



# SPEC® CPU2017 Floating Point Speed Result

Copyright 2017-2018 Standard Performance Evaluation Corporation

## Lenovo Global Technology

ThinkSystem SR950  
(2.10 GHz, Intel Xeon Platinum 8160)

SPECspeed2017\_fp\_base = 141

SPECspeed2017\_fp\_peak = 141

CPU2017 License: 9017

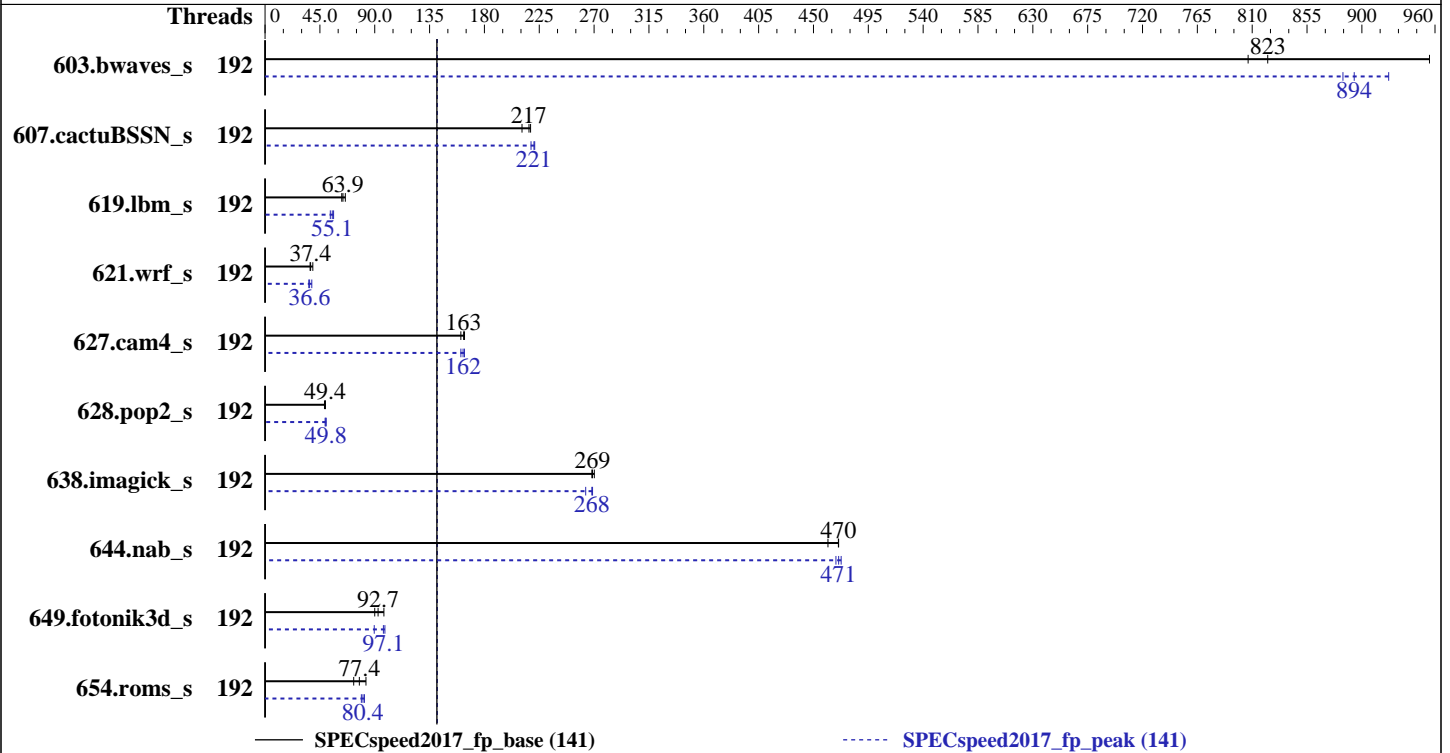
Test Sponsor: Lenovo Global Technology

Tested by: Lenovo Global Technology

Test Date: Dec-2017

Hardware Availability: Sep-2017

Software Availability: Sep-2017



### Hardware

CPU Name: Intel Xeon Platinum 8160  
 Max MHz.: 3700  
 Nominal: 2100  
 Enabled: 192 cores, 8 chips  
 Orderable: 2,4,8 chips  
 Cache L1: 32 KB I + 32 KB D on chip per core  
 L2: 1 MB I+D on chip per core  
 L3: 33 MB I+D on chip per chip  
 Other: None  
 Memory: 3 TB (96 x 32 GB 2Rx4 PC4-2666V-R)  
 Storage: 1 x 800 GB SAS SSD  
 Other: None

### Software

OS: SUSE Linux Enterprise Server 12 SP2 (x86\_64)  
 Kernel 4.4.21-69-default  
 Compiler: C/C++: Version 18.0.0.128 of Intel C/C++ Compiler for Linux;  
 Fortran: Version 18.0.0.128 of Intel Fortran Compiler for Linux  
 Parallel: Yes  
 Firmware: Lenovo BIOS Version PSE105X 1.00 released Aug-2017  
 File System: btrfs  
 System State: Run level 3 (multi-user)  
 Base Pointers: 64-bit  
 Peak Pointers: 64-bit  
 Other: None



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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	192	73.1	807	61.7	955	<b><u>71.7</u></b>	<b><u>823</u></b>	192	66.7	884	64.0	922	<b><u>66.0</u></b>	<b><u>894</u></b>
607.cactuBSSN_s	192	76.5	218	79.1	211	<b><u>77.0</u></b>	<b><u>217</u></b>	192	76.4	218	<b><u>75.5</u></b>	<b><u>221</u></b>	75.3	221
619.lbm_s	192	83.3	62.9	79.5	65.9	<b><u>81.9</u></b>	<b><u>63.9</u></b>	192	<b><u>95.0</u></b>	<b><u>55.1</u></b>	97.8	53.5	93.1	56.2
