



# SPEC CPU®2017 Floating Point Speed Result

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## Hewlett Packard Enterprise

(Test Sponsor: HPE)

### ProLiant DL20 Gen10 Plus

(3.20 GHz, Intel Xeon E-2356G)

SPECspeed®2017\_fp\_base = 40.8

SPECspeed®2017\_fp\_peak = 41.2

CPU2017 License: 3

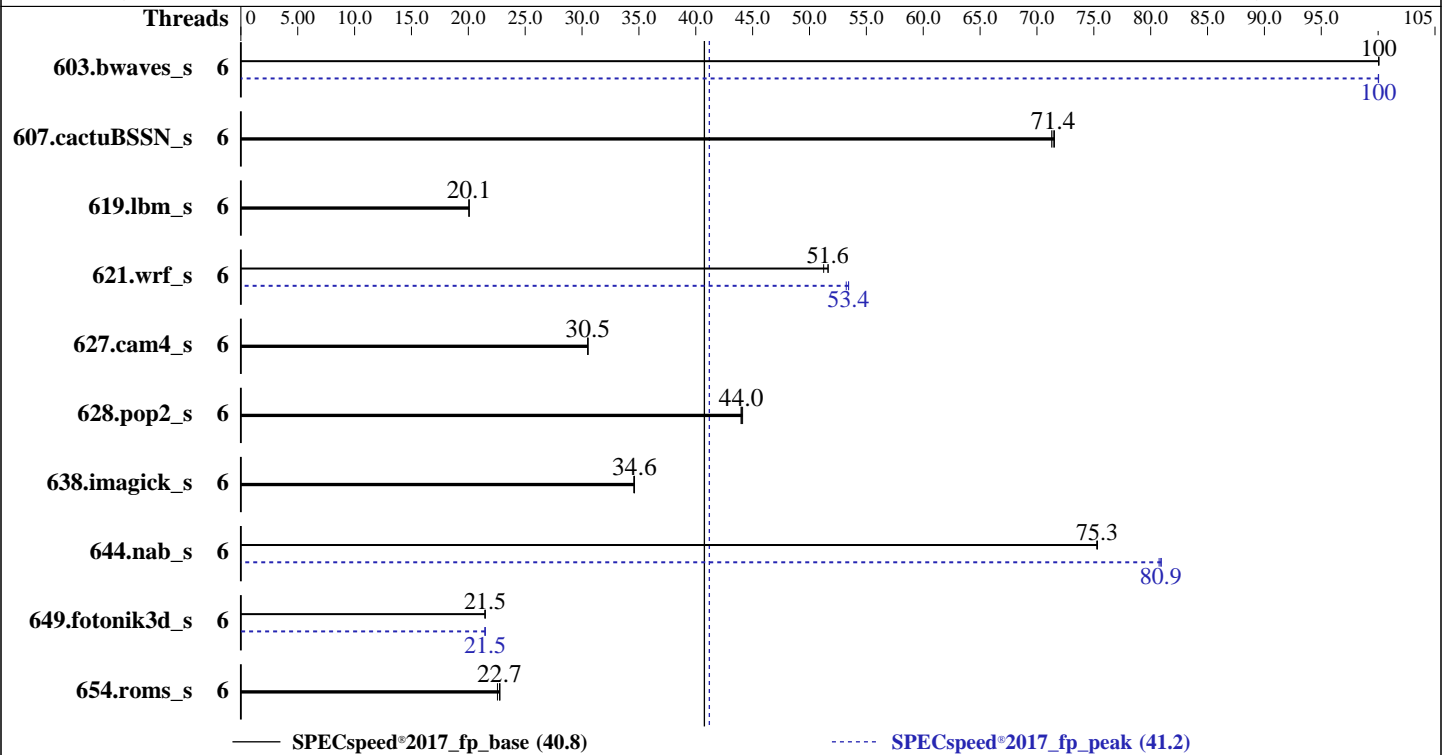
Test Sponsor: HPE

Tested by: HPE

Test Date: Mar-2022

Hardware Availability: Jan-2022

Software Availability: Jun-2021



### Hardware

CPU Name: Intel Xeon E-2356G  
 Max MHz: 5000  
 Nominal: 3200  
 Enabled: 6 cores, 1 chip  
 Orderable: 1 chip  
 Cache L1: 32 KB I + 48 KB D on chip per core  
 L2: 512 KB I+D on chip per core  
 L3: 12 MB I+D on chip per chip  
 Other: None  
 Memory: 128 GB (4 x 32 GB 2Rx8 PC4-3200AA-E, running at 2933)  
 Storage: 1 x 480 GB SATA SSD, RAID 0  
 Other: None

