



# SPEC® CPU2017 Floating Point Speed Result

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**Hewlett Packard Enterprise**

(Test Sponsor: HPE)

ProLiant DL360 Gen10

(2.20 GHz, Intel Xeon Silver 4210)

SPECspeed2017\_fp\_base = 81.1

SPECspeed2017\_fp\_peak = Not Run

CPU2017 License: 3

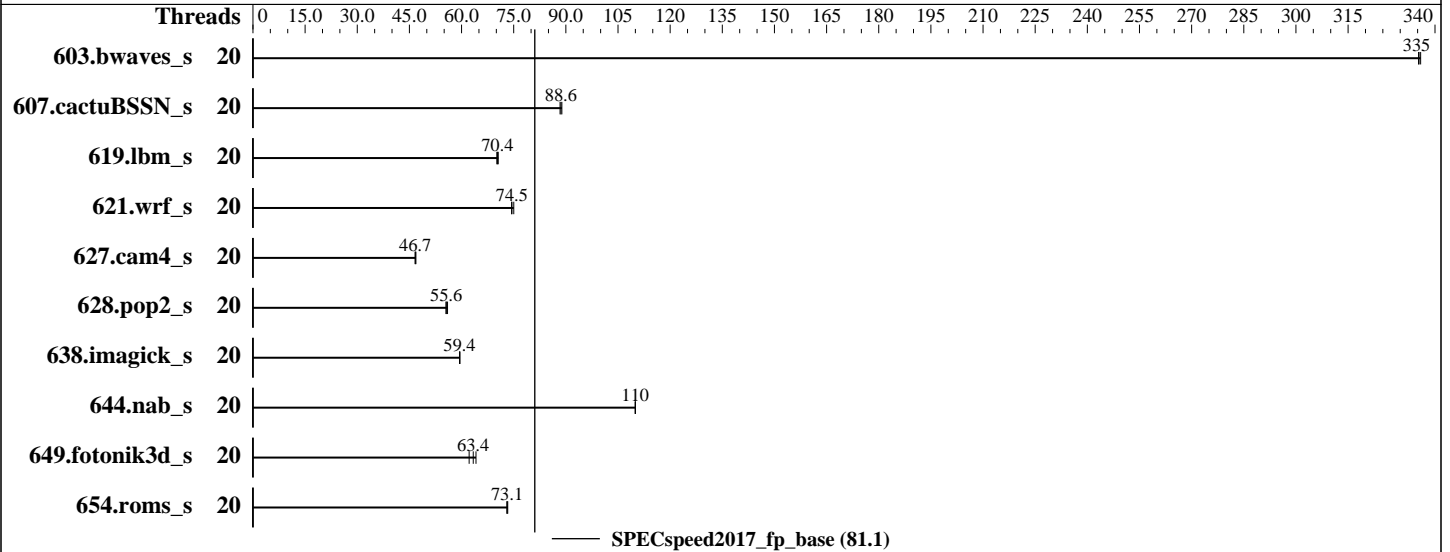
Test Sponsor: HPE

Tested by: HPE

Test Date: Apr-2019

Hardware Availability: Apr-2019

Software Availability: Feb-2019



## Hardware

CPU Name: Intel Xeon Silver 4210  
 Max MHz.: 3200  
 Nominal: 2200  
 Enabled: 20 cores, 2 chips  
 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 chip  
 Other: None  
 Memory: 384 GB (24 x 16 GB 2Rx8 PC4-2933V-R, running at 2400)  
 Storage: 1 x 400 GB SAS SSD, RAID 0  
 Other: None

## Software

OS: SUSE Linux Enterprise Server 15 (x86\_64)  
 Kernel 4.12.14-23-default  
 Compiler: C/C++: Version 19.0.2.187 of Intel C/C++ Compiler Build 20190117 for Linux;  
 Fortran: Version 19.0.2.187 of Intel Fortran Compiler Build 20190117 for Linux  
 Parallel: Yes  
 Firmware: HPE BIOS Version U32 02/02/2019 released Apr-2019  
 File System: xfs  
 System State: Run level 3 (multi-user)  
 Base Pointers: 64-bit  
 Peak Pointers: Not Applicable  
 Other: None



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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	20	176	335	176	336	<b>176</b>	<b>335</b>							
607.cactuBSSN_s	20	189	88.3	188	88.9	<b>188</b>	<b>88.6</b>							
619.lbm_s	20	74.7	70.1	<b>74.5</b>	<b>70.4</b>	74.2	70.6							
621.wrf_s	20	178	74.4	<b>178</b>	<b>74.5</b>	176	75.0							
627.cam4_s	20	<b>190</b>	<b>46.7</b>	190	46.7	189	46.9							
628.pop2_s	20	<b>213</b>	<b>55.6</b>	212	56.0	214	55.5							
638.imagick_s	20	243	59.4	<b>243</b>	<b>59.4</b>	242	59.5							
644.nab_s	20	159	110	<b>159</b>	<b>110</b>	159	110							
649.fotonik3d_s	20	<b>144</b>	<b>63.4</b>	142	64.2	147	62.2							
654.roms_s	20	216	73.0	<b>215</b>	<b>73.1</b>	215	73.3							

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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

## General Notes

Environment variables set by runcpu before the start of the run:  
KMP\_AFFINITY = "granularity=core,compact"  
LD\_LIBRARY\_PATH = "/home/cpu2017\_u2/lib/ia32:/home/cpu2017\_u2/lib/intel64"  
OMP\_STACKSIZE = "192M"

Binaries compiled on a system with 1x Intel Core i9-7900X CPU + 32GB RAM memory using Redhat Enterprise Linux 7.5  
Yes: 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.

