## SPEC CPU®2017 Floating Point Rate Result

**Hewlett Packard Enterprise**  
(Tes Sponsor: HPE)  
ProLiant DL360 Gen10  
(2.40 GHz, Intel Xeon Silver 4210R)

### SPECrate®2017_fp_base = 121

### SPECrate®2017_fp_peak = 126

<table>
<thead>
<tr>
<th>Test Date:</th>
<th>Mar-2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hardware Availability:</td>
<td>Apr-2020</td>
</tr>
<tr>
<td>Software Availability:</td>
<td>Jun-2019</td>
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</tbody>
</table>

### CPU2017 License:

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

### Hardware

**CPU Name:** Intel Xeon Silver 4210R  
**Max MHz:** 3200  
**Nominal:** 2400  
**Enabled:** 20 cores, 2 chips, 2 threads/core  
**Orderable:** 1, 2 chip(s)  
**Cache L1:** 32 KB I + 32 KB D on chip per core  
**L2:** 1 MB I+D on chip per core  
**L3:** 13.75 MB I+D on chip per core  
**Other:** None  
**Memory:** 384 GB (24 x 16 GB 2Rx8 PC4-2933Y-R, running at 2400)  
**Storage:** 1 x 400 GB SAS SSD, RAID 0  
**Other:** None

### Software

**OS:** SUSE Linux Enterprise Server 15 SP1 (x86_64)  
- Kernel 4.12.14-195-default  
**Compiler:** C/C++: Version 19.0.4.227 of Intel C/C++  
- Compiler Build 20190416 for Linux;  
- Fortran: Version 19.0.4.227 of Intel Fortran  
- Compiler Build 20190416 for Linux;  
**Parallel:** No  
**Firmware:** HPE BIOS Version U32 v2.22 (11/13/2019) released Apr-2020  
**File System:** btrfs  
**System State:** Run level 3 (multi-user)  
**Base Pointers:** 64-bit  
**Peak Pointers:** 64-bit  
**Other:** None  
**Power Management:** BIOS set to prefer performance at the cost of additional power usage

### Results

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>SPECrate®2017_fp_base</th>
<th>SPECrate®2017_fp_peak</th>
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<td>503.bwaves_r</td>
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<td>507.cactuBSSN_r</td>
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<td>554.roms_r</td>
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**Total SPECrate®2017_fp_peak:** 126

**Total SPECrate®2017_fp_base:** 121
### Results Table

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</tbody>
</table>

**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"

**General Notes**

Binaries compiled on a system with 1x Intel Core i9-7900X CPU + 32GB RAM
memory using Redhat Enterprise Linux 7.5
NA: The test sponsor attests, as of date of publication, that CVE-2017-5754 (Meltdown)
Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL360 Gen10
(2.40 GHz, Intel Xeon Silver 4210R)

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General Notes (Continued)

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.

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
Workload Profile set to Custom
Energy/Performance Bias set to Balanced Performance

Sysinfo program /cpu2017/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7edb1e6e46a485a0011
running on linux-9e60 Tue Mar 3 21:46:51 2020

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) Silver 4210R CPU @ 2.40GHz
2  "physical id"s (chips)
40 "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 : 10
siblings : 20
physical 0: cores 0 1 2 3 4 8 9 10 11 12
physical 1: cores 0 1 2 3 4 8 9 10 11 12

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physical 1: cores 0 1 2 3 4 8 9 10 11 12

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
Address sizes: 46 bits physical, 48 bits virtual
CPU(s): 40
On-line CPU(s) list: 0-39
Thread(s) per core: 2
Core(s) per socket: 10

(Continued on next page)
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<td>Test Sponsor: HPE</td>
<td>Hardware Availability: Apr-2020</td>
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<td>Tested by: HPE</td>
<td>Software Availability: Jun-2019</td>
</tr>
</tbody>
</table>

