### SPEC CPU®2017 Integer Rate Result

**Hewlett Packard Enterprise**  
(Test Sponsor: HPE)  
ProLiant DL360 Gen10 Plus  
(2.30 GHz, Intel Xeon Silver 4316)

**SPECrated®2017_int_base = 282**  
**SPECrated®2017_int_peak = 292**

**CPU2017 License:** 3  
**Test Date:** Jun-2021  
**Test Sponsor:** HPE  
**Hardware Availability:** Jun-2021  
**Tested by:** HPE  
**Software Availability:** Jun-2021

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<th>Benchmark</th>
<th>Copies</th>
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<td>gcc_r</td>
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<td>exchange2_r</td>
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</tr>
<tr>
<td>xz_r</td>
<td>80</td>
<td>157</td>
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</tr>
</tbody>
</table>

**Hardware**

- **CPU Name:** Intel Xeon Silver 4316  
- **Max MHz:** 3400  
- **Nominal:** 2300  
- **Enabled:** 40 cores, 2 chips, 2 threads/core  
- **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:** 30 MB I+D on chip per chip  
- **Other:** None  
- **Memory:** 2 TB (32 x 64 GB 2Rx4 PC4-3200AA-R, running at 2666)  
- **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:** No  
- **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:** 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

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**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

**Environment Variables Notes**

Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH = 
"/home/cpu2017_1.1.8/lib/intel64:/home/cpu2017_1.1.8/lib/ia32:/home/cpu2017_1.1.8/je5.0.1-32"
MALLOCONF = "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

(Continued on next page)
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General Notes (Continued)

runcpu command invoked through numactl i.e.:
numactl --interleave=all runcpu <etc>

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.


Submitted by: "Bhatnagar, Prateek" <prateek.bhatnagar@hpe.com>
Submitted: Mon Jun 21 10:35:38 EDT 2021
Submission: cpu2017-20210621-27593.sub

Platform Notes

The system ROM used for this result contains Intel microcode version 0xd0002a0 for the Intel Xeon Silver 4316 processor.

BIOS Configuration:
- Workload Profile set to General Throughput Compute
- Memory Patrol Scrubbing set to Disabled
- Advanced Memory Protection set to Advanced ECC
- XPT Remote Prefetcher set to Enabled
- Last Level Cache (LLC) Dead Line Allocation set to Disabled
- Enhanced Processor Performance set to Enabled
- Enhanced Processor Performance Profile set to Aggressive
- Thermal Configuration set to Maximum Cooling
- Intel UPI Link Frequency set to Minimum
- Intel UPI Link Enablement set to Single Link
- D2K set to Disabled
- Workload Profile set to Custom
  - DCU Stream Prefetcher set to Disabled
  - Energy Efficient Turbo set to Enabled
  - Adjacent Sector Prefetcher set to Disabled
  - Intel UPI Link Power Management set to Enabled

Sysinfo program /home/cpu2017_1.1.8/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acaf64d
running on localhost.localdomain Thu Jun 17 15:52:32 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

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Platform Notes (Continued)

From /proc/cpuinfo
model name : Intel(R) Xeon(R) Silver 4316 CPU @ 2.30GHz
  2 "physical id"s (chips)
  80 "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 : 20
siblings : 40
physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

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):              80
On-line CPU(s) list: 0-79
Thread(s) per core:  2
Core(s) per socket:  20
Socket(s):           2
NUMA node(s):        4
Vendor ID:           GenuineIntel
CPU family:          6
Model:               106
Model name:          Intel(R) Xeon(R) Silver 4316 CPU @ 2.30GHz
Stepping:            6
CPU MHz:             2428.879
BogoMIPS:            4600.00
Virtualization:      VT-x
L1d cache:           48K
L1i cache:           32K
L2 cache:            1280K
L3 cache:            30720K
NUMA node0 CPU(s):   0-9,40-49
NUMA node1 CPU(s):   10-19,50-59
NUMA node2 CPU(s):   20-29,60-69
NUMA node3 CPU(s):   30-39,70-79
Flags:               fpu vme de pmrs aes 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 ebpx cat 13 invpcid_single ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vnmi flexpriority ept vpid ept_ad fsrsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid cqm rdt_a avx512f avx512dq rdseed adx smap avx512ifma clflushopt clwb intel_pt avx512cd sha批示 sha ni avx512bw avx512vl xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm_occupp_llc cqm_mbb_total

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Platform Notes (Continued)

cqm_mbm_local split_lock_detect wbnoinvd dtherm ida arat pln pts avx512vbmi umip pku
ospke avx512_vbmi2 gfni vaes vpclmulqdq avx512_vnni avx512_bitalg tme
avx512_vpopcntdq la57 rdpid md_clear pconfig flush_l1d arch_capabilities

/proc/cpuinfo cache data
  cache size : 30720 KB

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 40 41 42 43 44 45 46 47 48 49
  node 0 size: 506431 MB
  node 0 free: 515405 MB
  node 1 cpus: 10 11 12 13 14 15 16 17 18 19 50 51 52 53 54 55 56 57 58 59
  node 1 size: 506508 MB
  node 1 free: 515619 MB
  node 2 cpus: 20 21 22 23 24 25 26 27 28 29 60 61 62 63 64 65 66 67 68 69
  node 2 size: 506948 MB
  node 2 free: 515763 MB
  node 3 cpus: 30 31 32 33 34 35 36 37 38 39 70 71 72 73 74 75 76 77 78 79
  node 3 size: 506650 MB
  node 3 free: 515720 MB
  node distances:
    node 0  1  2  3
    0: 10 20 30 30
    1: 20 10 30 30
    2: 30 30 10 20
    3: 30 30 20 10

From /proc/meminfo
  MemTotal:  2113484736 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"

(Continued on next page)
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Platform Notes (Continued)

- **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 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

- **run-level 3 Jun 17 15:51**

- **SPEC is set to:** /home/cpu2017_1.1.8
  
  Filesystem Type Size Used Avail Use% Mounted on
  /dev/mapper/rhel00-home xfs 372G 218G 155G 59% /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, configured at 2666

  - **BIOS:**
    
    BIOS Vendor: HPE
    BIOS Version: U46

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(End of data from sysinfo program)

**Compiler Version Notes**

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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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C benchmarks: icx
C++ benchmarks: icpx
Fortran benchmarks: ifort

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 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

(Continued on next page)
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<th>Test Date: Jun-2021</th>
</tr>
</thead>
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<tr>
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</tr>
<tr>
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<td>Software Availability: Jun-2021</td>
</tr>
</tbody>
</table>

**Base Optimization Flags (Continued)**

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`

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`
SPEC CPU®2017 Integer Rate Result

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Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL360 Gen10 Plus
(2.30 GHz, Intel Xeon Silver 4316)

SPECrate®2017_int_base = 282
SPECrate®2017_int_peak = 292

CPU2017 License: 3
Test Sponsor: HPE
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Test Date: Jun-2021
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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.profdata(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
-mbranches-within-32B-boundaries
-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin
-lqkmalloc

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-revC.html
### SPEC CPU®2017 Integer Rate Result

**Hewlett Packard Enterprise**  
(Test Sponsor: HPE)  
ProLiant DL360 Gen10 Plus  
(2.30 GHz, Intel Xeon Silver 4316)

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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-revC.xml](http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-V1.0-ICX-revC.xml)

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

Tested with SPEC CPU®2017 v1.1.8 on 2021-06-17 06:22:32-0400.  
Report generated on 2021-07-06 18:36:57 by CPU2017 PDF formatter v6442.  
Originally published on 2021-07-06.