SPEC® CPU2017 Floating Point Speed Result

Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL360 Gen10
(2.10 GHz, Intel Xeon Silver 4110)

SPECspeed2017_fp_base = 60.0
SPECspeed2017_fp_peak = Not Run

CPU2017 License: 3
Test Sponsor: HPE
Tested by: HPE
Test Date: Nov-2017
Hardware Availability: Oct-2017
Software Availability: Sep-2017

| Software | OS: Red Hat Enterprise Linux Server release 7.3 (Maipo),
Compiler: C/C++: Version 18.0.0.128 of Intel C/C++
Compiler for Linux:
Fortran: Version 18.0.0.128 of Intel Fortran
Compiler for Linux:
Parallel: Yes
File System: xfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: Not Applicable
Other: None

| Hardware | CPU Name: Intel Xeon Silver 4110
Max MHz.: 3000
Nominal: 2100
Enabled: 16 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: 11 MB I+D on chip per chip
Other: None
Memory: 192 GB (24 x 8 GB 2Rx8 PC4-2666V-R, running at 2400)
Storage: 1 x 600 GB SATA SSD, RAID 0
Other: None

Table:

<table>
<thead>
<tr>
<th>Threads</th>
<th>SPECspeed2017_fp_base (60.0)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>15.0</td>
</tr>
<tr>
<td>603.bwaves_s</td>
<td>16</td>
</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td>16</td>
</tr>
<tr>
<td>619.lbm_s</td>
<td>16</td>
</tr>
<tr>
<td>621.wrf_s</td>
<td>16</td>
</tr>
<tr>
<td>627.cam4_s</td>
<td>16</td>
</tr>
<tr>
<td>628.pop2_s</td>
<td>16</td>
</tr>
<tr>
<td>638.imagick_s</td>
<td>16</td>
</tr>
<tr>
<td>644.nab_s</td>
<td>16</td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>16</td>
</tr>
<tr>
<td>654.roms_s</td>
<td>16</td>
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**Results Table**

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Base Seconds</th>
<th>Base Ratio</th>
<th>Peak Seconds</th>
<th>Peak Ratio</th>
<th>Base Seconds</th>
<th>Base Ratio</th>
<th>Peak Seconds</th>
<th>Peak Ratio</th>
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<tbody>
<tr>
<td>603.bwaves_s</td>
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<td><strong>302</strong></td>
<td>197</td>
<td><strong>299</strong></td>
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<tr>
<td>607.cactuBSSN_s</td>
<td>16</td>
<td>228</td>
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<td>227</td>
<td>73.4</td>
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<td><strong>73.3</strong></td>
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<tr>
<td>619.lbm_s</td>
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<td>33.1</td>
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<td><strong>33.1</strong></td>
<td>159</td>
<td>33.0</td>
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<td></td>
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<tr>
<td>621.wrf_s</td>
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<td>299</td>
<td>44.2</td>
<td>303</td>
<td>43.7</td>
<td><strong>302</strong></td>
<td><strong>43.8</strong></td>
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<tr>
<td>627.cam4_s</td>
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<td>33.3</td>
<td>265</td>
<td>33.4</td>
<td><strong>266</strong></td>
<td><strong>33.3</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>628.pop2_s</td>
<td>16</td>
<td>261</td>
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<td><strong>45.4</strong></td>
<td>262</td>
<td>45.4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>638.imagick_s</td>
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<td><strong>346</strong></td>
<td><strong>41.7</strong></td>
<td>346</td>
<td>41.7</td>
<td></td>
<td></td>
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<tr>
<td>644.nab_s</td>
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<td><strong>62.9</strong></td>
<td>145</td>
<td>63.0</td>
<td>145</td>
<td>62.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>654.roms_s</td>
<td>16</td>
<td>243</td>
<td>64.8</td>
<td><strong>244</strong></td>
<td><strong>64.6</strong></td>
<td>244</td>
<td>64.5</td>
<td></td>
<td></td>
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</tbody>
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**SPECspeed2017_fp_base = 60.0**  
**SPECspeed2017_fp_peak = Not Run**

Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

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**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 disabled with "systemctl stop irqbalance"  
tuned profile set with "tuned-adm profile throughput-performance"

---

**General Notes**

Environment variables set by runcpu before the start of the run:  
KMP_AFFINITY = "granularity=core,compact"  
LD_LIBRARY_PATH = "/home/cpu2017/lib/ia32:/home/cpu2017/lib/intel64"  
LD_LIBRARY_PATH = "$LD_LIBRARY_PATH:/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

