# SPEC CPU®2017 Integer Rate Result

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## Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant DL580 Gen10
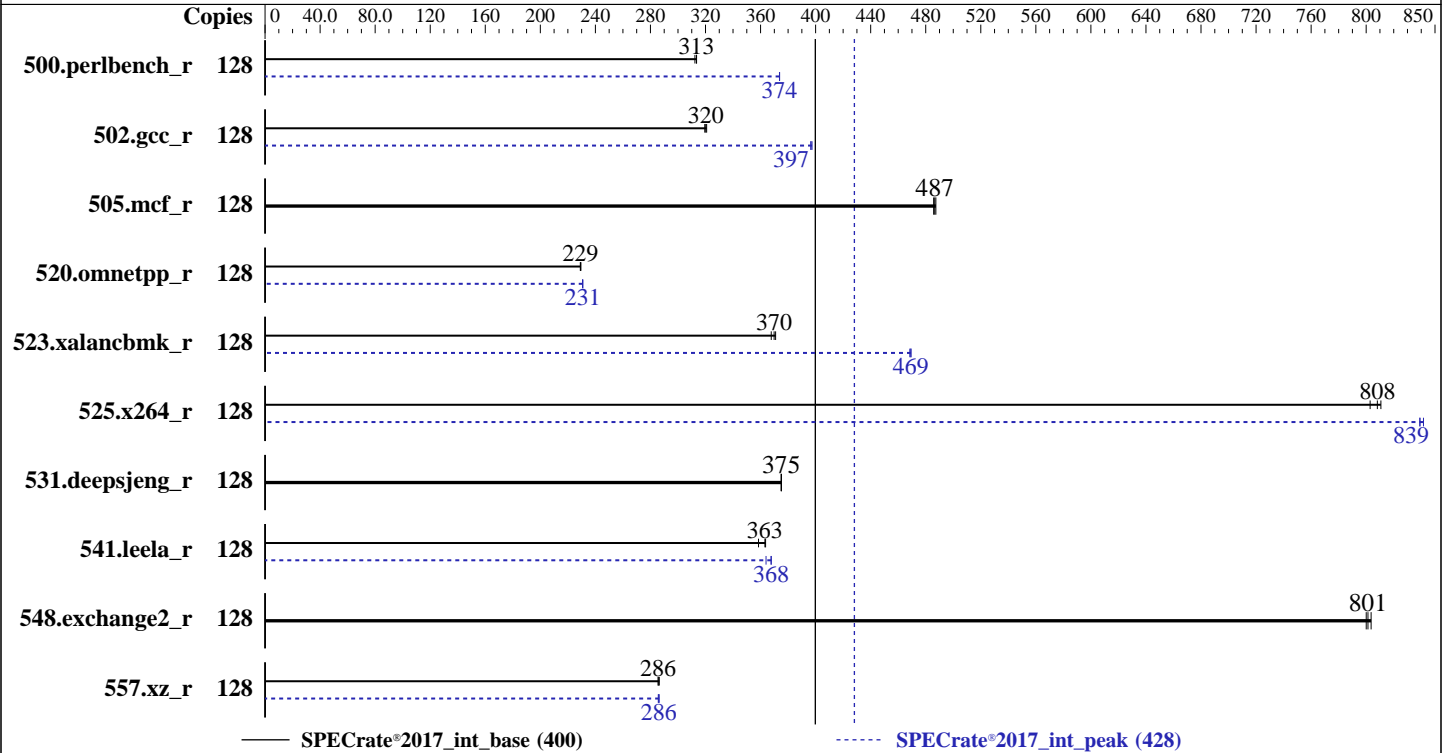(2.80 GHz, Intel Xeon Gold 6143)

$SPECrate®2017\_int\_base = 400$

$SPECrate®2017\_int\_peak = 428$

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

**Test Date:** Mar-2019
**Hardware Availability:** Oct-2018
**Software Availability:** Dec-2018

| Benchmark | Copies | base | peak |
|---|---|---|---|
| 500.perlbench_r | 128 | 313 | 374 |
| 502.gcc_r | 128 | 320 | 397 |
| 505.mcf_r | 128 | 487 | |
| 520.omnetpp_r | 128 | 229 | 231 |
| 523.xalancbmk_r | 128 | 370 | 469 |
| 525.x264_r | 128 | 808 | 839 |
| 531.deepsjeng_r | 128 | 375 | |
| 541.leela_r | 128 | 363 | 368 |
| 548.exchange2_r | 128 | 801 | |
| 557.xz_r | 128 | 286 | 286 |

