**SPEC® CPU2017 Integer Rate Result**

### Hewlett Packard Enterprise

**Test Sponsor:** HPE  
**ProLiant DL580 Gen10**  
**(2.70 GHz, Intel Xeon Platinum 8280)**

<table>
<thead>
<tr>
<th>SPECrate2017_int_base</th>
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<tbody>
<tr>
<td>SPECrate2017_int_peak</td>
<td>Not Run</td>
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**CPU2017 License:** 3  
**Test Sponsor:** HPE  
**Tested by:** HPE

**Copies**

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**Test Date:** Mar-2019  
**Hardware Availability:** Apr-2019  
**Software Availability:** Feb-2019

### Hardware

- **CPU Name:** Intel Xeon Platinum 8280  
- **Max MHz.:** 4000  
- **Nominal:** 2700  
- **Enabled:** 56 cores, 2 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:** 38.5 MB I+D on chip per chip  
- **Other:** None

### Software

- **OS:** SUSE Linux Enterprise Server 15 (x86_64)  
- **Kernel:** 4.12.14-23-default  
- **Compiler:** C/C++: Version 19.0.2.187 of Intel C/C++ Compiler Build 20190131 for Linux; Fortran: Version 19.0.2.187 of Intel Fortran Compiler Build 20190131 for Linux  
- **Parallel:** No  
- **Firmware:** HPE BIOS Version U34 02/02/2019 released Apr-2019  
- **File System:** btrfs  
- **System State:** Run level 3 (multi-user)  
- **Base Pointers:** 64-bit  
- **Peak Pointers:** Not Applicable  
- **Other:** None
Hewlett Packard Enterprise  
ProLiant DL580 Gen10  
(2.70 GHz, Intel Xeon Platinum 8280)  

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<tr>
<th>Benchmark</th>
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<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
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</tr>
</thead>
<tbody>
<tr>
<td>500.perlbench_r</td>
<td>112</td>
<td>656</td>
<td>272</td>
<td>655</td>
<td>272</td>
<td>657</td>
<td>271</td>
</tr>
<tr>
<td>502.gcc_r</td>
<td>112</td>
<td>663</td>
<td>239</td>
<td>667</td>
<td>238</td>
<td>660</td>
<td>240</td>
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<td>505.mcf_r</td>
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<td>431</td>
<td>420</td>
<td>432</td>
<td>419</td>
<td>428</td>
<td>423</td>
</tr>
<tr>
<td>520.omnetpp_r</td>
<td>112</td>
<td>770</td>
<td>191</td>
<td>770</td>
<td>191</td>
<td>770</td>
<td>191</td>
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<td>523.xalancbmk_r</td>
<td>112</td>
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<td>348</td>
<td>340</td>
<td>349</td>
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<tr>
<td>525.x264_r</td>
<td>112</td>
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<td>727</td>
<td>271</td>
<td>724</td>
<td>270</td>
<td>726</td>
</tr>
<tr>
<td>531.deepsjeng_r</td>
<td>112</td>
<td>429</td>
<td>299</td>
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<td>299</td>
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<td>299</td>
</tr>
<tr>
<td>541.leela_r</td>
<td>112</td>
<td>652</td>
<td>285</td>
<td>662</td>
<td>280</td>
<td>646</td>
<td>287</td>
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<tr>
<td>548.exchange2_r</td>
<td>112</td>
<td>459</td>
<td>639</td>
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<td>639</td>
<td>461</td>
<td>637</td>
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<tr>
<td>557.xz_r</td>
<td>112</td>
<td>536</td>
<td>226</td>
<td>535</td>
<td>226</td>
<td>536</td>
<td>226</td>
</tr>
</tbody>
</table>

**Results Table**

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_u2/lib/ia32:/home/cpu2017_u2/lib/intel64"  
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.  
Yes: The test sponsor attests, as of date of publication, that CVE-2017-5715 (Spectre variant 2)
**SPEC CPU2017 Integer Rate Result**

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Hewlett Packard Enterprise
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**General Notes (Continued)**

is mitigated in the system as tested and documented.

**Platform Notes**

BIOS Configuration:
- Thermal Configuration set to Maximum Cooling
- Memory Patrol Scrubbing set to Disabled
- LLC Prefetch set to Enabled
- LLC Dead Line Allocation set to Disabled
- Enhanced Processor Performance set to Enabled
- Workload Profile set to General Throughput Compute
- Minimum Processor Idle Power Core C-State set to C1E State
- Workload Profile set to Custom
- Advanced Memory Protection set to AdvancedECC

Sysinfo program /home/cpu2017_u2/bin/sysinfo
Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
running on linux-lj2l Wed Mar 13 14:47:47 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) Platinum 8280 CPU @ 2.70GHz
  2 "physical id"s (chips)
  112 "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 : 28
  siblings : 56
  physical 0: cores 0 1 2 3 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27 28 29 30
  physical 1: cores 0 1 2 3 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27 28 29 30
```

From lscpu:

