# SPEC CPU®2017 Integer Speed Result

## Hewlett Packard Enterprise

**(Test Sponsor: HPE)**

**ProLiant DL360 Gen10 Plus**

**(2.60 GHz, Intel Xeon Gold 6348)**

<table>
<thead>
<tr>
<th><strong>CPU2017 License:</strong></th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
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<td>HPE</td>
</tr>
<tr>
<td><strong>Tested by:</strong></td>
<td>HPE</td>
</tr>
</tbody>
</table>

**SPECspeed®2017_int_base = 11.8**

**SPECspeed®2017_int_peak = 12.0**

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### Hardware

- **CPU Name:** Intel Xeon Gold 6348
- **Max MHz:** 3500
- **Nominal:** 2600
- **Enabled:** 56 cores, 2 chips
- **Orderable:** 1, 2 chip(s)
- **Cache L1:** 32 KB I + 48 KB D on chip per core
- **L2:** 1.25 MB I+D on chip per core
- **L3:** 42 MB I+D on chip per chip
- **Other:** None
- **Memory:** 2 TB (32 x 64 GB 2Rx4 PC4-3200AA-R)
- **Storage:** 1 x 400 GB SAS SSD, RAID 0
- **Other:** None

### Software

- **OS:** Red Hat Enterprise Linux 8.3 (Ootpa)
- **Kernel:** 4.18.0-240.el8.x86_64
- **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:** Yes
- **Firmware:** HPE BIOS Version U46 v1.42 05/16/2021 released May-2021
- **File System:** xfs
- **System State:** Run level 3 (multi-user)
- **Base Pointers:** 64-bit
- **Peak Pointers:** 64-bit
- **Other:** jemalloc memory allocator V5.0.1
- **Power Management:** BIOS set to prefer performance at the cost of additional power usage

---

### SPECspeed Results

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>SPECspeed®2017_int_base</th>
<th>SPECspeed®2017_int_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>perlbench_s</td>
<td>56</td>
<td>7.16</td>
<td>8.30</td>
</tr>
<tr>
<td>gcc_s</td>
<td>56</td>
<td>10.7</td>
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<tr>
<td>mcf_s</td>
<td>56</td>
<td>11.1</td>
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<tr>
<td>omnetpp_s</td>
<td>56</td>
<td>11.5</td>
<td></td>
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<tr>
<td>xalancbmk_s</td>
<td>56</td>
<td>13.3</td>
<td></td>
</tr>
<tr>
<td>x264_s</td>
<td>56</td>
<td>17.0</td>
<td></td>
</tr>
<tr>
<td>deepsjeng_s</td>
<td>56</td>
<td>5.91</td>
<td>19.4</td>
</tr>
<tr>
<td>leela_s</td>
<td>56</td>
<td>4.85</td>
<td></td>
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<tr>
<td>exchange2_s</td>
<td>56</td>
<td>23.7</td>
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<tr>
<td>xz_s</td>
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</tr>
</tbody>
</table>

---

**Test Date:** May-2021

**Hardware Availability:** Jun-2021

**Software Availability:** Dec-2020

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Page 1 Standard Performance Evaluation Corporation (info@spec.org) https://www.spec.org/
## SPEC CPU®2017 Integer Speed Result

### Hewlett Packard Enterprise

(260 GHz, Intel Xeon Gold 6348)

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

---

### Results Table

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<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
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<tr>
<td><strong>600.perlbench</strong>_s</td>
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<td>248</td>
<td><strong>7.16</strong></td>
<td>246</td>
<td>7.23</td>
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<td>7.14</td>
<td>56</td>
<td><strong>214</strong></td>
<td><strong>8.30</strong></td>
<td>215</td>
<td>8.27</td>
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<td><strong>602.gcc</strong>_s</td>
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<tr>
<td><strong>605.mcf</strong>_s</td>
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<td><strong>11.4</strong></td>
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<td><strong>620.omnetpp</strong>_s</td>
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<td><strong>641.leela</strong>_s</td>
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<td>4.84</td>
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<td><strong>648.exchange2</strong>_s</td>
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</tr>
</tbody>
</table>

**SPECspeed®2017_int_base = 11.8**  
**SPECspeed®2017_int_peak = 12.0**

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

### 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:  
KMP_AFFINITY = "granularity=fine,scatter"  
LD_LIBRARY_PATH = 
"/home/cpu2017_1.1.8/lib/intel64:/home/cpu2017_1.1.8/je5.0.1-64"  
MALLOCP_CONF = "retain:true"  
OMP_STACKSIZE = "192M"

### General Notes

Binaries compiled on a system with 1x Intel Core i9-7980XE CPU + 64GB RAM memory using Redhat Enterprise Linux 8.0  
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, a general purpose malloc implementation

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Standard Performance Evaluation Corporation (info@spec.org)  
https://www.spec.org/
# SPEC CPU®2017 Integer Speed Result

## General Notes (Continued)


Submitted by: "Bhatnagar, Prateek" <prateek.bhatnagar@hpe.com>
Submitted: Mon Jun  7 11:57:55 EDT 2021
Submission: cpu2017-20210607-26916.sub

## Platform Notes

The system ROM used for this result contains Intel microcode version 0xd0002a0 for the Intel Xeon Gold 6348 processor.