### Software

OS: SUSE Linux Enterprise Server 15 SP3  
 Kernel 5.3.18-57-default  
 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 U60 v1.54 01/13/2022 released Jan-2022  
 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



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## Results Table

Benchmark	Base							Peak						
	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
603.bwaves_s	6	590	100	590	100	<b>590</b>	<b>100</b>	6	<b>590</b>	<b>100</b>	590	100	590	100
607.cactuBSSN_s	6	234	71.3	233	71.5	<b>233</b>	<b>71.4</b>	6	234	71.3	233	71.5	<b>233</b>	<b>71.4</b>
619.lbm_s	6	261	20.1	<b>261</b>	<b>20.1</b>	261	20.1	6	261	20.1	<b>261</b>	<b>20.1</b>	261	20.1
621.wrf_s	6	258	51.2	<b>256</b>	<b>51.6</b>	256	51.6	6	<b>248</b>	<b>53.4</b>	247	53.4	248	53.2
627.cam4_s	6	290	30.5	291	30.5	<b>290</b>	<b>30.5</b>	6	290	30.5	291	30.5	<b>290</b>	<b>30.5</b>
628.pop2_s	6	<b>270</b>	<b>44.0</b>	269	44.1	270	44.0	6	<b>270</b>	<b>44.0</b>	269	44.1	270	44.0
638.imagick_s	6	418	34.5	<b>417</b>	<b>34.6</b>	417	34.6	6	418	34.5	<b>417</b>	<b>34.6</b>	417	34.6
644.nab_s	6	232	75.3	232	75.3	<b>232</b>	<b>75.3</b>	6	<b>216</b>	<b>80.9</b>	216	80.9	216	80.7
649.fotonik3d_s	6	425	21.5	<b>424</b>	<b>21.5</b>	424	21.5	6	424	21.5	<b>424</b>	<b>21.5</b>	424	21.5
654.roms_s	6	<b>692</b>	<b>22.7</b>	691	22.8	698	22.6	6	<b>692</b>	<b>22.7</b>	691	22.8	698	22.6

SPECspeed®2017\_fp\_base = **40.8**

SPECspeed®2017\_fp\_peak = **41.2**

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,compact"
LD_LIBRARY_PATH = "/home/cpu2017/lib/intel64:/home/cpu2017/je5.0.1-64"
MALLOCONF = "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 built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5

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## General Notes (Continued)

sources available from jemalloc.net or <https://github.com/jemalloc/jemalloc/releases>

## Platform Notes

BIOS Configuration:

Workload Profile set to General Peak Frequency Compute

Thermal Configuration set to Maximum Cooling

Enhanced Processor Performance set to Enabled

Intel Hyper-Threading set to Disabled

Sysinfo program /home/cpu2017/bin/sysinfo

Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acafc64d

running on localhost Wed Mar 9 14:00:45 2022

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) E-2356G CPU @ 3.20GHz

1 "physical id"s (chips)

6 "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 : 6

siblings : 6

physical 0: cores 0 1 2 3 4 5

From lscpu from util-linux 2.36.2:

Architecture: x86\_64

CPU op-mode(s): 32-bit, 64-bit

Byte Order: Little Endian

Address sizes: 39 bits physical, 48 bits virtual

CPU(s): 6

On-line CPU(s) list: 0-5

Thread(s) per core: 1

Core(s) per socket: 6

Socket(s): 1

NUMA node(s): 1

Vendor ID: GenuineIntel

CPU family: 6

Model: 167

Model name: Intel(R) Xeon(R) E-2356G CPU @ 3.20GHz

Stepping: 1

CPU MHz: 4152.282

BogoMIPS: 6384.00

(Continued on next page)



