14:  32  32  32  32  32  32  32  32  12  12  12  12  12  12  10  11
   15:  32  32  32  32  32  32  32  32  12  12  12  12  12  12  11  10

 From /proc/meminfo
    MemTotal:       2113608184 kB
    HugePages_Total:        0
    Hugepagesize:        2048 kB

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

 From /etc/*release* /etc/*version*
    os-release:
        NAME="SLES"
        VERSION="15-SP2"
        VERSION_ID="15.2"
        PRETTY_NAME="SUSE Linux Enterprise Server 15 SP2"
        ID="sles"
        ID_LIKE="suse"
        ANSI_COLOR="0;32"
        CPE_NAME="cpe:/o:suse:sles:15:sp2"

 uname -a:
    Linux install 5.3.18-22-default #1 SMP Wed Jun 3 12:16:43 UTC 2020 (720aeba) 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
                                                     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
```

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Platform Notes (Continued)

```
  CVE-2019-11135 (TSX Asynchronous Abort):                Not affected


  run-level 3 Feb 7 21:39


  SPEC is set to: /home/cpu2017
     Filesystem      Type   Size  Used Avail Use% Mounted on
     /dev/sda2       btrfs  222G   32G  189G  15% /home


  From /sys/devices/virtual/dmi/id
     Vendor:         Cisco Systems Inc
     Product:        UCSC-C245-M6SX
     Serial:         WZP25130VQH


  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:
      16x 0xCE00 M386AAG40AM3-CWE 128 GB 4 rank 3200
      16x Unknown Unknown


  BIOS:
     BIOS Vendor:       Cisco Systems, Inc.
     BIOS Version:      C245M6.4.2.1.26.0116222143
     BIOS Date:         01/16/2022
     BIOS Revision:     5.22


  (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 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++                | 508.namd_r(base, peak) 510.parest_r(base, peak)
------------------------------------------------------------------------------
AMD clang version 13.0.0 (CLANG: AOCC_3.2.0-Build#128 2021_11_12) (based on
```

(Continued on next page)

Cisco Systems

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Compiler Version Notes (Continued)

```
    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++, C           | 511.povray_r(base, peak) 526.blender_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
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++, C, Fortran | 507.cactuBSSN_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
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
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          | 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak)
                 | 554.roms_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)
```

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Compiler Version Notes (Continued)

```
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.2.0/bin
------------------------------------------------------------------------


==========================================================================
Fortran, C        | 521.wrf_r(base, peak) 527.cam4_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
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
--------------------------------------------------------------------------
```

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`

(Continued on next page)

Cisco Systems

Cisco UCS C245 M6 (AMD EPYC 7773X 64-Core)

SPECrate®2017_fp_base = 717

SPECrate®2017_fp_peak = 747

CPU2017 License: 9019
Test Sponsor: Cisco Systems
Tested by: Cisco Systems

Test Date: Feb-2022
Hardware Availability: Mar-2022
Software Availability: Dec-2021

Base Portability Flags (Continued)

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 -D__BOOL_DEFINED -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,-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 -fstruct-layout=5 -mllvm -unroll-threshold=50
-mllvm -inline-threshold=1000 -fremap-arrays
-mllvm -function-specialize -flv-function-specialization
-mllvm -enable-gvn-hoist -mllvm -global-vectorize-slp=true
-mllvm -enable-licm-vrp -mllvm -reduce-array-computations=3
-mllvm -enable-loop-fusion -z muldefs -lamdlibm -ljemalloc -lflang
```

C++ benchmarks:

```
-m64 -std=c++98 -mno-adx -mno-sse4a
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -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 -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 -lamdlibm -ljemalloc -lflang
```

Cisco Systems

Cisco UCS C245 M6 (AMD EPYC 7773X 64-Core)

SPECrate®2017_fp_base = 717

SPECrate®2017_fp_peak = 747

CPU2017 License: 9019
Test Sponsor: Cisco Systems
Tested by: Cisco Systems

Test Date: Feb-2022
Hardware Availability: Mar-2022
Software Availability: Dec-2021

Base Optimization Flags (Continued)

