SPEC CPU®2017 Floating Point Rate Result

Hewlett Packard Enterprise
(Test Sponsor: HPE)
Synergy 480 Gen10
(2.20 GHz, Intel Xeon Gold 5220R)

SPECrate®2017_fp_base = 259
SPECrate®2017_fp_peak = Not Run

Test Date: Jul-2021
Hardware Availability: Feb-2020
Software Availability: Dec-2020

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<th>SPECrate®2017_fp_base</th>
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--- SPECrate®2017_fp_base (259) ---

Hardware

<table>
<thead>
<tr>
<th>CPU Name: Intel Xeon Gold 5220R</th>
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<tbody>
<tr>
<td>Max MHz: 4000</td>
</tr>
<tr>
<td>Nominal: 2200</td>
</tr>
<tr>
<td>Enabled: 48 cores, 2 chips, 2 threads/core</td>
</tr>
<tr>
<td>Orderable: 1, 2 chip(s)</td>
</tr>
<tr>
<td>Cache L1: 32 KB I + 32 KB D on chip per core</td>
</tr>
<tr>
<td>L2: 1 MB I+D on chip per core</td>
</tr>
<tr>
<td>L3: 35.75 MB I+D on chip per chip</td>
</tr>
<tr>
<td>Memory: 384 GB (24 x 16 GB 2Rx8 PC4-2933Y-R, running at 2666)</td>
</tr>
<tr>
<td>Storage: 1 x 670 GB SAS SSD, RAID 0</td>
</tr>
<tr>
<td>Other: None</td>
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Software

<table>
<thead>
<tr>
<th>OS: Red Hat Enterprise Linux 8.3 (Ootpa)</th>
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</thead>
<tbody>
<tr>
<td>Kernel 4.18.0-240.el8.x86_64</td>
</tr>
<tr>
<td>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;</td>
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<tr>
<td>Parallel: No</td>
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<tr>
<td>Firmware: HPE BIOS Version I42 v2.50 05/24/2021 released May-2021</td>
</tr>
<tr>
<td>File System: xfs</td>
</tr>
<tr>
<td>System State: Run level 3 (multi-user)</td>
</tr>
<tr>
<td>Base Pointers: 64-bit</td>
</tr>
<tr>
<td>Peak Pointers: Not Applicable</td>
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<tr>
<td>Other: jemalloc memory allocator V5.0.1</td>
</tr>
<tr>
<td>Power Management: BIOS set to prefer performance at the cost of additional power usage</td>
</tr>
</tbody>
</table>
SPEC CPU®2017 Floating Point Rate Result

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Hewlett Packard Enterprise
(Test Sponsor: HPE)
Synergy 480 Gen10
(2.20 GHz, Intel Xeon Gold 5220R)

SPECrate®2017_fp_base = 259
SPECrate®2017_fp_peak = Not Run

Results Table

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Submit Notes

The numactl mechanism was used to bind copies to processors. The config file option 'submit' was used to generate numactl 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"
MALLOC_CONF = "retain:true"
Hewlett Packard Enterprise
(Test Sponsor: HPE)
Synergy 480 Gen10
(2.20 GHz, Intel Xeon Gold 5220R)

SPECrate®2017_fp_base = 259
SPECrate®2017_fp_peak = Not Run

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 numaclt1 i.e.:
numactl --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 Jul 19 06:10:26 EDT 2021
Submission: cpu2017-20210719-28200.sub

Platform Notes

BIOS Configuration:
Thermal Configuration set to Maximum Cooling
Memory Patrol Scrubbing set to Disabled
LLC Prefetch set to Enabled
LLC Dead Line Allocation set to Disabled
Enhanced Processor Performance set to Enabled
Workload Profile set to General Throughput Compute
Workload Profile set to Custom
Energy/Performance Bias set to Balanced Performance
Advanced Memory Protection set to Advanced ECC

Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acafc64d
running on localhost.localdomain Wed Jul  7 18:33:00 2021

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) Gold 5220R CPU @ 2.20GHz
  2 "physical id"s (chips)
  96 "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 : 24
Platform Notes (Continued)

siblings : 48
physical 0: cores 0 1 2 3 9 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29
physical 1: cores 0 1 2 3 4 8 9 10 11 12 13 16 17 18 19 20 21 25 26 27 28 29

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): 96
On-line CPU(s) list: 0-95
Thread(s) per core: 2
Core(s) per socket: 24
Socket(s): 2
NUMA node(s): 4
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Gold 5220R CPU @ 2.20GHz
Stepping: 7
CPU MHz: 1067.513
BogoMIPS: 4400.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 36608K
NUMA node0 CPU(s): 0-11,48-59
NUMA node1 CPU(s): 12-23,60-71
NUMA node2 CPU(s): 24-35,72-83
NUMA node3 CPU(s): 36-47,84-95
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 pbs bts rep_good nopl xtopology nonstop_tsc cpuid
aperfmperf pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16
xtpr 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 cdp_l3
invpcid_single intel_pmeasure ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vnmi
flexpriority ext vpid ept_ad fsgsbase ept_tdefault ept_cpsee bmid hle avx2 smep bmi2 erms
invpcid cqm mpx rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt
avx512cd avx512bw avx512v1 xsaveopt xsavec xgetbv1 xsaveas cqm_llc cqm_occup_llc
cqm_mbb_total cqm_mbb_local dtherm ida arat pni pts pku ospke avx512_vnni md_clear
flush_l1d arch_capabilities