```
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 112
On-line CPU(s) list: 0-111
Thread(s) per core: 2
Core(s) per socket: 28
Socket(s): 2
NUMA node(s): 4
Vendor ID: GenuineIntel
```

(Continued on next page)
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CPU2017 License: 3
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Tested by: HPE

Hardware Availability: Apr-2019
Software Availability: Feb-2019

Test Date: Mar-2019

Platform Notes (Continued)

CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Platinum 8280 CPU @ 2.70GHz
Stepping: 7
CPU MHz: 2700.000
BogoMIPS: 5400.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 39424K
NUMA node0 CPU(s): 0-13,56-69
NUMA node1 CPU(s): 14-27,70-83
NUMA node2 CPU(s): 28-41,84-97
NUMA node3 CPU(s): 42-55,98-111
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 arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid
aperfmrperf tsc_known_freq pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3
sdmb fma cx16 xtrm pdcm pclid dca sse4_1 sse4_2 x2apic movbe popcnt
tsc_deadline_timer aes xsave avx f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault
ebp cat_l3 cdp_l3 invpcid_single intel_ppin mba tpr_shadow vmni flexpriority ept
vpid fsbgbase 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 xsaves cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local
ibpb ibrs stibp dtherm ida arat pln pts pku ospke avx512_vnni arch_capabilities ssbd

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 8 9 10 11 12 13 56 57 58 59 60 61 62 63 64 65 66 67 68 69
Node 0 size: 96347 MB
Node 0 free: 96154 MB

Node 1 cpus: 14 15 16 17 18 19 20 21 22 23 24 25 26 27 70 71 72 73 74 75 76 77 78 79 80
Node 1 size: 96762 MB
Node 1 free: 96572 MB

Node 2 cpus: 28 29 30 31 32 33 34 35 36 37 38 39 40 41 48 85 86 87 88 89 90 91 92 93 94
Node 2 size: 96733 MB
Node 2 free: 96306 MB

Node 3 cpus: 42 43 44 45 46 47 48 49 50 51 52 53 54 55 98 99 100 101 102 103 104 105
Node 3 size: 96761 MB

(Continued on next page)
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**Platform Notes (Continued)**

```
node 3 free: 96579 MB
node distances:
node  0  1  2  3
  0: 10 21 31 31
  1: 21 10 31 31
  2: 31 31 10 21
  3: 31 31 21 10
```

From /proc/meminfo

<table>
<thead>
<tr>
<th>MemTotal:</th>
<th>395884020 kB</th>
</tr>
</thead>
<tbody>
<tr>
<td>HugePages_Total:</td>
<td>0</td>
</tr>
<tr>
<td>Hugepagesize:</td>
<td>2048 kB</td>
</tr>
</tbody>
</table>

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

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

```
uname -a:
  Linux linux-lj2l 4.12.14-23-default #1 SMP Tue May 29 21:04:44 UTC 2018 (cd0437b)
  x86_64 x86_64 x86_64 GNU/Linux
```

Kernel self-reported vulnerability status:

- **CVE-2017-5754 (Meltdown):** Not affected
- **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 13 14:44
```

```
SPEC is set to: /home/cpu2017_u2
  Filesystem     Type  Size  Used Avail Use% Mounted on
  /dev/sdb3      xfs  141G  74G  68G  53% /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 02/02/2019**

**Memory:**

(Continued on next page)
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Test Sponsor: HPE
Tested by: HPE

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Platform Notes (Continued)

36x UNKNOWN NOT AVAILABLE
12x UNKNOWN NOT AVAILABLE 32 GB 2 rank 2933

(End of data from sysinfo program)

---

Compiler Version Notes

==============================================================================
CC  500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base) 525.x264_r(base)
  557.xz_r(base)
==============================================================================
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.2.187 Build 20190117
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

==============================================================================
CXXC 520.omnetpp_r(base) 523.xalancbmk_r(base) 531.deepsjeng_r(base)
  541.leela_r(base)
==============================================================================
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.2.187 Build 20190117
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

==============================================================================
FC  548.exchange2_r(base)
==============================================================================
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
64, Version 19.0.2.187 Build 20190117
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

---

Base Compiler Invocation

C benchmarks:
icc -m64 -std=c11

C++ benchmarks:
icpc -m64

Fortran benchmarks:
ifort -m64
Hewlett Packard Enterprise
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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:
-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4
-\LD/\usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/intel64
-1qkmalloc

C++ benchmarks:
-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4
-\LD/\usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/intel64
-1qkmalloc

Fortran benchmarks:
-Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4 -nostandard-realloc-lhs -align array32byte
-\LD/\usr/local/IntelCompiler19/compilers_and_libraries_2019.1.144/linux/compiler/lib/intel64
-1qkmalloc

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-V1.2-CLX-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-V1.2-CLX-revA.xml
http://www.spec.org/cpu2017/flags/Intel-ic18.0-official-linux64.2019-04-03.xml
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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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