



SPEC CPU® 2017 Floating Point Speed Result

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Hewlett Packard Enterprise

(Test Sponsor: HPE)

Superdome Flex 280

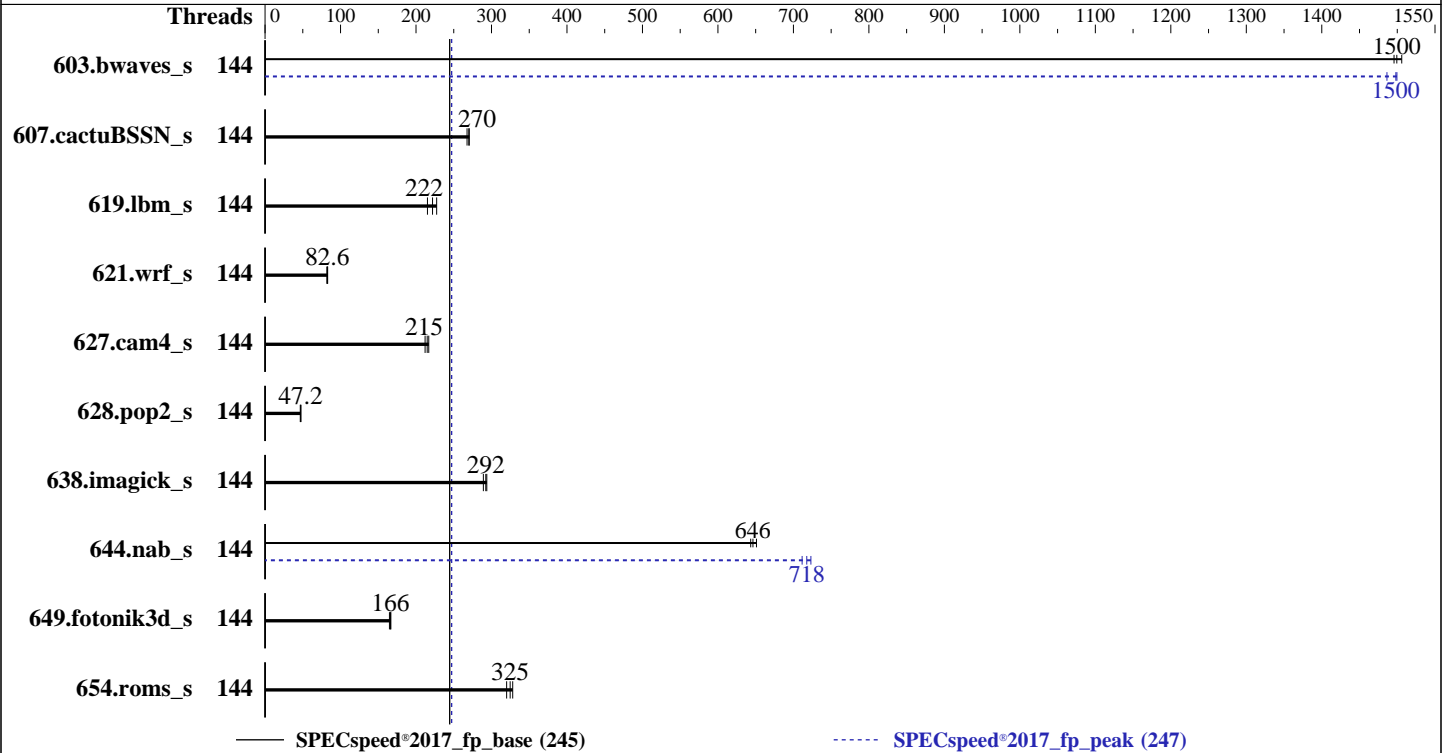
(3.10 GHz, Intel Xeon Platinum 8354H)

SPECspeed®2017_fp_base = 245

SPECspeed®2017_fp_peak = 247

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

Test Date: Nov-2020
Hardware Availability: Nov-2020
Software Availability: Apr-2020



Hardware

CPU Name: Intel Xeon Platinum 8354H
 Max MHz: 4300
 Nominal: 3100
 Enabled: 144 cores, 8 chips
 Orderable: 2, 4, 8 chip(s)
 Cache L1: 32 KB I + 32 KB D on chip per core
 L2: 1 MB I+D on chip per core
 L3: 24.75 MB I+D on chip per chip
 Other: None
 Memory: 6 TB (48 x 128 GB 4Rx4 PC4-3200AA-L)
 Storage: 2 x 480 GB SSD SATA
 Other: None

