



# SPEC CPU®2017 Floating Point Speed Result

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## Hewlett Packard Enterprise

(Test Sponsor: HPE)

### Superdome Flex 280

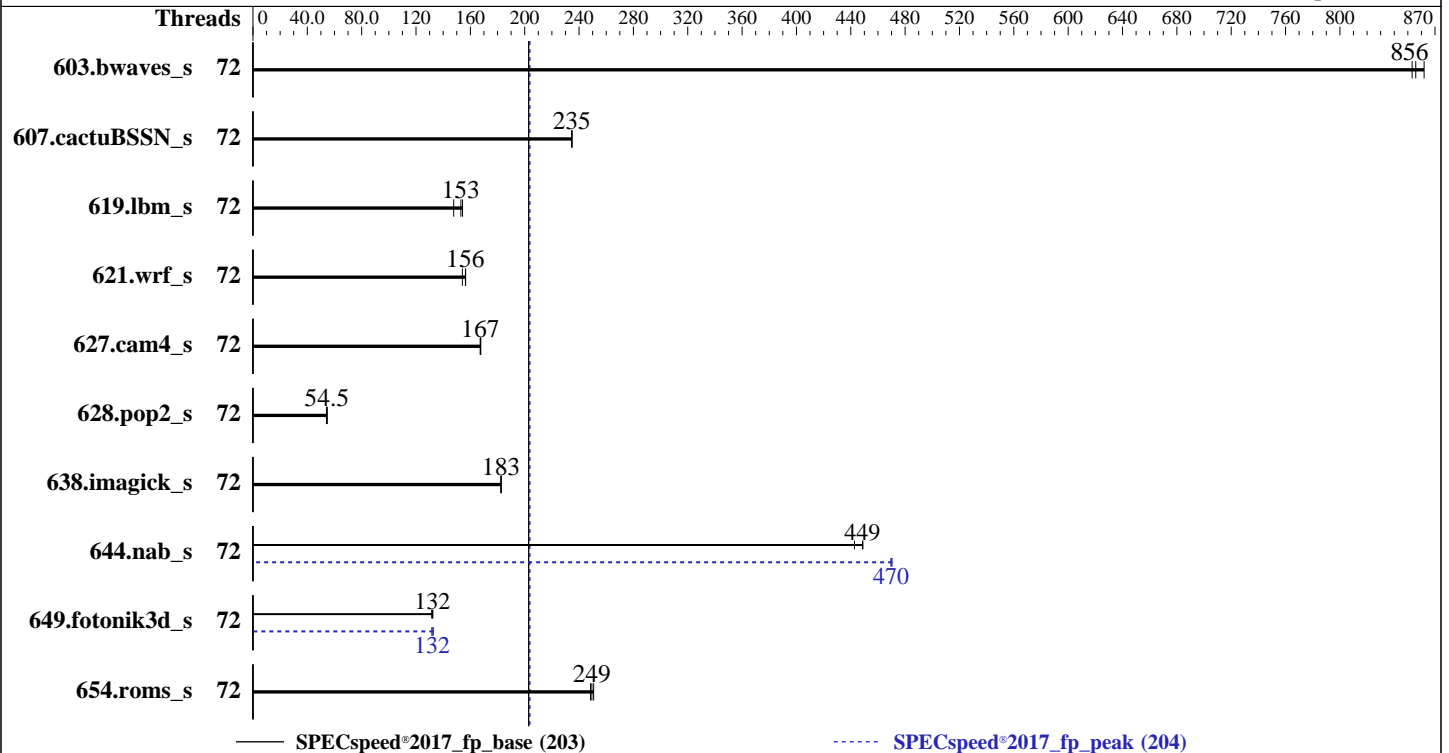
(3.10 GHz, Intel Xeon Platinum 8354H)

SPECspeed®2017\_fp\_base = 203

SPECspeed®2017\_fp\_peak = 204

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: 72 cores, 4 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: 3 TB (24 x 128 GB 4Rx4 PC4-3200AA-L)  
Storage: 1 x 1 TB SATA HDD, 7.2K RPM  
Other: None