**Platform Notes (Continued)**

Socket(s): 2  
NUMA node(s): 2  
Vendor ID: GenuineIntel  
CPU family: 6  
Model: 85  
Model name: Intel(R) Xeon(R) Silver 4210R CPU @ 2.40GHz  
Stepping: 7  
CPU MHz: 2400.000  
BogoMIPS: 4800.00  
Virtualization: VT-x  
L1d cache: 32K  
L1i cache: 32K  
L2 cache: 1024K  
L3 cache: 14080K  
NUMA node0 CPU(s): 0-9,20-29  
NUMA node1 CPU(s): 10-19,30-39  
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 rdtsscp 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 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 intel_pppin ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vnmi flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 ibrms invpcid rtm cqm mpx rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd avx512bw avx512vl xsaves xsaveopt xsavec xgetbv1 xsavevs cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local dtherm ida arat pln pts pku ospke avx512_vnni md_clear flush_l1d arch_capabilities

```
/proc/cpuinfo cache data  
cache size : 14080 KB
```

From numactl --hardware  
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 20 21 22 23 24 25 26 27 28 29  
node 0 size: 193097 MB  
node 0 free: 190736 MB  
node 1 cpus: 10 11 12 13 14 15 16 17 18 19 30 31 32 33 34 35 36 37 38 39  
node 1 size: 193531 MB  
node 1 free: 193146 MB  
node distances:  
node 0 1  
0: 10 21  
1: 21 10
```

From /proc/meminfo

(Continued on next page)
Platform Notes (Continued)

MemTotal: 395907724 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

From /etc/*release* /etc/*version*
os-release:
NAME="SLES"
VERSION="15-SP1"
VERSION_ID="15.1"
PRETTY_NAME="SUSE Linux Enterprise Server 15 SP1"
ID="sles"
ID_LIKE="suse"
ANSI_COLOR="0;32"
CPE_NAME="cpe:/o:suse:sles:15:sp1"

uname -a:
Linux linux-9e6o 4.12.14-195-default #1 SMP Tue May 7 10:55:11 UTC 2019 (8fba516)
x86_64 x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:
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: __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling

run-level 3 Mar 3 21:44

SPEC is set to: /cpu2017
Filesystem Type Size Used Avail Use% Mounted on
/dev/sda2 btrfs 369G 137G 233G 37% /

From /sys/devices/virtual/dmi/id
BIOS: HPE U32 11/13/2019
Vendor: HPE
Product: ProLiant DL360 Gen10
Product Family: ProLiant
Serial: MXQ94204PS

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.

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

Memory:

24x UNKNOWN NOT AVAILABLE 16 GB 2 rank 2933

(End of data from sysinfo program)

**Compiler Version Notes**

```
==============================================================================
C                 | 519.lbm_r(base, peak) 538.imagick_r(base, peak) 544.nab_r(base, peak)
------------------------------------------------------------------------------
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,  
       Version 19.0.4.227 Build 20190416  
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.  
------------------------------------------------------------------------------

==============================================================================
C++                | 508.namd_r(base, peak) 510.parest_r(base, peak)
------------------------------------------------------------------------------
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,  
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Copyright (C) 1985-2019 Intel Corporation. All rights reserved.  
------------------------------------------------------------------------------

==============================================================================
C++, C              | 511.povray_r(base, peak) 526.blender_r(base, peak)
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==============================================================================
C++, C, Fortran     | 507.cactuBSSN_r(base, peak)
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Compiler Version Notes (Continued)
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Fortran, C | 521.wrf_r(base, peak) 527.cam4_r(base, peak)

Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
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Base Compiler Invocation

C benchmarks:
icc -m64 -std=c11

C++ benchmarks:
icpc -m64

Fortran benchmarks:
ifort -m64

Benchmarks using both Fortran and C:
ifort -m64 icc -m64 -std=c11

Benchmarks using both C and C++:
icpc -m64 icc -m64 -std=c11

Benchmarks using Fortran, C, and C++:
icpc -m64 icc -m64 -std=c11 ifort -m64
**SPEC CPU®2017 Floating Point Rate Result**

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**Test Sponsor:** HPE  
**Tested by:** HPE