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**Platform Notes**

BIOS Configuration:  
Intel Hyperthreading 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  
Workload Profile set to General Peak Frequency Compute

(Continued on next page)
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<tbody>
<tr>
<td>SPECspeak2017_fp_peak</td>
<td>Not Run</td>
</tr>
</tbody>
</table>

### Platform Notes (Continued)

- Energy/Performance Bias set to Maximum Performance
- Workload Profile set to Custom
- NUMA Group Size Optimization set to Flat

Sysinfo program /home/cpu2017/bin/sysinfo  
Rev: r5797 of 2017-06-14 96c45e4568ad54c135fd618b091c0f  
running on DL360G10 Fri Nov 3 10:24:30 2017  

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 4110 CPU @ 2.10GHz  
  - "physical id"s (chips)
  - 16 "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 : 8
    - siblings : 8
    - physical 0: cores 0 1 2 3 4 5 6 7
    - physical 1: cores 0 1 2 3 4 5 6 7

From lscpu:
- Architecture: x86_64
- CPU op-mode(s): 32-bit, 64-bit
- Byte Order: Little Endian
- CPU(s): 16
- On-line CPU(s) list: 0-15
- Thread(s) per core: 1
- Core(s) per socket: 8
- Socket(s): 2
- NUMA node(s): 2
- Vendor ID: GenuineIntel
- CPU family: 6
- Model: 85
- Model name: Intel(R) Xeon(R) Silver 4110 CPU @ 2.10GHz
- Stepping: 4
- CPU MHz: 2100.000
- BogoMIPS: 4205.10
- Virtualization: VT-x
- L1d cache: 32K
- L1i cache: 32K
- L2 cache: 1024K
- L3 cache: 11264K
- NUMA node0 CPU(s): 0-7
- NUMA node1 CPU(s): 8-15

(Continued on next page)
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| SPECspeed2017_fp_base | 60.0 |
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CPU2017 License: 3
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**Platform Notes (Continued)**

/proc/cpuinfo cache data
  cache size : 11264 KB

From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a physical chip.

From /proc/meminfo
  MemTotal: 197752264 kB
  HugePages_Total: 0
  Hugepagesize: 2048 kB

From /etc/*release*/etc/*version*
  os-release:
    NAME="Red Hat Enterprise Linux Server"
    VERSION="7.3 (Maipo)"
    ID="rhel"
    ID_LIKE="fedora"
    VERSION_ID="7.3"
    PRETTY_NAME="Red Hat Enterprise Linux Server 7.3 (Maipo)"
    ANSI_COLOR="0;31"
    CPE_NAME="cpe:/o:redhat:enterprise_linux:7.3:GA:server"
  redhat-release: Red Hat Enterprise Linux Server release 7.3 (Maipo)
  system-release: Red Hat Enterprise Linux Server release 7.3 (Maipo)

uname -a:
  Linux DL360G10 3.10.0-514.el7.x86_64 #1 SMP Wed Oct 19 11:24:13 EDT 2016 x86_64 x86_64 GNU/Linux

run-level 3 Nov 3 01:49

SPEC is set to: /home/cpu2017

<table>
<thead>
<tr>
<th>Filesystem</th>
<th>Type</th>
<th>Size</th>
<th>Used</th>
<th>Avail</th>
<th>Use%</th>
<th>Mounted on</th>
</tr>
</thead>
<tbody>
<tr>
<td>/dev/mapper/rhel_dl360g10-home</td>
<td>xfs</td>
<td>504G</td>
<td>37G</td>
<td>467G</td>
<td>8%</td>
<td>/home</td>
</tr>
</tbody>
</table>

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 09/29/2017
Memory:
  24x UNKNOWN NOT AVAILABLE 8 GB 2 rank 2666, 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)

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
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FC  603.bwaves_s(base) 649.fotonik3d_s(base) 654.roms_s(base)

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Base Compiler Invocation

C benchmarks:
icc

Fortran benchmarks:
ifort

Benchmarks using both Fortran and C:
ifort icc

(Continued on next page)
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**Base Compiler Invocation (Continued)**

Benchmarks using Fortran, C, and C++:

icpc icc ifort

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**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

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**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
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**Hardware Availability:** Oct-2017  
**Software Availability:** Sep-2017  
**Tested by:** HPE

## 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`

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-revF.html](http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-V1.2-SKX-revF.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-revF.xml](http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-V1.2-SKX-revF.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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