



# SPEC CPU®2017 Integer Rate Result

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## Hewlett Packard Enterprise

(Test Sponsor: HPE)

### ProLiant ML30 Gen10 Plus

(2.80 GHz, Intel Xeon E-2378G)

SPECrate®2017\_int\_base = 69.1

SPECrate®2017\_int\_peak = 72.3

CPU2017 License: 3

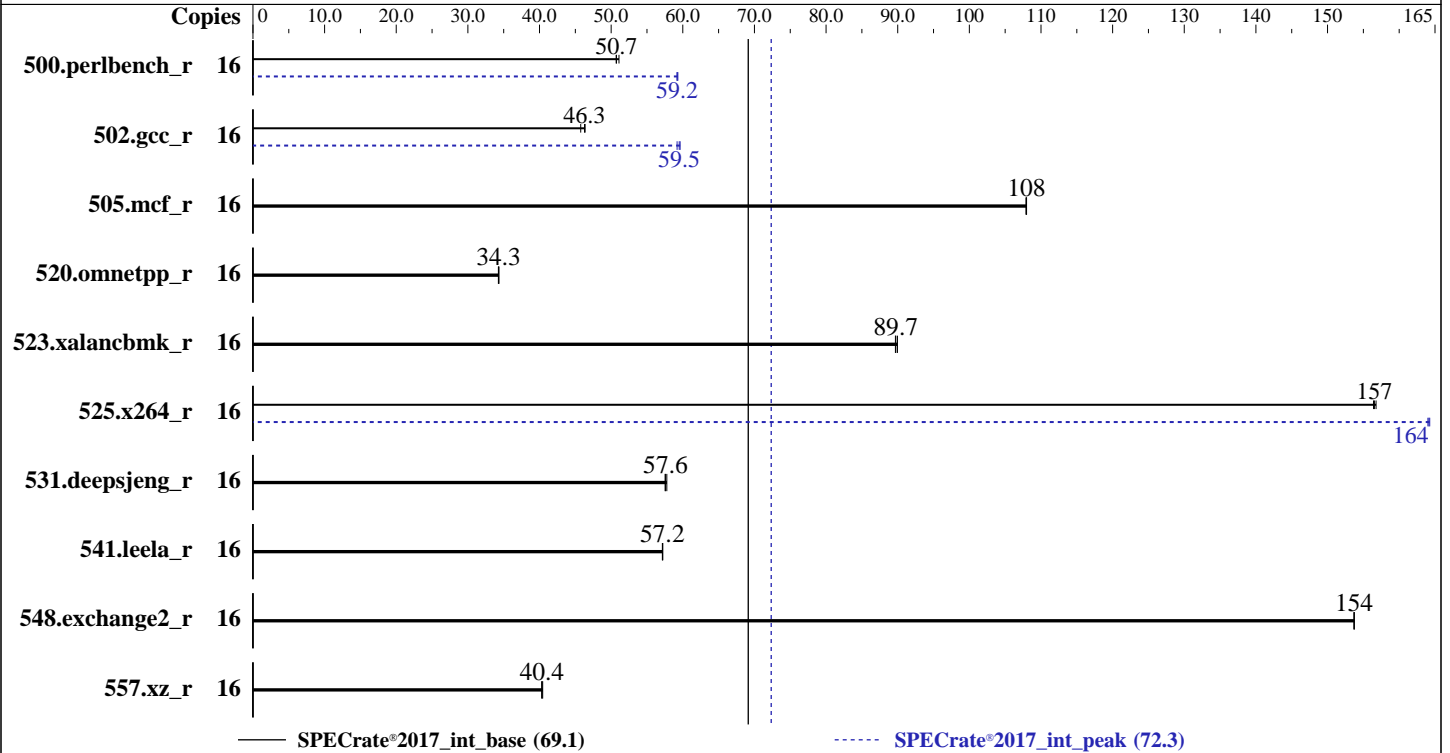
Test Sponsor: HPE

Tested by: HPE

Test Date: Mar-2022

Hardware Availability: Jan-2022

Software Availability: Jun-2021



### Hardware

CPU Name: Intel Xeon E-2378G  
 Max MHz: 5100  
 Nominal: 2800  
 Enabled: 8 cores, 1 chip, 2 threads/core  
 Orderable: 1 chip  
 Cache L1: 32 KB I + 48 KB D on chip per core  
 L2: 512 KB I+D on chip per core  
 L3: 16 MB I+D on chip per chip  
 Other: None  
 Memory: 128 GB (4 x 32 GB 2Rx8 PC4-3200AA-E, running at 2933)  
 Storage: 1 x 600 GB 15K SAS HDD  
 Other: None

### Software

OS: SUSE Linux Enterprise Server 15 SP3  
 Kernel 5.3.18-57-default  
 Compiler: C/C++: Version 2021.1 of Intel oneAPI DPC++/C++ Compiler Build 20201113 for Linux;  
 Fortran: Version 2021.1 of Intel Fortran Compiler Classic Build 20201112 for Linux;  
 C/C++: Version 2021.1 of Intel C/C++ Compiler Classic Build 20201112 for Linux  
 Parallel: No  
 Firmware: HPE BIOS Version U61 v1.54 (01/13/2022) released Jan-2022  
 File System: xfs  
 System State: Run level 5 (multi-user)  
 Base Pointers: 64-bit  
 Peak Pointers: 32/64-bit  
 Other: jemalloc memory allocator V5.0.1  
 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	16	499	51.1	502	50.7	<b><u>502</u></b>	<b><u>50.7</u></b>	16	429	59.3	430	59.2	<b><u>430</u></b>	<b><u>59.2</u></b>