Fortran benchmarks:

```
-m64 -Wl,-mllvm -Wl,-enable-X86-prefetching
-Wl,-mllvm -Wl,-enable-licm-vrp -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 -Hz,1,0x1 -O3 -march=znver3
-fveclib=AMDLIBM -ffast-math -Kieee -Mrecursive
-mllvm -fuse-tile-inner-loop -funroll-loops
-mllvm -extra-vectorizer-passes -mllvm -lsr-in-nested-loop
-mllvm -enable-licm-vrp -mllvm -reduce-array-computations=3
-mllvm -global-vectorize-slp=true -mllvm -enable-loop-fusion
-mllvm -enable-loopinterchange -mllvm -compute-interchange-order
-z muldefs -lamdlibm -ljemalloc -lflang
```

Benchmarks using both Fortran and C:

```
-m64 -Wl,-mllvm -Wl,-enable-X86-prefetching
-Wl,-mllvm -Wl,-enable-licm-vrp -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 -fstruct-layout=5 -mllvm -unroll-threshold=50
-mllvm -inline-threshold=1000 -fremap-arrays
-mllvm -function-specialize -flv-function-specialization
-mllvm -enable-gvn-hoist -mllvm -global-vectorize-slp=true
-mllvm -enable-licm-vrp -mllvm -reduce-array-computations=3
-mllvm -enable-loop-fusion -Hz,1,0x1 -Kieee -Mrecursive
-mllvm -fuse-tile-inner-loop -funroll-loops
-mllvm -extra-vectorizer-passes -mllvm -lsr-in-nested-loop
-mllvm -enable-loopinterchange -mllvm -compute-interchange-order
-z muldefs -lamdlibm -ljemalloc -lflang
```

Benchmarks using both C and C++:

```
-m64 -std=c++98 -mno-adx -mno-sse4a
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -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 -fstruct-layout=5 -mllvm -unroll-threshold=50
-mllvm -inline-threshold=1000 -fremap-arrays
-mllvm -function-specialize -flv-function-specialization
-mllvm -enable-gvn-hoist -mllvm -global-vectorize-slp=true
-mllvm -enable-licm-vrp -mllvm -reduce-array-computations=3
-mllvm -enable-loop-fusion -mllvm -enable-partial-unswitch
```

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Cisco Systems

Cisco UCS C245 M6 (AMD EPYC 7773X 64-Core)

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Test Date: Feb-2022
Hardware Availability: Mar-2022
Software Availability: Dec-2021

Base Optimization Flags (Continued)

Benchmarks using both C and C++ (continued):
```
-mllvm -unroll-threshold=100 -finline-aggressive
-mllvm -loop-unswitch-threshold=200000 -mllvm -reroll-loops
-mllvm -aggressive-loop-unswitch -mllvm -extra-vectorizer-passes
-mllvm -convert-pow-exp-to-int=false -z muldefs -lamdlibm -ljemalloc
-lflang
```

Benchmarks using Fortran, C, and C++:
```
-m64 -std=c++98 -mno-adx -mno-sse4a
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -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 -fstruct-layout=5 -mllvm -unroll-threshold=50
-mllvm -inline-threshold=1000 -fremap-arrays
-mllvm -function-specialize -flv-function-specialization
-mllvm -enable-gvn-hoist -mllvm -global-vectorize-slp=true
-mllvm -enable-licm-vrp -mllvm -reduce-array-computations=3
-mllvm -enable-loop-fusion -mllvm -enable-partial-unswitch
-mllvm -unroll-threshold=100 -finline-aggressive
-mllvm -loop-unswitch-threshold=200000 -mllvm -reroll-loops
-mllvm -aggressive-loop-unswitch -mllvm -extra-vectorizer-passes
-mllvm -convert-pow-exp-to-int=false -Hz,1,0x1 -Kieee -Mrecursive
-mllvm -fuse-tile-inner-loop -funroll-loops -mllvm -lsr-in-nested-loop
-mllvm -enable-loopinterchange -mllvm -compute-interchange-order
-z muldefs -lamdlibm -ljemalloc -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
```

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

SPEC CPU®2017 Floating Point Rate Result

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Cisco Systems

Cisco UCS C245 M6 (AMD EPYC 7773X 64-Core)

SPECrate®2017_fp_base = 717

SPECrate®2017_fp_peak = 747

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Test Sponsor: Cisco Systems
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Test Date: Feb-2022
Hardware Availability: Mar-2022
Software Availability: Dec-2021

Base Other Flags (Continued)

