SPEC CPU®2017 Floating Point Speed Result

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Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant DL360 Gen10
(2.10 GHz, Intel Xeon Gold 6230R)

$SPECspeed^®2017\_fp\_base = 147$
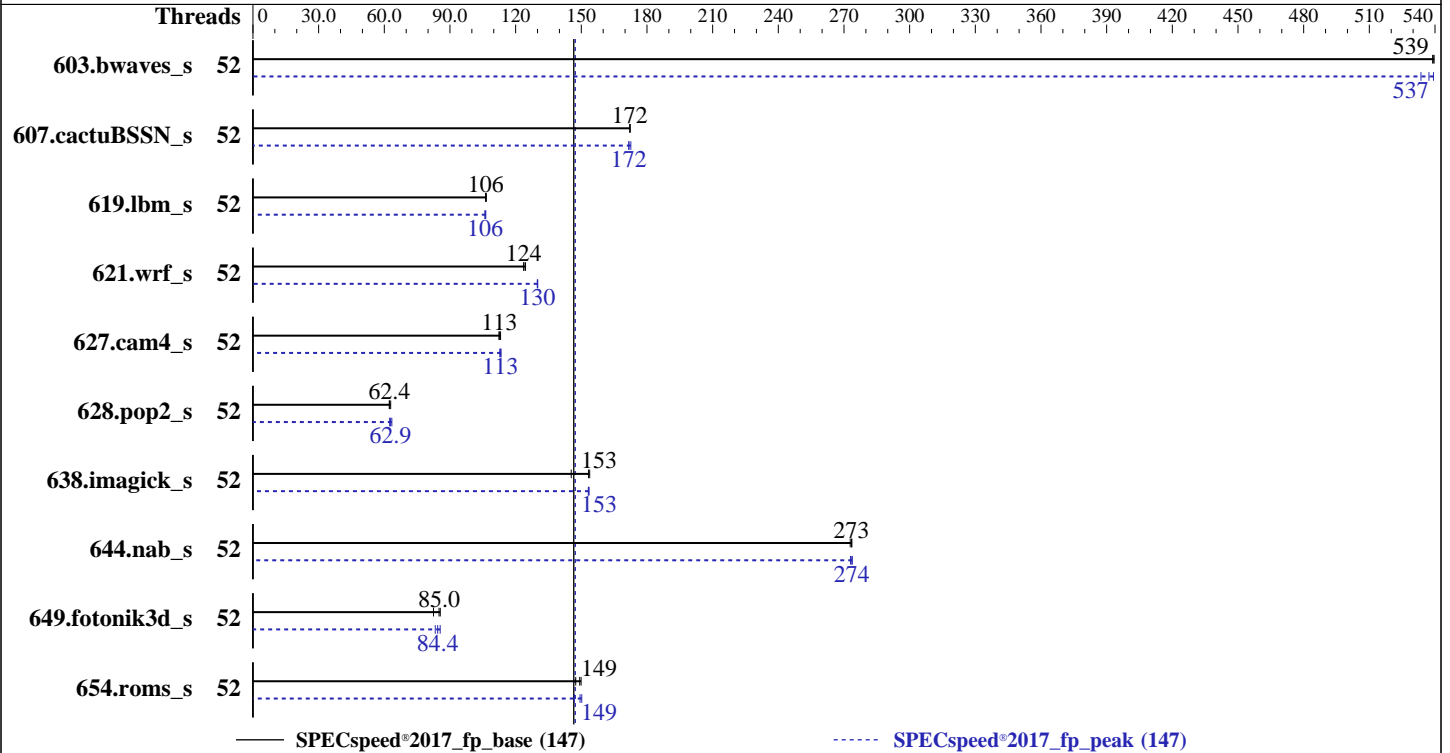
$SPECspeed^®2017\_fp\_peak = 147$

CPU2017 License: 3

Test Sponsor: HPE

Tested by: HPE

Test Date: Feb-2020

Hardware Availability: Feb-2020

Software Availability: Jun-2019

Threads

Benchmark	Threads	base	peak
603.bwaves_s	52	539	537
607.cactuBSSN_s	52	172	172
619.lbm_s	52	106	106
621.wrf_s	52	124	130
627.cam4_s	52	113	113
628.pop2_s	52	62.4	62.9
638.imagick_s	52	153	153
644.nab_s	52	273	274
649.fotonik3d_s	52	85.0	84.4
654.roms_s	52	149	149