Software

OS: Red Hat Enterprise Linux release 8.2 (Ootpa)
 Kernel 4.18.0-193.el8.x86_64
 Compiler: C/C++: Version 19.1.1.217 of Intel C/C++ Compiler Build 20200306 for Linux;
 Fortran: Version 19.1.1.217 of Intel Fortran Compiler Build 20200306 for Linux;
 Parallel: Yes
 Firmware: HPE Firmware Bundle Version 1.0.142 released Oct-2020
 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
 HPE Foundation Software 2.4,
 Build 734.0820.200723T0100.a.rhel82hpe-200723T0100
 Power Management: BIOS set to prefer performance at the cost of additional power usage



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Results Table

Benchmark	Base							Peak						
	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
603.bwaves_s	144	39.4	1500	<u>39.3</u>	<u>1500</u>	39.2	1510	144	<u>39.4</u>	<u>1500</u>	39.3	1500	39.7	1490
607.cactuBSSN_s	144	61.6	271	62.3	268	<u>61.8</u>	<u>270</u>	144	61.6	271	62.3	268	<u>61.8</u>	<u>270</u>
619.lbm_s	144	24.3	215	23.0	227	<u>23.6</u>	<u>222</u>	144	24.3	215	23.0	227	<u>23.6</u>	<u>222</u>
621.wrf_s	144	159	82.9	162	81.9	<u>160</u>	<u>82.6</u>	144	159	82.9	162	81.9	<u>160</u>	<u>82.6</u>
627.cam4_s	144	<u>41.3</u>	<u>215</u>	41.8	212	40.9	217	144	<u>41.3</u>	<u>215</u>	41.8	212	40.9	217
628.pop2_s	144	250	47.5	<u>251</u>	<u>47.2</u>	254	46.7	144	250	47.5	<u>251</u>	<u>47.2</u>	254	46.7
638.imagick_s	144	49.9	289	49.1	294	<u>49.3</u>	<u>292</u>	144	49.9	289	49.1	294	<u>49.3</u>	<u>292</u>
644.nab_s	144	<u>27.0</u>	<u>646</u>	27.2	643	26.8	651	144	24.6	712	<u>24.3</u>	<u>718</u>	24.2	723
649.fotonik3d_s	144	55.3	165	<u>54.9</u>	<u>166</u>	54.7	167	144	55.3	165	<u>54.9</u>	<u>166</u>	54.7	167
654.roms_s	144	49.2	320	<u>48.5</u>	<u>325</u>	48.0	328	144	49.2	320	<u>48.5</u>	<u>325</u>	48.0	328

SPECSpeed®2017_fp_base = 245

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

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
Tuned-adm profile was set to Throughput-Performance using "tuned-adm profile throughput-performance"

Environment Variables Notes

Environment variables set by runcpu before the start of the run:
KMP_AFFINITY = "granularity=fine,compact"
LD_LIBRARY_PATH = "/home/cpu2017/lib/intel64:/home/cpu2017/je5.0.1-64"
MALLOC_CONF = "retain:true"
OMP_STACKSIZE = "192M"

General Notes

Binaries compiled on a system with 1x Intel Core i9-7980XE CPU + 64GB RAM
memory using Redhat Enterprise Linux 8.0
NA: The test sponsor attests, as of date of publication, that CVE-2017-5754 (Meltdown)

(Continued on next page)



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General Notes (Continued)

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

sources available from jemalloc.net or <https://github.com/jemalloc/jemalloc/releases>

Platform Notes

BIOS Configuration:

Workload Profile set to HPC

Intel Hyper-Threading set to Disabled

Workload Profile set to Custom

Minimum Processor Idle Power Core C-State set to C6 State

Minimum Processor Idle Power Package C-State set to Package C6 (non-retention) State

LLC Prefetch set to Enabled

Sysinfo program /home/cpu2017/bin/sysinfo

Rev: r6365 of 2019-08-21 295195f888a3d7edble6e46a485a0011

running on ch-622.fchst.rdlabs.hpccorp.net Tue Nov 17 11:44:40 2020

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) Platinum 8354H CPU @ 3.10GHz

8 "physical id"s (chips)

144 "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 : 18

siblings : 18

physical 0: cores 0 1 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27

physical 1: cores 0 1 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27

physical 2: cores 0 1 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27

physical 3: cores 0 1 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27

physical 4: cores 0 1 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27

physical 5: cores 0 1 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27

physical 6: cores 0 1 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27

physical 7: cores 0 1 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27

From lscpu:

