## SPEC® CPU2017 Floating Point Speed Result

**Hewlett Packard Enterprise**  
(Test Sponsor: HPE)  
ProLiant XL420 Gen9  
(2.20 GHz, Intel Xeon E5-2650 v4)  

**SPECspeed2017_fp_base = 68.4**  
**SPECspeed2017_fp_peak = Not Run**

<table>
<thead>
<tr>
<th>Test Sponsor</th>
<th>HPE</th>
<th>Hardware Availability</th>
<th>Oct-2017</th>
</tr>
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<tr>
<td>Tested by</td>
<td>HPE</td>
<td>Software Availability</td>
<td>Sep-2017</td>
</tr>
</tbody>
</table>

**CPU2017 License:** 3  
**Test Date:** Feb-2018

### Hardware

- **CPU Name:** Intel Xeon E5-2650 v4  
- **Max MHz.:** 2900  
- **Nominal:** 2200  
- **Enabled:** 24 cores, 2 chips  
- **Orderable:** 1, 2 chip(s)  
- **Cache L1:** 32 KB I + 32 KB D on chip per core  
- **L2:** 256 KB I+D on chip per core  
- **L3:** 30 MB I+D on chip per chip  
- **Other:** None  
- **Memory:** 512 GB (8 x 64 GB 4Rx4 PC4-2400T-L)  
- **Storage:** 2 x 400 GB SAS SSD, RAID 0  
- **Other:** None

### Software

- **OS:** SUSE Linux Enterprise Server 12 (x86_64) SP3  
- **Kernel:** 4.4.73-5-default  
- **Compiler:** C/C++: Version 18.0.0.128 of Intel C/C++  
- **Compiler for Linux:** Intel Fortran: Version 18.0.0.128 of Intel Fortran  
- **Compiler for Linux:**  
- **Parallel:** Yes  
- **Firmware:** HPE BIOS Version U19 released Oct-2017 (tested as U19 10/25/2017)  
- **File System:** xfs  
- **System State:** Run level 3 (multi-user)  
- **Base Pointers:** 64-bit  
- **Peak Pointers:** Not Applicable  
- **Other:** None

### Benchmark Results

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>SPECspeed2017_fp_base</th>
</tr>
</thead>
<tbody>
<tr>
<td>bwaves</td>
<td>24</td>
<td>89.8</td>
</tr>
<tr>
<td>cactuBSSN</td>
<td>24</td>
<td>64.4</td>
</tr>
<tr>
<td>lbm</td>
<td>24</td>
<td>50.7</td>
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<tr>
<td>wrf</td>
<td>24</td>
<td>51.0</td>
</tr>
<tr>
<td>cam4</td>
<td>24</td>
<td>54.5</td>
</tr>
<tr>
<td>pop2</td>
<td>24</td>
<td>106</td>
</tr>
<tr>
<td>imagick</td>
<td>24</td>
<td>50.1</td>
</tr>
<tr>
<td>fotonik3d</td>
<td>24</td>
<td>73.6</td>
</tr>
<tr>
<td>roms</td>
<td>24</td>
<td>60.0</td>
</tr>
</tbody>
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Results Table

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<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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<tbody>
<tr>
<td>603.bwaves_s</td>
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<td>284</td>
<td>209</td>
<td>283</td>
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<td>284</td>
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<tr>
<td>607.cactuBSSN_s</td>
<td>24</td>
<td>186</td>
<td>89.8</td>
<td>185</td>
<td>90.1</td>
<td>186</td>
<td>89.6</td>
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<tr>
<td>619.lbm_s</td>
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<td>24.9</td>
<td>211</td>
<td>24.9</td>
<td>209</td>
<td>25.0</td>
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<td>621.wrf_s</td>
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<td>205</td>
<td>64.5</td>
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<td>627.cam4_s</td>
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<td>628.pop2_s</td>
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<td>233</td>
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<td>50.8</td>
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<td>638.imagick_s</td>
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<tr>
<td>644.nab_s</td>
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<td>106</td>
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<td>106</td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
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<td>180</td>
<td>50.5</td>
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<td>50.0</td>
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<tr>
<td>654.roms_s</td>
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<td>214</td>
<td>73.6</td>
<td>215</td>
<td>73.3</td>
<td>214</td>
<td>73.6</td>
</tr>
</tbody>
</table>