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## Platform Notes (Continued)

```

Virtualization:          VT-x
L1d cache:              288 KiB
L1i cache:              192 KiB
L2 cache:               3 MiB
L3 cache:               12 MiB
NUMA node0 CPU(s):     0-5
Vulnerability Itlb multihit: Not affected
Vulnerability L1tf:    Not affected
Vulnerability Mds:     Not affected
Vulnerability Meltdown: Not affected
Vulnerability Spec store bypass: Mitigation; Speculative Store Bypass disabled via prctl and seccomp
Vulnerability Spectre v1: Mitigation; usercopy/swapgs barriers and __user pointer sanitization
Vulnerability Spectre v2: Mitigation; Enhanced IBRS, IBPB conditional, RSB filling
Vulnerability Srbds:    Not affected
Vulnerability Tsx async abort: Not affected
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 aperfmperf tsc_known_freq pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtpr pdcm pcid sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault epb invpcid_single ssbd ibrs ibpb stibp ibrs_enhanced tpr_shadow vnmi flexpriority ept vpid ept_ad fsgsbase tsc_adjust bmi1 avx2 smep bmi2 erms invpcid mpx avx512f avx512dq rdseed adx smap avx512ifma clflushopt intel_pt avx512cd sha_ni avx512bw avx512vl xsaveopt xsavec xgetbv1 xsaves dtherm ida arat pln pts avx512vbmi umip pku ospke avx512_vbmi2 gfni vaes vpclmulqdq avx512_vnni avx512_bitalg avx512_vpopcntdq rdpid fsrm md_clear flush_l1d arch_capabilities

```

From lscpu --cache:

NAME	ONE-SIZE	ALL-SIZE	WAYS	TYPE	LEVEL	SETS	PHY-LINE	COHERENCY-SIZE
L1d	48K	288K	12	Data	1	64	1	64
L1i	32K	192K	8	Instruction	1	64	1	64
L2	512K	3M	8	Unified	2	1024	1	64
L3	12M	12M	16	Unified	3	12288	1	64

/proc/cpuinfo cache data  
cache size : 12288 KB

From numactl --hardware

```

WARNING: a numactl 'node' might or might not correspond to a physical chip.
available: 1 nodes (0)
node 0 cpus: 0 1 2 3 4 5
node 0 size: 128743 MB
node 0 free: 128286 MB

```

(Continued on next page)



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## Platform Notes (Continued)

node distances:

```
node 0
0: 10
```

From /proc/meminfo

```
MemTotal: 131833600 kB
HugePages_Total: 0
Hugepagesize: 2048 kB
```

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

```
os-release:
NAME="SLES"
VERSION="15-SP3"
VERSION_ID="15.3"
PRETTY_NAME="SUSE Linux Enterprise Server 15 SP3"
ID="sles"
ID_LIKE="suse"
ANSI_COLOR="0;32"
CPE_NAME="cpe:/o:suse:sles:15:sp3"
```

uname -a:

```
Linux localhost 5.3.18-57-default #1 SMP Wed Apr 28 10:54:41 UTC 2021 (ba3c2e9) 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/swaps
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 Mar 9 13:59

SPEC is set to: /home/cpu2017

```
Filesystem Type Size Used Avail Use% Mounted on
/dev/sda4 xfs 404G 46G 358G 12% /home
```

(Continued on next page)



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## Platform Notes (Continued)

From /sys/devices/virtual/dmi/id

Vendor: HPE  
Product: ProLiant DL20 Gen10 Plus  
Product Family: ProLiant  
Serial: SerNum.ACC

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:

4x Hynix HMAA4GU7AJR8N-XN 32 GB 2 rank 3200, configured at 2933

BIOS:

BIOS Vendor: HPE  
BIOS Version: U60  
BIOS Date: 01/13/2022  
BIOS Revision: 1.54  
Firmware Revision: 2.55

(End of data from sysinfo program)

## Compiler Version Notes

```
=====  
C | 619.lbm_s(base, peak) 638.imagick_s(base, peak)  
| 644.nab_s(base)  
-----
```

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 | 644.nab_s(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 | 619.lbm_s(base, peak) 638.imagick_s(base, peak)  
| 644.nab_s(base)  
-----
```

Intel(R) C Intel(R) 64 Compiler Classic for applications running on Intel(R)

(Continued on next page)



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## Compiler Version Notes (Continued)

64, Version 2021.1 Build 20201112\_000000  
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

=====  
C | 644.nab\_s(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++, C, Fortran | 607.cactuBSSN\_s(base, 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.  
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.  
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.

=====  
Fortran | 603.bwaves\_s(base, peak) 649.fotonik3d\_s(base, peak)  
| 654.roms\_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.