621.wrf_s	192	337	39.2	<b><u>354</u></b>	<b><u>37.4</u></b>	358	37.0	192	345	38.4	<b><u>362</u></b>	<b><u>36.6</u></b>	369	35.9
627.cam4_s	192	55.2	161	54.2	164	<b><u>54.4</u></b>	<b><u>163</u></b>	192	<b><u>54.5</u></b>	<b><u>162</u></b>	54.2	164	55.2	161
628.pop2_s	192	240	49.5	<b><u>240</u></b>	<b><u>49.4</u></b>	243	48.8	192	<b><u>238</u></b>	<b><u>49.8</u></b>	237	50.2	241	49.3
638.imagick_s	192	53.8	268	53.4	270	<b><u>53.7</u></b>	<b><u>269</u></b>	192	53.7	269	<b><u>53.8</u></b>	<b><u>268</u></b>	54.8	263
644.nab_s	192	37.8	462	<b><u>37.1</u></b>	<b><u>470</u></b>	37.1	471	192	<b><u>37.1</u></b>	<b><u>471</u></b>	37.3	468	37.0	473
649.fotonik3d_s	192	93.5	97.5	<b><u>98.3</u></b>	<b><u>92.7</u></b>	101	90.0	192	92.7	98.3	<b><u>93.9</u></b>	<b><u>97.1</u></b>	102	89.6
654.roms_s	192	190	82.8	216	72.7	<b><u>204</u></b>	<b><u>77.4</u></b>	192	193	81.5	199	79.0	<b><u>196</u></b>	<b><u>80.4</u></b>

SPECSpeed2017\_fp\_base = 141

SPECSpeed2017\_fp\_peak = 141

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"

## General Notes

Environment variables set by runcpu before the start of the run:  
LD\_LIBRARY\_PATH = "/home/cpu2017.1.0.2.ic18.0/lib/ia32:/home/cpu2017.1.0.2.ic18.0/lib/intel64"  
LD\_LIBRARY\_PATH = "\$LD\_LIBRARY\_PATH:/home/cpu2017.1.0.2.ic18.0/je5.0.1-32:/home/cpu2017.1.0.2.ic18.0/je5.0.1-64"  
OMP\_STACKSIZE = "192M"

Binaries compiled on a system with 1x Intel Core i7-4790 CPU + 32GB RAM  
memory using Redhat Enterprise Linux 7.4  
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

No: The test sponsor attests, as of date of publication, that CVE-2017-5754 (Meltdown) is mitigated in the system as tested and documented.  
No: 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.  
No: 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.

