## SPEC CPU®2017 Integer Rate Result

**Hewlett Packard Enterprise**  
(Test Sponsor: HPE)  
ProLiant DL110 Gen10 Plus  
(2.20 GHz, Intel Xeon Gold 5320)

<table>
<thead>
<tr>
<th>SPECrate®2017_int_base</th>
<th>= 183</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECrate®2017_int_peak</td>
<td>= 189</td>
</tr>
</tbody>
</table>

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

### Hardware

- **CPU Name:** Intel Xeon Gold 5320  
  - Max MHz: 3400  
  - Nominal: 2200  
  - Enabled: 26 cores, 1 chip, 2 threads/core  
  - Orderable: 1 chip  
- **Cache L1:** 32 KB I + 48 KB D on chip per core  
- **Cache L2:** 1.25 MB I+D on chip per core  
- **Cache L3:** 39 MB I+D on chip per chip  
- **Other:** None  
- **Memory:** 512 GB (8 x 64 GB 2Rx4 PC4-3200AA-R, running at 2933)  
- **Storage:** 1 x 480 GB NVMe 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 U56 v1.50 05/13/2021 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  

**Test Date:** May-2021  
**Hardware Availability:** Jun-2021  
**Software Availability:** Jun-2021  

### SPEC CPU®2017 Integer Rate Results

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<tr>
<th>Benchmark</th>
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<tr>
<td>xz_r</td>
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**Notes:**  
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- SPECrate2017_int_peak = 189
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### SPECrate®2017_int_base = 183  
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Results Table

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</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

Environment Variables Notes

Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH = "/cpu2017/lib/intel64:/cpu2017/lib/ia32:/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 
runcpu command invoked through numactl i.e.:
numactl --interleave=all runcpu <etc>

(Continued on next page)
General Notes (Continued)

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 10:17:01 EDT 2021
Submission: cpu2017-20210621-27530.sub

Platform Notes

The system ROM used for this result contains Intel microcode version 0xd0002a0 for the Intel Xeon Gold 5320 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
- Workload Profile set to Custom
- DCU Stream Prefetcher set to Disabled
- Energy Efficient Turbo set to Enabled
- Adjacent Sector Prefetcher set to Disabled

Sysinfo program /cpu2017/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acaf64d
running on localhost.localdomain Sat May 29 11:01:34 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 5320 CPU @ 2.20GHz
  - "physical id"s (chips)
    - 1 "physical id"s (chips)
    - 52 "processors"
cores, siblings (Caution: counting these is hw and system dependent. The following excerpts from /proc/cpuinfo might not be reliable. Use with caution.)
Hewlett Packard Enterprise  
ProLiant DL110 Gen10 Plus  
(2.20 GHz, Intel Xeon Gold 5320)  
SPECrater®2017_int_base = 183  
SPECrater®2017_int_peak = 189

Copyright 2017-2021 Standard Performance Evaluation Corporation

Platform Notes (Continued)

```
cpu cores : 26
siblings : 52
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 25

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):              52
On-line CPU(s) list: 0-51
Thread(s) per core:  2
Core(s) per socket:  26
Socket(s):           1
NUMA node(s):        2
Vendor ID:           GenuineIntel
CPU family:          6
Model:               106
Model name:          Intel(R) Xeon(R) Gold 5320 CPU @ 2.20GHz
Stepping:            6
CPU MHz:             3392.920
BogoMIPS:            4400.00
Virtualization:      VT-x
L1d cache:           48K
L1l cache:           32K
L2 cache:            1280K
L3 cache:            39936K
NUMA node0 CPU(s):   0-12,26-38
NUMA nodel CPU(s):   13-25,39-51
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
aperfmprefp pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16
xtrr pdcm pclid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave
avx f16c rdrand lahf_lm abm 3nowprefetch cpuid_fault epb cat_l3 invvpcd_single ssbd
mba ibpb stibp ibrs ibrs_enhanced tpr_shadow vmmi f lexpriority ept vpid ept_ad
fgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invvpid cqm rdt_a avx512f avx512dq
rdsseed adx smap avx512ifmaclfushopt clwb intel_pt avx512cd sha ni avx512bw
avx512vl xsaveopt xsavec xsavevc xsave vmm tmsave setc_711 ccq l1l ccq_occup l1l ccq_mbb_total
ccom_mbb_local split_lock_detect wbnoinvd dtherm ida arat pln pts avx512v bmi umip pku
ospe avx512_v bmi2 gfi vaes vclmulqdq avx512_vnni avx512_bitalg tme
avx512vpopcntdq la57 rdpid md_clear pconfig flush_l1d arch_capabilities
```

