## SPEC CPU®2017 Floating Point Speed Result

### Test Sponsor: HPE
ProLiant DL380 Gen10
(2.90 GHz, Intel Xeon Gold 6226R)

### SPECspeed®2017_fp_base = 129
SPECspeed®2017_fp_peak = 129

<table>
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<th>Threads</th>
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<th>SPECspeed®2017_fp_peak (129)</th>
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<tr>
<td>603.bwaves_s</td>
<td>141</td>
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<tr>
<td>607.cactuBSSN_s</td>
<td>87.2</td>
<td>87.5</td>
</tr>
<tr>
<td>619.lbm_s</td>
<td>85.5</td>
<td>85.3</td>
</tr>
<tr>
<td>621.wrf_s</td>
<td>67.8</td>
<td>68.6</td>
</tr>
<tr>
<td>627.cam4_s</td>
<td>117</td>
<td>110</td>
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<tr>
<td>628.pop2_s</td>
<td>78.8</td>
<td>79.3</td>
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<tr>
<td>638.imagick_s</td>
<td>79.3</td>
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<tr>
<td>644.nab_s</td>
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<tr>
<td>649.fotonik3d_s</td>
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</tr>
<tr>
<td>654.roms_s</td>
<td>150</td>
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</tr>
</tbody>
</table>

### Hardware

| CPU Name: | Intel Xeon Gold 6226R |
| Max MHz: | 3900 |
| Nominal: | 2900 |
| Enabled: | 32 cores, 2 chips |
| Orderable: | 1, 2 chip(s) |
| Cache L1: | 32 KB I + 32 KB D on chip per core |
| Cache L2: | 1 MB I+D on chip per core |
| Cache L3: | 22 MB I+D on chip per chip |
| Memory: | 384 GB (12 x 32 GB 2Rx4 PC4-2933Y-R) |
| Storage: | 1 x 400 GB SAS SSD |
| Other: | None |

### Software

| OS: | SUSE Linux Enterprise Server 15 SP1 (x86_64) |
| 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 2.30 (09/12/2019) 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 |
## Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
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<th>Seconds</th>
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</table>

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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**Hewlett Packard Enterprise**  
(Test Sponsor: HPE)  
ProLiant DL380 Gen10  
(2.90 GHz, Intel Xeon Gold 6226R)

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**SPECspeed®2017_fp_base** = 129  
**SPECspeed®2017_fp_peak** = 129

**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 295195f888a3d7edbe6e46a485a0011  
running on linux-3rlx Fri Feb 28 16:32:24 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 6226R CPU @ 2.90GHz  
2 "physical id"s (chips)  
32 "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 : 16  
siblings : 16  
physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15  
physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

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): 32  
On-line CPU(s) list: 0-31  
Thread(s) per core: 1  
Core(s) per socket: 16  
Socket(s): 2  
NUMA node(s): 2  
Vendor ID: GenuineIntel  
CPU family: 6  
Model: 85

(Continued on next page)
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SPECspeed®2017_fp_base = 129
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CPU2017 License: 3
Test Sponsor: HPE
Tested by: HPE

Platform Notes (Continued)

Model name: Intel(R) Xeon(R) Gold 6226R CPU @ 2.90GHz
Stepping: 7
CPU MHz: 2900.000
BogoMIPS: 5800.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 22528K
NUMA node0 CPU(s): 0-15
NUMA node1 CPU(s): 16-31
Flags: fpu vme de pse tsc msr pae mce cmov pat pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtscp lm constant_tsc arch_perfmon pebs bts rep_good 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 ebpx 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 3ms invpcid rtm cqm mpx rt_d a avx512f avx512dq rdseed adx snap clflushopt clwb intell_pt avx512cd avx512bw avx512vl xsaveopt xsavec xgetbv1 xsave xsev cqm_llc cqm_occup_llc cqm_mb_mtotal cqm_mb_local dtherm ida arat pln pts pku ospke avx512_vnni md_clear flush_lld arch_capabilities

/proc/cpuinfo cache data
   cache size : 22528 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
   node 0 size: 193090 MB
   node 0 free: 190629 MB
   node 1 cpus: 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
   node 1 size: 193532 MB
   node 1 free: 193225 MB
   node distances:
      node 0 1
      0: 10 21
      1: 21 10

From /proc/meminfo
   MemTotal: 395901548 kB
   HugePages_Total: 0
   Hugepagesize: 2048 kB

From /etc/*release* /etc/*version* (Continued on next page)
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<td>Tested by: HPE</td>
<td>Software Availability: Jun-2019</td>
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</tbody>
</table>

**Platform Notes (Continued)**

```plaintext
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-3rlx 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 28 16:30

SPEC is set to: /home/cpu2017  
Filesystem Type Size Used Avail Use% Mounted on
/dev/sda2 btrfs 369G 169G 201G 46% /home

From /sys/devices/virtual/dmi/id
BIOS:  HPE U30 09/12/2019
Vendor:  HPE
Product: ProLiant DL380 Gen10
Product Family: ProLiant
Serial:  2M294204YV

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:
12x UNKNOWN NOT AVAILABLE
12x UNKNOWN NOT AVAILABLE 32 GB 2 rank 2933

(End of data from sysinfo program)
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ProLiant DL380 Gen10
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CPU2017 License: 3
Test Sponsor: HPE
Tested by: HPE

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.
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Fortran, C      | 621.wrf_s(base, peak) 627.cam4_s(base, peak) 628.pop2_s(base, peak)
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Test Sponsor: HPE
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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

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

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