This benchmark result is intended to provide perspective on past performance using the historical hardware and/or software described on this result page.

The system as described on this result page was formerly

(Continued on next page)



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### General Notes (Continued)

generally available. At the time of this publication, it may not be shipping, and/or may not be supported, and/or may fail to meet other tests of General Availability described in the SPEC OSG Policy document, <http://www.spec.org/osg/policy.html>

This measured result may not be representative of the result that would be measured were this benchmark run with hardware and software available as of the publication date.

### Platform Notes

BIOS configuration:

Choose Operating Mode set to Maximum Performance  
Hyper-Threading set to Disable  
Hardware Prefetcher set to Disable  
MONITORMWAIT set to Enable  
Execute Disable Bit set to Disable  
Intel Virtualization Technology set to Disable  
Uncore Frequency Scaling set to Disable  
UPI Prefetcher set to Disable  
Stale AtoS set to Enable  
Sysinfo program /home/cpu2017.1.0.2.ic18.0/bin/sysinfo  
Rev: r5797 of 2017-06-14 96c45e4568ad54c135fd618bcc091c0f  
running on linux-boxi Tue Dec 26 23:32:34 2017

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 8160 CPU @ 2.10GHz
 8 "physical id"s (chips)
192 "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
siblings : 24
physical 0: cores 0 1 2 3 4 5 8 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 5 8 9 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29
physical 2: cores 0 1 2 3 4 5 8 9 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29
physical 3: cores 0 1 2 3 4 5 8 9 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29
physical 4: cores 0 1 2 3 4 5 8 9 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29
physical 5: cores 0 1 2 3 4 5 8 9 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29
physical 6: cores 0 1 2 3 4 5 8 9 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29
physical 7: cores 0 1 2 3 4 5 8 9 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29
```

(Continued on next page)



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### Platform Notes (Continued)

```

From lscpu:
Architecture:          x86_64
CPU op-mode(s):        32-bit, 64-bit
Byte Order:            Little Endian
CPU(s):                192
On-line CPU(s) list:  0-191
Thread(s) per core:    1
Core(s) per socket:    24
Socket(s):              8
NUMA node(s):          8
Vendor ID:              GenuineIntel
CPU family:             6
Model:                 85
Model name:             Intel(R) Xeon(R) Platinum 8160 CPU @ 2.10GHz
Stepping:               4
CPU MHz:                2095.061
BogoMIPS:              4190.12
Virtualization:        VT-x
L1d cache:              32K
L1i cache:              32K
L2 cache:               1024K
L3 cache:               33792K
NUMA node0 CPU(s):     0-23
NUMA node1 CPU(s):     24-47
NUMA node2 CPU(s):     48-71
NUMA node3 CPU(s):     72-95
NUMA node4 CPU(s):     96-119
NUMA node5 CPU(s):     120-143
NUMA node6 CPU(s):     144-167
NUMA node7 CPU(s):     168-191
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
aperfmpperf eagerfpu 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 ida arat epb pln pts dtherm intel_pt
tpr_shadow vnmi flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2
erms invpcid rtm cqm mpx avx512f avx512dq rdseed adx smap clflushopt clwb avx512cd
avx512bw avx512vl xsaveopt xsavec xgetbv1 cqm_llc cqm_occup_llc

```

```
/proc/cpuinfo cache data
cache size : 33792 KB
```

```

From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a
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 18 19 20 21 22 23

```

(Continued on next page)



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### Platform Notes (Continued)