———— SPECrate®2017_int_base (400)  ------- SPECrate®2017_int_peak (428)

## Hardware

CPU Name: Intel Xeon Gold 6143
 Max MHz: 4000
 Nominal: 2800
Enabled: 64 cores, 4 chips, 2 threads/core
Orderable: 1, 2, 3, 4 chip(s)
Cache L1: 32 KB I + 32 KB D on chip per core
 L2: 1 MB I+D on chip per core
 L3: 22 MB I+D on chip per chip
 Other: None
Memory: 768 GB (48 x 16 GB 2Rx4 PC4-2666V-R)
Storage: 2 x 1 TB 7.2 K SAS HDD, RAID 1
Other: None

## Software

OS: SUSE Linux Enterprise Server 12 (x86_64) SP4
Kernel 4.12.14-94.41-default
Compiler: C/C++: Version 19.0.0.117 of Intel C/C++
Compiler for Linux;
Fortran: Version 19.0.0.117 of Intel Fortran
Compiler for Linux
Parallel: No
Firmware: HPE BIOS Version U34 10/02/2018 released Oct-2018
File System: xfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: 32/64-bit
Other: jemalloc memory allocator V5.0.1
Power Management: --

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| | |
|---|---|
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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 | **650** | **313** | 652 | 312 | 650 | 314 | 128 | 545 | 374 | **545** | **374** | 545 | 374 |
| 502.gcc_r | 128 | **566** | **320** | 565 | 321 | 567 | 319 | 128 | 456 | 397 | 457 | 397 | **457** | **397** |
| 505.mcf_r | 128 | **425** | **487** | 426 | 486 | 424 | 487 | 128 | **425** | **487** | 426 | 486 | 424 | 487 |
| 520.omnetpp_r | 128 | 733 | 229 | **733** | **229** | 732 | 229 | 128 | 728 | 231 | **728** | **231** | 728 | 231 |
| 523.xalancbmk_r | 128 | 368 | 368 | 364 | 371 | **365** | **370** | 128 | 289 | 468 | **288** | **469** | 288 | 469 |
| 525.x264_r | 128 | 279 | 803 | 276 | 811 | **277** | **808** | 128 | **267** | **839** | 267 | 839 | 266 | 842 |
| 531.deepsjeng_r | 128 | 391 | 375 | **391** | **375** | 391 | 375 | 128 | 391 | 375 | **391** | **375** | 391 | 375 |
| 541.leela_r | 128 | **584** | **363** | 591 | 359 | 583 | 364 | 128 | 576 | 368 | **577** | **368** | 582 | 364 |
| 548.exchange2_r | 128 | 419 | 800 | 417 | 804 | **419** | **801** | 128 | 419 | 800 | 417 | 804 | **419** | **801** |
| 557.xz_r | 128 | 483 | 286 | **484** | **286** | 484 | 286 | 128 | **483** | **286** | 483 | 286 | 484 | 286 |
| **SPECrate®2017_int_base =** | **400** | | | | | | | | | | | | | |
| **SPECrate®2017_int_peak =** | **428** | | | | | | | | | | | | | |

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

## Submit Notes

The numactl mechanism was used to bind copies to processors. The config file option 'submit'
was used to generate numactl 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
runcpu command invoked through numactl i.e.:
  numactl --interleave=all runcpu <etc>

## General Notes

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

LD_LIBRARY_PATH = "/home/cpu2017/lib/ia32:/home/cpu2017/lib/intel64:/home/cpu2017/je5.0.1-32:/home/cpu2017/je5.0.1-64"

Binaries compiled on a system with 1x Intel Core i9-7900X CPU + 32GB RAM
memory using Redhat Enterprise Linux 7.5

Yes: 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.

