SPEC CPU®2017 Floating Point Rate Result

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Hewlett Packard Enterprise
(Test Sponsor: HPE)
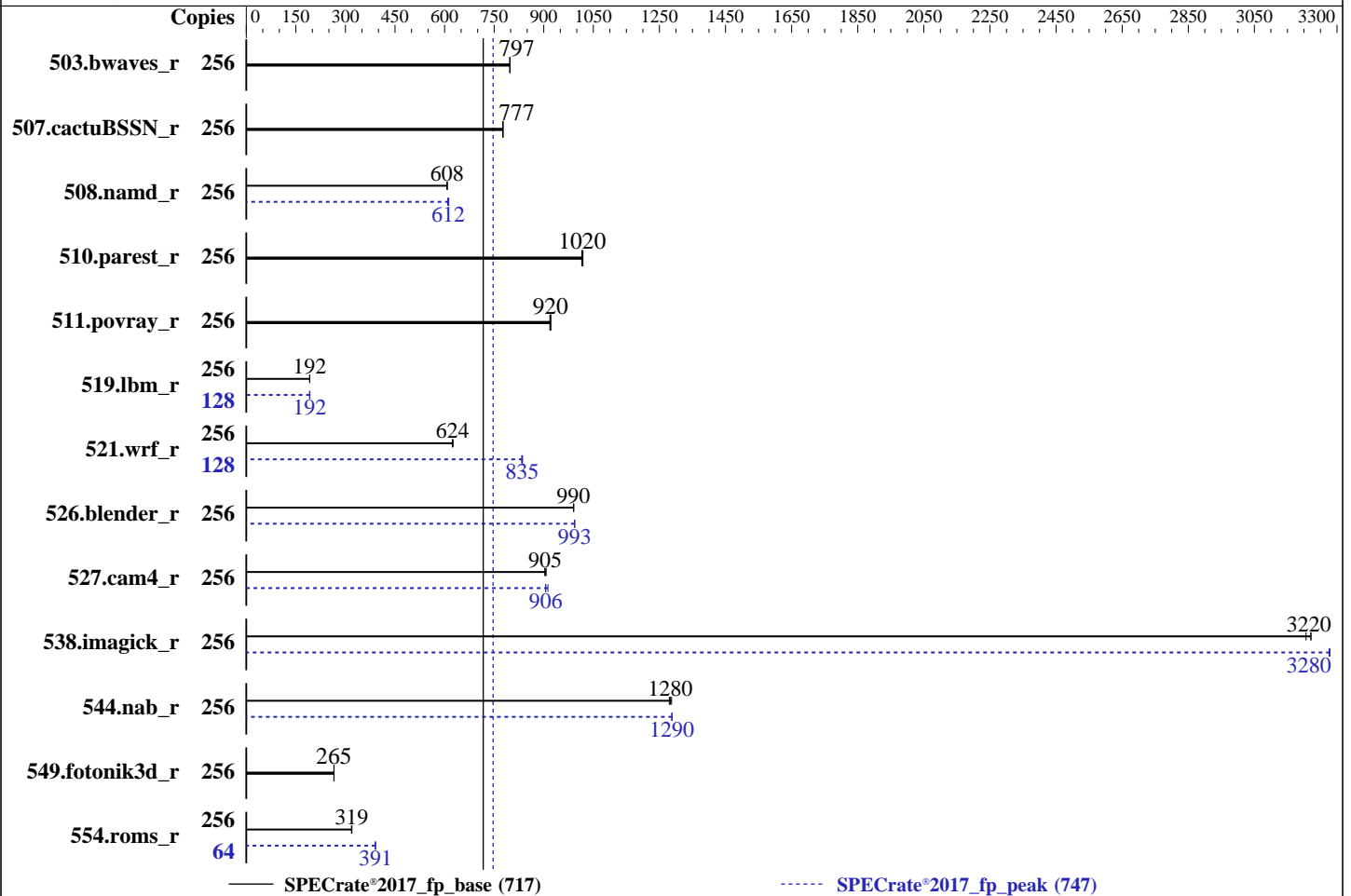
ProLiant DL385 Gen10 Plus v2
(2.20 GHz, AMD EPYC 7773X)

$SPECrate®2017\_fp\_base = 717$

$SPECrate®2017\_fp\_peak = 747$

CPU2017 License: 3   **Test Date:** Feb-2022
Test Sponsor: HPE   **Hardware Availability:** Mar-2022
Tested by: HPE   **Software Availability:** Jan-2022

