SPEC CPU®2017 Integer Rate Result

Hewlett Packard Enterprise
(Test Sponsor: HPE)

$SPECrate^{®}2017\_int\_base =$ **206**

ProLiant DL325 Gen10 Plus
(2.35 GHz, AMD EPYC 7452)

$SPECrate^{®}2017\_int\_peak =$ Not Run

CPU2017 License: 3	**Test Date:** Apr-2020
Test Sponsor: HPE	**Hardware Availability:** Apr-2020
Tested by: HPE	**Software Availability:** Aug-2019

Copies 0   30.0   60.0   90.0   120   150   180   210   240   270   300   330   360   390   420   450   480   530

- 500.perlbench_r 64 — 159
- 502.gcc_r 64 — 164
- 505.mcf_r 64 — 268
- 520.omnetpp_r 64 — 100
- 523.xalancbmk_r 64 — 174
- 525.x264_r 64 — 457
- 531.deepsjeng_r 64 — 195
- 541.leela_r 64 — 191
- 548.exchange2_r 64 — 529
- 557.xz_r 64 — 128

SPECrate®2017_int_base (206)

Hardware

CPU Name: AMD EPYC 7452
 Max MHz: 3350
 Nominal: 2350
Enabled: 32 cores, 1 chip, 2 threads/core
Orderable: 1 chip
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 / 4 cores
 Other: None
Memory: 512 GB (8 x 64 GB 2Rx4 PC4-3200AA-R)
Storage: 1 x 800 GB SAS SSD, RAID 0
Other: None

Software

OS: SUSE Linux Enterprise Server 15 (x86_64) SP1
  Kernel 4.12.14-195-default
Compiler: C/C++/Fortran: Version 2.0.0 of AOCC
Parallel: No
Firmware: HPE BIOS Version A43 04/02/2020 released Apr-2020
File System: xfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: Not Applicable
Other: jemalloc: jemalloc memory allocator library v5.2.0
Power Management: BIOS set to prefer performance at the cost of additional power usage

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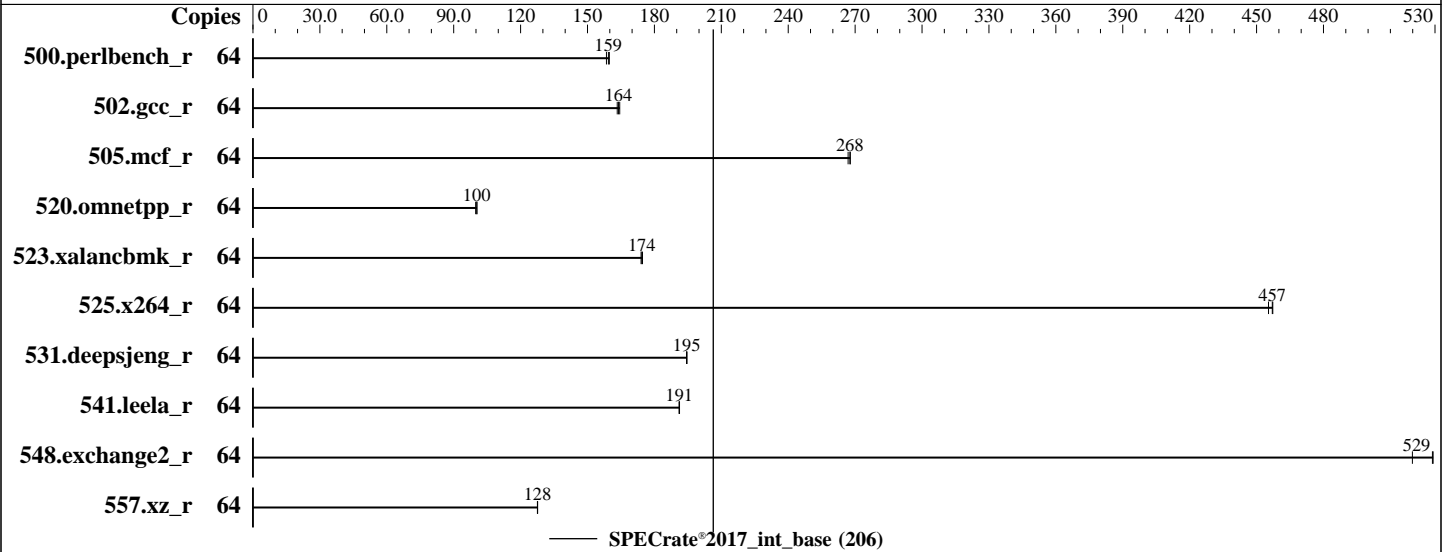## Hewlett Packard Enterprise

