SPEC CPU®2017 Floating Point Speed Result

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Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant DL380 Gen10
(2.10 GHz, Intel Xeon Gold 5218R)

$SPECspeed®2017\_fp\_base = 129$
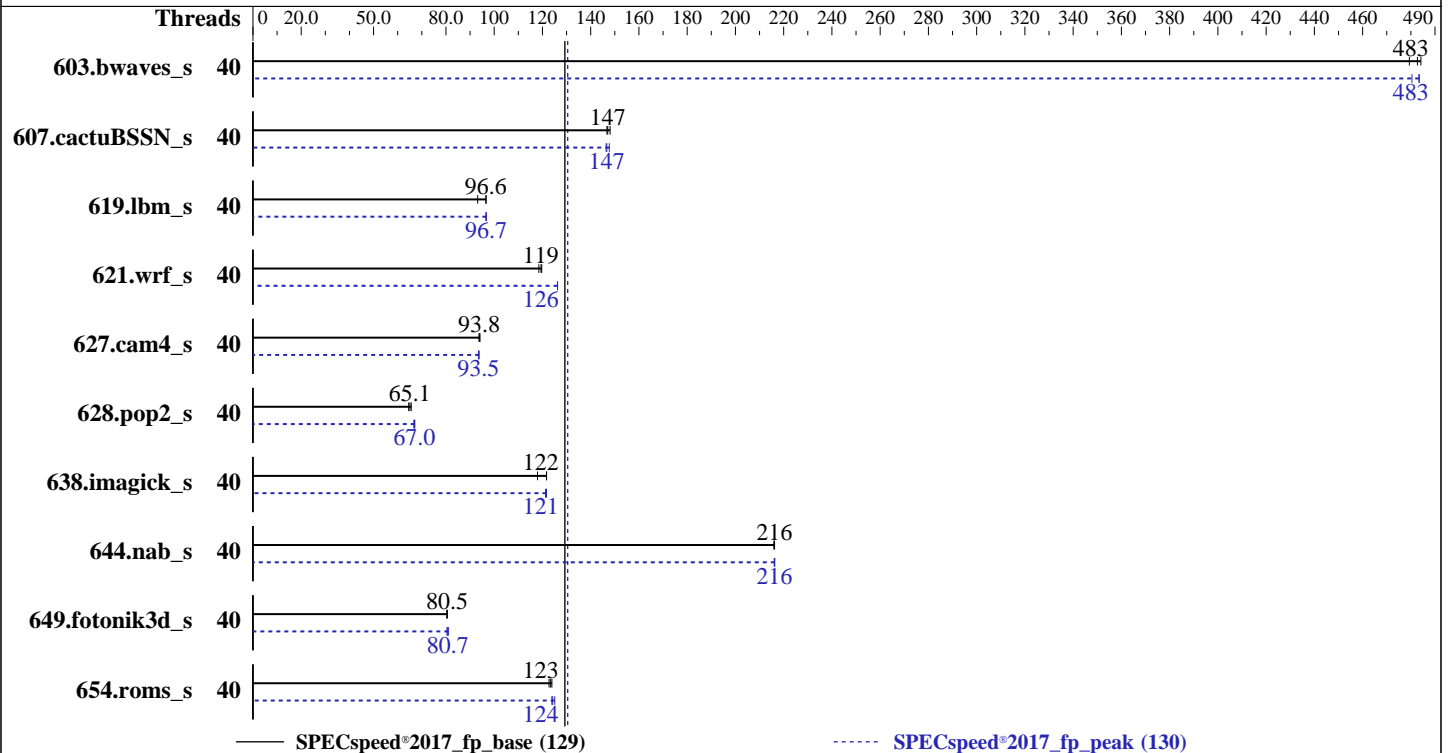
$SPECspeed®2017\_fp\_peak = 130$