502.gcc_r	16	495	45.8	489	46.4	<b><u>490</u></b>	<b><u>46.3</u></b>	16	383	59.2	380	59.6	<b><u>381</u></b>	<b><u>59.5</u></b>
505.mcf_r	16	240	108	239	108	<b><u>239</u></b>	<b><u>108</u></b>	16	240	108	239	108	<b><u>239</u></b>	<b><u>108</u></b>
520.omnetpp_r	16	<b><u>612</u></b>	<b><u>34.3</u></b>	611	34.3	613	34.3	16	<b><u>612</u></b>	<b><u>34.3</u></b>	611	34.3	613	34.3
523.xalancbmk_r	16	188	89.7	<b><u>188</u></b>	<b><u>89.7</u></b>	188	90.0	16	188	89.7	<b><u>188</u></b>	<b><u>89.7</u></b>	188	90.0
525.x264_r	16	179	157	179	156	<b><u>179</u></b>	<b><u>157</u></b>	16	<b><u>171</u></b>	<b><u>164</u></b>	171	164	171	164
531.deepsjeng_r	16	317	57.8	<b><u>318</u></b>	<b><u>57.6</u></b>	319	57.5	16	317	57.8	<b><u>318</u></b>	<b><u>57.6</u></b>	319	57.5
541.leela_r	16	463	57.2	464	57.2	<b><u>464</u></b>	<b><u>57.2</u></b>	16	463	57.2	464	57.2	<b><u>464</u></b>	<b><u>57.2</u></b>
548.exchange2_r	16	273	154	273	154	<b><u>273</u></b>	<b><u>154</u></b>	16	273	154	273	154	<b><u>273</u></b>	<b><u>154</u></b>
557.xz_r	16	<b><u>428</u></b>	<b><u>40.4</u></b>	427	40.4	429	40.3	16	<b><u>428</u></b>	<b><u>40.4</u></b>	427	40.4	429	40.3

SPECrate®2017\_int\_base = **69.1**

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Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

## Submit Notes

The taskset mechanism was used to bind copies to processors. The config file option 'submit' was used to generate taskset commands to bind each copy to a specific processor. For details, please see the config file.