Benchmark	Copies	base	peak
503.bwaves_r	256	797	
507.cactuBSSN_r	256	777	
508.namd_r	256	608	612
510.parest_r	256	1020	
511.povray_r	256	920	
519.lbm_r	256 / 128	192	192
521.wrf_r	256 / 128	624	835
526.blender_r	256	990	993
527.cam4_r	256	905	906
538.imagick_r	256	3220	3280
544.nab_r	256	1280	1290
549.fotonik3d_r	256	265	
554.roms_r	256 / 64	319	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 chip(s)
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 PC4-3200AA-L)
Storage: 1 x 400 GB SAS SSD
Other: None

Software

OS: Ubuntu 20.04.2 LTS (x86_64)
Kernel 5.11.0-41-generic
Compiler: C/C++/Fortran: Version 3.2.0 of AOCC
Parallel: No
Firmware: HPE BIOS Version A42 v2.56 02/10/2022 released
Feb-2022
File System: ext4
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 set to prefer performance at the cost of
additional power usage

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Results Table

	Base						Peak						
Benchmark	**Copies**	**Seconds**	**Ratio**	**Seconds**	**Ratio**	**Seconds**	**Ratio**	**Copies**	**Seconds**	**Ratio**	**Seconds**	**Ratio**	**Seconds**	**Ratio**
503.bwaves_r	256	3220	797	**3219**	**797**	3217	798	256	3220	797	**3219**	**797**	3217	798
507.cactuBSSN_r	256	417	777	**417**	**777**	418	776	256	417	777	**417**	**777**	418	776
508.namd_r	256	401	607	400	608	**400**	**608**	256	397	613	399	609	**398**	**612**
510.parest_r	256	660	1020	657	1020	**659**	**1020**	256	660	1020	657	1020	**659**	**1020**
511.povray_r	256	**649**	**920**	651	919	649	921	256	**649**	**920**	651	919	649	921
519.lbm_r	256	**1404**	**192**	1404	192	1409	192	128	701	192	**702**	**192**	705	191
521.wrf_r	256	**918**	**624**	920	624	917	625	128	344	833	343	836	**344**	**835**
526.blender_r	256	394	991	394	990	**394**	**990**	256	393	993	**392**	**993**	392	994
527.cam4_r	256	496	903	493	907	**495**	**905**	256	491	913	**494**	**906**	494	906
538.imagick_r	256	199	3210	**198**	**3220**	198	3220	256	**194**	**3280**	194	3280	194	3280
544.nab_r	256	**336**	**1280**	335	1290	337	1280	256	**335**	**1290**	335	1290	334	1290
549.fotonik3d_r	256	**3760**	**265**	3756	266	3762	265	256	**3760**	**265**	3756	266	3762	265
554.roms_r	256	1277	319	1272	320	**1277**	**319**	64	**260**	**391**	260	391	261	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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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
 Workload Profile set to General Throughput Compute
 Determinism Control set to Manual
   Performance Determinism set to Power Deterministic
 Last-Level Cache (LLC) as NUMA Node set to Enabled
 NUMA memory domains per socket set to Four memory domains  per socket
 Memory Interleaving Mode set to Disabled
 Thermal Configuration set to Maximum Cooling
 Infinity Fabric Power Management set to Disabled
```

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Platform Notes (Continued)

```
    Infinity Fabric Performance State set to P0
 Workload Profile set to Custom
    L2 HW Prefetcher set to Disabled


The system date and time as discovered by sysinfo is incorrect as the time was not updated
prior to the run. The test_date field shows an accurate date for the result.


The system ROM used for this result contains microcode version 0x 0A001227h for the
AMD EPYC 7nn3X family of processors. The reference code/AGESA version used in this
ROM is version MilanPI 1.0.0.8

 Sysinfo program /home/cpu2017/bin/sysinfo
 Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acafc64d
 running on oem-ProLiant-DL385-Gen10-Plus Thu Jul 22 08:57:59 2021

 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 2.34:
    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
```

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Platform Notes (Continued)

```
        Model:                          1
        Model name:                     AMD EPYC 7773X 64-Core Processor
        Stepping:                       2
        CPU MHz:                        2195.902
        BogoMIPS:                       4391.80
        Virtualization:                 AMD-V
        L1d cache:                      4 MiB
        L1i cache:                      4 MiB
        L2 cache:                       64 MiB
        L3 cache:                       1.5 GiB
        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
        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 and seccomp
        Vulnerability Spectre v1:       Mitigation; usercopy/swapgs barriers and __user
        pointer sanitization
        Vulnerability Spectre v2:       Mitigation; Full AMD retpoline, IBPB conditional,
        IBRS_FW, STIBP always-on, RSB filling
        Vulnerability Srbds:            Not affected
        Vulnerability Tsx async abort:  Not affected
        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 invpcid cqm rdt_a rdseed adx smap
        clflushopt clwb sha_ni xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc
```

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Platform Notes (Continued)