## Platform Notes

BIOS Configuration:  
Hyper-Threading set to Disabled  
Thermal Configuration set to Maximum Cooling

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## Platform Notes (Continued)

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 Peak Frequency Compute  
 Energy/Performance Bias set to Balanced Power  
 Workload Profile set to Custom  
 Numa Group Size Optimization set to Flat  
 Sysinfo program /home/cpu2017\_u2/bin/sysinfo  
 Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9  
 running on linux-nub3 Sun Apr 7 19:23:00 2019

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 4210 CPU @ 2.20GHz
 2 "physical id"s (chips)
 20 "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     : 10
 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

```

From lscpu:

```

Architecture:    x86_64
CPU op-mode(s):  32-bit, 64-bit
Byte Order:      Little Endian
CPU(s):          20
On-line CPU(s) list: 0-19
Thread(s) per core: 1
Core(s) per socket: 10
Socket(s):       2
NUMA node(s):   2
Vendor ID:       GenuineIntel
CPU family:      6
Model:           85
Model name:      Intel(R) Xeon(R) Silver 4210 CPU @ 2.20GHz
Stepping:        6
CPU MHz:         2200.000
BogoMIPS:        4400.00
Virtualization:  VT-x
L1d cache:      32K
L1i cache:      32K

```

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## Platform Notes (Continued)

```

L2 cache:          1024K
L3 cache:          14080K
NUMA node0 CPU(s): 0-9
NUMA node1 CPU(s): 10-19
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
aperfperf tsc_known_freq 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_l3 cdp_l3 invpcid_single intel_ppin mba tpr_shadow vnmi flexpriority ept
vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm cqm mpx rdt_a
avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd avx512bw avx512vl
xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local
ibpb ibrs stibp dtherm ida arat pln pts pku ospke avx512_vnni arch_capabilities ssbd

```

```

/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
node 0 size: 193120 MB
node 0 free: 192657 MB
node 1 cpus: 10 11 12 13 14 15 16 17 18 19
node 1 size: 193504 MB
node 1 free: 193290 MB
node distances:
node  0  1
 0:  10  21
 1:  21  10

```

```

From /proc/meminfo
MemTotal:          395904324 kB
HugePages_Total:      0
Hugepagesize:       2048 kB

```

```

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

```

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## Platform Notes (Continued)

CPE\_NAME="cpe:/o:suse:sles:15"

uname -a:

```
Linux linux-nub3 4.12.14-23-default #1 SMP Tue May 29 21:04:44 UTC 2018 (cd0437b)
x86_64 x86_64 x86_64 GNU/Linux
```

Kernel self-reported vulnerability status:

CVE-2017-5754 (Meltdown): Not affected

CVE-2017-5753 (Spectre variant 1): Mitigation: \_\_user pointer sanitization

CVE-2017-5715 (Spectre variant 2): Mitigation: Indirect Branch Restricted Speculation, IBPB, IBRS\_FW

run-level 3 Apr 7 19:20

SPEC is set to: /home/cpu2017\_u2

```
Filesystem      Type  Size  Used Avail Use% Mounted on
/dev/sdal        xfs   373G   94G  279G  26% /home
```

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.

BIOS HPE U32 02/02/2019

Memory:

24x UNKNOWN NOT AVAILABLE 16 GB 2 rank 2933, configured at 2400

(End of data from sysinfo program)

## Compiler Version Notes

=====  
CC 619.lbm\_s(base) 638.imagick\_s(base) 644.nab\_s(base)  
=====

Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,  
Version 19.0.2.187 Build 20190117  
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.  
=====

=====  
FC 607.cactuBSSN\_s(base)  
=====

Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,  
Version 19.0.2.187 Build 20190117  
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.  
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## Compiler Version Notes (Continued)

Version 19.0.2.187 Build 20190117  
 Copyright (C) 1985-2019 Intel Corporation. All rights reserved.  
 Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)  
 64, Version 19.0.2.187 Build 20190117  
 Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

=====

FC 603.bwaves\_s(base) 649.fotonik3d\_s(base) 654.roms\_s(base)

-----

Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)  
 64, Version 19.0.2.187 Build 20190117  
 Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

=====

CC 621.wrf\_s(base) 627.cam4\_s(base) 628.pop2\_s(base)

-----

Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)  
 64, Version 19.0.2.187 Build 20190117  
 Copyright (C) 1985-2019 Intel Corporation. All rights reserved.  
 Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,  
 Version 19.0.2.187 Build 20190117  
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## Base Compiler Invocation

C benchmarks:

icc -m64 -std=c11

Fortran benchmarks:

ifort -m64

Benchmarks using both Fortran and C:

ifort -m64 icc -m64 -std=c11

Benchmarks using Fortran, C, and C++:

icpc -m64 icc -m64 -std=c11 ifort -m64

## Base Portability Flags

603.bwaves\_s: -DSPEC\_LP64

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## Base Portability Flags (Continued)

```

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:

```

-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP

```

Fortran benchmarks:

```

-DSPEC_OPENMP -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp
-nostandard-realloc-lhs

```

Benchmarks using both Fortran and C:

```

-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
-nostandard-realloc-lhs

```

Benchmarks using Fortran, C, and C++:

```

-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
-nostandard-realloc-lhs

```

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-SKX-revJ.html>

<http://www.spec.org/cpu2017/flags/Intel-ic18.0-official-linux64.2019-04-03.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-SKX-revJ.xml>

<http://www.spec.org/cpu2017/flags/Intel-ic18.0-official-linux64.2019-04-03.xml>



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