## Operating System Notes

Stack size set to unlimited using "ulimit -s unlimited"  
Transparent Huge Pages enabled by default  
Prior to runcpu invocation  
Filesystem page cache synced and cleared with:  
sync; echo 3 > /proc/sys/vm/drop\_caches

## Environment Variables Notes

Environment variables set by runcpu before the start of the run:  
LD\_LIBRARY\_PATH =  
"/home/cpu2017/lib/intel64:/home/cpu2017/lib/ia32:/home/cpu2017/je5.0.1-32"  
MALLOC\_CONF = "retain:true"

## General Notes

Binaries compiled on a system with 1x Intel Core i9-7980XE CPU + 64GB RAM memory using Red Hat Enterprise Linux 8.1  
NA: The test sponsor attests, as of date of publication, that CVE-2017-5754 (Meltdown)

(Continued on next page)



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## General Notes (Continued)

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, a general purpose malloc implementation

built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5

sources available from jemalloc.net or <https://github.com/jemalloc/jemalloc/releases>

## Platform Notes

BIOS Configuration:

Workload Profile set to General Throughput Compute

Thermal Configuration set to Maximum Cooling

Enhanced Processor Performance set to Enabled

Last Level Cache (LLC) prefetch set to Enabled

Sysinfo program /home/cpu2017/bin/sysinfo

Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acafc64d

running on localhost Thu Mar 3 01:14:00 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 : Intel(R) Xeon(R) E-2378G CPU @ 2.80GHz

1 "physical id"s (chips)

16 "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 : 8

siblings : 16

physical 0: cores 0 1 2 3 4 5 6 7

From lscpu from util-linux 2.36.2:

Architecture: x86\_64

CPU op-mode(s): 32-bit, 64-bit

Byte Order: Little Endian

Address sizes: 39 bits physical, 48 bits virtual

CPU(s): 16

On-line CPU(s) list: 0-15

Thread(s) per core: 2

Core(s) per socket: 8

Socket(s): 1

NUMA node(s): 1

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## Platform Notes (Continued)

```

Vendor ID: GenuineIntel
CPU family: 6
Model: 167
Model name: Intel(R) Xeon(R) E-2378G CPU @ 2.80GHz
Stepping: 1
CPU MHz: 2803.125
BogoMIPS: 5616.00
Virtualization: VT-x
L1d cache: 384 KiB
L1i cache: 256 KiB
L2 cache: 4 MiB
L3 cache: 16 MiB
NUMA node0 CPU(s): 0-15
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; Enhanced IBRS, IBPB conditional, 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 dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtscp lm constant_tsc art arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid aperfperf tsc_known_freq pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtpr pdcm pcid sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault epb invpcid_single ssbd ibrs_ibpb stibp ibrs_enhanced tpr_shadow vnmi flexpriority ept vpid ept_ad fsgsbase tsc_adjust bmi1 avx2 smep bmi2 erms invpcid mpx avx512f avx512dq rdseed adx smap avx512ifma clflushopt intel_pt avx512cd sha_ni avx512bw avx512vl xsaveopt xsavec xgetbv1 xsaves dtherm ida arat pln pts avx512vbmi umip pku ospke avx512_vbmi2 gfni vaes vpclmulqdq avx512_vnni avx512_bitalg avx512_vpopcntdq rdpid fsrm md_clear flush_lld arch_capabilities

```

From lscpu --cache:

NAME	ONE-SIZE	ALL-SIZE	WAYS	TYPE	LEVEL	SETS	PHY-LINE	COHERENCY-SIZE
L1d	48K	384K	12	Data	1	64	1	64
L1i	32K	256K	8	Instruction	1	64	1	64
L2	512K	4M	8	Unified	2	1024	1	64
L3	16M	16M	16	Unified	3	16384	1	64

/proc/cpuinfo cache data  
cache size : 16384 KB

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## Platform Notes (Continued)

From numactl --hardware

WARNING: a numactl 'node' might or might not correspond to a physical chip.