—— SPECspeed®2017_fp_base (147)   ----- SPECspeed®2017_fp_peak (147)

Hardware

CPU Name: Intel Xeon Gold 6230R
 Max MHz: 4000
 Nominal: 2100
 Enabled: 52 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: 35.75 MB I+D on chip per chip
 Other: None
 Memory: 384 GB (24 x 16 GB 2Rx8 PC4-2933Y-R)
 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: Yes
Firmware: HPE BIOS Version U32 2.22 (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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CPU2017 License: 3	**Test Date:** Feb-2020
Test Sponsor: HPE	**Hardware Availability:** Feb-2020
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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	52	**109**	**539**	109	540	109	539	52	109	539	111	534	**110**	**537**
607.cactuBSSN_s	52	96.8	172	**96.8**	**172**	96.8	172	52	96.6	173	**97.1**	**172**	97.1	172
619.lbm_s	52	49.3	106	49.1	107	**49.2**	**106**	52	49.2	106	49.4	106	**49.4**	**106**
621.wrf_s	52	106	125	107	124	**107**	**124**	52	**102**	**130**	102	130	102	130
627.cam4_s	52	78.4	113	78.9	112	**78.6**	**113**	52	**78.4**	**113**	78.2	113	78.6	113
628.pop2_s	52	**190**	**62.4**	189	62.9	191	62.3	52	190	62.4	187	63.4	**189**	**62.9**
638.imagick_s	52	93.8	154	99.2	145	**94.1**	**153**	52	94.2	153	94.0	153	**94.0**	**153**
644.nab_s	52	63.9	274	64.0	273	**63.9**	**273**	52	63.8	274	64.0	273	**63.9**	**274**
649.fotonik3d_s	52	111	82.5	**107**	**85.0**	107	85.6	52	109	83.3	**108**	**84.4**	107	85.5
654.roms_s	52	105	150	**105**	**149**	107	147	52	105	150	107	147	**105**	**149**
SPECspeed®2017_fp_base =		**147**												
SPECspeed®2017_fp_peak =		**147**												

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 = "/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
Test Sponsor: HPE
Tested by: HPE

Test Date: Feb-2020
Hardware Availability: Feb-2020
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
   Energy/Performance Bias set to Balanced Power
  Workload Profile set to Custom
   Numa Group Size Optimization set to Flat
   Intel UPI Link Power Management set to Enabled


 Sysinfo program /cpu2017/bin/sysinfo
 Rev: r6365 of 2019-08-21 295195f888a3d7edb1e6e46a485a0011
 running on linux-9e6o Sun Feb 23 15:13:55 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 6230R CPU @ 2.10GHz
       2  "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.)
       cpu cores : 26
       siblings  : 26
       physical 0: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 16 17 18 19 20 21 22 24 25 26 27 28
       29
       physical 1: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 16 17 18 19 20 21 22 24 25 26 27 28
       29

 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):              52
      On-line CPU(s) list: 0-51
      Thread(s) per core:  1
      Core(s) per socket:  26
      Socket(s):           2
      NUMA node(s):        2
      Vendor ID:           GenuineIntel
      CPU family:          6
```

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https://www.spec.org/

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CPU2017 License: 3

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Test Date: Feb-2020

Hardware Availability: Feb-2020

Software Availability: Jun-2019

Platform Notes (Continued)

```
        Model:                 85
        Model name:            Intel(R) Xeon(R) Gold 6230R 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:              36608K
        NUMA node0 CPU(s):     0-25
        NUMA node1 CPU(s):     26-51
        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 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 : 36608 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 20 21 22 23 24 25
   node 0 size: 193125 MB
   node 0 free: 183863 MB
   node 1 cpus: 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50
   51
   node 1 size: 193500 MB
   node 1 free: 192902 MB
   node distances:
   node   0   1
     0:  10  21
     1:  21  10

 From /proc/meminfo
   MemTotal:       395904952 kB
   HugePages_Total:        0
   Hugepagesize:        2048 kB
```

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

Platform Notes (Continued)

```
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 Feb 23 10:40

SPEC is set to: /cpu2017
   Filesystem     Type   Size  Used Avail Use% Mounted on
   /dev/sda2      btrfs  369G  133G  237G  36% /

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

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Platform Notes (Continued)

```
  (End of data from sysinfo program)
```

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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Compiler Version Notes (Continued)

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`

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Base Optimization Flags (Continued)

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
```

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
```

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Peak Optimization Flags (Continued)

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 -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`

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`

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

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