



# SPEC CPU®2017 Floating Point Speed Result

Copyright 2017-2023 Standard Performance Evaluation Corporation

## Supermicro

SuperServer SSG-121E-NES24R  
(X13DSF-A , Intel Xeon Platinum 8454H)

**SPECSpeed®2017\_fp\_base = 274**

**SPECSpeed®2017\_fp\_peak = 274**

CPU2017 License: 001176

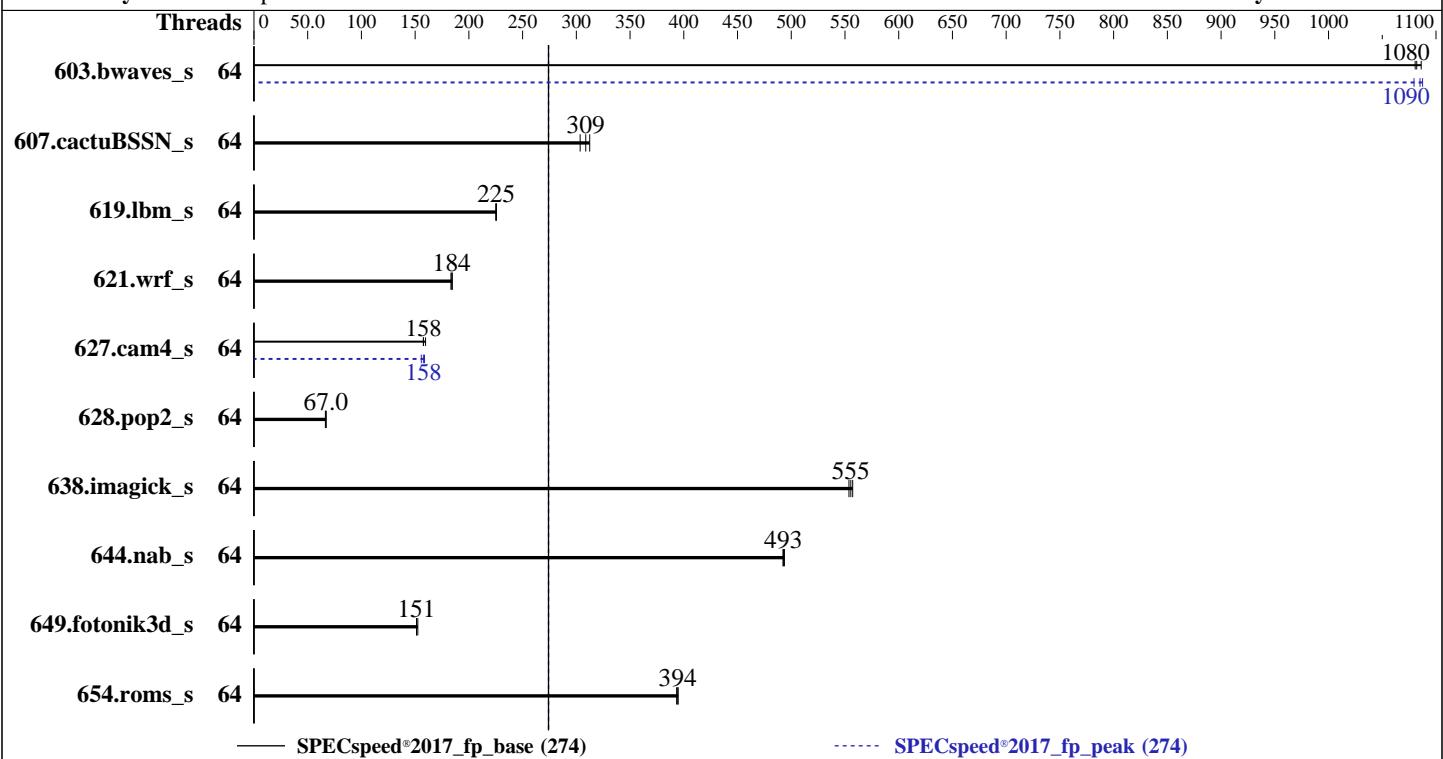
Test Date: Dec-2022

Test Sponsor: Supermicro

Hardware Availability: Jan-2023

Tested by: Supermicro

Software Availability: Jun-2022



— SPECSpeed®2017\_fp\_base (274)

----- SPECSpeed®2017\_fp\_peak (274)