=====  
Fortran, C | 621.wrf\_s(base, peak) 627.cam4\_s(base, peak)  
| 628.pop2\_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.  
Intel(R) C Intel(R) 64 Compiler Classic for applications running on Intel(R)  
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## Base Compiler Invocation

C benchmarks:

icc

Fortran benchmarks:

ifort

Benchmarks using both Fortran and C:

ifort icc

Benchmarks using Fortran, C, and C++:

icpc icc ifort

## Base Portability Flags

603.bwaves\_s: -DSPEC\_LP64

607.cactuBSSN\_s: -DSPEC\_LP64

619.lbm\_s: -DSPEC\_LP64

621.wrf\_s: -DSPEC\_LP64 -DSPEC\_CASE\_FLAG -convert big\_endian

627.cam4\_s: -DSPEC\_LP64 -DSPEC\_CASE\_FLAG

628.pop2\_s: -DSPEC\_LP64 -DSPEC\_CASE\_FLAG -convert big\_endian

-assume byterecl

638.imagick\_s: -DSPEC\_LP64

644.nab\_s: -DSPEC\_LP64

649.fotonik3d\_s: -DSPEC\_LP64

654.roms\_s: -DSPEC\_LP64

## Base Optimization Flags

C benchmarks:

-m64 -std=c11 -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch

-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC\_OPENMP

-mbranches-within-32B-boundaries

Fortran benchmarks:

-m64 -Wl,-z,muldefs -DSPEC\_OPENMP -xCORE-AVX512 -ipo -O3

-no-prec-div -qopt-prefetch -ffinite-math-only

-qopt-mem-layout-trans=4 -qopenmp -nostandard-realloc-lhs

-mbranches-within-32B-boundaries -L/usr/local/jemalloc64-5.0.1/lib

-ljemalloc

Benchmarks using both Fortran and C:

-m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div

(Continued on next page)





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## Base Optimization Flags (Continued)

Benchmarks using both Fortran and C (continued):

```
-qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp
-DSPEC_OPENMP -mbranches-within-32B-boundaries -nostandard-realloc-lhs
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

Benchmarks using Fortran, C, and C++:

```
-m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp
-DSPEC_OPENMP -mbranches-within-32B-boundaries -nostandard-realloc-lhs
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

## Peak Compiler Invocation

C benchmarks (except as noted below):

icc

644.nab\_s: icx

Fortran benchmarks:

ifort

Benchmarks using both Fortran and C:

ifort icc

Benchmarks using Fortran, C, and C++:

icpc icc ifort

## Peak Portability Flags

Same as Base Portability Flags

## Peak Optimization Flags

C benchmarks:

619.lbm\_s: basepeak = yes

638.imagick\_s: basepeak = yes

(Continued on next page)



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## Peak Optimization Flags (Continued)

```
644.nab_s: -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops -fiopenmp
-DSPEC_OPENMP -qopt-mem-layout-trans=4
-fimf-accuracy-bits=14:sqrt
-mbranches-within-32B-boundaries
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

Fortran benchmarks:

```
603.bwaves_s: -m64 -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2)
-DSPEC_SUPPRESS_OPENMP -DSPEC_OPENMP -ipo -xCORE-AVX512
-O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4 -qopenmp -nostandard-realloc-lhs
-mbranches-within-32B-boundaries
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

649.fotonik3d\_s: Same as 603.bwaves\_s

654.roms\_s: basepeak = yes

Benchmarks using both Fortran and C:

```
621.wrf_s: -m64 -std=c11 -Wl,-z,muldefs -prof-gen(pass 1)
-prof-use(pass 2) -ipo -xCORE-AVX512 -O3 -no-prec-div
-qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4
-DSPEC_SUPPRESS_OPENMP -qopenmp -DSPEC_OPENMP
-mbranches-within-32B-boundaries -nostandard-realloc-lhs
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

627.cam4\_s: basepeak = yes

628.pop2\_s: basepeak = yes

Benchmarks using Fortran, C, and C++:

607.cactuBSSN\_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>

[http://www.spec.org/cpu2017/flags/Intel-ic2021-official-linux64\\_revA.html](http://www.spec.org/cpu2017/flags/Intel-ic2021-official-linux64_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-V1.0-ICX-revE.xml>

[http://www.spec.org/cpu2017/flags/Intel-ic2021-official-linux64\\_revA.xml](http://www.spec.org/cpu2017/flags/Intel-ic2021-official-linux64_revA.xml)



# SPEC CPU®2017 Floating Point Speed Result

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**Hewlett Packard Enterprise**

(Test Sponsor: HPE)

ProLiant DL20 Gen10 Plus

(3.20 GHz, Intel Xeon E-2356G)

SPECspeed®2017\_fp\_base = 40.8

SPECspeed®2017\_fp\_peak = 41.2

**CPU2017 License:** 3

**Test Sponsor:** HPE

**Tested by:** HPE

**Test Date:** Mar-2022

**Hardware Availability:** Jan-2022

**Software Availability:** Jun-2021

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For questions about this result, please contact the tester. For other inquiries, please contact [info@spec.org](mailto:info@spec.org).

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