```

node 0 size: 386513 MB
node 0 free: 385494 MB
node 1 cpus: 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
node 1 size: 387057 MB
node 1 free: 386125 MB
node 2 cpus: 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71
node 2 size: 387057 MB
node 2 free: 386105 MB
node 3 cpus: 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95
node 3 size: 387057 MB
node 3 free: 385904 MB
node 4 cpus: 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114
115 116 117 118 119
node 4 size: 387057 MB
node 4 free: 386168 MB
node 5 cpus: 120 121 122 123 124 125 126 127 128 129 130 131 132 133 134 135 136 137
138 139 140 141 142 143
node 5 size: 387057 MB
node 5 free: 386110 MB
node 6 cpus: 144 145 146 147 148 149 150 151 152 153 154 155 156 157 158 159 160 161
162 163 164 165 166 167
node 6 size: 387057 MB
node 6 free: 386134 MB
node 7 cpus: 168 169 170 171 172 173 174 175 176 177 178 179 180 181 182 183 184 185
186 187 188 189 190 191
node 7 size: 387052 MB
node 7 free: 386061 MB
node distances:
node  0  1  2  3  4  5  6  7
  0: 10 21 31 21 21 31 31 31
  1: 21 10 21 31 31 21 31 31
  2: 31 21 10 21 31 31 21 31
  3: 21 31 21 10 31 31 31 21
  4: 21 31 31 31 10 21 21 31
  5: 31 21 31 31 21 10 31 21
  6: 31 31 21 31 21 31 10 21
  7: 31 31 31 21 31 21 21 10

```

```

From /proc/meminfo
MemTotal:      3170210052 kB
HugePages_Total:      0
Hugepagesize:    2048 kB

```

```

From /etc/*release* /etc/*version*
SuSE-release:
SUSE Linux Enterprise Server 12 (x86_64)
VERSION = 12

```

(Continued on next page)



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### Platform Notes (Continued)

```

PATCHLEVEL = 2
# This file is deprecated and will be removed in a future service pack or release.
# Please check /etc/os-release for details about this release.
os-release:
NAME="SLES"
VERSION="12-SP2"
VERSION_ID="12.2"
PRETTY_NAME="SUSE Linux Enterprise Server 12 SP2"
ID="sles"
ANSI_COLOR="0;32"
CPE_NAME="cpe:/o:suse:sles:12:sp2"

```

```

uname -a:
Linux linux-boxi 4.4.21-69-default #1 SMP Tue Oct 25 10:58:20 UTC 2016 (9464f67)
x86_64 x86_64 x86_64 GNU/Linux

```

run-level 3 Dec 26 23:23

```

SPEC is set to: /home/cpu2017.1.0.2.ic18.0
Filesystem      Type      Size  Used Avail Use% Mounted on
/dev/sdb2       btrfs    744G   25G  719G   4% /home

```

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.

```

BIOS Lenovo -[PSE105X-1.00]- 08/17/2017
Memory:
96x Samsung M393A4K40BB2-CTD 32 GB 2 rank 2666

```

(End of data from sysinfo program)

### Compiler Version Notes

```

=====
CC 619.lbm_s(base) 638.imagick_s(base, peak) 644.nab_s(base, peak)
-----

```

