# SPEC CPU®2017 Floating Point Rate Result

**Hewlett Packard Enterprise**  
(Test Sponsor: HPE)  
ProLiant DL20 Gen10 Plus  
(3.70 GHz, Intel Xeon E-2374G)

<table>
<thead>
<tr>
<th>SPECrate®2017_fp_base = 44.0</th>
<th>SPECrate®2017_fp_peak = 45.8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Sponsor: HPE</td>
<td>Hardware Availability: Jan-2022</td>
</tr>
<tr>
<td>Tested by: HPE</td>
<td>Software Availability: Jun-2021</td>
</tr>
</tbody>
</table>

**CPU2017 License:** 3  
**Test Date:** Mar-2022

## Hardware

**CPU Name:** Intel Xeon E-2374G  
**Max MHz:** 5000  
**Nominal:** 3700  
**Enabled:** 4 cores, 1 chip, 2 threads/core  
**Orderable:** 1 chip  
**Cache L1:** 32 KB I + 48 KB D on chip per core  
**L2:** 512 KB I+D on chip per core  
**L3:** 8 MB I+D on chip per chip  
**Other:** None  
**Memory:** 128 GB (4 x 32 GB 2Rx8 PC4-3200AA-E, running at 2933)  
**Storage:** 1 x 480 GB SATA SSD, RAID 0  
**Other:** None

## Software

**OS:** SUSE Linux Enterprise Server 15 SP3  
**Kernel:** 5.3.18-57-default  
**Compiler:** C/C++: Version 2021.1 of Intel oneAPI DPC++/C++ Compiler Build 20201113 for Linux; Fortran: Version 2021.1 of Intel Fortran Compiler Classic Build 20201112 for Linux; C/C++: Version 2021.1 of Intel C/C++ Compiler Classic Build 20201112 for Linux  
**Parallel:** No  
**Firmware:** HPE BIOS Version U60 v1.54 01/13/2022 released Jan-2022  
**File System:** xfs  
**System State:** Run level 3 (multi-user)  
**Base Pointers:** 64-bit  
**Peak Pointers:** 64-bit  
**Other:** jemalloc memory allocator V5.0.1  

(Continued on next page)
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SPEC CPU® 2017 Floating Point Rate Result

SPECratre®2017_fp_base = 44.0
SPECratre®2017_fp_peak = 45.8

Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
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<th>Benchmark</th>
<th>Copies</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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</thead>
<tbody>
<tr>
<td>503.bwaves_r</td>
<td>8</td>
<td>921</td>
<td>87.1</td>
<td>920</td>
<td>87.2</td>
<td>922</td>
<td>87.0</td>
<td>507.cactuBSSN_r</td>
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<td>70.0</td>
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<td>51.6</td>
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<td>29.9</td>
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<td>479</td>
<td>37.4</td>
<td>493</td>
<td>36.3</td>
<td>484</td>
<td>37.0</td>
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<td>308</td>
<td>45.4</td>
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<td>120</td>
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<td>544.nab_r</td>
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<td>78.8</td>
<td>171</td>
<td>78.7</td>
<td>549.fotonik3d_r</td>
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<td></td>
<td></td>
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<td></td>
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</table>

SPECratre®2017_fp_base = 44.0
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Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

Submit Notes

The taskset mechanism was used to bind copies to processors. The config file option 'submit' was used to generate taskset commands to bind each copy to a specific processor. For details, please see the config file.

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:
LD_LIBRARY_PATH = "/home/cpu2017/lib/intel64:/home/cpu2017/je5.0.1-64"
MALLOCONF_CONF = "retain:true"
Hewlett Packard Enterprise
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ProLiant DL20 Gen10 Plus
(3.70 GHz, Intel Xeon E-2374G)

SPEC CPU®2017 Floating Point Rate Result
Copyright 2017-2022 Standard Performance Evaluation Corporation

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

General Notes

Binaries compiled on a system with 1x Intel Core i9-7980XE CPU + 64GB RAM memory using Red Hat Enterprise Linux 8.1
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.