available: 1 nodes (0)

node 0 cpus: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

node 0 size: 128464 MB

node 0 free: 127387 MB

node distances:

node 0  
0: 10

From /proc/meminfo

MemTotal: 131548012 kB

HugePages\_Total: 0

Hugepagesize: 2048 kB

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

os-release:

NAME="SLES"

VERSION="15-SP3"

VERSION\_ID="15.3"

PRETTY\_NAME="SUSE Linux Enterprise Server 15 SP3"

ID="sles"

ID\_LIKE="suse"

ANSI\_COLOR="0;32"

CPE\_NAME="cpe:/o:suse:sles:15:sp3"

uname -a:

Linux localhost 5.3.18-57-default #1 SMP Wed Apr 28 10:54:41 UTC 2021 (ba3c2e9) 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/swaps barriers and \_\_user pointer sanitization

CVE-2017-5715 (Spectre variant 2):

Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling

CVE-2020-0543 (Special Register Buffer Data Sampling):

Not affected

CVE-2019-11135 (TSX Asynchronous Abort):

Not affected

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## Platform Notes (Continued)

run-level 5 Mar 3 01:13

SPEC is set to: /home/cpu2017

Filesystem	Type	Size	Used	Avail	Use%	Mounted on
/dev/sdc3	xfs	519G	41G	478G	8%	/home

From /sys/devices/virtual/dmi/id

```
Vendor:          HPE
Product:         ProLiant ML30 Gen10 Plus
Product Family: ProLiant
Serial:          SerNum.ACC
```

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:

```
1x Hynix HMAA4GU7AJR8N-XN 32 GB 2 rank 3200, configured at 2933
2x Micron 18ASF4G72AZ-3G2B1 32 GB 2 rank 3200, configured at 2933
1x Samsung M391A4G43AB1-CWE 32 GB 2 rank 3200, configured at 2933
```

BIOS:

```
BIOS Vendor:      HPE
BIOS Version:     U61
BIOS Date:        01/13/2022
BIOS Revision:    1.54
Firmware Revision: 2.55
```

(End of data from sysinfo program)

## Compiler Version Notes

=====  
C | 500.perlbench\_r(peak)

```
-----
Intel(R) C Intel(R) 64 Compiler Classic for applications running on Intel(R)
64, Version 2021.1 Build 20201112_000000
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
-----
```

=====  
C | 502.gcc\_r(peak)

```
-----
Intel(R) oneAPI DPC++/C++ Compiler for applications running on IA-32, Version
2021.1 Build 20201113
```

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## Compiler Version Notes (Continued)

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```
=====  
C      | 500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base, peak)  
      | 525.x264_r(base, peak) 557.xz_r(base, peak)  
=====
```

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,  
Version 2021.1 Build 20201113

Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

```
=====  
C      | 500.perlbench_r(peak)  
=====
```

Intel(R) C Intel(R) 64 Compiler Classic for applications running on Intel(R)  
64, Version 2021.1 Build 20201112\_000000

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```
=====  
C      | 502.gcc_r(peak)  
=====
```

Intel(R) oneAPI DPC++/C++ Compiler for applications running on IA-32, Version  
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```
=====  
C      | 500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base, peak)  
      | 525.x264_r(base, peak) 557.xz_r(base, peak)  
=====
```

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```
=====  
C      | 500.perlbench_r(peak)  
=====
```

Intel(R) C Intel(R) 64 Compiler Classic for applications running on Intel(R)  
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```
=====  
C      | 502.gcc_r(peak)  
=====
```

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-----  
Intel(R) oneAPI DPC++/C++ Compiler for applications running on IA-32, Version 2021.1 Build 20201113

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-----

=====  
C | 500.perlbench\_r(base) 502.gcc\_r(base) 505.mcf\_r(base, peak)  
525.x264\_r(base, peak) 557.xz\_r(base, peak)

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2021.1 Build 20201113

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-----

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

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2021.1 Build 20201113

Copyright (C) 1985-2020 Intel Corporation. All rights reserved.  
-----

=====  
Fortran | 548.exchange2\_r(base, peak)  
-----

Intel(R) Fortran Intel(R) 64 Compiler Classic for applications running on Intel(R) 64, Version 2021.1 Build 20201112\_000000

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-----

## Base Compiler Invocation

C benchmarks:

icx

C++ benchmarks:

icpx

Fortran benchmarks:

ifort





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## Base Portability Flags