/proc/cpuinfo cache data
cache size : 36608 KB

From numactl --hardware

(Continued on next page)
Hewlett Packard Enterprise
(Test Sponsor: HPE)
Synergy 480 Gen10
(2.20 GHz, Intel Xeon Gold 5220R)

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Platform Notes (Continued)

WARNING: a numactl 'node' might or might not correspond to a physical chip.
available: 4 nodes (0-3)
node 0 cpus: 0 1 2 3 4 5 6 7 8 9 10 11 48 49 50 51 52 53 54 55 56 57 58 59
node 0 size: 91034 MB
node 0 free: 96086 MB
node 1 cpus: 12 13 14 15 16 17 18 19 20 21 22 23 60 61 62 63 64 65 66 67 68 69 70 71
node 1 size: 92232 MB
node 1 free: 96453 MB
node 2 cpus: 24 25 26 27 28 29 30 31 32 33 34 35 72 73 74 75 76 77 78 79 80 81 82 83
node 2 size: 91902 MB
node 2 free: 96364 MB
node 3 cpus: 36 37 38 39 40 41 42 43 44 45 46 47 84 85 86 87 88 89 90 91 92 93 94 95
node 3 size: 92714 MB
node 3 free: 96298 MB
node distances:
node 0 1 2 3
0: 10 21 31 31
1: 21 10 31 31
2: 31 31 10 21
3: 31 31 21 10

From /proc/meminfo
MemTotal: 395885096 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

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

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

(Continued on next page)
Hewlett Packard Enterprise
(Test Sponsor: HPE)
Synergy 480 Gen10
(2.20 GHz, Intel Xeon Gold 5220R)

SPECrate®2017_fp_base = 259
SPECrate®2017_fp_peak = Not Run

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

Test Date: Jul-2021
Hardware Availability: Feb-2020
Software Availability: Dec-2020

Platform Notes (Continued)

Kernel self-reported vulnerability status:

CVE-2018-12207 (iTLB Multihit):
KVM: Mitigation: Split huge pages
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/swaps
bars 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):
Mitigation: TSX disabled

run-level 3 Jul 7 18:31
SPEC is set to: /home/cpu2017

Filesystem Type Size Used Avail Use% Mounted on
/dev/mapper/rhel-home xfs 670G 32G 638G 5% /home

From /sys/devices/virtual/dmi/id
Vendor: HPE
Product: Synergy 480 Gen10
Product Family: Synergy
Serial: MXQ72204FC

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:
24x UNKNOWN NOT AVAILABLE 16 GB 2 rank 2933, configured at 2666

BIOS:
BIOS Vendor: HPE
BIOS Version: I42
BIOS Date: 05/24/2021
BIOS Revision: 2.50
Firmware Revision: 2.10

(End of data from sysinfo program)
### SPEC CPU®2017 Floating Point Rate Result

**Hewlett Packard Enterprise**

*Test Sponsor: HPE*

**Synergy 480 Gen10**

**(2.20 GHz, Intel Xeon Gold 5220R)**

**SPECr视听®2017_fp_base = 259**

**SPECr视听®2017_fp_peak = Not Run**

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<th>CPU2017 License:</th>
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<td>Tested by:</td>
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<td>Test Date:</td>
<td>Jul-2021</td>
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<td>Software Availability:</td>
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**Compiler Version Notes**

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<th>C</th>
<th>519.lbm_r(base) 538.imagick_r(base) 544.nab_r(base)</th>
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<th>C++</th>
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<th>C++, C</th>
<th>511.povray_r(base) 526.blender_r(base)</th>
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<th>C++, C, Fortran</th>
<th>507.cactuBSSN_r(base)</th>
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<th>503.bwaves_r(base) 549.fotonik3d_r(base) 554.roms_r(base)</th>
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(Continued on next page)
Hewlett Packard Enterprise
(Test Sponsor: HPE)
Synergy 480 Gen10
(2.20 GHz, Intel Xeon Gold 5220R)

SPECrater®2017_fp_base = 259
SPECrater®2017_fp_peak = Not Run

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

Compiler Version Notes (Continued)

------------------------------------------------------------------------------
Fortran, C | 521.wrf_r(base) 527.cam4_r(base)
------------------------------------------------------------------------------
Intel(R) Fortran 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) 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.
------------------------------------------------------------------------------

Base Compiler Invocation

C benchmarks:
icx

C++ benchmarks:
icpx

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.lbm_r: -DSPEC_LP64
521.wrf_r: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
526.blender_r: -DSPEC_LP64 -DSPEC_LINUX -funsigned-char

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

Hewlett Packard Enterprise
(Test Sponsor: HPE)
Synergy 480 Gen10
(2.20 GHz, Intel Xeon Gold 5220R)

SPECrater®2017_fp_base = 259
SPECrater®2017_fp_peak = Not Run

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

Base Portability Flags (Continued)

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

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
-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

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

Hewlett Packard Enterprise
(Test Sponsor: HPE)
Synergy 480 Gen10
(2.20 GHz, Intel Xeon Gold 5220R)

SPECrate®2017_fp_base = 259
SPECrate®2017_fp_peak = Not Run

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

Test Date: Jul-2021
Hardware Availability: Feb-2020
Software Availability: Dec-2020

Base Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++ (continued):
- 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

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.

Tested with SPEC CPU®2017 v1.1.8 on 2021-07-07 09:03:00-0400.
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