```
     cqm_mbm_total cqm_mbm_local clzero irperf xsaveerptr rdpru wbnoinvd amd_ppin 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

  From lscpu --cache:
     NAME ONE-SIZE ALL-SIZE WAYS TYPE          LEVEL
     L1d        32K       4M    8 Data              1
     L1i        32K       4M    8 Instruction       1
     L2        512K      64M    8 Unified           2
     L3         96M     1.5G   16 Unified           3

  /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: 128709 MB
    node 0 free: 127878 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: 128542 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: 128542 MB
    node 3 cpus: 24 25 26 27 28 29 30 31 152 153 154 155 156 157 158 159
    node 3 size: 129019 MB
    node 3 free: 128558 MB
    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: 128426 MB
    node 5 cpus: 40 41 42 43 44 45 46 47 168 169 170 171 172 173 174 175
    node 5 size: 128987 MB
    node 5 free: 128522 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: 128551 MB
    node 7 cpus: 56 57 58 59 60 61 62 63 184 185 186 187 188 189 190 191
    node 7 size: 129007 MB
    node 7 free: 128538 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: 128554 MB
    node 9 cpus: 72 73 74 75 76 77 78 79 200 201 202 203 204 205 206 207
    node 9 size: 129019 MB
```

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Platform Notes (Continued)

```
    node 9 free: 128556 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: 128524 MB
    node 11 cpus: 88 89 90 91 92 93 94 95 216 217 218 219 220 221 222 223
    node 11 size: 129019 MB
    node 11 free: 128541 MB
    node 12 cpus: 96 97 98 99 100 101 102 103 224 225 226 227 228 229 230 231
    node 12 size: 129020 MB
    node 12 free: 128539 MB
    node 13 cpus: 104 105 106 107 108 109 110 111 232 233 234 235 236 237 238 239
    node 13 size: 129019 MB
    node 13 free: 128550 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: 128497 MB
    node 15 cpus: 120 121 122 123 124 125 126 127 248 249 250 251 252 253 254 255
    node 15 size: 129009 MB
    node 15 free: 128285 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
      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:       2113486504 kB
    HugePages_Total:        0
    Hugepagesize:        2048 kB


  /sbin/tuned-adm active
      Current active profile: throughput-performance


  /usr/bin/lsb_release -d
```

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Platform Notes (Continued)

```
    Ubuntu 20.04.2 LTS

 From /etc/*release* /etc/*version*
    debian_version: bullseye/sid
    os-release:
        NAME="Ubuntu"
        VERSION="20.04.2 LTS (Focal Fossa)"
        ID=ubuntu
        ID_LIKE=debian
        PRETTY_NAME="Ubuntu 20.04.2 LTS"
        VERSION_ID="20.04"
        HOME_URL="https://www.ubuntu.com/"
        SUPPORT_URL="https://help.ubuntu.com/"

 uname -a:
    Linux oem-ProLiant-DL385-Gen10-Plus 5.11.0-41-generic #45~20.04.1-Ubuntu SMP Wed Nov
    10 10:20:10 UTC 2021 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
 CVE-2019-11135 (TSX Asynchronous Abort):             Not affected

 run-level 3 Jul 22 00:30

 SPEC is set to: /home/cpu2017
    Filesystem      Type  Size  Used Avail Use% Mounted on
    /dev/sda2       ext4  366G   74G  274G  22% /

 From /sys/devices/virtual/dmi/id
     Vendor:          HPE
     Product:         ProLiant DL385 Gen10 Plus
     Product Family: ProLiant
     Serial:          CN7931051F
```

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Platform Notes (Continued)

```
  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 Samsung M386AAG40AM3-CWE 128 GB 4 rank 3200
      16x UNKNOWN NOT AVAILABLE

  BIOS:
     BIOS Vendor:       HPE
     BIOS Version:      A42
     BIOS Date:         02/10/2022
     BIOS Revision:     2.56
     Firmware Revision: 2.55

  (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
  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)
```

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Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant DL385 Gen10 Plus v2
(2.20 GHz, AMD EPYC 7773X)

SPECrate®2017_fp_base = 717

SPECrate®2017_fp_peak = 747

CPU2017 License:	3	**Test Date:**	Feb-2022
Test Sponsor:	HPE	**Hardware Availability:**	Mar-2022
Tested by:	HPE	**Software Availability:**	Jan-2022

Compiler Version Notes (Continued)

