Spec CPU®2017 Floating Point Speed Result

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Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL20 Gen10
(3.80 GHz, Intel Xeon E-2244G)

CPU2017 License: 3
Test Sponsor: HPE
Tested by: HPE

Test Date: Oct-2019
Hardware Availability: Nov-2019
Software Availability: Oct-2019

SPECspeed®2017_fp_base = 28.1
SPECspeed®2017_fp_peak = Not Run

Hardware

CPU Name: Intel Xeon E-2244G
Max MHz: 4800
Nominal: 3800
Enabled: 4 cores, 1 chip, 2 threads/core
Orderable: 1 chip
Cache L1: 32 KB I + 32 KB D on chip per core
L2: 256 KB I+D on chip per core
L3: 8 MB I+D on chip per chip
Other: None
Memory: 64 GB (4 x 16 GB 2Rx8 PC4-2666V-U)
Storage: 1 x 400 GB SATA SSD, RAID 0
Other: None

Software

OS: SUSE Linux Enterprise Server 15 (x86_64) SP1
Kernel 4.12.14-195-default
Compiler: C/C++: Version 19.0.1.144 of Intel C/C++
Compiler Build 20181018 for Linux;
Fortran: Version 19.0.1.144 of Intel Fortran
Compiler Build 20181018 for Linux
Parallel: Yes
Firmware: HPE BIOS Version U43 09/05/2019 released Sep-2019
File System: xfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: Not Applicable
Other: None
Power Management: --
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<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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<th>Ratio</th>
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<td>408</td>
<td>29.1</td>
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<td>21.7</td>
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<td>654.roms_s</td>
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<td>1123</td>
<td>14.0</td>
<td>1123</td>
<td>14.0</td>
</tr>
</tbody>
</table>

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

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"
OMP_STACKSIZE = "192M"

Binaries compiled on a system with 1x Intel Core i9-7900X CPU + 32GB RAM memory using Redhat Enterprise Linux 7.5
Yes: 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.

Platform Notes
BIOS Configuration:
Thermal Configuration set to Maximum Cooling

(Continued on next page)
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**Platform Notes (Continued)**

LLC Prefetch set to Enabled

Workload Profile set to General Peak Frequency Compute

Sysinfo program /home/cpu2017/bin/sysinfo

Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9

running on linux-vb4y Sun Oct 6 02:15:54 2019

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) E-2244G CPU @ 3.80GHz
 1 "physical id"s (chips)
 8 "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 : 4
siblings : 8
physical 0: cores 0 1 2 3
```

From lscpu:

```
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
Address sizes: 39 bits physical, 48 bits virtual
CPU(s): 8
On-line CPU(s) list: 0-7
Thread(s) per core: 2
Core(s) per socket: 4
Socket(s): 1
NUMA node(s): 1
Vendor ID: GenuineIntel
CPU family: 6
Model: 158
Model name: Intel(R) Xeon(R) E-2244G CPU @ 3.80GHz
Stepping: 10
CPU MHz: 3800.000
BogoMIPS: 7584.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 256K
L3 cache: 8192K
NUMA node0 CPU(s): 0-7
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
```

(Continued on next page)
### Platform Notes (Continued)

- `aperfmperf tsc_known_freq pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtpr pdcmt pcid sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c rdrand lahf_lm abm 3nowprefetch cpuid_fault epb invpcid_single pti ssbd ibrs ibpb stibp tpr_shadow vmmi flexpriority ept vpid fsqsbse tsc_adjust bni hle avx2 smep bmi2 erms invpcid rtm mpx rdseed adx smap clflushopt intel_pt xsaveopt xsavec xgetbv1 xsavec dtherm ida arat pln pts md_clear flush_l1d`  
  `/proc/cpuinfo cache data`  
  cache size : 8192 KB

From `numactl --hardware` WARNING: a `numactl 'node' might or might not correspond to a physical chip.
- available: 1 nodes (0)
- node 0 cpus: 0 1 2 3 4 5 6 7
- node 0 size: 64022 MB
- node 0 free: 63485 MB
- node distances:
  - node 0: 10

From `/proc/meminfo`
- MemTotal: 65559328 kB
- HugePages_Total: 0
- Hugepagesize: 2048 kB

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`
  x86_64 x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:
- CVE-2017-5754 (Meltdown): Mitigation: PTI
- CVE-2017-5753 (Spectre variant 1): Mitigation: __user pointer sanitization
- CVE-2017-5715 (Spectre variant 2): Mitigation: Indirect Branch Restricted Speculation, IBPB: conditional, IBRS_FW, STIBP: conditional, RSB filling

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run-level 3 Oct 6 02:14
SPEC is set to: /home/cpu2017

Filesystem     Type  Size  Used Avail Use% Mounted on
/dev/sda3      xfs   270G   63G  207G  24% /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.

BIOS HPE U43 09/05/2019
Memory:
4x UNKNOWN NOT AVAILABLE 16 GB 2 rank 2666

Compiler Version Notes

C               | 619.lbm_s(base) 638.imagick_s(base) 644.nab_s(base)
------------------------------------------------------------------------------
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------
C++, C, Fortran | 607.cactuBSSN_s(base)
------------------------------------------------------------------------------
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
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Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
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Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
64, Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------
Fortran         | 603.bwaves_s(base) 649.fotonik3d_s(base) 654.roms_s(base)
------------------------------------------------------------------------------
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
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**Compiler Version Notes (Continued)**

```plaintext
Fortran, C  | 621.wrf_s(base) 627.cam4_s(base) 628.pop2_s(base)
```

---

**Base Compiler Invocation**

C benchmarks:

```bash
icc -m64 -std=c11
```

Fortran benchmarks:

```bash
ifort -m64
```

Benchmarks using both Fortran and C:

```bash
ifort -m64 icc -m64 -std=c11
```

Benchmarks using Fortran, C, and C++:

```bash
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 byte reconcile
- `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=4`  
- `-qopenmp`  
- `-DSPEC_OPENMP`

**Fortran benchmarks:**
- `-DSPEC_OPENMP`  
- `-xCORE-AVX2`  
- `-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-AVX2`  
- `-ipo`  
- `-O3`  
- `-no-prec-div`  
- `-qopt-prefetch`  
- `-ffinite-math-only`  
- `-qopt-mem-layout-trans=4`  
- `-qopenmp`  
- `-DSPEC_OPENMP`

**Benchmarks using Fortran, C, and C++:**
- `-xCORE-AVX2`  
- `-ipo`  
- `-O3`  
- `-no-prec-div`  
- `-qopt-prefetch`  
- `-ffinite-math-only`  
- `-qopt-mem-layout-trans=4`  
- `-qopenmp`  
- `-DSPEC_OPENMP`

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/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-ic19.0u1-flags-linux64.2019-12-10.xml](http://www.spec.org/cpu2017/flags/HPE-ic19.0u1-flags-linux64.2019-12-10.xml)
- [http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-V1.2-CLX-revB.xml](http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-V1.2-CLX-revB.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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