SPECspeed2017_fp_base = 68.4

SPECspeed2017_fp_peak = Not Run

Operating System Notes

Stack size set to unlimited using "ulimit -s unlimited"
Transparent Huge Pages enabled by default.
Filesystem page cache cleared with:
shell invocation of 'sync; echo 3 > /proc/sys/vm/drop_caches' prior to run
irqbalance service stopped using "systemctl stop irqbalance.service"

General Notes

Environment variables set by runcpu before the start of the run:
KMP_AFFINITY = "granularity=fine,compact"
LD_LIBRARY_PATH = "*/home/cpu2017/lib/ia32:/home/cpu2017/lib/intel64:/home/cpu2017/je5.0.1-32:/home/cpu2017/je5.0.1-64"
OMP_STACKSIZE = "192M"

Binaries compiled on a system with 1x Intel Core i7-4790 CPU + 32GB RAM
memory using Redhat Enterprise Linux 7.4

No: The test sponsor attests, as of date of publication, that CVE-2017-5754 (Meltdown)
is mitigated in the system as tested and documented.
No: 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.
No: 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:
Intel Hyperthreading set to Disabled

(Continued on next page)
Platform Notes (Continued)

Power Profile set to Maximum Performance
QPI Snoop Configuration set to Home Snoop
Collaborative Power Control set to Disabled
Thermal Configuration set to Maximum Cooling
Power Profile set to Custom
Minimum Processor Idle Power Core C-State set to C6 state
Processor Power and Utilization Monitoring set to Disabled
Memory Patrol Scrubbing set to Disabled
Memory Refresh Rate set to 1x Refresh
Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r5797 of 2017-06-14 96c45e4568ad54c135fd618bccc091c0f
running on Apollo4200gen9 Mon Feb 12 06:20:13 2018

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) CPU E5-2650 v4@ 2.20GHz
  2 "physical id"s (chips)
  24 "processors"
core, siblings (Caution: counting these is hw and system dependent. The following excerpts from /proc/cpuinfo might not be reliable. Use with caution.)
cpu cores : 12
siblings : 12
physical 0: cores 0 1 2 3 4 5 8 9 10 11 12 13
physical 1: cores 0 1 2 3 4 5 8 9 10 11 12 13

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 24
On-line CPU(s) list: 0-23
Thread(s) per core: 1
Core(s) per socket: 12
Socket(s): 2
NUMA node(s): 2
Vendor ID: GenuineIntel
CPU family: 6
Model: 79
Model name: Intel(R) Xeon(R) CPU E5-2650 v4@ 2.20GHz
Stepping: 1
CPU MHz: 2197.378
BogoMIPS: 4394.75
Virtualization: VT-x
L1d cache: 32K

(Continued on next page)
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### SPECspeed2017_fp_base = 68.4

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### Platform Notes (Continued)

- **L1i cache:** 32K
- **L2 cache:** 256K
- **L3 cache:** 30720K
- **NUMA node0 CPU(s):** 0-5,12-17
- **NUMA node1 CPU(s):** 6-11,18-23
- **Flags:** fpu vme de pae mce cx8 apic sep mtrr pge mca cmov
  pat pse36 clflush dts msr pae mca cx8 ht tm pbe syscall nx pdpe1gb rdtscp
  lm constant_tsc arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc aperf
  perfmemperf eagerfpu pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16
  xtrunc pcrm pcid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave
  avx f16c rdrand lahf_lm abm 3dnowprefetch ida arat epb pln pts dtherm intel_pt
  tpr_shadow vnmi flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2
  erms invpcid rtm cqm rdseed adx smap xsaveopt cqm_llc cqm_occup_llc

```
/testinfo/cpuinfo cache data
    cache size: 30720 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 12 13 14 15 16 17
    node 0 size: 257636 MB
    node 0 free: 257244 MB
    node 1 cpus: 6 7 8 9 10 11 18 19 20 21 22 23
    node 1 size: 257893 MB
    node 1 free: 257574 MB
    node distances:
        node 0 1
        0: 10 21
        1: 21 10
```

