



# SPEC CPU®2017 Integer Rate Result

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## Hewlett Packard Enterprise

(Test Sponsor: HPE)

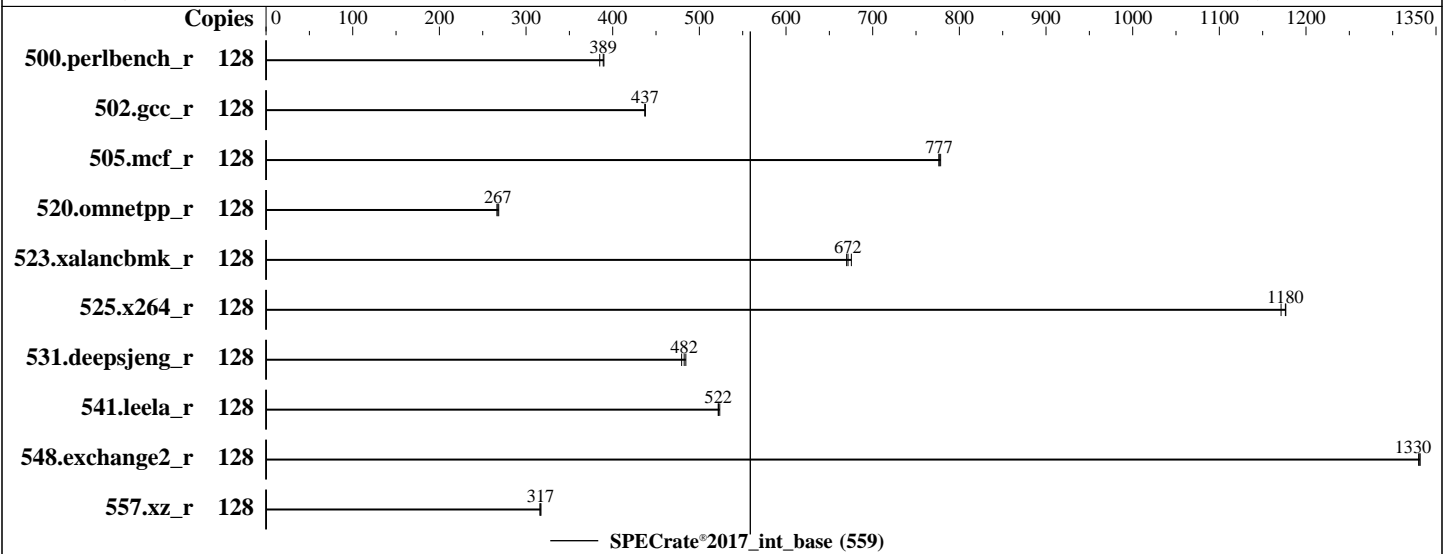
ProLiant XL225n Gen10 Plus  
(2.95 GHz, AMD EPYC 75F3)

SPECrate®2017\_int\_base = 559

SPECrate®2017\_int\_peak = Not Run

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

Test Date: Mar-2021  
Hardware Availability: Apr-2021  
Software Availability: Mar-2021



### Hardware

CPU Name: AMD EPYC 75F3  
 Max MHz: 4000  
 Nominal: 2950  
 Enabled: 64 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: 256 MB I+D on chip per chip, 32 MB shared / 4 cores  
 Other: None  
 Memory: 2 TB (16 x 128 GB 4Rx4 PC4-3200AA-L)  
 Storage: 1 x 960 GB SATA SSD, RAID 0  
 Other: None

### Software

OS: Ubuntu 20.04.1 LTS (x86\_64)  
 Kernel 5.4.0-42-generic  
 Compiler: C/C++/Fortran: Version 3.0.0 of AOCC  
 Parallel: No  
 Firmware: HPE BIOS Version A46 v2.42 02/15/2021 released Feb-2021  
 File System: ext4  
 System State: Run level 5 (multi-user)  
 Base Pointers: 64-bit  
 Peak Pointers: Not Applicable  
 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

Benchmark	Base								Peak							
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio		
500.perlbench_r	128	529	385	<b>524</b>	<b>389</b>	523	390									
502.gcc_r	128	<b>414</b>	<b>437</b>	414	438	415	437									
505.mcf_r	128	266	776	266	778	<b>266</b>	<b>777</b>									
520.omnetpp_r	128	630	266	<b>628</b>	<b>267</b>	625	268									
523.xalancbmk_r	128	200	675	202	670	<b>201</b>	<b>672</b>									
525.x264_r	128	<b>191</b>	<b>1180</b>	190	1180	191	1170									
531.deepsjeng_r	128	306	480	303	484	<b>304</b>	<b>482</b>									
541.leela_r	128	406	522	405	524	<b>406</b>	<b>522</b>									
548.exchange2_r	128	252	1330	<b>252</b>	<b>1330</b>	252	1330									
557.xz_r	128	<b>436</b>	<b>317</b>	438	316	436	317									

