



# SPEC CPU®2017 Floating Point Speed Result

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## Lenovo Global Technology

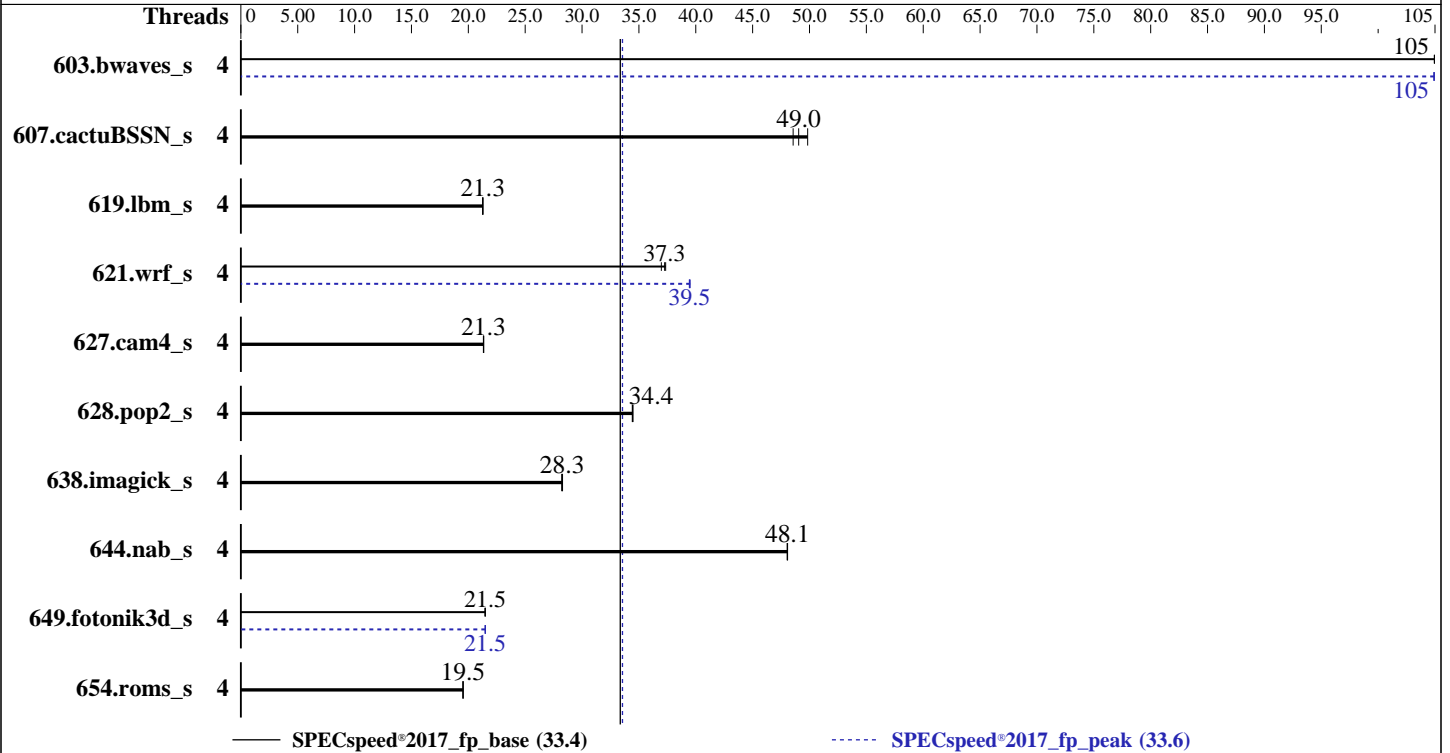
ThinkSystem ST250 V2  
(3.40 GHz, Intel Xeon E-2334)

SPECspeed®2017\_fp\_base = 33.4

SPECspeed®2017\_fp\_peak = 33.6

CPU2017 License: 9017  
Test Sponsor: Lenovo Global Technology  
Tested by: Lenovo Global Technology

Test Date: Jun-2022  
Hardware Availability: Apr-2022  
Software Availability: Jun-2021



### Hardware

CPU Name: Intel Xeon E-2334  
Max MHz: 4800  
Nominal: 3400  
Enabled: 4 cores, 1 chip  
Orderable: 1 chip  
Cache L1: 32 KB I + 48 KB D on chip per core  
L2: 512 KB I+D on chip per core  
L3: 8 MB I+D on chip per chip  
Other: None  
Memory: 64 GB (2 x 32 GB 2Rx8 PC4-3200AA-E)  
Storage: 1 x 960 GB SATA SSD  
Other: None