```
500.perlbench_r: -DSPEC_LP64 -DSPEC_LINUX_X64
502.gcc_r: -DSPEC_LP64
505.mcf_r: -DSPEC_LP64
520.omnetpp_r: -DSPEC_LP64
523.xalancbmk_r: -DSPEC_LP64 -DSPEC_LINUX
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:

```
-w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-mbranches-within-32B-boundaries
-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin
-lqkmalloc
```

C++ benchmarks:

```
-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ffast-math -flto
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-mbranches-within-32B-boundaries
-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin
-lqkmalloc
```

Fortran benchmarks:

```
-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ipo -no-prec-div
-qopt-mem-layout-trans=4 -nostandard-realloc-lhs -align array32byte
-auto -mbranches-within-32B-boundaries
-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin
-lqkmalloc
```

## Peak Compiler Invocation

C benchmarks (except as noted below):

icx

500.perlbench\_r: icc

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## Peak Compiler Invocation (Continued)

C++ benchmarks:

icpx

Fortran benchmarks:

ifort

## Peak Portability Flags

```
500.perlbench_r: -DSPEC_LP64 -DSPEC_LINUX_X64
502.gcc_r: -D_FILE_OFFSET_BITS=64
505.mcf_r: -DSPEC_LP64
520.omnetpp_r: -DSPEC_LP64
523.xalancbmk_r: -DSPEC_LP64 -DSPEC_LINUX
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
```

## Peak Optimization Flags

C benchmarks:

```
500.perlbench_r: -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2)
-xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4 -fno-strict-overflow
-mbranches-within-32B-boundaries
-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin
-lqkmalloc

502.gcc_r: -m32
-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/ia32_lin
-std=gnu89 -Wl,-z,muldefs -fprofile-generate(pass 1)
-fprofile-use=default.profddata(pass 2) -xCORE-AVX512 -flto
-Ofast(pass 1) -O3 -ffast-math -qopt-mem-layout-trans=4
-mbranches-within-32B-boundaries
-L/usr/local/jemalloc32-5.0.1/lib -ljemalloc

505.mcf_r: basepeak = yes

525.x264_r: -w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX512 -flto
-O3 -ffast-math -qopt-mem-layout-trans=4 -fno-alias
```

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**SPECrate®2017\_int\_peak = 72.3**

**CPU2017 License:** 3

**Test Sponsor:** HPE

**Tested by:** HPE

**Test Date:** Mar-2022

**Hardware Availability:** Jan-2022

**Software Availability:** Jun-2021

## Peak Optimization Flags (Continued)

525.x264\_r (continued):

```
-mbranches-within-32B-boundaries  
-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin  
-lqkmallocc
```

557.xz\_r: basepeak = yes

C++ benchmarks:

520.omnetpp\_r: basepeak = yes

523.xalancbmk\_r: basepeak = yes

531.deepsjeng\_r: basepeak = yes

541.leela\_r: basepeak = yes

Fortran benchmarks:

548.exchange2\_r: basepeak = yes

The flags files that were used to format this result can be browsed at

<http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-V1.0-ICX-revE.html>

[http://www.spec.org/cpu2017/flags/Intel-ic2021-official-linux64\\_revA.html](http://www.spec.org/cpu2017/flags/Intel-ic2021-official-linux64_revA.html)

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

<http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-V1.0-ICX-revE.xml>

[http://www.spec.org/cpu2017/flags/Intel-ic2021-official-linux64\\_revA.xml](http://www.spec.org/cpu2017/flags/Intel-ic2021-official-linux64_revA.xml)

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For questions about this result, please contact the tester. For other inquiries, please contact [info@spec.org](mailto:info@spec.org).

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