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| **Tested by:** | HPE | **Software Availability:** | Dec-2018 |

## General Notes (Continued)

```
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:
 Memory Patrol Scrubbing set to Disabled
 LLC Dead Line Allocation set to Disabled
 LLC Prefetch set to Enabled
 Thermal Configuration set to Maximum Cooling
 Workload Profile set to General Throughput Compute
  Minimum Processor Idle Power Core C-State set to C1E
 Sysinfo program /home/cpu2017/bin/sysinfo
 Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
 running on linux-di46 Fri Mar 29 12:44:33 2019

 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) Gold 6143 CPU @ 2.80GHz
       4  "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 : 16
       siblings  : 32
       physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
       physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
       physical 2: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
       physical 3: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

 From lscpu:
    Architecture:          x86_64
    CPU op-mode(s):        32-bit, 64-bit
    Byte Order:            Little Endian
    CPU(s):                128
    On-line CPU(s) list:   0-127
    Thread(s) per core:    2
    Core(s) per socket:    16
    Socket(s):             4
    NUMA node(s):          8
```

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**Test Date:** Mar-2019
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## Platform Notes (Continued)

```
      Vendor ID:              GenuineIntel
      CPU family:             6
      Model:                  85
      Model name:             Intel(R) Xeon(R) Gold 6143 CPU @ 2.80GHz
      Stepping:               4
      CPU MHz:                2800.000
      BogoMIPS:               5600.00
      Virtualization:         VT-x
      L1d cache:              32K
      L1i cache:              32K
      L2 cache:               1024K
      L3 cache:               22528K
      NUMA node0 CPU(s):      0-7,64-71
      NUMA node1 CPU(s):      8-15,72-79
      NUMA node2 CPU(s):      16-23,80-87
      NUMA node3 CPU(s):      24-31,88-95
      NUMA node4 CPU(s):      32-39,96-103
      NUMA node5 CPU(s):      40-47,104-111
      NUMA node6 CPU(s):      48-55,112-119
      NUMA node7 CPU(s):      56-63,120-127
      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
    aperfmperf pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16
    xtpr pdcm pcid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave
    avx f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault epb cat_l3 cdp_l3
    invpcid_single pti intel_ppin ssbd mba ibrs ibpb stibp tpr_shadow vnmi flexpriority
    ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm cqm mpx rdt_a
    avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd avx512bw avx512vl
    xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local
    dtherm ida arat pln pts pku ospke flush_l1d

 /proc/cpuinfo cache data
    cache size : 22528 KB

 From numactl --hardware  WARNING: a numactl 'node' might or might not correspond to a
 physical chip.
   available: 8 nodes (0-7)
   node 0 cpus: 0 1 2 3 4 5 6 7 64 65 66 67 68 69 70 71
   node 0 size: 96249 MB
   node 0 free: 91096 MB
   node 1 cpus: 8 9 10 11 12 13 14 15 72 73 74 75 76 77 78 79
   node 1 size: 96764 MB
   node 1 free: 93152 MB
   node 2 cpus: 16 17 18 19 20 21 22 23 80 81 82 83 84 85 86 87
   node 2 size: 96764 MB
   node 2 free: 93545 MB
```

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## Platform Notes (Continued)

```
    node 3 cpus: 24 25 26 27 28 29 30 31 88 89 90 91 92 93 94 95
    node 3 size: 96764 MB
    node 3 free: 93510 MB
    node 4 cpus: 32 33 34 35 36 37 38 39 96 97 98 99 100 101 102 103
    node 4 size: 96764 MB
    node 4 free: 93556 MB
    node 5 cpus: 40 41 42 43 44 45 46 47 104 105 106 107 108 109 110 111
    node 5 size: 96764 MB
    node 5 free: 93534 MB
    node 6 cpus: 48 49 50 51 52 53 54 55 112 113 114 115 116 117 118 119
    node 6 size: 96764 MB
    node 6 free: 93553 MB
    node 7 cpus: 56 57 58 59 60 61 62 63 120 121 122 123 124 125 126 127
    node 7 size: 96555 MB
    node 7 free: 93328 MB
    node distances:
    node   0   1   2   3   4   5   6   7
      0:  10  21  31  31  31  31  31  31
      1:  21  10  31  31  31  31  31  31
      2:  31  31  10  21  31  31  31  31
      3:  31  31  21  10  31  31  31  31
      4:  31  31  31  31  10  21  31  31
      5:  31  31  31  31  21  10  31  31
      6:  31  31  31  31  31  31  10  21
      7:  31  31  31  31  31  31  21  10

  From /proc/meminfo
     MemTotal:       791955124 kB
     HugePages_Total:        0
     Hugepagesize:        2048 kB

  /usr/bin/lsb_release -d
     SUSE Linux Enterprise Server 12 SP4

  From /etc/*release* /etc/*version*
     SuSE-release:
        SUSE Linux Enterprise Server 12 (x86_64)
        VERSION = 12
        PATCHLEVEL = 4
        # This file is deprecated and will be removed in a future service pack or release.
        # Please check /etc/os-release for details about this release.
     os-release:
        NAME="SLES"
        VERSION="12-SP4"
        VERSION_ID="12.4"
        PRETTY_NAME="SUSE Linux Enterprise Server 12 SP4"
        ID="sles"
```