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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>
'echo 8 > /proc/sys/vm/dirty_ratio' run as root to limit dirty cache to 8% of
memory.
'echo 1 > /proc/sys/vm/swappiness' run as root to limit swap usage to minimum
necessary.
'echo 1 > /proc/sys/vm/zone_reclaim_mode' run as root to free node-local memory
and avoid remote memory usage.
'sync; echo 3 > /proc/sys/vm/drop_caches' run as root to reset filesystem caches.
'sysctl -w kernel.randomize_va_space=0' run as root to disable address space layout
randomization (ASLR) to reduce run-to-run variability.
'echo always > /sys/kernel/mm/transparent_hugepage/enabled' and
```

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## Operating System Notes (Continued)

'echo always > /sys/kernel/mm/transparent\_hugepage/defrag' run as root for peak integer runs and all FP runs to enable Transparent Hugepages (THP).

'echo madvise > /sys/kernel/mm/transparent\_hugepage/enabled' run as root for base integer runs to enable THP only on request.

## Environment Variables Notes

Environment variables set by runcpu before the start of the run:

LD\_LIBRARY\_PATH =

"/home/cpu2017/amd\_rate\_aocc300\_milan\_A\_lib/64;/home/cpu2017/amd\_rate\_aocc300\_milan\_A\_lib/32:"

MALLOC\_CONF = "retain:true"

## General Notes

Binaries were compiled on a system with 2x AMD EPYC 7742 CPU + 512GiB 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

Infinity Fabric Power Management set to Disabled

Infinity Fabric Performance State set to P0

Thermal Configuration set to Maximum Cooling

Workload Profile set to Custom

L2 HW Prefetcher set to Disabled

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## Platform Notes (Continued)

sysinfo program /home/cpu2017/bin/sysinfo  
Rev: r6538 of 2020-09-24 e8664e66d2d7080afeaa89d4b38e2f1c  
running on ubuntu Wed Apr 1 22:58:36 2020

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 75F3 32-Core Processor  
2 "physical id"s (chips)  
128 "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  
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

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): 128  
On-line CPU(s) list: 0-127  
Thread(s) per core: 2  
Core(s) per socket: 32  
Socket(s): 2  
NUMA node(s): 16  
Vendor ID: AuthenticAMD  
CPU family: 25  
Model: 1  
Model name: AMD EPYC 75F3 32-Core Processor  
Stepping: 1  
CPU MHz: 1796.211  
BogoMIPS: 5888.79  
Virtualization: AMD-V  
L1d cache: 2 MiB  
L1i cache: 2 MiB  
L2 cache: 32 MiB  
L3 cache: 512 MiB  
NUMA node0 CPU(s): 0-3,64-67  
NUMA node1 CPU(s): 4-7,68-71  
NUMA node2 CPU(s): 8-11,72-75

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## Platform Notes (Continued)

```

NUMA node3 CPU(s):          12-15,76-79
NUMA node4 CPU(s):          16-19,80-83
NUMA node5 CPU(s):          20-23,84-87
NUMA node6 CPU(s):          24-27,88-91
NUMA node7 CPU(s):          28-31,92-95
NUMA node8 CPU(s):          32-35,96-99
NUMA node9 CPU(s):          36-39,100-103
NUMA node10 CPU(s):         40-43,104-107
NUMA node11 CPU(s):         44-47,108-111
NUMA node12 CPU(s):         48-51,112-115
NUMA node13 CPU(s):         52-55,116-119
NUMA node14 CPU(s):         56-59,120-123
NUMA node15 CPU(s):         60-63,124-127
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 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 bml avx2 smep bmi2 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 64 65 66 67
node 0 size: 128776 MB
node 0 free: 128603 MB

```

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## Platform Notes (Continued)

```

node 1 cpus: 4 5 6 7 68 69 70 71
node 1 size: 129020 MB
node 1 free: 128883 MB
node 2 cpus: 8 9 10 11 72 73 74 75
node 2 size: 129022 MB
node 2 free: 128866 MB
node 3 cpus: 12 13 14 15 76 77 78 79
node 3 size: 129021 MB
node 3 free: 128815 MB
node 4 cpus: 16 17 18 19 80 81 82 83
node 4 size: 129022 MB
node 4 free: 128413 MB
node 5 cpus: 20 21 22 23 84 85 86 87
node 5 size: 129021 MB
node 5 free: 128791 MB
node 6 cpus: 24 25 26 27 88 89 90 91
node 6 size: 129022 MB
node 6 free: 128885 MB
node 7 cpus: 28 29 30 31 92 93 94 95
node 7 size: 128984 MB
node 7 free: 128821 MB
node 8 cpus: 32 33 34 35 96 97 98 99
node 8 size: 129022 MB
node 8 free: 128898 MB
node 9 cpus: 36 37 38 39 100 101 102 103
node 9 size: 129021 MB
node 9 free: 128899 MB
node 10 cpus: 40 41 42 43 104 105 106 107
node 10 size: 129022 MB
node 10 free: 128897 MB
node 11 cpus: 44 45 46 47 108 109 110 111
node 11 size: 129021 MB
node 11 free: 128897 MB
node 12 cpus: 48 49 50 51 112 113 114 115
node 12 size: 129022 MB
node 12 free: 128906 MB
node 13 cpus: 52 53 54 55 116 117 118 119
node 13 size: 129021 MB
node 13 free: 128901 MB
node 14 cpus: 56 57 58 59 120 121 122 123
node 14 size: 129022 MB
node 14 free: 128907 MB
node 15 cpus: 60 61 62 63 124 125 126 127
node 15 size: 129019 MB
node 15 free: 128903 MB
node distances:
node 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

```

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## Platform Notes (Continued)

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: 2113598528 kB  
HugePages\_Total: 0  
Hugepagesize: 2048 kB

/usr/bin/lsb\_release -d  
Ubuntu 20.04.1 LTS

From /etc/\*release\* /etc/\*version\*

debian\_version: bullseye/sid  
os-release:  
NAME="Ubuntu"  
VERSION="20.04.1 LTS (Focal Fossa)"  
ID=ubuntu  
ID\_LIKE=debian  
PRETTY\_NAME="Ubuntu 20.04.1 LTS"  
VERSION\_ID="20.04"  
HOME\_URL="https://www.ubuntu.com/"  
SUPPORT\_URL="https://help.ubuntu.com/"

uname -a:

Linux ubuntu 5.4.0-42-generic #46-Ubuntu SMP Fri Jul 10 00:24:02 UTC 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

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## Platform Notes (Continued)

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 5 Apr 1 22:54

SPEC is set to: /home/cpu2017

Filesystem	Type	Size	Used	Avail	Use%	Mounted on
/dev/mapper/vgubuntu-root	ext4	878G	9.3G	824G	2%	/

From /sys/devices/virtual/dmi/id

