## SPEC CPU®2017 Floating Point Rate Result

### Hewlett Packard Enterprise

**Test Sponsor:** HPE  
**Hewlett Packard Enterprise**  
**Synergy 480 Gen10 Plus**  
**(2.20 GHz, Intel Xeon Gold 6330N)**  

<table>
<thead>
<tr>
<th>SPECrate®2017_fp_base = 318</th>
<th>SPECrate®2017_fp_peak = 334</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>HPE</strong></td>
<td><strong>Jan-2022</strong></td>
</tr>
<tr>
<td><strong>Test Date:</strong></td>
<td><strong>Hardware Availability:</strong></td>
</tr>
<tr>
<td><strong>Test Sponsor:</strong></td>
<td><strong>Hardware Availability:</strong></td>
</tr>
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### Hardware

<table>
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<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>SPECrate®2017_fp_base (318)</th>
<th>SPECrate®2017_fp_peak (334)</th>
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<tr>
<td>554.roms_r</td>
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### Software

| OS | Red Hat Enterprise Linux 8.3 (Ootpa)  
| Kernel 4.18.0-240.el8.x86_64 |
| 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;  |
| Firmware | No  
| HPE BIOS Version I44 v1.54 11/03/2021 released Nov-2021 |
| 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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(Test Sponsor: HPE)
Synergy 480 Gen10 Plus
(2.20 GHz, Intel Xeon Gold 6330N)

SPECrater®2017_fp_base = 318
SPECrater®2017_fp_peak = 334

Results Table

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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:
LD_LIBRARY_PATH = "/home/cpu2017/lib/intel64:/home/cpu2017/j5.0.1-64"
MALLOC_CONF = "retain:true"
Hewlett Packard Enterprise
(Test Sponsor: HPE)
Synergy 480 Gen10 Plus
(2.20 GHz, Intel Xeon Gold 6330N)

HPE

SPECrate®2017_fp_base = 318
SPECrate®2017_fp_peak = 334

General Notes

Binaries compiled on a system with 1x Intel Core i9-7980XE CPU + 64GB RAM
memory using Red Hat Enterprise Linux 8.1
runcpu command invoked through numactl i.e.:
umactl --interleave=all runcpu <etc>
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.
jemalloc, a general purpose malloc implementation
built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5

Submitted_by: "Bhatnagar, Prateek" <prateek.bhatnagar@hpe.com>
Submitted: Mon Jan 31 01:24:32 EST 2022
Submission: cpu2017-20220131-30796.sub

Platform Notes

BIOS Configuration:
Workload Profile set to General Throughput Compute
Memory Patrol Scrubbing set to Disabled
Advanced Memory Protection set to Advanced ECC
Last Level Cache (LLC) Prefetch set to Enabled
Last Level Cache (LLC) Dead Line Allocation set to Disabled
Enhanced Processor Performance set to Enabled
Thermal Configuration set to Maximum Cooling

From /proc/cpuinfo
model name : Intel(R) Xeon(R) Gold 6330N CPU @ 2.20GHz
  2 "physical id"s (chips)
  112 "processors"
cores, siblings (Caution: counting these is hw and system dependent. The following

(Continued on next page)
Hewlett Packard Enterprise
(Test Sponsor: HPE)
Synergy 480 Gen10 Plus
(2.20 GHz, Intel Xeon Gold 6330N)

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

SPECrate®2017_fp_base = 318
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Platform Notes (Continued)

excerpts from /proc/cpuinfo might not be reliable. Use with caution.)
cpu cores : 28
siblings : 56
physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27
physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27

From lscpu from util-linux 2.32.1:
Architecture:        x86_64
CPU op-mode(s):      32-bit, 64-bit
Byte Order:          Little Endian
CPU(s):              112
On-line CPU(s) list: 0-111
Thread(s) per core:  2
Core(s) per socket:  28
Socket(s):           2
NUMA node(s):        2
Vendor ID:           GenuineIntel
CPU family:          6
Model:               106
Model name:          Intel(R) Xeon(R) Gold 6330N CPU @ 2.20GHz
Stepping:            6
CPU MHz:             2416.095
CPU max MHz:         3400.000
CPU min MHz:         800.000
BogoMIPS:            4400.00
Virtualization:      VT-x
L1d cache:           48K
L1i cache:           32K
L2 cache:            1280K
L3 cache:            43008K
NUMA node0 CPU(s):   0-27,56-83
NUMA node1 CPU(s):   28-55,84-111
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 rdtps
  c6 constant_tsc art arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid
  aperfmpref pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16
  xtrig pdcm pcid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave
  avx f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault epb cat_l3 invpcid_single ssbd
  mba ibrs ibpb ibrs_enhanced tpr_shadow vnmi flexpriority ept vpid ept_ad
  fscbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid cqrd_single ssbd
  mba ibrs ibpb ibrs_enhanced tpr_shadow vnmi flexpriority ept vpid ept_ad
  fsz gcbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid cqrd_single ssbd
  mba ibrs ibpb ibrs_enhanced tpr_shadow vnmi flexpriority ept vpid ept_ad
  fsz gcbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid cqrd_single ssbd
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SPECrate®2017_fp_peak = 334

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

Test Date: Jan-2022
Hardware Availability: Nov-2021
Software Availability: Dec-2020