```
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)
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
```

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

Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL385 Gen10 Plus v2
(2.20 GHz, AMD EPYC 7773X)

SPECrate®2017_fp_base = 717

SPECrate®2017_fp_peak = 747

CPU2017 License: 3		**Test Date:**	Feb-2022
Test Sponsor:	HPE	**Hardware Availability:**	Mar-2022
Tested by:	HPE	**Software Availability:**	Jan-2022

Compiler Version Notes (Continued)

```
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`
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`

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Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL385 Gen10 Plus v2
(2.20 GHz, AMD EPYC 7773X)

SPECrate®2017_fp_base = 717

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CPU2017 License:	3	**Test Date:**	Feb-2022
Test Sponsor:	HPE	**Hardware Availability:**	Mar-2022
Tested by:	HPE	**Software Availability:**	Jan-2022

Base Portability Flags (Continued)

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
```

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
```

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Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL385 Gen10 Plus v2
(2.20 GHz, AMD EPYC 7773X)

SPECrate®2017_fp_base = 717

SPECrate®2017_fp_peak = 747

CPU2017 License: 3		**Test Date:**	Feb-2022
Test Sponsor: HPE		**Hardware Availability:**	Mar-2022
Tested by: HPE		**Software Availability:**	Jan-2022

Base Optimization Flags (Continued)

Fortran benchmarks (continued):
```
-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
-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
```

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Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant DL385 Gen10 Plus v2
(2.20 GHz, AMD EPYC 7773X)

SPECrate®2017_fp_base = 717

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CPU2017 License: 3		**Test Date:**	Feb-2022
Test Sponsor:	HPE	**Hardware Availability:**	Mar-2022
Tested by:	HPE	**Software Availability:**	Jan-2022

Base Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++ (continued):

```
-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
```

Benchmarks using Fortran, C, and C++:

```
-Wno-unused-command-line-argument
```

Peak Compiler Invocation

C benchmarks:

```
clang
```

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Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL385 Gen10 Plus v2
(2.20 GHz, AMD EPYC 7773X)

SPECrate®2017_fp_base = 717

SPECrate®2017_fp_peak = 747

CPU2017 License: 3
Test Sponsor: HPE
Tested by: HPE

Test Date: Feb-2022
Hardware Availability: Mar-2022
Software Availability: Jan-2022

Peak Compiler Invocation (Continued)

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`
`-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:` `-m64 -flto -Wl,-mllvm -Wl,-region-vectorize`
`-Wl,-mllvm -Wl,-function-specialize -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`

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Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant DL385 Gen10 Plus v2
(2.20 GHz, AMD EPYC 7773X)

SPECrate®2017_fp_base = 717

SPECrate®2017_fp_peak = 747

CPU2017 License: 3	**Test Date:** Feb-2022
Test Sponsor: HPE	**Hardware Availability:** Mar-2022
Tested by: HPE	**Software Availability:** Jan-2022

Peak Optimization Flags (Continued)

544.nab_r (continued):
```
-mllvm -function-specialize -mllvm -enable-licm-vrp
-mllvm -reduce-array-computations=3 -lamdlibm -ljemalloc
```

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:

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
```

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Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL385 Gen10 Plus v2
(2.20 GHz, AMD EPYC 7773X)

$SPECrate®2017\_fp\_base = 717$

$SPECrate®2017\_fp\_peak = 747$

CPU2017 License:	3	**Test Date:**	Feb-2022
Test Sponsor:	HPE	**Hardware Availability:**	Mar-2022
Tested by:	HPE	**Software Availability:**	Jan-2022

Peak Optimization Flags (Continued)

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

SPEC CPU®2017 Floating Point Rate Result

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(Test Sponsor: HPE)

ProLiant DL385 Gen10 Plus v2
(2.20 GHz, AMD EPYC 7773X)

SPECrate®2017_fp_base = 717

SPECrate®2017_fp_peak = 747

CPU2017 License: 3	**Test Date:** Feb-2022
Test Sponsor: HPE	**Hardware Availability:** Mar-2022
Tested by: HPE	**Software Availability:** Jan-2022

Peak Optimization Flags (Continued)

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/HPE-Platform-Flags-AMD-V1.2-EPYC-revR.html`
`http://www.spec.org/cpu2017/flags/aocc320-flags-A1.html`

You can also download the XML flags sources by saving the following links:
`http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-AMD-V1.2-EPYC-revR.xml`
`http://www.spec.org/cpu2017/flags/aocc320-flags-A1.xml`

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

Tested with SPEC CPU®2017 v1.1.8 on 2021-07-21 23:27:58-0400.
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