From `/proc/meminfo`

```
MemTotal:       527903020 kB
MemFree:        2048 kB
```

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

```
SuSE-release:
    SuSE Linux Enterprise Server 12 SP3
```

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

```
SuSE-release:
    SuSE Linux Enterprise Server 12 (x86_64)
    VERSION = 12
    PATCHLEVEL = 3
    # This file is deprecated and will be removed in a future service pack or release.
    # Please check /etc/os-release for details about this release.
    os-release:
```

(Continued on next page)
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| Tested by: | HPE |

**Platform Notes (Continued)**

```plaintext
NAME="SLES"
VERSION="12-SP3"
VERSION_ID="12.3"
PRETTY_NAME="SUSE Linux Enterprise Server 12 SP3"
ID="sles"
ANSI_COLOR="0;32"
CPE_NAME="cpe:/o:suse:sles:12:sp3"
```

```plaintext
uname -a:
Linux apollo4200gen9 4.4.73-5-default #1 SMP Tue Jul 4 15:33:39 UTC 2017 (b7ce4e4)
x86_64 x86_64 x86_64 GNU/Linuxun-level 3 Feb 12 06:13
```

SPEC is set to: /home/cpu2017  
Filesystem     Type  Size  Used Avail Use% Mounted on  
/dev/sda4      xfs   703G   52G  652G   8% /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.

**Compiler Version Notes**

```plaintext
==============================================================================
CC  619.lbm_s(base) 638.imagick_s(base) 644.nab_s(base)
==============================================================================
```

```
icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
```

```
==============================================================================
FC  607.cactuBSSN_s(base)
==============================================================================
```

```
icpc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
ifort (IFORT) 18.0.0 20170811
```

(Continued on next page)
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Compiler Version Notes (Continued)

Copyright (C) 1985-2017 Intel Corporation. All rights reserved.

==============================================================================
FC 603.bwaves_s(base) 649.fotonik3d_s(base) 654.roms_s(base)
ifort (IFORT) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.

==============================================================================
CC 621.wrf_s(base) 627.cam4_s(base) 628.pop2_s(base)
ifort (IFORT) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.

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

(Continued on next page)
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Base Portability Flags (Continued)

644.nab_s: -DSPEC_LP64
649.fotonik3d_s: -DSPEC_LP64
654.roms_s: -DSPEC_LP64

Base Optimization Flags

C benchmarks:
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=3 -qopenmp -DSPEC_OPENMP

Fortran benchmarks:
-DSPEC_OPENMP -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=3 -qopenmp
-nostandard-realloc-lhs -align array32byte

Benchmarks using both Fortran and C:
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=3 -qopenmp -DSPEC_OPENMP
-nostandard-realloc-lhs -align array32byte

Benchmarks using Fortran, C, and C++:
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=3 -qopenmp -DSPEC_OPENMP
-nostandard-realloc-lhs -align array32byte

Base Other Flags

C benchmarks:
-m64 -std=c11

Fortran benchmarks:
-m64

Benchmarks using both Fortran and C:
-m64 -std=c11

Benchmarks using Fortran, C, and C++:
-m64 -std=c11
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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-HSW-revG.html](http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-V1.2-HSW-revG.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-HSW-revG.xml](http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-V1.2-HSW-revG.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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