**Test Date:** Mar-2020  
**Hardware Availability:** Apr-2020  
**Software Availability:** Jun-2019

---

### Base Portability Flags

- 503.bwaves_r: -DSPEC_LP64
- 507.cactuBSSN_r: -DSPEC_LP64
- 508.namd_r: -DSPEC_LP64
- 510.parest_r: -DSPEC_LP64
- 511.povray_r: -DSPEC_LP64
- 519.lbm_r: -DSPEC_LP64
- 521.wrf_r: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
- 526.blender_r: -DSPEC_LP64 -DSPEC_LINUX -funsigned-char
- 527.cam4_r: -DSPEC_LP64 -DSPEC_CASE_FLAG
- 538.imagick_r: -DSPEC_LP64
- 544.nab_r: -DSPEC_LP64
- 549.fotonik3d_r: -DSPEC_LP64
- 554.roms_r: -DSPEC_LP64

### Base Optimization Flags

**C benchmarks:**

- -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
- -qopt-mem-layout-trans=4

**C++ benchmarks:**

- -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
- -qopt-mem-layout-trans=4

**Fortran benchmarks:**

- -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
- -qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs
- -align array32byte

**Benchmarks using both Fortran and C:**

- -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
- -qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs
- -align array32byte

**Benchmarks using both C and C++:**

- -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
- -qopt-mem-layout-trans=4

**Benchmarks using Fortran, C, and C++:**

- -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
- -qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs
- -align array32byte
**SPEC CPU®2017 Floating Point Rate Result**

Hewlett Packard Enterprise  
(Test Sponsor: HPE)  
ProLiant DL360 Gen10  
(2.40 GHz, Intel Xeon Silver 4210R)  

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<tr>
<th>SPECrate®2017_fp_base</th>
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<tbody>
<tr>
<td>SPECrate®2017_fp_peak</td>
<td>126</td>
</tr>
</tbody>
</table>

**CPU2017 License:** 3  
**Test Sponsor:** HPE  
**Tested by:** HPE  
**Test Date:** Mar-2020  
**Hardware Availability:** Apr-2020  
**Software Availability:** Jun-2019

---

**Peak Compiler Invocation**

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

C++ benchmarks:
```
icpc -m64
```

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

Benchmarks using both Fortran and C:
```
ifort -m64 icc -m64 -std=c11
```

Benchmarks using both C and C++:
```
icpc -m64 icc -m64 -std=c11
```

Benchmarks using Fortran, C, and C++:
```
icpc -m64 icc -m64 -std=c11 ifort -m64
```

---

**Peak Portability Flags**

Same as Base Portability Flags

---

**Peak Optimization Flags**

C benchmarks:
```
519.lbm_r: -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4
```

```
538.imagick_r: -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4
```

```
544.nab_r: Same as 538.imagick_r
```

C++ benchmarks:
```
508.namd_r: -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4
```

(Continued on next page)
Hewlett Packard Enterprise  
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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-revB.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-revB.xml  

Peak Optimization Flags (Continued)

510.parest_r: -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch  
-ffinite-math-only -qopt-mem-layout-trans=4

Fortran benchmarks:

503.bwaves_r: -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch  
-ffinite-math-only -qopt-mem-layout-trans=4 -auto  
-nostandard-realloc-lhs -align array32byte

549.fotonik3d_r: Same as 503.bwaves_r

554.roms_r: -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3  
-no-prec-div -qopt-prefetch -ffinite-math-only  
-qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs  
-align array32byte

Benchmarks using both Fortran and C:

511.povray_r: -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3  
-no-prec-div -qopt-prefetch -ffinite-math-only  
-qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs  
-align array32byte

Benchmarks using both C and C++:

511.povray_r: -prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3  
-no-prec-div -qopt-prefetch -ffinite-math-only  
-qopt-mem-layout-trans=4

526.blender_r: -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch  
-ffinite-math-only -qopt-mem-layout-trans=4

Benchmarks using Fortran, C, and C++:

-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only  
-qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs  
-align array32byte
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Tested with SPEC CPU®2017 v1.1.0 on 2020-03-03 22:46:50-0500.  
Report generated on 2020-04-14 14:06:37 by CPU2017 PDF formatter v6255.  
Originally published on 2020-04-14.