Architecture: x86_64

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Platform Notes (Continued)

```

CPU op-mode(s):      32-bit, 64-bit
Byte Order:          Little Endian
CPU(s):              144
On-line CPU(s) list: 0-143
Thread(s) per core:  1
Core(s) per socket:  18
Socket(s):           8
NUMA node(s):        8
Vendor ID:            GenuineIntel
CPU family:           6
Model:                85
Model name:           Intel(R) Xeon(R) Platinum 8354H CPU @ 3.10GHz
Stepping:             11
CPU MHz:              3898.944
CPU max MHz:          4300.0000
CPU min MHz:          1000.0000
BogoMIPS:             6199.87
Virtualization:       VT-x
L1d cache:            32K
L1i cache:            32K
L2 cache:             1024K
L3 cache:             25344K
NUMA node0 CPU(s):   0-17
NUMA node1 CPU(s):   18-35
NUMA node2 CPU(s):   36-53
NUMA node3 CPU(s):   54-71
NUMA node4 CPU(s):   72-89
NUMA node5 CPU(s):   90-107
NUMA node6 CPU(s):   108-125
NUMA node7 CPU(s):   126-143
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 rep_good nopl xtopology nonstop_tsc cpuid
aperfperf 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 fl6c rdrand lahf_lm abm 3dnowprefetch cpuid_fault epb cat_l3 cdp_l3
invpcid_single intel_ppin ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vnmi
flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm
cqm mpx rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd
avx512bw avx512vl xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbm_total
cqm_mbm_local avx512_bf16 dtherm ida arat pln pts pku ospke avx512_vnni md_clear
flush_lld arch_capabilities

```

```
/proc/cpuinfo cache data
cache size : 25344 KB
```

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

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Platform Notes (Continued)

```

physical chip.
available: 8 nodes (0-7)
node 0 cpus: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
node 0 size: 772593 MB
node 0 free: 771820 MB
node 1 cpus: 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35
node 1 size: 774139 MB
node 1 free: 773984 MB
node 2 cpus: 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53
node 2 size: 774139 MB
node 2 free: 766645 MB
node 3 cpus: 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71
node 3 size: 774139 MB
node 3 free: 773954 MB
node 4 cpus: 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89
node 4 size: 774139 MB
node 4 free: 773744 MB
node 5 cpus: 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107
node 5 size: 774139 MB
node 5 free: 773946 MB
node 6 cpus: 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123 124 125
node 6 size: 774139 MB
node 6 free: 773990 MB
node 7 cpus: 126 127 128 129 130 131 132 133 134 135 136 137 138 139 140 141 142 143
node 7 size: 773107 MB
node 7 free: 772947 MB
node distances:
node  0  1  2  3  4  5  6  7
  0:  10  16  16  24  16  16  16  16
  1:  16  10  24  16  16  16  16  16
  2:  16  24  10  16  16  16  16  16
  3:  24  16  16  10  16  16  16  16
  4:  16  16  16  16  10  16  16  24
  5:  16  16  16  16  16  10  24  16
  6:  16  16  16  16  16  24  10  16
  7:  16  16  16  16  24  16  16  10

```

```

From /proc/meminfo
MemTotal:      6339109192 kB
HugePages_Total:      0
Hugepagesize:    2048 kB

```

```

/usr/bin/lsb_release -d
Red Hat Enterprise Linux release 8.2 (Ootpa)

```

```

From /etc/*release* /etc/*version*
hpe-foundation-release: HPE Foundation Software 2.4, Build

```

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Platform Notes (Continued)

734.0820.200723T0100.a.rhel82hpe-200723T0100

os-release:

```
NAME="Red Hat Enterprise Linux"
VERSION="8.2 (Ootpa)"
ID="rhel"
ID_LIKE="fedora"
VERSION_ID="8.2"
PLATFORM_ID="platform:el8"
PRETTY_NAME="Red Hat Enterprise Linux 8.2 (Ootpa)"
ANSI_COLOR="0;31"
```

redhat-release: Red Hat Enterprise Linux release 8.2 (Ootpa)

system-release: Red Hat Enterprise Linux release 8.2 (Ootpa)

system-release-cpe: cpe:/o:redhat:enterprise_linux:8.2:ga

uname -a:

```
Linux ch-622.fchst.rdlabs.hpecorp.net 4.18.0-193.el8.x86_64 #1 SMP Fri Mar 27 14:35:58
UTC 2020 x86_64 x86_64 x86_64 GNU/Linux
```

Kernel self-reported vulnerability status:

```
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/swaps barriers and __user
pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Enhanced IBRS, IBPB: conditional,
RSB filling
tsx_async_abort: Not affected
```

run-level 3 Nov 17 07:50

SPEC is set to: /home/cpu2017

```
Filesystem Type Size Used Avail Use% Mounted on
/dev/mapper/rhel-home xfs 392G 58G 334G 15% /home
```

From /sys/devices/virtual/dmi/id

```
BIOS: HPE Bundle:1.0.142 SFW:008.000.189.000.2010080501 10/08/2020
Vendor: HPE
Product: Superdome Flex 280
Product Family: 1590PID02020001
Serial: 5UF0090539
```