### Software

OS: SUSE Linux Enterprise Server 15 SP3 (x86\_64)  
Kernel 5.3.18-57-default  
Compiler: Fortran: Version 2021.1 of Intel Fortran Compiler Classic Build 20201112 for Linux;  
C/C++: Version 2021.1 of Intel C/C++ Compiler Classic Build 20201112 for Linux  
Parallel: Yes  
Firmware: Lenovo BIOS Version TQE104H 1.01 released Jun-2022 tested as TQE103G 1.01 Apr-2022  
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  
Power Management: BIOS and OS 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    | 4       | 562               | 105                | <b><u>562</u></b> | <b><u>105</u></b>  | 562     | 105   | 4       | 562               | 105                | 562               | 105                | <b><u>562</u></b> | <b><u>105</u></b> |
| 607.cactuBSSN_s | 4       | 334               | 49.8               | <b><u>340</u></b> | <b><u>49.0</u></b> | 343     | 48.6  | 4       | 334               | 49.8               | <b><u>340</u></b> | <b><u>49.0</u></b> | 343               | 48.6              |
| 619.lbm_s       | 4       | 246               | 21.3               | <b><u>246</u></b> | <b><u>21.3</u></b> | 246     | 21.3  | 4       | 246               | 21.3               | <b><u>246</u></b> | <b><u>21.3</u></b> | 246               | 21.3              |
| 621.wrf_s       | 4       | <b><u>355</u></b> | <b><u>37.3</u></b> | 354               | 37.4               | 358     | 37.0  | 4       | 335               | 39.5               | <b><u>335</u></b> | <b><u>39.5</u></b> | 335               | 39.4              |
| 627.cam4_s      | 4       | 415               | 21.4               | <b><u>415</u></b> | <b><u>21.3</u></b> | 416     | 21.3  | 4       | 415               | 21.4               | <b><u>415</u></b> | <b><u>21.3</u></b> | 416               | 21.3              |
| 628.pop2_s      | 4       | <b><u>345</u></b> | <b><u>34.4</u></b> | 345               | 34.4               | 344     | 34.5  | 4       | <b><u>345</u></b> | <b><u>34.4</u></b> | 345               | 34.4               | 344               | 34.5              |
| 638.imagick_s   | 4       | <b><u>511</u></b> | <b><u>28.3</u></b> | 510               | 28.3               | 511     | 28.2  | 4       | <b><u>511</u></b> | <b><u>28.3</u></b> | 510               | 28.3               | 511               | 28.2              |
| 644.nab_s       | 4       | <b><u>364</u></b> | <b><u>48.1</u></b> | 363               | 48.1               | 364     | 48.0  | 4       | <b><u>364</u></b> | <b><u>48.1</u></b> | 363               | 48.1               | 364               | 48.0              |
| 649.fotonik3d_s | 4       | 424               | 21.5               | <b><u>424</u></b> | <b><u>21.5</u></b> | 425     | 21.5  | 4       | <b><u>424</u></b> | <b><u>21.5</u></b> | 424               | 21.5               | 424               | 21.5              |
| 654.roms_s      | 4       | 806               | 19.5               | <b><u>806</u></b> | <b><u>19.5</u></b> | 805     | 19.5  | 4       | 806               | 19.5               | <b><u>806</u></b> | <b><u>19.5</u></b> | 805               | 19.5              |

SPECSpeed®2017\_fp\_base = **33.4**

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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"

## Environment Variables Notes

Environment variables set by runcpu before the start of the run:

```
KMP_AFFINITY = "granularity=fine,compact"
LD_LIBRARY_PATH =
"/home/cpu2017-1.1.8-ic2021.1-revA-updatel/lib/intel64:/home/cpu2017-1.1
.8-ic2021.1-revA-updatel/je5.0.1-64"
MALLOCONF = "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  
Transparent Huge Pages disabled by default  
echo never > /sys/kernel/mm/transparent\_hugepage/enabled  
echo never > /sys/kernel/mm/transparent\_hugepage/defrag  
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.

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### General Notes (Continued)

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:

Choose Operating Mode set to Maximum Performance and then set it to Custom Mode  
Hyper-Threading set to Disabled

Sysinfo program /home/cpu2017-1.1.8-ic2021.1-revA-updatel/bin/sysinfo

Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acafc64d

running on node1 Fri Jun 3 21:02:09 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) E-2334 CPU @ 3.40GHz

1 "physical id"s (chips)

4 "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 : 4

siblings : 4

physical 0: cores 0 1 2 3

From lscpu from util-linux 2.36.2:

Architecture: x86\_64

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

Byte Order: Little Endian

Address sizes: 39 bits physical, 48 bits virtual

CPU(s): 4

On-line CPU(s) list: 0-3

Thread(s) per core: 1

Core(s) per socket: 4

Socket(s): 1

NUMA node(s): 1

Vendor ID: GenuineIntel

CPU family: 6

Model: 167

Model name: Intel(R) Xeon(R) E-2334 CPU @ 3.40GHz

Stepping: 1

(Continued on next page)



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### Platform Notes (Continued)