### Software

OS: Red Hat Enterprise Linux 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    | 72      | 68.4        | 862        | 69.2        | 853        | <b>68.9</b> | <b>856</b>  | 72      | 68.4        | 862        | 69.2        | 853        | <b>68.9</b> | <b>856</b>  |
| 607.cactuBSSN_s | 72      | 71.1        | 235        | <b>71.0</b> | <b>235</b> | 71.0        | 235         | 72      | 71.1        | 235        | <b>71.0</b> | <b>235</b> | 71.0        | 235         |
| 619.lbm_s       | 72      | 35.5        | 148        | 34.0        | 154        | <b>34.2</b> | <b>153</b>  | 72      | 35.5        | 148        | 34.0        | 154        | <b>34.2</b> | <b>153</b>  |
| 621.wrf_s       | 72      | 84.5        | 157        | <b>84.6</b> | <b>156</b> | 85.8        | 154         | 72      | 84.5        | 157        | <b>84.6</b> | <b>156</b> | 85.8        | 154         |
| 627.cam4_s      | 72      | 53.0        | 167        | <b>52.9</b> | <b>167</b> | 52.9        | 168         | 72      | 53.0        | 167        | <b>52.9</b> | <b>167</b> | 52.9        | 168         |
| 628.pop2_s      | 72      | 220         | 54.1       | 217         | 54.7       | <b>218</b>  | <b>54.5</b> | 72      | 220         | 54.1       | 217         | 54.7       | <b>218</b>  | <b>54.5</b> |
| 638.imagick_s   | 72      | <b>79.0</b> | <b>183</b> | 79.0        | 183        | 79.1        | 182         | 72      | <b>79.0</b> | <b>183</b> | 79.0        | 183        | 79.1        | 182         |
| 644.nab_s       | 72      | 39.5        | 443        | <b>38.9</b> | <b>449</b> | 38.9        | 449         | 72      | 37.2        | 470        | 37.1        | 470        | <b>37.2</b> | <b>470</b>  |
| 649.fotonik3d_s | 72      | 68.8        | 132        | <b>69.0</b> | <b>132</b> | 69.3        | 132         | 72      | <b>69.2</b> | <b>132</b> | 69.2        | 132        | 68.7        | 133         |
| 654.roms_s      | 72      | 62.8        | 251        | <b>63.1</b> | <b>249</b> | 63.4        | 248         | 72      | 62.8        | 251        | <b>63.1</b> | <b>249</b> | 63.4        | 248         |

**SPECSpeed®2017\_fp\_base = 203**

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

HPE Foundation Software (HFS) is a collection of software packages designed to make the HPE Superdome Flex family of servers easier to use for customers. This software is compatible with RHEL, SLES, and Oracle Linux only. It is highly recommended all users install HFS for the Superdome Flex system. More details, and a revision history list, can be found at: [https://support.hpe.com/hpsc/swd/public/detail?swItemId=MTX\\_b48de5f6a8a041f0ae985825a5#tab-history](https://support.hpe.com/hpsc/swd/public/detail?swItemId=MTX_b48de5f6a8a041f0ae985825a5#tab-history)

## 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) is mitigated in the system as tested and documented.

(Continued on next page)



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## General Notes (Continued)

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-620.fchst.rdlabs.hpccorp.net Mon Nov 23 23:26:00 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

4 "physical id"s (chips)

72 "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

From lscpu:

Architecture: x86\_64

CPU op-mode(s): 32-bit, 64-bit

Byte Order: Little Endian

CPU(s): 72

On-line CPU(s) list: 0-71

Thread(s) per core: 1

(Continued on next page)



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## Platform Notes (Continued)

```

Core(s) per socket: 18
Socket(s): 4
NUMA node(s): 4
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Platinum 8354H CPU @ 3.10GHz
Stepping: 11
CPU MHz: 3329.938
CPU max MHz: 4300.0000
CPU min MHz: 1000.0000
BogoMIPS: 6200.04
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
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
aperfmpperf 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_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 physical chip.

```

available: 4 nodes (0-3)
node 0 cpus: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
node 0 size: 772594 MB
node 0 free: 765376 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: 773416 MB
node 2 cpus: 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53

```

(Continued on next page)



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## Platform Notes (Continued)

```

node 2 size: 774139 MB
node 2 free: 773696 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: 773619 MB
node 3 free: 773324 MB
node distances:
node 0 1 2 3
0: 10 16 16 24
1: 16 10 24 16
2: 16 24 10 16
3: 24 16 16 10

```

```

From /proc/meminfo
MemTotal:          3168760120 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
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-620.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

```

(Continued on next page)



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## Platform Notes (Continued)

```

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 23 19:24

SPEC is set to: /home/cpu2017

| Filesystem            | Type | Size | Used | Avail | Use% | Mounted on |
|-----------------------|------|------|------|-------|------|------------|
| /dev/mapper/rhel-home | xfs  | 876G | 186G | 690G  | 22%  | /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: 5UF0130953

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.

Memory:

24x Hynix HMABAGL7ABR4N-XN 128 GB 4 rank 3200

24x 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

(Continued on next page)



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## Compiler Version Notes (Continued)

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)

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

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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



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## 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
-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

(Continued on next page)





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## Peak Compiler Invocation (Continued)

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

## 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: basepeak = yes

649.fotonik3d\_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

654.roms\_s: basepeak = yes

(Continued on next page)



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## Peak Optimization Flags (Continued)

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](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](http://www.spec.org/cpu2017/flags/Intel-ic19.1ul-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](mailto:info@spec.org).

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