SPEC CPU®2017 Integer Rate Result

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Hewlett Packard Enterprise

(Test Sponsor: HPE)
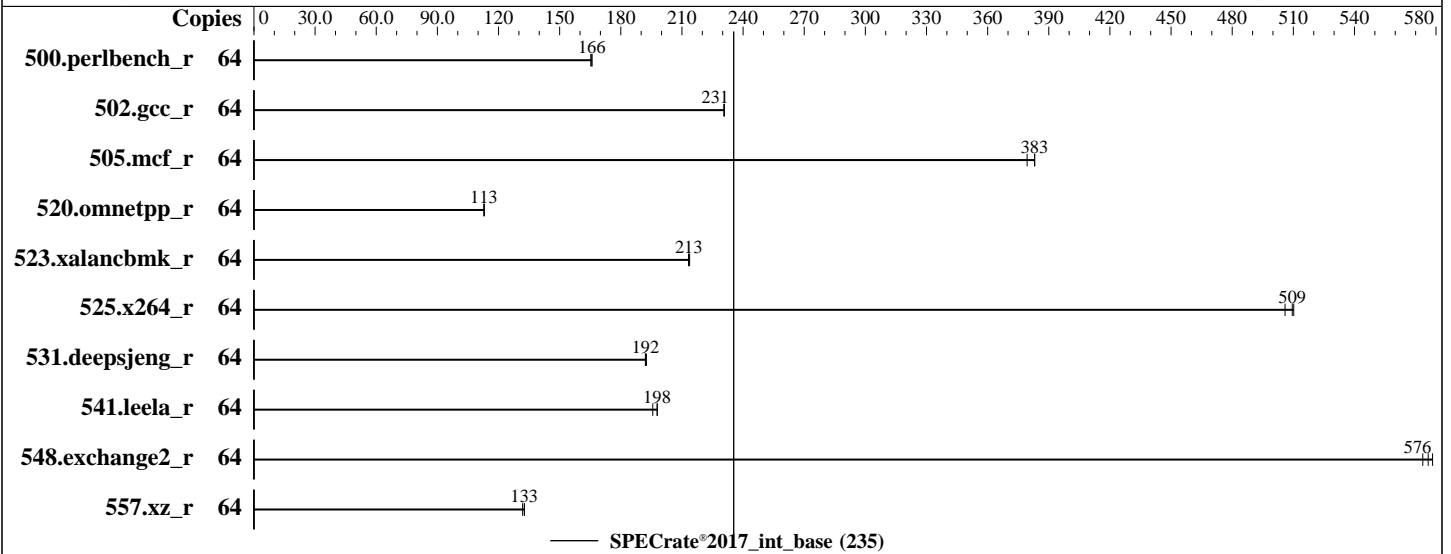
SPECrate®2017_int_base =   235

ProLiant DL365 Gen10 Plus
(3.00 GHz, AMD EPYC 7302)

SPECrate®2017_int_peak = Not Run

CPU2017 License: 3	**Test Date:** Nov-2022
Test Sponsor: HPE	**Hardware Availability:** Jun-2022
Tested by: HPE	**Software Availability:** Dec-2021

Copies — scale: 0 30.0 60.0 90.0 120 150 180 210 240 270 300 330 360 390 420 450 480 510 540 580

- 500.perlbench_r 64 — 166
- 502.gcc_r 64 — 231
- 505.mcf_r 64 — 383
- 520.omnetpp_r 64 — 113
- 523.xalancbmk_r 64 — 213
- 525.x264_r 64 — 509
- 531.deepsjeng_r 64 — 192
- 541.leela_r 64 — 198
- 548.exchange2_r 64 — 576
- 557.xz_r 64 — 133

—— **SPECrate®2017_int_base (235)**

Hardware

CPU Name: AMD EPYC 7302
 Max MHz: 3300
 Nominal: 3000
Enabled: 32 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: 128 MB I+D on chip per chip,
  16 MB shared / 2 cores
 Other: None
Memory: 2 TB (16 x 128 GB 4Rx4 PC4-3200AA-L)
Storage: 1 x 960 GB SATA SSD
Other: None

Software

OS: Red Hat Enterprise Linux 8.3 (Oopta)
  Kernel 4.18.0-240.el8.x86_64
Compiler: C/C++/Fortran: Version 3.2.0 of AOCC
Parallel: No
Firmware: HPE BIOS Version v2.58 06/09/2022 released
  Jun-2022
File System: xfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: Not Applicable
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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Results Table

Benchmark	Base Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Peak Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
500.perlbench_r	64	614	166	**615**	**166**	617	165							
502.gcc_r	64	393	231	393	231	**393**	**231**							
505.mcf_r	64	270	383	**270**	**383**	273	379							
520.omnetpp_r	64	743	113	**744**	**113**	744	113							
523.xalancbmk_r	64	316	214	317	213	**317**	**213**							
525.x264_r	64	220	510	**220**	**509**	221	506							
531.deepsjeng_r	64	**382**	**192**	382	192	381	193							
541.leela_r	64	542	196	535	198	**536**	**198**							
548.exchange2_r	64	290	578	292	574	**291**	**576**							
557.xz_r	64	521	133	524	132	**521**	**133**							
SPECrate®2017_int_base =	**235**													
SPECrate®2017_int_peak =	**Not Run**													