### BIOS Configuration:
- Workload Profile set to General Peak Frequency Compute
- Intel Hyper-Threading set to Disabled
- Thermal Configuration set to Maximum Cooling
- Memory Patrol Scrubbing set to Disabled
- Advanced Memory Protection set to Advanced ECC
- Last Level Cache (LLC) Prefetch set to Enabled
- Last Level Cache (LLC) Dead Line Allocation set to Disabled
- Enhanced Processor Performance set to Enabled
- Workload Profile set to Custom
  - Energy/Performance Bias set to Balanced Power
  - DCU Stream Prefetcher set to Disabled
  - Adjacent Sector Prefetch set to Disabled
  - Minimum Processor Idle Power Package C-State set to No Package State
  - Numa Group Size Optimization set to Flat

Sysinfo program /home/cpu2017_1.1.8/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acaf64d
running on localhost.localdomain Sat May 29 11:47:20 2021

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 6348 CPU @ 2.60GHz
- 2 "physical id"s (chips)
- 56 "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 : 28
- 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
- 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

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

Test Date: May-2021
Hardware Availability: Jun-2021
Software Availability: Dec-2020

Platform Notes (Continued)

25 26 27

From lscpu from util-linux 2.32.1:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 56
On-line CPU(s) list: 0-55
Thread(s) per core: 1
Core(s) per socket: 2
Socket(s): 2
NUMA node(s): 2
Vendor ID: GenuineIntel
CPU family: 6
Model: 106
Model name: Intel(R) Xeon(R) Gold 6348 CPU @ 2.60GHz
Stepping: 6
CPU MHz: 1061.669
BogoMIPS: 5200.00
Virtualization: VT-x
L1d cache: 48K
L1i cache: 32K
L2 cache: 1280K
L3 cache: 43008K
NUMA node0 CPU(s): 0-27
NUMA node1 CPU(s): 28-55
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
aperfmprefp 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_13 invpcid_single ssbd
mba ibrs ibpb ibrs_enhanced tpr_shadow vmmf flexpriority ept vpid ept_ad
fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid cmp cqm xsaveopt xsave
xtmem rdtscp cmp cqm cqm_local split_lock_detect wbinvd dt sph ida arat pin pts avx512bf
avx512dq avx512v1 xsavesopt xsaves xgetbv1 xsaves cmp cqm cqm_cach dangerous cqm_mbm_total
cqm_mbm vlock detect wbinvd dtherm ida arat pin pts avx512bfnum pku
ospe avx512_vbmi2 gfn vps vcpu1m lgdq avx512 vnni avx512_vbmi tde
avx512_vpopcntdq la57 rdpid md clear pconfig flush_l1d arch_capabilities

From numactl --hardware
WARNING: a numactl 'node' might or might not correspond to a physical chip.
available: 2 nodes (0-1)
ode 0 cpus: 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

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<td>Software Availability: Dec-2020</td>
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</tbody>
</table>

Platform Notes (Continued)

node 0 size: 976555 MB
node 0 free: 1031162 MB
node 1 cpus: 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55
node 1 size: 973430 MB
node 1 free: 1031492 MB
node distances:
node 0 1
  0: 10 20
  1: 20 10

From /proc/meminfo
MemTotal: 2113490752 kB
HugePages_Total: 0
Hugepagesize: 2048 kB
/sbin/tuned-adm active
Current active profile: throughput-performance

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

os-release:
NAME="Red Hat Enterprise Linux"
VERSION="8.3 (Ootpa)"
ID="rhel"
ID_LIKE="fedora"
VERSION_ID="8.3"
PLATFORM_ID="platform:el8"
PRETTY_NAME="Red Hat Enterprise Linux 8.3 (Ootpa)"
ANSI_COLOR="0;31"

redhat-release: Red Hat Enterprise Linux release 8.3 (Ootpa)
system-release: Red Hat Enterprise Linux release 8.3 (Ootpa)
system-release-cpe: cpe:/o:redhat:enterprise_linux:8.3:ga

uname -a:
Linux localhost.localdomain 4.18.0-240.el8.x86_64 #1 SMP Wed Sep 23 05:13:10 EDT 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
CVE-2018-3639 (Speculative Store Bypass): Mitigation: Speculative Store Bypass disabled via prctl and seccomp
CVE-2017-5753 (Spectre variant 1): Mitigation: usercopy/swapgs

(Continued on next page)
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Platform Notes (Continued)

barriers and __user pointer sanitation
Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling

CVE-2017-5715 (Spectre variant 2):
CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
CVE-2019-11135 (TSX Asynchronous Abort): Not affected

run-level 3 May 29 11:46
SPEC is set to: /home/cpu2017_1.1.8
Filesystem Type Size Used Avail Use% Mounted on
/dev/mapper/rhel00-home xfs 372G 216G 157G 58% /home

From /sys/devices/virtual/dmi/id
Vendor: HPE
Product: ProLiant DL360 Gen10 Plus
Product Family: ProLiant
Serial: CN701108CQ

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:
32x Micron 36ASF8G72PZ-3G2B2 64 GB 2 rank 3200

BIOS:
BIOS Vendor: HPE
BIOS Version: U46
BIOS Date: 05/16/2021
BIOS Revision: 1.42
Firmware Revision: 2.40

(End of data from sysinfo program)

Compiler Version Notes
==============================================================================
C       | 600.perlbench_s(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.
==============================================================================

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Tested by: HPE

Compiler Version Notes (Continued)

C

| 600.perlbench_s(base) 602.gcc_s(base, peak) 605.mcf_s(base, peak) 625.x264_s(base, peak) 657.xz_s(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

| 600.perlbench_s(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

| 600.perlbench_s(base) 602.gcc_s(base, peak) 605.mcf_s(base, peak) 625.x264_s(base, peak) 657.xz_s(base, peak)

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

| 620.omnetpp_s(base, peak) 623.xalancbmk_s(base, peak) 631.deepsjeng_s(base, peak) 641.leela_s(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

| 648.exchange2_s(base, peak)

Intel(R) Fortran 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.

Base Compiler Invocation

C benchmarks:
icx
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**Base Compiler Invocation (Continued)**

C++ benchmarks:
- icpx

Fortran benchmarks:
- ifort

**Base Portability Flags**

600.perlbench_s: -DSPEC_LP64 -DSPEC_LINUX_X64  
602.gcc_s: -DSPEC_LP64  
605.mcf_s: -DSPEC_LP64  
620.omnetpp_s: -DSPEC_LP64  
623.xalancbmk_s: -DSPEC_LP64 -DSPEC_LINUX  
625.x264_s: -DSPEC_LP64  
631.deepsjeng_s: -DSPEC_LP64  
641.leela_s: -DSPEC_LP64  
648.exchange2_s: -DSPEC_LP64  
657.xz_s: -DSPEC_LP64

**Base Optimization Flags**

C benchmarks:
- -DSPEC_OPENMP -std=c11 -m64 -fiopenmp -Wl,-z,muldefs -xCORE-AVX512  
- -O3 -ffast-math -flto -mfpmath=sse -funroll-loops  
- -qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries  
- -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

C++ benchmarks:
- -DSPEC_OPENMP -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:
- -m64 -xCORE-AVX512 -O3 -ipo -no-prec-div -qopt-mem-layout-trans=4  
- -nostandard-realloc-lhs -align array32byte -auto  
- -mbranches-within-32B-boundaries

Test Date: May-2021  
Hardware Availability: Jun-2021  
Software Availability: Dec-2020
## Peak Compiler Invocation

C benchmarks (except as noted below):
- icx
- 600.perlbench_s: icc

C++ benchmarks:
- icpx

Fortran benchmarks:
- ifort

## Peak Portability Flags

Same as Base Portability Flags

## Peak Optimization Flags

C benchmarks:
- 600.perlbench_s: -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/usr/local/jemalloc64-5.0.1/lib -ljemalloc

- 602.gcc_s: -m64 -std=c11 -Wl,-z,muldefs -fprofile-generate(pass 1)
  -fprofile-use=default.profdatalatpass 2) -xCORE-AVX512 -flto
  -Ofast(pass 1) -O3 -ffast-math -qopt-mem-layout-trans=4
  -mbranches-within-32B-boundaries
  -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

- 605.mcf_s: basepeak = yes

- 625.x264_s: -DSPEC_OPENMP -fiopenmp -std=c11 -m64 -Wl,-z,muldefs
  -xCORE-AVX512 -flto -O3 -ffast-math
  -qopt-mem-layout-trans=4 -fno-alias
  -mbranches-within-32B-boundaries
  -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

- 657.xz_s: basepeak = yes

(Continued on next page)
Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL360 Gen10 Plus
(2.60 GHz, Intel Xeon Gold 6348)

SPECspeed®2017_int_base = 11.8
SPECspeed®2017_int_peak = 12.0

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

Test Date: May-2021
Hardware Availability: Jun-2021
Software Availability: Dec-2020

Peak Optimization Flags (Continued)

C++ benchmarks:

620.omnetpp_s: basepeak = yes
623.xalancbmk_s: basepeak = yes
631.deepsjeng_s: basepeak = yes
641.leela_s: basepeak = yes

Fortran benchmarks:

648.exchange2_s: 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

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/Intel-ic2021-official-linux64_revA.xml
http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-V1.0-ICX-revE.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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