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## Platform Notes (Continued)

```
        ANSI_COLOR="0;32"
        CPE_NAME="cpe:/o:suse:sles:12:sp4"

 uname -a:
    Linux linux-di46 4.12.14-94.41-default #1 SMP Wed Oct 31 12:25:04 UTC 2018 (3090901)
    x86_64 x86_64 x86_64 GNU/Linux

 Kernel self-reported vulnerability status:

 CVE-2017-5754 (Meltdown):           Mitigation: PTI
 CVE-2017-5753 (Spectre variant 1): Mitigation: __user pointer sanitization
 CVE-2017-5715 (Spectre variant 2): Mitigation: Indirect Branch Restricted Speculation,
 IBPB, IBRS_FW

 run-level 3 Mar 29 10:11

 SPEC is set to: /home/cpu2017
    Filesystem      Type  Size  Used Avail Use% Mounted on
    /dev/sdb4       xfs   889G   33G  857G   4% /home

 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.
    BIOS HPE U34 10/02/2018
    Memory:
     48x HPE 840756-091 16 GB 2 rank 2666

 (End of data from sysinfo program)
```

## Compiler Version Notes

```
==============================================================================
C      | 502.gcc_r(peak)
------------------------------------------------------------------------------
Intel(R) C Intel(R) 64 Compiler for applications running on IA-32, Version
 19.0.0.117 Build 20180804
Copyright (C) 1985-2018 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------


==============================================================================
C      | 500.perlbench_r(base, peak) 502.gcc_r(base) 505.mcf_r(base, peak)
       | 525.x264_r(base, peak) 557.xz_r(base, peak)
------------------------------------------------------------------------------
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
 Version 19.0.0.117 Build 20180804
```

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## Compiler Version Notes (Continued)

```
Copyright (C) 1985-2018 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------


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C       | 502.gcc_r(peak)
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Intel(R) C Intel(R) 64 Compiler for applications running on IA-32, Version
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Copyright (C) 1985-2018 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------


==============================================================================
C       | 500.perlbench_r(base, peak) 502.gcc_r(base) 505.mcf_r(base, peak)
        | 525.x264_r(base, peak) 557.xz_r(base, peak)
------------------------------------------------------------------------------
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.0.117 Build 20180804
Copyright (C) 1985-2018 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------


==============================================================================
C++     | 523.xalancbmk_r(peak)
------------------------------------------------------------------------------
Intel(R) C++ Intel(R) 64 Compiler for applications running on IA-32, Version
  19.0.0.117 Build 20180804
Copyright (C) 1985-2018 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------


==============================================================================
C++     | 520.omnetpp_r(base, peak) 523.xalancbmk_r(base)
        | 531.deepsjeng_r(base, peak) 541.leela_r(base, peak)
------------------------------------------------------------------------------
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.0.117 Build 20180804
Copyright (C) 1985-2018 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------


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------------------------------------------------------------------------------


==============================================================================
C++     | 520.omnetpp_r(base, peak) 523.xalancbmk_r(base)
```

**(Continued on next page)**

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## Compiler Version Notes (Continued)

```
      | 531.deepsjeng_r(base, peak) 541.leela_r(base, peak)
------------------------------------------------------------------------
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.0.117 Build 20180804
Copyright (C) 1985-2018 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------


==============================================================================
Fortran | 548.exchange2_r(base, peak)
------------------------------------------------------------------------
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
  64, Version 19.0.0.117 Build 20180804
Copyright (C) 1985-2018 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------
```