CPU2017 License: 3

Test Sponsor: HPE

Tested by: HPE

Test Date: Mar-2020

Hardware Availability: Feb-2020

Software Availability: Jun-2019

Threads

Benchmark		base	peak
603.bwaves_s	40	483	483
607.cactuBSSN_s	40	147	147
619.lbm_s	40	96.6	96.7
621.wrf_s	40	119	126
627.cam4_s	40	93.8	93.5
628.pop2_s	40	65.1	67.0
638.imagick_s	40	122	121
644.nab_s	40	216	216
649.fotonik3d_s	40	80.5	80.7
654.roms_s	40	123	124

—— SPECspeed®2017_fp_base (129)   ----- SPECspeed®2017_fp_peak (130)

Hardware

CPU Name: Intel Xeon Gold 5218R
 Max MHz: 4000
 Nominal: 2100
Enabled: 40 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: 27.5 MB I+D on chip per chip
 Other: None
Memory: 384 GB (24 x 16 GB 2Rx8 PC4-2933Y-R, running at 2666)
Storage: 1 x 400 GB SAS SSD
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: Yes
Firmware: HPE BIOS Version U30 v2.22 (11/13/2019) released Feb-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

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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	40	123	479	122	484	**122**	**483**	40	**122**	**483**	123	480	122	483
607.cactuBSSN_s	40	**113**	**147**	113	148	114	147	40	**114**	**147**	114	146	113	148
619.lbm_s	40	56.2	93.2	**54.2**	**96.6**	54.2	96.7	40	54.1	96.8	**54.2**	**96.7**	54.2	96.6
621.wrf_s	40	110	120	**111**	**119**	112	119	40	**105**	**126**	105	126	105	126
627.cam4_s	40	94.2	94.1	**94.5**	**93.8**	94.5	93.8	40	94.8	93.5	**94.8**	**93.5**	94.5	93.8
628.pop2_s	40	184	64.5	**182**	**65.1**	181	65.6	40	177	67.1	**177**	**67.0**	178	66.7
638.imagick_s	40	122	118	**119**	**122**	119	122	40	**119**	**121**	119	122	119	121
644.nab_s	40	**80.8**	**216**	80.9	216	80.8	216	40	80.8	216	**80.8**	**216**	80.9	216
649.fotonik3d_s	40	**113**	**80.5**	113	80.4	113	80.5	40	**113**	**80.7**	113	80.4	113	81.0
654.roms_s	40	128	123	**128**	**123**	127	124	40	**127**	**124**	126	125	127	124
SPECspeed®2017_fp_base =	**129**													
SPECspeed®2017_fp_peak =	**130**													

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=core,compact"
LD_LIBRARY_PATH = "/home/cpu2017/lib/intel64"
OMP_STACKSIZE = "192M"
```

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) 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.

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CPU2017 License: 3

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Software Availability: Jun-2019

Platform Notes

```
BIOS Configuration:
 Hyper-Threading set to Disabled
 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 Peak Frequency Compute
 Workload Profile set to Custom
  Energy/Performance Bias set to Balanced Power
  Minimum Processor Idle Power Core C-State set to C1E State
  Numa Group Size Optimization set to Flat
  XPT Prefetcher set to Disabled


Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7edb1e6e46a485a0011
running on linux-r6ge Thu Mar  5 14:10:52 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) Gold 5218R CPU @ 2.10GHz
      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 : 20
      siblings  : 20
      physical 0: cores 0 1 2 3 4 8 9 10 11 12 16 17 18 19 20 24 25 26 27 28
      physical 1: cores 0 1 2 3 4 8 9 10 11 12 16 17 18 19 20 24 25 26 27 28

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:  1
   Core(s) per socket:  20
   Socket(s):           2
   NUMA node(s):        2
   Vendor ID:           GenuineIntel
   CPU family:          6
   Model:               85
```

(Continued on next page)

Standard Performance Evaluation Corporation (info@spec.org)

https://www.spec.org/

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

Platform Notes (Continued)

```
        Model name:             Intel(R) Xeon(R) Gold 5218R CPU @ 2.10GHz
        Stepping:               7
        CPU MHz:                2100.000
        BogoMIPS:               4200.00
        Virtualization:         VT-x
        L1d cache:              32K
        L1i cache:              32K
        L2 cache:               1024K
        L3 cache:               28160K
        NUMA node0 CPU(s):      0-19
        NUMA node1 CPU(s):      20-39
        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 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 epb cat_l3 cdp_l3
    invpcid_single intel_ppin ssbd mba ibrs ibpb stibp ibrs_enhanced 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 dtherm ida arat pln pts pku ospke avx512_vnni md_clear flush_l1d
    arch_capabilities