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.
```

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Operating System Notes (Continued)

```
To enable Transparent Hugepages (THP) only on request for base runs,
'echo madvise > /sys/kernel/mm/transparent_hugepage/enabled' run as root.
To enable THP for all allocations for peak runs,
'echo always > /sys/kernel/mm/transparent_hugepage/enabled' and
'echo always > /sys/kernel/mm/transparent_hugepage/defrag' run as root.
```

Environment Variables Notes

```
Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH =
      "/home/cpu2017/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:
 Thermal Configuration set to Maximum Cooling
 Determinism Control set to Manual
 Performance Determinism set to Power Deterministic
 Minimum Processor Idle Power core C-State set to C6 State
 Memory Patrol Scrubbing set to Disabled
 Workload Profile set to General Throughput Compute
 NUMA memory domains per socket set to Four memory domains per socket
 Package Power Limit Control Mode set to Manual
 Package Power Limit value set to 180
 Last-Level Cache (LLC) as NUMA node enabled

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

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

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Platform Notes (Continued)

```
 Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acafc64d
 running on localhost.localdomain Thu Nov 17 13:41:15 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 7302 16-Core Processor
       2  "physical id"s (chips)
       64 "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 : 16
       siblings  : 32
       physical 0: cores 0 1 4 5 8 9 12 13 16 17 20 21 24 25 28 29
       physical 1: cores 0 1 4 5 8 9 12 13 16 17 20 21 24 25 28 29

 From lscpu from util-linux 2.32.1:
       Architecture:       x86_64
       CPU op-mode(s):     32-bit, 64-bit
       Byte Order:         Little Endian
       CPU(s):             64
       On-line CPU(s) list: 0-63
       Thread(s) per core: 2
       Core(s) per socket: 16
       Socket(s):          2
       NUMA node(s):       16
       Vendor ID:          AuthenticAMD
       CPU family:         23
       Model:              49
       Model name:         AMD EPYC 7302 16-Core Processor
       Stepping:           0
       CPU MHz:            1796.543
       BogoMIPS:           5988.61
       Virtualization:     AMD-V
       L1d cache:          32K
       L1i cache:          32K
       L2 cache:           512K
       L3 cache:           16384K
       NUMA node0 CPU(s):  0,1,32,33
       NUMA node1 CPU(s):  2,3,34,35
       NUMA node2 CPU(s):  4,5,36,37
       NUMA node3 CPU(s):  6,7,38,39
       NUMA node4 CPU(s):  8,9,40,41
       NUMA node5 CPU(s):  10,11,42,43
       NUMA node6 CPU(s):  12,13,44,45
```

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Platform Notes (Continued)

```
     NUMA node7 CPU(s):     14,15,46,47
     NUMA node8 CPU(s):     16,17,48,49
     NUMA node9 CPU(s):     18,19,50,51
     NUMA node10 CPU(s):    20,21,52,53
     NUMA node11 CPU(s):    22,23,54,55
     NUMA node12 CPU(s):    24,25,56,57
     NUMA node13 CPU(s):    26,27,58,59
     NUMA node14 CPU(s):    28,29,60,61
     NUMA node15 CPU(s):    30,31,62,63
     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 sse4_1 sse4_2 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 hw_pstate ssbd mba ibrs ibpb stibp vmmcall fsgsbase bmi1 avx2 smep bmi2 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 amd_ppin
   arat npt lbrv svm_lock nrip_save tsc_scale vmcb_clean flushbyasid decodeassists
   pausefilter pfthreshold avic v_vmsave_vmload vgif umip 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 32 33
   node 0 size: 128703 MB
   node 0 free: 128601 MB
   node 1 cpus: 2 3 34 35
   node 1 size: 129017 MB
   node 1 free: 128914 MB
   node 2 cpus: 4 5 36 37
   node 2 size: 129020 MB
   node 2 free: 128914 MB
   node 3 cpus: 6 7 38 39
   node 3 size: 129005 MB
   node 3 free: 128865 MB
   node 4 cpus: 8 9 40 41
   node 4 size: 129018 MB
   node 4 free: 128918 MB
   node 5 cpus: 10 11 42 43
   node 5 size: 129017 MB
   node 5 free: 128914 MB
   node 6 cpus: 12 13 44 45
```