Platform Notes

BIOS Configuration:
Workload Profile set to General Throughput Compute
Thermal Configuration set to Maximum Cooling
Enhanced Processor Performance set to Enabled
Last Level Cache (LLC) prefetch set to Enabled
Workload Profile set to Custom
HW Prefetcher set to Disabled

Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16a6ac64d
running on localhost Sat Mar 19 13:44:21 2022

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-2374G CPU @ 3.70GHz
 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 from util-linux 2.36.2:
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

(Continued on next page)
Platform Notes (Continued)

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: 167
Model name: Intel(R) Xeon(R) E-2374G CPU @ 3.70GHz
Stepping: 1
CPU MHz: 4268.230
BogoMIPS: 7392.00
Virtualization: VT-x
L1d cache: 192 KiB
L1i cache: 128 KiB
L2 cache: 2 MiB
L3 cache: 8 MiB
NUMA node0 CPU(s): 0-7
Vulnerability Itlb multihit: Not affected
Vulnerability L1tf: Not affected
Vulnerability Mds: Not affected
Vulnerability Meltdown: Not affected
Vulnerability Spec store bypass: Mitigation; Speculative Store Bypass disabled via prctl and seccomp
Vulnerability Spectre v1: Mitigation; usercopy/swapgs barriers and __user pointer sanitization
Vulnerability Spectre v2: Mitigation; Enhanced IBRS, IBPB conditional, RSB filling
Vulnerability Srbds: Not affected
Vulnerability Txs async abort: Not affected
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 tsc_known_freq pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtpr pdcm pcid sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c rdrand lahf_mcm abm 3dnowprefetch cpuid_fault ebp invpcid_single ssbd ibrs ibpb stibp ibrs_extended tpr_shadow vmmi flexpriority ept vpid ept_ad fsgsbase tsc_adjust bmi1 avx2 smep bmi2 erms invpcid mxv avx512f avx512dq rdseed adx smap avx512ifma cflushopt intel_pt avx512cd sha ni avx512bw avx512vl xsaveopt xsaves xsavec xsaveopt xsaves dtherm ida arat pln pts avx512vmbi umip pku ospke avx512_vmbi2 gfn vaes vpclmulqdq avx512_vnni avx512_vbitalg avx512 vpvpcntdq rdpid fsgm md_clear flush_l1d arch_capabilities

From lscpu --cache:

<table>
<thead>
<tr>
<th>NAME</th>
<th>ONE-SIZE</th>
<th>ALL-SIZE</th>
<th>WAYS</th>
<th>TYPE</th>
<th>LEVEL</th>
<th>SETS</th>
<th>PHY-LINE</th>
<th>COHERENCY-SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1d</td>
<td>48K</td>
<td>192K</td>
<td>12</td>
<td>Data</td>
<td>1</td>
<td>64</td>
<td>1</td>
<td>64</td>
</tr>
<tr>
<td>L1i</td>
<td>32K</td>
<td>128K</td>
<td>8</td>
<td>Instruction</td>
<td>1</td>
<td>64</td>
<td>1</td>
<td>64</td>
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**Hardware Availability:** Jan-2022  
**Tested by:** HPE  
**Software Availability:** Jun-2021  

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#### Platform Notes (Continued)

```
L2  512K  2M  8 Unified  2 1024  1  64  
L3  8M  8M  16 Unified  3 8192  1  64
```