```
Vendor:      HPE
Product:    ProLiant XL225n Gen10 Plus
Product Family: ProLiant
Serial:     CN700303ZH
```

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:

16x UNKNOWN HMABAGL7ABR4N-XN 128 GB 4 rank 3200

BIOS:

```
BIOS Vendor:      HPE
BIOS Version:     A46
BIOS Date:        02/15/2021
BIOS Revision:    2.42
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)
=====
```

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## Compiler Version Notes (Continued)

AMD clang version 12.0.0 (CLANG: AOCC\_3.0.0-Build#78 2020\_12\_10) (based on LLVM Mirror.Version.12.0.0)  
Target: x86\_64-unknown-linux-gnu  
Thread model: posix  
InstalledDir: /opt/AMD/aocc-compiler-3.0.0/bin

=====  
C++ | 520.omnetpp\_r(base) 523.xalanbmk\_r(base) 531.deepsjeng\_r(base)  
| 541.leela\_r(base)  
=====

AMD clang version 12.0.0 (CLANG: AOCC\_3.0.0-Build#78 2020\_12\_10) (based on LLVM Mirror.Version.12.0.0)  
Target: x86\_64-unknown-linux-gnu  
Thread model: posix  
InstalledDir: /opt/AMD/aocc-compiler-3.0.0/bin

=====  
Fortran | 548.exchange2\_r(base)  
=====

AMD clang version 12.0.0 (CLANG: AOCC\_3.0.0-Build#78 2020\_12\_10) (based on LLVM Mirror.Version.12.0.0)  
Target: x86\_64-unknown-linux-gnu  
Thread model: posix  
InstalledDir: /opt/AMD/aocc-compiler-3.0.0/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:

```
-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 -O3 -ffast-math
-march=znver3 -fveclib=AMDLIBM -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 -z muldefs
-lamdlibm -ljemalloc -lflang -lflangrti
```

C++ benchmarks:

```
-m64 -std=c++98 -Wl,-mllvm -Wl,-do-block-reorder=aggressive -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 -O3 -ffast-math
-march=znver3 -fveclib=AMDLIBM -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
-z muldefs -mllvm -do-block-reorder=aggressive
-fvirtual-function-elimination -fvisibility=hidden -lamdlibm
-ljemalloc -lflang -lflangrti
```

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
```

(Continued on next page)



# SPEC CPU®2017 Integer Rate Result

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**Hewlett Packard Enterprise**

(Test Sponsor: HPE)

**ProLiant XL225n Gen10 Plus**  
(2.95 GHz, AMD EPYC 75F3)

SPECrate®2017\_int\_base = 559

SPECrate®2017\_int\_peak = Not Run

**CPU2017 License:** 3

**Test Sponsor:** HPE

**Tested by:** HPE

**Test Date:** Mar-2021

**Hardware Availability:** Apr-2021

**Software Availability:** Mar-2021

## Base Optimization Flags (Continued)

Fortran benchmarks (continued):

```
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6  
-Wl,-mllvm -Wl,-reduce-array-computations=3 -O3 -ffast-math  
-march=znver3 -fveclib=AMDLIBM -z muldefs -mllvm -unroll-aggressive  
-mllvm -unroll-threshold=500 -lamdlibm -ljemalloc -lflang -lflangrti
```

## Base Other Flags

C benchmarks:

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

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/aocc300-flags-A1.html>

<http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-AMD-V1.2-EPYC-revP.html>

You can also download the XML flags sources by saving the following links:

<http://www.spec.org/cpu2017/flags/aocc300-flags-A1.xml>

<http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-AMD-V1.2-EPYC-revP.xml>

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