```

CPU MHz: 4250.768
BogoMIPS: 6816.00
Virtualization: VT-x
L1d cache: 192 KiB
L1i cache: 128 KiB
L2 cache: 2 MiB
L3 cache: 8 MiB
NUMA node0 CPU(s): 0-3
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/swapgs 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
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 aperfmperf tsc_known_freq pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtpr pdcm pcid sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault epb invpcid_single ssbd ibrs ibpb stibp ibrs_enhanced tpr_shadow vnmi flexpriority ept vpid ept_ad fsgsbase tsc_adjust bmi1 avx2 smep bmi2 erms invpcid mpx avx512f avx512dq rdseed adx smap avx512ifma clflushopt intel_pt avx512cd sha_ni avx512bw avx512vl xsaveopt xsavec xgetbv1 xsaves dtherm ida arat pln pts avx512vbmi umip pku ospke avx512_vbmi2 gfni vaes vpclmulqdq avx512_vnni avx512_bitalg avx512_vpopcntdq rdpid fsrm md_clear flush_lld arch_capabilities

```

From `lscpu --cache:`

| NAME | ONE-SIZE | ALL-SIZE | WAYS | TYPE        | LEVEL | SETS | PHY-LINE | COHERENCY-SIZE |
|------|----------|----------|------|-------------|-------|------|----------|----------------|
| L1d  | 48K      | 192K     | 12   | Data        | 1     | 64   | 1        | 64             |
| L1i  | 32K      | 128K     | 8    | Instruction | 1     | 64   | 1        | 64             |
| L2   | 512K     | 2M       | 8    | Unified     | 2     | 1024 | 1        | 64             |
| L3   | 8M       | 8M       | 16   | Unified     | 3     | 8192 | 1        | 64             |

`/proc/cpuinfo` cache data  
cache size : 8192 KB

From `numactl --hardware`

WARNING: a numactl 'node' might or might not correspond to a physical chip.  
available: 1 nodes (0)  
node 0 cpus: 0 1 2 3

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### Platform Notes (Continued)

```
node 0 size: 64234 MB
node 0 free: 62968 MB
node distances:
node 0
0: 10
```

```
From /proc/meminfo
MemTotal:      65776012 kB
HugePages_Total:      0
Hugepagesize:    2048 kB
```

```
From /etc/*release* /etc/*version*
os-release:
NAME="SLES"
VERSION="15-SP3"
VERSION_ID="15.3"
PRETTY_NAME="SUSE Linux Enterprise Server 15 SP3"
ID="sles"
ID_LIKE="suse"
ANSI_COLOR="0;32"
CPE_NAME="cpe:/o:suse:sles:15:sp3"
```

```
uname -a:
Linux node1 5.3.18-57-default #1 SMP Wed Apr 28 10:54:41 UTC 2021 (ba3c2e9) 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 Jun 3 16:20
```

```
SPEC is set to: /home/cpu2017-1.1.8-ic2021.1-revA-update1
Filesystem      Type  Size  Used Avail Use% Mounted on
```

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### Platform Notes (Continued)

```
/dev/sda2      xfs      894G  118G  777G  14% /
```

```
From /sys/devices/virtual/dmi/id
Vendor:         Lenovo
Product:        ThinkSystem ST250 V2
Product Family: ThinkSystem
Serial:         1234567890
```

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:  
2x Micron Technology 18ASF4G72AZ-3G2B1 32 GB 2 rank 3200

BIOS:  
BIOS Vendor: Lenovo  
BIOS Version: TQE103G-1.01  
BIOS Date: 04/19/2022  
BIOS Revision: 1.1  
Firmware Revision: 1.96

(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 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, Fortran | 607.cactuBSSN_s(base, peak)
=====
```

```
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.
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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### Compiler Version Notes (Continued)

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 Classic for applications running on  
Intel(R) 64, Version 2021.1 Build 20201112\_000000  
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 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.

### 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

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## Base Portability Flags (Continued)

```
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-AVX2 -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-AVX2 -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-AVX2 -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-AVX2 -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

(Continued on next page)





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## Peak Compiler Invocation (Continued)

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: basepeak = yes

Fortran benchmarks:

603.bwaves\_s: -m64 -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2)  
-DSPEC\_SUPPRESS\_OPENMP -DSPEC\_OPENMP -ipo -xCORE-AVX2  
-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: Same as 603.bwaves\_s

654.roms\_s: basepeak = yes

Benchmarks using both Fortran and C:

621.wrf\_s: -m64 -std=c11 -Wl,-z,muldefs -prof-gen(pass 1)  
-prof-use(pass 2) -ipo -xCORE-AVX2 -O3 -no-prec-div  
-qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4  
-DSPEC\_SUPPRESS\_OPENMP -qopenmp -DSPEC\_OPENMP  
-mbranches-within-32B-boundaries -nostandard-realloc-lhs  
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

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## Peak Optimization Flags (Continued)

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/Lenovo-Platform-SPECcpu2017-Flags-V1.2-RocketB-A.html>

[http://www.spec.org/cpu2017/flags/Intel-ic2021-official-linux64\\_revA.html](http://www.spec.org/cpu2017/flags/Intel-ic2021-official-linux64_revA.html)

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

<http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-RocketB-A.xml>

[http://www.spec.org/cpu2017/flags/Intel-ic2021-official-linux64\\_revA.xml](http://www.spec.org/cpu2017/flags/Intel-ic2021-official-linux64_revA.xml)

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Tested with SPEC CPU®2017 v1.1.8 on 2022-06-03 09:02:09-0400.

Report generated on 2022-06-21 17:29:45 by CPU2017 PDF formatter v6442.

Originally published on 2022-06-21.