### Hardware

CPU Name: Intel Xeon Platinum 8454H  
Max MHz: 3400  
Nominal: 2100  
Enabled: 64 cores, 2 chips  
Orderable: 2 chips  
Cache L1: 32 KB I + 48 KB D on chip per core  
L2: 2 MB I+D on chip per core  
L3: 82.5 MB I+D on chip per chip  
Other: None  
Memory: 512 GB (16 x 32 GB 2Rx8 PC5-4800B-R)  
Storage: 1 x 480 GB NVMe SSD  
Other: None

### OS:

SUSE Linux Enterprise Server 15 SP4

Kernel 5.14.21-150400.22-default

C/C++: Version 2022.1 of Intel oneAPI DPC++/C++ Compiler for Linux;

Fortran: Version 2022.1 of Intel Fortran Compiler for Linux;

Yes

Firmware: Version 1.0 released Nov-2022

xfs

File System: Run level 3 (multi-user)

System State: 64-bit

Base Pointers: 64-bit

Peak Pointers: 64-bit

Other: jemalloc memory allocator V5.0.1

Power Management: BIOS set to prefer performance at the cost of additional power usage.

### Software



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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    | 64      | 54.3        | 1090       | 54.6        | 1080        | <b>54.5</b> | <b>1080</b> | 64      | 54.6        | 1080       | <b>54.4</b> | <b>1090</b> | 54.2        | 1090       |
| 607.cactuBSSN_s | 64      | <b>54.0</b> | <b>309</b> | 53.4        | 312         | 54.9        | 304         | 64      | <b>54.0</b> | <b>309</b> | 53.4        | 312         | 54.9        | 304        |
| 619.lbm_s       | 64      | <b>23.2</b> | <b>225</b> | 23.2        | 226         | 23.3        | 225         | 64      | <b>23.2</b> | <b>225</b> | 23.2        | 226         | 23.3        | 225        |
| 621.wrf_s       | 64      | 72.2        | 183        | 71.6        | 185         | <b>71.9</b> | <b>184</b>  | 64      | 72.2        | 183        | 71.6        | 185         | <b>71.9</b> | <b>184</b> |
| 627.cam4_s      | 64      | 55.5        | 160        | 56.2        | 158         | <b>56.2</b> | <b>158</b>  | 64      | 56.9        | 156        | 55.8        | 159         | <b>56.2</b> | <b>158</b> |
| 628.pop2_s      | 64      | 177         | 67.1       | <b>177</b>  | <b>67.0</b> | 179         | 66.5        | 64      | 177         | 67.1       | <b>177</b>  | <b>67.0</b> | 179         | 66.5       |
| 638.imagick_s   | 64      | <b>26.0</b> | <b>555</b> | 26.1        | 554         | 25.9        | 557         | 64      | <b>26.0</b> | <b>555</b> | 26.1        | 554         | 25.9        | 557        |
| 644.nab_s       | 64      | 35.5        | 492        | <b>35.5</b> | <b>493</b>  | 35.4        | 494         | 64      | 35.5        | 492        | <b>35.5</b> | <b>493</b>  | 35.4        | 494        |
| 649.fotonik3d_s | 64      | 59.8        | 152        | <b>60.2</b> | <b>151</b>  | 60.2        | 151         | 64      | 59.8        | 152        | <b>60.2</b> | <b>151</b>  | 60.2        | 151        |
| 654.roms_s      | 64      | <b>39.9</b> | <b>394</b> | 40.0        | 393         | 39.9        | 395         | 64      | <b>39.9</b> | <b>394</b> | 40.0        | 393         | 39.9        | 395        |

**SPECSpeed®2017\_fp\_base = 274**

**SPECSpeed®2017\_fp\_peak = 274**

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"

## 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 2x Intel Xeon Platinum 8280M CPU + 384GB RAM memory using Redhat Enterprise Linux 8.0

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
```

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

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## General Notes (Continued)

sources available from [jemalloc.net](http://jemalloc.net) or <https://github.com/jemalloc/jemalloc/releases>

## Platform Notes

BIOS Settings:

Power Technology = Custom

Power Performance Tuning = BIOS Controls EPB

ENERGY\_PERF\_BIAS\_CFG mode = Performance

DCU Streamer Prefetcher = Disable

Hyper-Threading [ALL]= Disable

LLC Dead Line Alloc = Disable

KTI Prefetch = Enable

Stale AtoS = Disable

Patrol Scrub = Disable

Sysinfo program /home/cpu2017/bin/sysinfo  
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acafcc64d  
running on 135-179-217 Mon Dec 5 13:34:18 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) Platinum 8454H
  2 "physical id"s (chips)
  64 "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 : 32
  siblings : 32
  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 28 29 30 31
  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 28 29 30 31
```