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Platform Notes (Continued)

```
     node 6 size: 129016 MB
     node 6 free: 128927 MB
     node 7 cpus: 14 15 46 47
     node 7 size: 128997 MB
     node 7 free: 128918 MB
     node 8 cpus: 16 17 48 49
     node 8 size: 129020 MB
     node 8 free: 128890 MB
     node 9 cpus: 18 19 50 51
     node 9 size: 129017 MB
     node 9 free: 128896 MB
     node 10 cpus: 20 21 52 53
     node 10 size: 128975 MB
     node 10 free: 128899 MB
     node 11 cpus: 22 23 54 55
     node 11 size: 129013 MB
     node 11 free: 128922 MB
     node 12 cpus: 24 25 56 57
     node 12 size: 129016 MB
     node 12 free: 128939 MB
     node 13 cpus: 26 27 58 59
     node 13 size: 129013 MB
     node 13 free: 128943 MB
     node 14 cpus: 28 29 60 61
     node 14 size: 129008 MB
     node 14 free: 128944 MB
     node 15 cpus: 30 31 62 63
     node 15 size: 129019 MB
     node 15 free: 128901 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
```

(Continued on next page)

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Platform Notes (Continued)

```
From /proc/meminfo
   MemTotal:       2113530380 kB
   HugePages_Total:        0
   Hugepagesize:        2048 kB

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

From /etc/*release* /etc/*version*
   os-release:
      NAME="Red Hat Enterprise Linux"
      VERSION="8.3 (Ootpa)"
      ID="rhel"
      ID_LIKE="fedora"
      VERSION_ID="8.3"
      PLATFORM_ID="platform:el8"
      PRETTY_NAME="Red Hat Enterprise Linux 8.3 (Ootpa)"
      ANSI_COLOR="0;31"
   redhat-release: Red Hat Enterprise Linux release 8.3 (Ootpa)
   system-release: Red Hat Enterprise Linux release 8.3 (Ootpa)
   system-release-cpe: cpe:/o:redhat:enterprise_linux:8.3:ga

uname -a:
   Linux localhost.localdomain 4.18.0-240.el8.x86_64 #1 SMP Wed Sep 23 05:13:10 EDT 2020
   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:
                                                  conditional, RSB filling
CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
CVE-2019-11135 (TSX Asynchronous Abort):          Not affected

run-level 3 Nov 17 11:50
```

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Platform Notes (Continued)

```
  SPEC is set to: /home/cpu2017
     Filesystem                Type   Size  Used Avail Use% Mounted on
     /dev/mapper/rhel00-home xfs    819G   11G  808G   2% /home

  From /sys/devices/virtual/dmi/id
      Vendor:          HPE
      Product:         ProLiant DL365 Gen10 Plus
      Product Family:  ProLiant
      Serial:          CN70430NKT


  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:         06/09/2022
     BIOS Revision:     2.58
     Firmware Revision: 2.40

  (End of data from sysinfo program)
```

Compiler Version Notes

```
==============================================================================
C        | 500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base)
         | 525.x264_r(base) 557.xz_r(base)
------------------------------------------------------------------------------
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++      | 520.omnetpp_r(base) 523.xalancbmk_r(base) 531.deepsjeng_r(base)
         | 541.leela_r(base)
------------------------------------------------------------------------------
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 | 548.exchange2_r(base)
--------------------------------------------------------------------------
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`

Base Portability Flags

500.perlbench_r: `-DSPEC_LINUX_X64 -DSPEC_LP64`
502.gcc_r: `-DSPEC_LP64`
505.mcf_r: `-DSPEC_LP64`
520.omnetpp_r: `-DSPEC_LP64`
523.xalancbmk_r: `-DSPEC_LINUX -DSPEC_LP64`
525.x264_r: `-DSPEC_LP64`
531.deepsjeng_r: `-DSPEC_LP64`
541.leela_r: `-DSPEC_LP64`
548.exchange2_r: `-DSPEC_LP64`
557.xz_r: `-DSPEC_LP64`

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Base Optimization Flags

C benchmarks:
```
-m64 -Wl,-allow-multiple-definition -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 -z muldefs -lamdlibm -ljemalloc -lflang
```

C++ benchmarks:
```
-m64 -std=c++98 -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 -fvirtual-function-elimination
-fvisibility=hidden -lamdlibm -ljemalloc -lflang
```

Fortran benchmarks:
```
-m64 -Wl,-mllvm -Wl,-inline-recursion=4
-Wl,-mllvm -Wl,-lsr-in-nested-loop -Wl,-mllvm -Wl,-enable-iv-split
-flto -Wl,-mllvm -Wl,-region-vectorize
-Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-enable-loop-fusion -O3 -march=znver3 -fveclib=AMDLIBM
-ffast-math -z muldefs -mllvm -unroll-aggressive
-mllvm -unroll-threshold=500 -lamdlibm -ljemalloc -lflang
```

Base Other Flags

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

(Continued on next page)

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

Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL365 Gen10 Plus
(3.00 GHz, AMD EPYC 7302)

SPECrate®2017_int_base = 235

SPECrate®2017_int_peak = Not Run

CPU2017 License: 3	**Test Date:** Nov-2022
Test Sponsor: HPE	**Hardware Availability:** Jun-2022
Tested by: HPE	**Software Availability:** Dec-2021

Base Other Flags (Continued)

C++ benchmarks:
-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-revS.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-revS.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 2022-11-17 03:11:14-0500.
Report generated on 2022-12-08 15:32:32 by CPU2017 PDF formatter v6442.
Originally published on 2022-12-08.