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Results Table

Benchmark	Copies	Base Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Peak Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
500.perlbench_r	64	643	158	**639**	**159**	638	160							
502.gcc_r	64	555	163	551	164	**553**	**164**							
505.mcf_r	64	**386**	**268**	388	267	386	268							
520.omnetpp_r	64	**837**	**100**	841	99.8	836	100							
523.xalancbmk_r	64	387	175	388	174	**388**	**174**							
525.x264_r	64	246	455	**245**	**457**	245	457							
531.deepsjeng_r	64	377	194	377	195	**377**	**195**							
541.leela_r	64	555	191	**554**	**191**	554	191							
548.exchange2_r	64	317	529	**317**	**529**	323	520							
557.xz_r	64	**542**	**128**	542	128	542	128							
SPECrate®2017_int_base =		**206**												
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
'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>

Set dirty_ratio=8 to limit dirty cache to 8% of memory
Set swappiness=1 to swap only if necessary
Set zone_reclaim_mode=1 to free local node memory and avoid remote memory
sync then drop_caches=3 to reset caches before invoking runcpu

dirty_ratio, swappiness, zone_reclaim_mode and drop_caches were
all set using privileged echo (e.g. echo 1 > /proc/sys/vm/swappiness).
```

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Operating System Notes (Continued)

```
Transparent huge pages set to 'always' for this run (OS default)
```

Environment Variables Notes

```
Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH =
     "/home/cpu2017/amd_rate_aocc200_rome_C_lib/64;/home/cpu2017/amd_rate_aoc
     c200_rome_C_lib/32:"
MALLOC_CONF = "retain:true"
```

General Notes

```
Binaries were compiled on a system with 2x AMD EPYC 7601 CPU + 512GB Memory using Fedora 26

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 v9.1.0 in Ubuntu 19.04 with -O3 -znver2 -flto
jemalloc 5.2.0 is available here:
https://github.com/jemalloc/jemalloc/releases/download/5.2.0/jemalloc-5.2.0.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
 C-State Efficiency set to Enabled

 Sysinfo program /home/cpu2017/bin/sysinfo
 Rev: r6365 of 2019-08-21 295195f888a3d7edb1e6e46a485a0011
 running on linux-3xau Thu Feb 14 09:22:41 2019
```

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

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Test Date: Apr-2020

Hardware Availability: Apr-2020

Software Availability: Aug-2019

Platform Notes (Continued)

```
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 7452 32-Core Processor
      1  "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 : 32
      siblings  : 64
      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

From lscpu:
   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):              64
   On-line CPU(s) list: 0-63
   Thread(s) per core:  2
   Core(s) per socket:  32
   Socket(s):           1
   NUMA node(s):        4
   Vendor ID:           AuthenticAMD
   CPU family:          23
   Model:               49
   Model name:          AMD EPYC 7452 32-Core Processor
   Stepping:            0
   CPU MHz:             2345.489
   BogoMIPS:            4690.97
   Virtualization:      AMD-V
   L1d cache:           32K
   L1i cache:           32K
   L2 cache:            512K
   L3 cache:            16384K
   NUMA node0 CPU(s):   0-7,32-39
   NUMA node1 CPU(s):   8-15,40-47
   NUMA node2 CPU(s):   16-23,48-55
   NUMA node3 CPU(s):   24-31,56-63
   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 xtopology 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
```

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Platform Notes (Continued)

```
    osvw ibs skinit wdt tce topoext perfctr_core perfctr_nb bpext perfctr_l2 mwaitx cpb
    cat_l3 cdp_l3 hw_pstate ssbd 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 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: 4 nodes (0-3)
   node 0 cpus: 0 1 2 3 4 5 6 7 32 33 34 35 36 37 38 39
   node 0 size: 128709 MB
   node 0 free: 128470 MB
   node 1 cpus: 8 9 10 11 12 13 14 15 40 41 42 43 44 45 46 47
   node 1 size: 129020 MB
   node 1 free: 128655 MB
   node 2 cpus: 16 17 18 19 20 21 22 23 48 49 50 51 52 53 54 55
   node 2 size: 129020 MB
   node 2 free: 128822 MB
   node 3 cpus: 24 25 26 27 28 29 30 31 56 57 58 59 60 61 62 63
   node 3 size: 128977 MB
   node 3 free: 128626 MB
   node distances:
   node   0   1   2   3
     0:  10  12  12  12
     1:  12  10  12  12
     2:  12  12  10  12
     3:  12  12  12  10