From lscpu from util-linux 2.37.2:

|                      |                                   |
|----------------------|-----------------------------------|
| Architecture:        | x86_64                            |
| CPU op-mode(s):      | 32-bit, 64-bit                    |
| Address sizes:       | 46 bits physical, 57 bits virtual |
| Byte Order:          | Little Endian                     |
| CPU(s):              | 64                                |
| On-line CPU(s) list: | 0-63                              |
| Vendor ID:           | GenuineIntel                      |
| Model name:          | Intel(R) Xeon(R) Platinum 8454H   |
| CPU family:          | 6                                 |

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## Platform Notes (Continued)

|                                  |   |
|----------------------------------|---|
| Model:                           | 143   |
| Thread(s) per core:              | 1   |
| Core(s) per socket:              | 32  |
| Socket(s):                       | 2   |
| Stepping:                        | 8   |
| Frequency boost:                 | enabled   |
| CPU max MHz:                     | 2101.0000   |
| CPU min MHz:                     | 800.0000  |
| BogoMIPS:                        | 4200.00   |
| Flags:                           | fpu vme de pse tsc msr pae mce cx8 apic sep mttr 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 aperfmpf perf tsc_known_freq 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_13 cat_12 cdp_13 invpcid_single cdp_12 ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vnmi flexpriority ept vpid ept_ad fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm cqm rdt_a avx512f avx512dq rdseed adx smap avx512ifma clflushopt clwb intel_pt avx512cd sha_ni avx512bw avx512vl xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local split_lock_detect avx_vnni avx512_bf16 wbnoinvd dtherm ida arat pln pts avx512vbmi umip pku ospke waitpkg avx512_vbmi2 gfni vaes vpclmulqdq avx512_vnni avx512_bitalg tme avx512_vpocndq la57 rdpid bus_lock_detect cldemote movdiri movdir64b enqcmd fsrm md_clear serialize tsxldtrk pconfig arch_lbr avx512_fp16 amx_tile flush_l1d arch_capabilities |
| Virtualization:                  | VT-x  |
| L1d cache:                       | 3 MiB (64 instances)  |
| L1i cache:                       | 2 MiB (64 instances)  |
| L2 cache:                        | 128 MiB (64 instances)  |
| L3 cache:                        | 165 MiB (2 instances)   |
| NUMA node(s):                    | 2   |
| NUMA node0 CPU(s):               | 0-31  |
| NUMA node1 CPU(s):               | 32-63   |
| 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/swaps barriers and __user pointer sanitization   |
| Vulnerability Spectre v2:        | Mitigation; Enhanced IBRS, IBPB conditional, RSB filling  |
| Vulnerability Srbds:             | Not affected  |
| Vulnerability Tsx async abort:   | Not affected  |

From lscpu --cache:

(Continued on next page)



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## Platform Notes (Continued)

| NAME | ONE-SIZE | ALL-SIZE | WAYS | TYPE        | LEVEL | SETS  | PHY-LINE | COHERENCY-SIZE |
|------|----------|----------|------|-------------|-------|-------|----------|----------------|
| L1d  | 48K      | 3M       | 12   | Data        | 1     | 64    | 1        | 64             |
| L1i  | 32K      | 2M       | 8    | Instruction | 1     | 64    | 1        | 64             |
| L2   | 2M       | 128M     | 16   | Unified     | 2     | 2048  | 1        | 64             |
| L3   | 82.5M    | 165M     | 15   | Unified     | 3     | 90112 | 1        | 64             |

/proc/cpuinfo cache data  
cache size : 84480 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  
28 29 30 31

node 0 size: 257678 MB

node 0 free: 256985 MB

node 1 cpus: 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56  
57 58 59 60 61 62 63

node 1 size: 257976 MB

node 1 free: 250133 MB

node distances:

node 0 1

0: 10 21

1: 21 10

From /proc/meminfo

MemTotal: 528031196 kB

HugePages\_Total: 0

Hugepagesize: 2048 kB

/sys/devices/system/cpu/cpu\*/cpufreq/scaling\_governor has  
ondemand

From /etc/\*release\* /etc/\*version\*

os-release:

NAME="SLES"

VERSION="15-SP4"

VERSION\_ID="15.4"

PRETTY\_NAME="SUSE Linux Enterprise Server 15 SP4"

ID="sles"

ID\_LIKE="suse"

ANSI\_COLOR="0;32"

CPE\_NAME="cpe:/o:suse:sles:15:sp4"

uname -a:

Linux 135-179-217 5.14.21-150400.22-default #1 SMP PREEMPT\_DYNAMIC Wed May 11 06:57:18  
UTC 2022 (49db222) x86\_64 x86\_64 x86\_64 GNU/Linux

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## Platform Notes (Continued)

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/swaps 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 Dec 5 09:48

SPEC is set to: /home/cpu2017

| Filesystem     | Type | Size | Used | Avail | Use% | Mounted on |
|----------------|------|------|------|-------|------|------------|
| /dev/nvme0n1p2 | xfs  | 445G | 83G  | 362G  | 19%  | /          |

From /sys/devices/virtual/dmi/id

|                 |              |
|-----------------|--------------|
| Vendor:         | Supermicro   |
| Product:        | Super Server |
| Product Family: | Family       |
| Serial:         | 0123456789   |

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:

16x Samsung M321R4GA3BB6-CQKEG 32 GB 2 rank 4800

BIOS:

|                |   |
|----------------|---|
| BIOS Vendor:   | American Megatrends International, LLC. |
| BIOS Version:  | 1.0                                     |
| BIOS Date:     | 11/29/2022                              |
| BIOS Revision: | 5.29                                    |

(End of data from sysinfo program)



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## Compiler Version Notes

=====

C | 619.lbm\_s(base, peak) 638.imagick\_s(base, peak)  
| 644.nab\_s(base, peak)

=====

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,  
Version 2022.1.0 Build 20220316  
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.

=====

C++, C, Fortran | 607.cactuBSSN\_s(base, peak)

=====

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,  
Version 2022.1.0 Build 20220316  
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.

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Version 2022.1.0 Build 20220316  
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.

Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version  
2022.1.0 Build 20220316  
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.

=====

Fortran | 603.bwaves\_s(base, peak) 649.fotonik3d\_s(base, peak)  
| 654.roms\_s(base, peak)

=====

Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version  
2022.1.0 Build 20220316  
Copyright (C) 1985-2022 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 Compiler for applications running on Intel(R) 64, Version  
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## Base Compiler Invocation

C benchmarks:

icx

Fortran benchmarks:

ifx

Benchmarks using both Fortran and C:

ifx icx

Benchmarks using Fortran, C, and C++:

icpx icx ifx

## 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 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math -fno-math-errno  
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -fopenmp  
-DSPEC\_OPENMP -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

Fortran benchmarks:

-m64 -Wl,-z,muldefs -DSPEC\_OPENMP -xCORE-AVX512 -Ofast -ffast-math  
-fno-math-errno -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -fopenmp  
-fno-standard-realloc-lhs -align array32byte -auto  
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

Benchmarks using both Fortran and C:

-m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math -fno-math-errno  
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -fopenmp

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## Base Optimization Flags (Continued)

Benchmarks using both Fortran and C (continued):

```
-DSPEC_OPENMP -nostandard-realloc-lhs -align array32byte -auto
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

Benchmarks using Fortran, C, and C++:

```
-m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math -fsto
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -fopenmp
-DSPEC_OPENMP -nostandard-realloc-lhs -align array32byte -auto
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

## Peak Compiler Invocation

C benchmarks:

icx

Fortran benchmarks:

ifx

Benchmarks using both Fortran and C:

ifx icx

Benchmarks using Fortran, C, and C++:

icpx icx ifx

## 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: basepeak = yes

Fortran benchmarks:

(Continued on next page)



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## Peak Optimization Flags (Continued)

```
603.bwaves_s: -m64 -Wl,-z,muldefs -DSPEC_OPENMP -xCORE-AVX512 -Ofast
-ffast-math -fsto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -fiopenmp -nostandard-realloc-lhs
-align array32byte -auto -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: -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast
-ffast-math -fsto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -fiopenmp -DSPEC_OPENMP
-nostandard-realloc-lhs -align array32byte -auto
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

```
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/Intel-ic2022-official-linux64\\_revA.html](http://www.spec.org/cpu2017/flags/Intel-ic2022-official-linux64_revA.html)  
<http://www.spec.org/cpu2017/flags/Supermicro-Platform-Settings-V1.2-SPR-revC.html>

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

[http://www.spec.org/cpu2017/flags/Intel-ic2022-official-linux64\\_revA.xml](http://www.spec.org/cpu2017/flags/Intel-ic2022-official-linux64_revA.xml)  
<http://www.spec.org/cpu2017/flags/Supermicro-Platform-Settings-V1.2-SPR-revC.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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