 /proc/cpuinfo cache data
   cache size : 28160 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 10 11 12 13 14 15 16 17 18 19
   node 0 size: 193097 MB
   node 0 free: 190724 MB
   node 1 cpus: 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39
   node 1 size: 193531 MB
   node 1 free: 193176 MB
   node distances:
   node   0   1
     0:  10  21
     1:  21  10

 From /proc/meminfo
    MemTotal:       395907216 kB
    HugePages_Total:       0
    Hugepagesize:       2048 kB

 From /etc/*release* /etc/*version*
```

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Platform Notes (Continued)

```
   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-r6ge 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 5 14:08

   SPEC is set to: /home/cpu2017
      Filesystem     Type   Size  Used Avail Use% Mounted on
      /dev/sda2      btrfs  371G  146G  225G  40% /home

   From /sys/devices/virtual/dmi/id
      BIOS:    HPE U30 11/13/2019
      Vendor:  HPE
      Product: ProLiant DL380 Gen10
      Product Family: ProLiant
      Serial:  2M294204YX


   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.
     Memory:
       24x UNKNOWN NOT AVAILABLE 16 GB 2 rank 2933

   (End of data from sysinfo program)
```

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Compiler Version Notes

```
==============================================================================
C                    | 619.lbm_s(base, peak) 638.imagick_s(base, peak)
                     | 644.nab_s(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++, C, Fortran | 607.cactuBSSN_s(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.
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.
Intel(R) Fortran 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.
------------------------------------------------------------------------------


==============================================================================
Fortran              | 603.bwaves_s(base, peak) 649.fotonik3d_s(base, peak)
                     | 654.roms_s(base, peak)
------------------------------------------------------------------------------
Intel(R) Fortran 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.
------------------------------------------------------------------------------


==============================================================================
Fortran, C      | 621.wrf_s(base, peak) 627.cam4_s(base, peak)
                     | 628.pop2_s(base, peak)
------------------------------------------------------------------------------
Intel(R) Fortran 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.
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.
------------------------------------------------------------------------------
```

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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
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
```

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Base Optimization Flags (Continued)

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
```

Peak 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
```

Peak Portability Flags

```
Same as Base Portability Flags
```

Peak 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:

```
603.bwaves_s: -prof-gen(pass 1) -prof-use(pass 2) -DSPEC_SUPPRESS_OPENMP
-DSPEC_OPENMP -O2 -xCORE-AVX512 -qopt-prefetch -ipo -O3
-ffinite-math-only -no-prec-div -qopt-mem-layout-trans=4
-qopenmp -nostandard-realloc-lhs
```

```
649.fotonik3d_s: Same as 603.bwaves_s
```

```
654.roms_s: -DSPEC_OPENMP -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4
```

(Continued on next page)

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Peak Optimization Flags (Continued)

654.roms_s (continued):
`-qopenmp -nostandard-realloc-lhs`

Benchmarks using both Fortran and C:

621.wrf_s: `-prof-gen`(pass 1) `-prof-use`(pass 2) `-O2 -xCORE-AVX512`
`-qopt-prefetch -ipo -O3 -ffinite-math-only -no-prec-div`
`-qopt-mem-layout-trans=4 -DSPEC_SUPPRESS_OPENMP -qopenmp`
`-DSPEC_OPENMP -nostandard-realloc-lhs`

627.cam4_s: `-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch`
`-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp`
`-DSPEC_OPENMP -nostandard-realloc-lhs`

628.pop2_s: `Same as 621.wrf_s`

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-CLX-revB.html
http://www.spec.org/cpu2017/flags/Intel-ic19.0u1-official-linux64.2019-07-09.html

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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-V1.2-CLX-revB.xml
http://www.spec.org/cpu2017/flags/Intel-ic19.0u1-official-linux64.2019-07-09.xml

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

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