 From /proc/meminfo
    MemTotal:       528105996 kB
    HugePages_Total:        0
    Hugepagesize:        2048 kB

 From /etc/*release* /etc/*version*
    os-release:
      NAME="SLES"
      VERSION="15-SP1"
      VERSION_ID="15.1"
      PRETTY_NAME="SUSE Linux Enterprise Server 15 SP1"
      ID="sles"
      ID_LIKE="suse"
      ANSI_COLOR="0;32"
      CPE_NAME="cpe:/o:suse:sles:15:sp1"
```

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Platform Notes (Continued)

```
uname -a:
   Linux linux-3xau 4.12.14-195-default #1 SMP Tue May 7 10:55:11 UTC 2019 (8fba516)
   x86_64 x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:

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: __user pointer sanitization
CVE-2017-5715 (Spectre variant 2):     Mitigation: Full AMD retpoline, IBPB:
                                        conditional, IBRS_FW, STIBP: conditional, RSB
                                        filling


run-level 3 Feb 14 09:21

SPEC is set to: /home/cpu2017
   Filesystem     Type  Size  Used Avail Use% Mounted on
   /dev/sda5      xfs   161G   29G  133G  18% /home

From /sys/devices/virtual/dmi/id
   BIOS:    HPE A43 04/02/2020
   Vendor:  HPE
   Product: ProLiant DL325 Gen10 Plus
   Product Family: ProLiant
   Serial:  CN79290FKQ

Additional information from dmidecode 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:
     8x Hynix HMAA8GR7AJR4N-XN 64 GB 2 rank 3200
     8x UNKNOWN NOT AVAILABLE

(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)
------------------------------------------------------------------------------
```

(Continued on next page)

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Compiler Version Notes (Continued)

```
AOCC.LLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins
  AOCC_2_0_0-Build#191) (based on LLVM AOCC.LLVM.2.0.0.B191.2019_07_19)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin
------------------------------------------------------------------------------


==============================================================================
C++      | 520.omnetpp_r(base) 523.xalancbmk_r(base) 531.deepsjeng_r(base)
         | 541.leela_r(base)
------------------------------------------------------------------------------
AOCC.LLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins
  AOCC_2_0_0-Build#191) (based on LLVM AOCC.LLVM.2.0.0.B191.2019_07_19)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin
------------------------------------------------------------------------------


==============================================================================
Fortran | 548.exchange2_r(base)
------------------------------------------------------------------------------
AOCC.LLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins
  AOCC_2_0_0-Build#191) (based on LLVM AOCC.LLVM.2.0.0.B191.2019_07_19)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/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`

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Base Portability Flags (Continued)

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`

Base Optimization Flags

C benchmarks:
```
-flto -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-vector-library=LIBMVEC
-Wl,-mllvm -Wl,-reduce-array-computations=3 -O3 -ffast-math
-march=znver2 -fstruct-layout=3 -mllvm -unroll-threshold=50
-fremap-arrays -mllvm -function-specialize -mllvm -enable-gvn-hoist
-mllvm -reduce-array-computations=3 -mllvm -global-vectorize-slp
-mllvm -vector-library=LIBMVEC -mllvm -inline-threshold=1000
-flv-function-specialization -z muldefs -lmvec -lamdlibm -ljemalloc
-lflang
```

C++ benchmarks:
```
-flto -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-vector-library=LIBMVEC
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-suppress-fmas -O3 -ffast-math -march=znver2
-mllvm -loop-unswitch-threshold=200000 -mllvm -vector-library=LIBMVEC
-mllvm -unroll-threshold=100 -flv-function-specialization
-mllvm -enable-partial-unswitch -z muldefs -lmvec -lamdlibm
-ljemalloc -lflang
```

Fortran benchmarks:
```
-flto -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-vector-library=LIBMVEC
-Wl,-mllvm -Wl,-reduce-array-computations=3 -ffast-math
-Wl,-mllvm -Wl,-inline-recursion=4 -Wl,-mllvm -Wl,-lsr-in-nested-loop
-Wl,-mllvm -Wl,-enable-iv-split -O3 -march=znver2 -funroll-loops
-Mrecursive -mllvm -vector-library=LIBMVEC -z muldefs
-mllvm -disable-indvar-simplify -mllvm -unroll-aggressive
-mllvm -unroll-threshold=150 -lmvec -lamdlibm -ljemalloc -lflang
```

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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-revH.2020-05-12.html
http://www.spec.org/cpu2017/flags/aocc200-flags-C1-HPE.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-revH.2020-05-12.xml
http://www.spec.org/cpu2017/flags/aocc200-flags-C1-HPE.xml

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

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