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: -m64 -flto -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-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
```

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

Cisco Systems

Cisco UCS C245 M6 (AMD EPYC 7773X 64-Core)

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Hardware Availability: Mar-2022
Software Availability: Dec-2021

Peak Optimization Flags (Continued)

519.lbm_r (continued):
```
-mllvm -global-vectorize-slp=true
-mllvm -function-specialize -mllvm -enable-licm-vrp
-mllvm -reduce-array-computations=3 -lamdlibm -ljemalloc
```

538.imagick_r: `Same as 519.lbm_r`

544.nab_r: `basepeak = yes`

C++ benchmarks:

508.namd_r: `-m64 -std=c++98 -mno-adx -mno-sse4a`
```
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false
-Wl,-mllvm -Wl,-enable-licm-vrp -flto
-Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast
-march=znver3 -fveclib=AMDLIBM -ffast-math
-finline-aggressive -mllvm -unroll-threshold=100
-flv-function-specialization -mllvm -enable-licm-vrp
-mllvm -reroll-loops -mllvm -aggressive-loop-unswitch
-mllvm -reduce-array-computations=3
-mllvm -global-vectorize-slp=true -lamdlibm -ljemalloc
```

510.parest_r: `basepeak = yes`

Fortran benchmarks:

503.bwaves_r: `basepeak = yes`

549.fotonik3d_r: `basepeak = yes`

554.roms_r: `-m64 -Wl,-mllvm -Wl,-enable-X86-prefetching`
```
-Wl,-mllvm -Wl,-enable-licm-vrp -flto
-Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast
-march=znver3 -fveclib=AMDLIBM -ffast-math -Mrecursive
-mllvm -reduce-array-computations=3
-mllvm -global-vectorize-slp=true -mllvm -enable-licm-vrp
-Hz,1,0x1 -mllvm -fuse-tile-inner-loop -lamdlibm
-ljemalloc -lflang
```

Benchmarks using both Fortran and C:

Cisco Systems

Cisco UCS C245 M6 (AMD EPYC 7773X 64-Core)

SPECrate®2017_fp_base = 717

SPECrate®2017_fp_peak = 747

CPU2017 License: 9019
Test Sponsor: Cisco Systems
Tested by: Cisco Systems

Test Date: Feb-2022
Hardware Availability: Mar-2022
Software Availability: Dec-2021

Peak Optimization Flags (Continued)

```
521.wrf_r: -m64 -Wl,-mllvm -Wl,-enable-X86-prefetching
-Wl,-mllvm -Wl,-enable-licm-vrp -flto
-Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-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-licm-vrp
-mllvm -reduce-array-computations=3 -Mrecursive -lamdlibm
-ljemalloc -lflang
```

```
527.cam4_r: -m64 -Wl,-mllvm -Wl,-enable-X86-prefetching
-Wl,-mllvm -Wl,-enable-licm-vrp -flto
-Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-force-vector-interleave=1 -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-licm-vrp
-mllvm -reduce-array-computations=3 -O3 -funroll-loops
-mllvm -extra-vectorizer-passes -mllvm -lsr-in-nested-loop
-Mrecursive -Hz,1,0x1 -mllvm -enable-loopinterchange
-mllvm -compute-interchange-order -lamdlibm -ljemalloc
-lflang
```

Benchmarks using both C and C++:

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

```
526.blender_r: -m64 -std=c++98 -mno-adx -mno-sse4a
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false
-Wl,-mllvm -Wl,-enable-licm-vrp -flto
-Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-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-licm-vrp
```

Cisco Systems

SPECrate®2017_fp_base = 717

Cisco UCS C245 M6 (AMD EPYC 7773X 64-Core)

SPECrate®2017_fp_peak = 747

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Peak Optimization Flags (Continued)

526.blender_r (continued):
```
-mllvm -reduce-array-computations=3 -finline-aggressive
-mllvm -unroll-threshold=100 -mllvm -reroll-loops
-mllvm -aggressive-loop-unswitch -lamdlibm -ljemalloc
```

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
```

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/aocc320-flags-A1.html
http://www.spec.org/cpu2017/flags/Cisco-Platform-Settings-AMD-v2-revD.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/aocc320-flags-A1.xml
http://www.spec.org/cpu2017/flags/Cisco-Platform-Settings-AMD-v2-revD.xml

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

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