Additional information from dmidecode follows. **WARNING:** Use caution when you interpret this section. The 'dmidecode' program reads system data which is "intended to allow

(Continued on next page)



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Platform Notes (Continued)

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:

48x Hynix HMABAGL7ABR4N-XN 128 GB 4 rank 3200

48x NO DIMM NO DIMM

(End of data from sysinfo program)

Compiler Version Notes

```

=====
C | 619.lbm_s(base, peak) 638.imagick_s(base, peak)
  | 644.nab_s(base, peak)
=====

```

```

-----
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.1.1.217 Build 20200306
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
-----

```

```

=====
C++, C, Fortran | 607.cactuBSSN_s(base, peak)
=====

```

```

-----
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.1.1.217 Build 20200306
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.1.1.217 Build 20200306
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
64, Version 19.1.1.217 Build 20200306
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
-----

```

```

=====
Fortran | 603.bwaves_s(base, peak) 649.fotonik3d_s(base, peak)
        | 654.roms_s(base, peak)
=====

```

```

-----
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
64, Version 19.1.1.217 Build 20200306
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
-----

```

```

=====
Fortran, C | 621.wrf_s(base, peak) 627.cam4_s(base, peak)
           | 628.pop2_s(base, peak)
=====

```

(Continued on next page)



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Compiler Version Notes (Continued)

Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.1.1.217 Build 20200306

Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64, Version 19.1.1.217 Build 20200306

Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

Base Compiler Invocation

C benchmarks:

icc

Fortran benchmarks:

ifort

Benchmarks using both Fortran and C:

ifort icc

Benchmarks using Fortran, C, and C++:

icpc icc ifort

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

Base Optimization Flags

C benchmarks:

-m64 -std=c11 -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch

-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP

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Base Optimization Flags (Continued)

C benchmarks (continued):

`-mbranches-within-32B-boundaries`

Fortran benchmarks:

`-m64 -Wl,-z,muldefs -DSPEC_OPENMP -xCORE-AVX512 -ipo -O3
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4 -qopenmp -nostandard-realloc-lhs
-mbranches-within-32B-boundaries -L/usr/local/jemalloc64-5.0.1/lib
-ljemalloc`

Benchmarks using both Fortran and C:

`-m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp
-DSPEC_OPENMP -mbranches-within-32B-boundaries -nostandard-realloc-lhs
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc`

Benchmarks using Fortran, C, and C++:

`-m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp
-DSPEC_OPENMP -mbranches-within-32B-boundaries -nostandard-realloc-lhs
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc`

Peak Compiler Invocation

C benchmarks:

`icc`

Fortran benchmarks:

`ifort`

Benchmarks using both Fortran and C:

`ifort icc`

Benchmarks using Fortran, C, and C++:

`icpc icc ifort`

Peak Portability Flags

Same as Base Portability Flags



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Peak Optimization Flags

C benchmarks:

619.lbm_s: basepeak = yes

638.imagick_s: basepeak = yes

```
644.nab_s: -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -ipo -O3
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
-mbranches-within-32B-boundaries
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

Fortran benchmarks:

```
603.bwaves_s: -m64 -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2)
-DSPEC_SUPPRESS_OPENMP -DSPEC_OPENMP -ipo -xCORE-AVX512
-O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4 -qopenmp -nostandard-realloc-lhs
-mbranches-within-32B-boundaries
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

649.fotonik3d_s: basepeak = yes

654.roms_s: basepeak = yes

Benchmarks using both Fortran and C:

621.wrf_s: basepeak = yes

627.cam4_s: basepeak = yes

628.pop2_s: basepeak = yes

Benchmarks using Fortran, C, and C++:

607.cactuBSSN_s: 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-V1.3-CLX-revC.html>

http://www.spec.org/cpu2017/flags/Intel-ic19.1ul-official-linux64_revA.html

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

<http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-V1.3-CLX-revC.xml>

http://www.spec.org/cpu2017/flags/Intel-ic19.1ul-official-linux64_revA.xml



SPEC CPU®2017 Floating Point Speed Result

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Hewlett Packard Enterprise

(Test Sponsor: HPE)

Superdome Flex 280

(3.10 GHz, Intel Xeon Platinum 8354H)

SPECspeed®2017_fp_base = 245

SPECspeed®2017_fp_peak = 247

CPU2017 License: 3

Test Sponsor: HPE

Tested by: HPE

Test Date: Nov-2020

Hardware Availability: Nov-2020

Software Availability: Apr-2020

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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 v1.1.0 on 2020-11-17 01:14:40-0500.
Report generated on 2020-12-08 17:13:24 by CPU2017 PDF formatter v6255.
Originally published on 2020-12-08.