/procf/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: 128743 MB  
node 0 free: 128277 MB  
node distances:  
node 0  
0: 10
```

From `/proc/meminfo`  
```
MemTotal: 131833156 kB  
HugePages_Total: 0  
Hugepagesize: 2048 kB
```

From `/etc/*release* /etc/*version*`  
```
os-release:  
NAME="SLES"  
VERSION="15-SP3"  
VERSION_ID="15.3"  
PRETTY_NAME="SUSE Linux Enterprise Server 15 SP3"  
ID="sles"  
ID_LIKE="suse"  
ANSI_COLOR="0;32"  
CPE_NAME="cpe:/o:suse:sles:15:sp3"
```

uname -a:  
```  
Linux localhost 5.3.18-57-default #1 SMP Wed Apr 28 10:54:41 UTC 2021 (ba3c2e9) x86_64  
x86_64 x86_64 GNU/Linux
```

Kernel self-reported vulnerability status:  
```
CVE-2018-12207 (iTLB Multihit): Not affected  
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: usercopy/swapgs barriers and __user pointer
```

(Continued on next page)
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Platform Notes (Continued)

CVE-2017-5715 (Spectre variant 2):
Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling

CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
CVE-2019-11135 (TSX Asynchronous Abort): Not affected

run-level 3 Mar 19 13:43

SPEC is set to: /home/cpu2017
From /sys/devices/virtual/dmi/id
Vendor: HPE
Product: ProLiant DL20 Gen10 Plus
Product Family: ProLiant
Serial: SerNum.ACC

Additional information from dmidecode 3.2 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:
4x Hynix HMAA4GU7AJR8N-XN 32 GB 2 rank 3200, configured at 2933

BIOS:
BIOS Vendor: HPE
BIOS Version: U60
BIOS Date: 01/13/2022
BIOS Revision: 1.54
Firmware Revision: 2.55

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
<table>
<thead>
<tr>
<th>C</th>
<th>519.lbm_r(base, peak) 538.imagick_r(base, peak) 544.nab_r(base, peak)</th>
</tr>
</thead>
</table>

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
Version 2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

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Compiler Version Notes (Continued)

C++                 | 508.namd_r(base, peak) 510.parest_r(base, peak)
-------------------|-----------------------------------------------

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C++, C             | 511.povray_r(peak)
-------------------|-----------------------------------------------

Intel(R) C++ Intel(R) 64 Compiler Classic for applications running on
Intel(R) 64, Version 2021.1 Build 20201112_000000
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
Intel(R) C Intel(R) 64 Compiler Classic for applications running on Intel(R)
64, Version 2021.1 Build 20201112_000000
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

C++, C             | 511.povray_r(base) 526.blender_r(base, peak)
-------------------|-----------------------------------------------

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C++, C             | 511.povray_r(peak)
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C++, C             | 511.povray_r(base) 526.blender_r(base, peak)
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Compiler Version Notes (Continued)

Version 2021.1 Build 20201113
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==============================================================================
C++, C, Fortran | 507.cactuBSSN_r(base, peak)
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==============================================================================
Fortran | 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak)
554.roms_r(base, peak)
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Base Compiler Invocation (Continued)

Fortran benchmarks:
ifort

Benchmarks using both Fortran and C:
ifort icx

Benchmarks using both C and C++:
icpx icx

Benchmarks using Fortran, C, and C++:
icpx icx ifort

Base Portability Flags

503.bwaves_r: -DSPEC_LP64
507.cactuBSSN_r: -DSPEC_LP64
508.namd_r: -DSPEC_LP64
510.parest_r: -DSPEC_LP64
511.povray_r: -DSPEC_LP64
519.ibm_r: -DSPEC_LP64
521.wrf_r: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
526.blender_r: -DSPEC_LP64 -DSPEC_LINUX -funsigned-char
527.cam4_r: -DSPEC_LP64 -DSPEC_CASE_FLAG
538.imagick_r: -DSPEC_LP64
544.nab_r: -DSPEC_LP64
549.fotonik3d_r: -DSPEC_LP64
554.roms_r: -DSPEC_LP64

Base Optimization Flags

C benchmarks:
-w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-mbranches-within-32B-boundaries -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib

C++ benchmarks:
-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math -flto
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-mbranches-within-32B-boundaries -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib

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**Base Optimization Flags (Continued)**

Fortran benchmarks:
- `-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ipo -no-prec-div`
- `-qopt-prefetch -ffinite-math-only`
- `-qopt-multiple-gather-scatter-by-shuffles -qopt-mem-layout-trans=4`
- `-nostandard-realloc-lhs -align array32byte -auto`
- `-mbranches-within-32B-boundaries -ljemalloc`
- `-L/usr/local/jemalloc64-5.0.1/lib`

Benchmarks using both Fortran and C:
- `-w -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math`
- `-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -O3 -ipo`
- `-no-prec-div -qopt-prefetch -ffinite-math-only`
- `-qopt-multiple-gather-scatter-by-shuffles`
- `-mbranches-within-32B-boundaries -nostandard-realloc-lhs`
- `-align array32byte -auto -ljemalloc -L/usr/local/jemalloc64-5.0.1/lib`

Benchmarks using both C and C++:
- `-w -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math`
- `-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4`
- `-mbranches-within-32B-boundaries -ljemalloc`
- `-L/usr/local/jemalloc64-5.0.1/lib`

Benchmarks using Fortran, C, and C++:
- `-w -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math`
- `-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -O3`
- `-no-prec-div -qopt-prefetch -ffinite-math-only`
- `-qopt-multiple-gather-scatter-by-shuffles`
- `-mbranches-within-32B-boundaries -nostandard-realloc-lhs`
- `-align array32byte -auto -ljemalloc -L/usr/local/jemalloc64-5.0.1/lib`

**Peak Compiler Invocation**

C benchmarks:
- `icx`

C++ benchmarks:
- `icpx`

Fortran benchmarks:
- `ifort`

Benchmarks using both Fortran and C:
- `ifort icx`

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

Benchmarks using both C and C++:

- 511.povray_r: icpc icc
- 526.blender_r: icpx icx

Benchmarks using Fortran, C, and C++:
- icpx icx ifort

**Peak Portability Flags**

Same as Base Portability Flags

**Peak Optimization Flags**

C benchmarks:

- 519.lbm_r: basepeak = yes
- 538.imagick_r: basepeak = yes

C++ benchmarks:

- 508.namd_r: basepeak = yes
- 510.parest_r: -w -m64 -W1,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math -flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries -ljemalloc -L/usr/local/jemalloc64-5.0.1/lib

Fortran benchmarks:

- 503.bwaves_r: basepeak = yes
- 549.fotonik3d_r: basepeak = yes
Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL20 Gen10 Plus
(3.70 GHz, Intel Xeon E-2374G)

### SPECrate®2017 fp_base = 44.0

### SPECrate®2017 fp_peak = 45.8

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<th>Test Date: Mar-2022</th>
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<tr>
<td>Tested by: HPE</td>
<td>Software Availability: Jun-2021</td>
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### Peak Optimization Flags (Continued)

554.roms_r: -w -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ipo
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-multiple-gather-scatter-by-shuffles
-qopt-mem-layout-trans=4 -nostandard-realloc-1hs
-align array32byte -auto -mbranches-within-32B-boundaries
-1jemalloc -L/usr/local/jemalloc64-5.0.1/lib

Benchmarks using both Fortran and C:

521.wrf_r: basepeak = yes
527.cam4_r: basepeak = yes

Benchmarks using both C and C++:

511.povray_r: -prof-gen(pass 1) -prof-use(pass 2) -xCORE-AVX512 -O3
-ipo -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-multiple-gather-scatter-by-shuffles
-qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
526.blender_r: basepeak = yes

Benchmarks using Fortran, C, and C++:

507.cactuBSSN_r: basepeak = yes

The flags files that were used to format this result can be browsed at

http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-V1.0-ICX-revE.html

You can also download the XML flags sources by saving the following links:

http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-V1.0-ICX-revE.xml
http://www.spec.org/cpu2017/flags/Intel-ic2021-official-linux64_revA.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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