From numactl --hardware

```
/cache data
```
Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL110 Gen10 Plus
(2.20 GHz, Intel Xeon Gold 5320)

SPECrate®2017_int_base = 183
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Platform Notes (Continued)

WARNING: a numactl 'node' might or might not correspond to a physical chip.
available: 2 nodes (0-1)
node 0 cpus: 0 1 2 3 4 5 6 7 8 9 10 11 12 26 27 28 29 30 31 32 33 34 35 36 37 38
node 0 size: 248997 MB
node 0 free: 256917 MB
node 1 cpus: 13 14 15 16 17 18 19 20 21 22 23 24 25 39 40 41 42 43 44 45 46 47 48 49 50 51
node 1 size: 249369 MB
node 1 free: 256745 MB
node distances:
node 0 1
0: 10 20
1: 20 10

From /proc/meminfo
MemTotal: 528047324 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

(Continued on next page)
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<td>Hardware Availability: Jun-2021</td>
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<tr>
<td>Tested by: HPE</td>
<td>Software Availability: Jun-2021</td>
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</tbody>
</table>

### Platform Notes (Continued)

Bypass disabled via prctl and seccomp
Mitigation: usercopy/swapsgs barriers and __user pointer sanitization

CVE-2017-5753 (Spectre variant 1):
CVE-2017-5715 (Spectre variant 2):
CVE-2020-0543 (Special Register Buffer Data Sampling):
CVE-2019-11135 (TSX Asynchronous Abort):

Not affected
Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling

run-level 3 May 29 10:35
SPEC is set to: /cpu2017

Filesystem          Type Size  Used Avail Use% Mounted on
/dev/nvme1n1p4      xfs  442G  137G  305G  32% /

From /sys/devices/virtual/dmi/id
Vendor:         HPE
Product:        ProLiant DL110 Gen10 Plus
Product Family: ProLiant
Serial:         T912PP0032

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:
8x Micron 36ASF8G72PZ-3G2B2 64 GB 2 rank 3200, configured at 2933

BIOS:
BIOS Vendor:       HPE
BIOS Version:      U56
BIOS Date:         05/13/2021
BIOS Revision:     1.50
Firmware Revision: 2.40

(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.

(Continued on next page)
**Hewlett Packard Enterprise**  
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**Compiler Version Notes (Continued)**

```
C       | 502.gcc_r(peak)

Intel(R) oneAPI DPC++/C++ Compiler for applications running on IA-32, Version 2021.1 Build 20201113  
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
```

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

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C       | 500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base, peak)  
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Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2021.1 Build 20201113  
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```
C       | 500.perlbench_r(peak)

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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)  

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,  
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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  
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

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

**Base Compiler Invocation**

C benchmarks:  
icx  

C++ benchmarks:  
icpx  

(Continued on next page)
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---

**Base Compiler Invocation (Continued)**

Fortran benchmarks:

ifort

---

**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.leelax_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
**SPEC CPU®2017 Integer Rate Result**

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Hewlett Packard Enterprise  
(Test Sponsor: HPE)  
ProLiant DL110 Gen10 Plus  
(2.20 GHz, Intel Xeon Gold 5320)

SPECrate®2017_int_base = 183  
SPECrate®2017_int_peak = 189

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<th>Test Date: May-2021</th>
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<td>Hardware Availability: Jun-2021</td>
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<tr>
<td>Tested by: HPE</td>
<td>Software Availability: Jun-2021</td>
</tr>
</tbody>
</table>

**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

**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

(Continued on next page)
Peak Optimization Flags (Continued)

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-boundsaries
-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin
-1qkmalloc

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

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/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.