Platform Notes (Continued)

```
arch_capabilities

/proc/cpuinfo cache data
  cache size : 43008 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 16 17 18 19 20 21 22 23 24 25 26 27
          56  57  58  59  60  61  62  63  64  65  66  67  68  69  70  71  72  73  74  75  76  77  78  79  80  81  82  83
  node 0 size: 960120 MB
  node 0 free: 1030727 MB
  node 1 cpus: 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 110 111
  node 1 size: 964376 MB
  node 1 free: 1031470 MB
  node distances:
    node 0 1
      0:  10  20
      1:  20  10

From /proc/meminfo
  MemTotal:       2113477956 kB
  HugePages_Total:       0
  Hugepagesize:       2048 kB

/sbin/tuned-adm active
  Current active profile: throughput-performance

/sys/devices/system/cpu/cpu*/cpufreq/scaling_governor has
  performance

From /etc/*release* /etc/*version*
  os-release:
    NAME="Red Hat Enterprise Linux"
    VERSION="8.3 (Ootpa)"
    ID="rhel"
    ID_LIKE="fedora"
    VERSION_ID="8.3"
    PLATFORM_ID="platform:el8"
    PRETTY_NAME="Red Hat Enterprise Linux 8.3 (Ootpa)"
    ANSI_COLOR="0;31"
  redhat-release: Red Hat Enterprise Linux release 8.3 (Ootpa)
  system-release: Red Hat Enterprise Linux release 8.3 (Ootpa)
  system-release-cpe: cpe:/o:redhat:enterprise_linux:8.3:ga
```

(Continued on next page)
Platform Notes (Continued)

uname -a:
    Linux localhost.localdomain 4.18.0-240.el8.x86_64 #1 SMP Wed Sep 23 05:13:10 EDT 2020
    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 sanitization
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 Jan 30 05:28

SPEC is set to: /home/cpu2017
    Filesystem  Type Size  Used Avail Use% Mounted on
    /dev/mapper/rhel-home xfs  670G  112G  558G  17% /home

From /sys/devices/virtual/dmi/id
    Vendor: HPE
    Product: Synergy 480 Gen10 Plus
    Product Family: Synergy
    Serial: CN70330Q5F

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:
    32x Micron 36ASF8G72PZ-3G2B2 64 GB 2 rank 3200, configured at 2666

BIOS:
    BIOS Vendor: HPE
    BIOS Version: I44
    BIOS Date: 11/03/2021
    BIOS Revision: 1.54
    Firmware Revision: 2.50
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CPU2017 License: 3
Test Sponsor: HPE
Tested by: HPE

Platform Notes (Continued)

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
C        | 519.lbm_r(base, peak) 538.imagick_r(base, peak)
         | 544.nab_r(base, peak)
==============================================================================
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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C++      | 508.namd_r(base, peak) 510.parest_r(base, peak)
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C++, C    | 511.povray_r(peak)
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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)
==============================================================================

(Continued on next page)
COMPILER VERSION NOTES (CONTINUED)

Intel(R) C++ Intel(R) 64 Compiler Classic for applications running on Intel(R) 64, Version 2021.1 Build 20201112_000000
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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

Test Date: Jan-2022
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Fortran, C | 521.wrf_r(peak)

Intel (R) Fortran Intel (R) 64 Compiler Classic for applications running on Intel (R) 64, Version 2021.1 Build 20201112_000000
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Intel (R) C Intel (R) 64 Compiler Classic for applications running on Intel (R) 64, Version 2021.1 Build 20201112_000000
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Fortran, C | 521.wrf_r(base) 527.cam4_r(base, peak)

Intel (R) Fortran Intel (R) 64 Compiler Classic for applications running on Intel (R) 64, Version 2021.1 Build 20201112_000000
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Intel (R) oneAPI DPC++/C++ Compiler for applications running on Intel (R) 64, Version 2021.1 Build 20201113
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Base Compiler Invocation

C benchmarks:
icx

C++ benchmarks:
icpx

(Continued on next page)
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 -gopt-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 -gopt-mem-layout-trans=4
-mbranches-within-32B-boundaries -ljemalloc
Hewlett Packard Enterprise
(Test Sponsor: HPE)
Synergy 480 Gen10 Plus
(2.20 GHz, Intel Xeon Gold 6330N)

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

SPECrate®2017_fp_base = 318
SPECrate®2017_fp_peak = 334

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

Base Optimization Flags (Continued)

C++ benchmarks (continued):
-\L/usr/local/jemalloc64-5.0.1/lib

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

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

Benchmarks using both Fortran and C:

521.wrf_r: ifort icc
527.cam4_r: ifort icx

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
544.nab_r: -w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX512 -flto
-Ofast -qopt-mem-layout-trans=4
-fimf-accuracy-bits=14:sqrt
-mbranches-within-32B-boundaries -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib

C++ benchmarks:

508.namd_r: basepeak = yes
510.parest_r: -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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Hewlett Packard Enterprise  
Synergy 480 Gen10 Plus  
(2.20 GHz, Intel Xeon Gold 6330N)  

SPEC CPU®2017 Floating Point Rate Result  
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SPECrate®2017_fp_base = 318  
SPECrate®2017_fp_peak = 334  

Peak Optimization Flags (Continued)

Fortran benchmarks:

503.bwaves_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-lhs
-align array32byte -auto -mbranches-within-32B-boundaries
-ljemalloc -L/usr/local/jemalloc64-5.0.1/lib

549.fotonik3d_r: basepeak = yes

554.roms_r: Same as 503.bwaves_r

Benchmarks using both Fortran and C:

521.wrf_r: -prof-gen(pass 1) -prof-use(pass 2) -xCORE-AVX512 -O3
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-multiple-gather-scatter-by-shuffles
-qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries
-nostandard-realloc-lhs -align array32byte -auto
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

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
-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
### SPEC CPU®2017 Floating Point Rate Result

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**Hewlett Packard Enterprise**  
(Test Sponsor: HPE)  
**Synergy 480 Gen10 Plus**  
(2.20 GHz, Intel Xeon Gold 6330N)  

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Tested with SPEC CPU®2017 v1.1.8 on 2022-01-29 19:01:37-0500.  
Originally published on 2022-02-15.