## Base Compiler Invocation

C benchmarks:
`icc -m64 -std=c11`

C++ benchmarks:
`icpc -m64`

Fortran benchmarks:
`ifort -m64`

## 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`

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## Base Optimization Flags

C benchmarks:
```
-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=3 -L/usr/local/je5.0.1-64/lib -ljemalloc
```

C++ benchmarks:
```
-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=3 -L/usr/local/je5.0.1-64/lib -ljemalloc
```

Fortran benchmarks:
```
-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=3 -nostandard-realloc-lhs -align array32byte
-L/usr/local/je5.0.1-64/lib -ljemalloc
```

## Peak Compiler Invocation

C benchmarks (except as noted below):
```
icc -m64 -std=c11
```

502.gcc_r: `icc -m32 -std=c11 -L/usr/local/IntelCompiler19/compilers_and_libraries_2019.0.117/linux/compiler/lib/ia32_lin`

C++ benchmarks (except as noted below):
```
icpc -m64
```

523.xalancbmk_r: `icpc -m32 -L/usr/local/IntelCompiler19/compilers_and_libraries_2019.0.117/linux/compiler/lib/ia32_lin`

Fortran benchmarks:
```
ifort -m64
```

## 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: `-D_FILE_OFFSET_BITS=64 -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`

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# Peak Optimization Flags

C benchmarks:

500.perlbench_r: `-Wl,-z,muldefs` -prof-gen(pass 1) -prof-use(pass 2) `-ipo`
`-xCORE-AVX512 -O3 -no-prec-div -qopt-mem-layout-trans=3`
`-fno-strict-overflow -L/usr/local/je5.0.1-64/lib`
`-ljemalloc`

502.gcc_r: `-Wl,-z,muldefs` -prof-gen(pass 1) -prof-use(pass 2) `-ipo`
`-xCORE-AVX512 -O3 -no-prec-div -qopt-mem-layout-trans=3`
`-L/usr/local/je5.0.1-32/lib -ljemalloc`

505.mcf_r: `basepeak = yes`

525.x264_r: `-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div`
`-qopt-mem-layout-trans=3 -fno-alias`
`-L/usr/local/je5.0.1-64/lib -ljemalloc`

557.xz_r: `-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div`
`-qopt-mem-layout-trans=3 -L/usr/local/je5.0.1-64/lib`
`-ljemalloc`

C++ benchmarks:

520.omnetpp_r: `-Wl,-z,muldefs` -prof-gen(pass 1) -prof-use(pass 2) `-ipo`
`-xCORE-AVX512 -O3 -no-prec-div -qopt-mem-layout-trans=3`
`-L/usr/local/je5.0.1-64/lib -ljemalloc`

523.xalancbmk_r: `-Wl,-z,muldefs` -prof-gen(pass 1) -prof-use(pass 2) `-ipo`
`-xCORE-AVX512 -O3 -no-prec-div -qopt-mem-layout-trans=3`
`-L/usr/local/je5.0.1-32/lib -ljemalloc`

531.deepsjeng_r: `basepeak = yes`

541.leela_r: `Same as 520.omnetpp_r`

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/Intel-ic19.0-official-linux64.2019-01-15.html
http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-V1.2-SKX-revJ.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/Intel-ic19.0-official-linux64.2019-01-15.xml
http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-V1.2-SKX-revJ.xml

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

# SPEC CPU®2017 Integer Rate Result

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**Hewlett Packard Enterprise**

(Test Sponsor: HPE)

ProLiant DL580 Gen10
(2.80 GHz, Intel Xeon Gold 6143)

$SPECrate^{®}2017\_int\_base = 400$

$SPECrate^{®}2017\_int\_peak = 428$

| | | | |
|---|---|---|---|
| **CPU2017 License:** | 3 | **Test Date:** | Mar-2019 |
| **Test Sponsor:** | HPE | **Hardware Availability:** | Oct-2018 |
| **Tested by:** | HPE | **Software Availability:** | Dec-2018 |

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

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