```

icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.
-----

```

```

=====
CC 619.lbm_s(peak)
-----

```

```

icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.

```

(Continued on next page)



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### Compiler Version Notes (Continued)

=====  
FC 607.cactuBSSN\_s(base)  
-----

icpc (ICC) 18.0.0 20170811  
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.  
icc (ICC) 18.0.0 20170811  
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.  
ifort (IFORT) 18.0.0 20170811  
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.  
-----

=====  
FC 607.cactuBSSN\_s(peak)  
-----

icpc (ICC) 18.0.0 20170811  
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.  
icc (ICC) 18.0.0 20170811  
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.  
ifort (IFORT) 18.0.0 20170811  
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.  
-----

=====  
FC 603.bwaves\_s(base) 649.fotonik3d\_s(base) 654.roms\_s(base)  
-----

ifort (IFORT) 18.0.0 20170811  
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.  
-----

=====  
FC 603.bwaves\_s(peak) 649.fotonik3d\_s(peak) 654.roms\_s(peak)  
-----

ifort (IFORT) 18.0.0 20170811  
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.  
-----

=====  
CC 621.wrf\_s(base) 627.cam4\_s(base, peak) 628.pop2\_s(base)  
-----

ifort (IFORT) 18.0.0 20170811  
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.  
icc (ICC) 18.0.0 20170811  
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.  
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## Compiler Version Notes (Continued)

=====  
CC 621.wrf\_s(peak) 628.pop2\_s(peak)  
=====

ifort (IFORT) 18.0.0 20170811  
Copyright (C) 1985-2017 Intel Corporation. All rights reserved.  
icc (ICC) 18.0.0 20170811  
Copyright (C) 1985-2017 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:  
-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch

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## Base Optimization Flags (Continued)

C benchmarks (continued):

-ffinite-math-only -qopt-mem-layout-trans=3 -qopenmp -DSPEC\_OPENMP

Fortran benchmarks:

-DSPEC\_OPENMP -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch

-ffinite-math-only -qopt-mem-layout-trans=3 -qopenmp

-nostandard-realloc-lhs -align array32byte

Benchmarks using both Fortran and C:

-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch

-ffinite-math-only -qopt-mem-layout-trans=3 -qopenmp -DSPEC\_OPENMP

-nostandard-realloc-lhs -align array32byte

Benchmarks using Fortran, C, and C++:

-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch

-ffinite-math-only -qopt-mem-layout-trans=3 -qopenmp -DSPEC\_OPENMP

-nostandard-realloc-lhs -align array32byte

## Base Other Flags

C benchmarks:

-m64 -std=c11

Fortran benchmarks:

-m64

Benchmarks using both Fortran and C:

-m64 -std=c11

Benchmarks using Fortran, C, and C++:

-m64 -std=c11

## Peak Compiler Invocation

C benchmarks:

icc

Fortran benchmarks:

ifort

Benchmarks using both Fortran and C:

ifort icc

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## Peak Compiler Invocation (Continued)

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: -prof-gen(pass 1) -prof-use(pass 2) -O2 -xCORE-AVX512
-qopt-prefetch -ipo -O3 -ffinite-math-only -no-prec-div
-qopt-mem-layout-trans=3 -DSPEC_SUPPRESS_OPENMP -qopenmp
-DSPEC_OPENMP
```

```
638.imagick_s: -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=3 -qopenmp
-DSPEC_OPENMP
```

644.nab\_s: Same as 638.imagick\_s

Fortran benchmarks:

```
-prof-gen(pass 1) -prof-use(pass 2) -DSPEC_SUPPRESS_OPENMP
-DSPEC_OPENMP -O2 -xCORE-AVX512 -qopt-prefetch -ipo -O3
-ffinite-math-only -no-prec-div -qopt-mem-layout-trans=3 -qopenmp
-nostandard-realloc-lhs -align array32byte
```

Benchmarks using both Fortran and C:

```
621.wrf_s: -prof-gen(pass 1) -prof-use(pass 2) -O2 -xCORE-AVX512
-qopt-prefetch -ipo -O3 -ffinite-math-only -no-prec-div
-qopt-mem-layout-trans=3 -DSPEC_SUPPRESS_OPENMP -qopenmp
-DSPEC_OPENMP -nostandard-realloc-lhs -align array32byte
```

```
627.cam4_s: -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=3 -qopenmp
-DSPEC_OPENMP -nostandard-realloc-lhs -align array32byte
```

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## Peak Optimization Flags (Continued)

628.pop2\_s: Same as 621.wrf\_s

Benchmarks using Fortran, C, and C++:

```
-prof-gen(pass 1) -prof-use(pass 2) -O2 -xCORE-AVX512 -qopt-prefetch
-ipo -O3 -ffinite-math-only -no-prec-div -qopt-mem-layout-trans=3
-DSPEC_SUPPRESS_OPENMP -qopenmp -DSPEC_OPENMP -nostandard-realloc-lhs
-align array32byte
```

## Peak Other Flags

C benchmarks:

```
-m64 -std=c11
```

Fortran benchmarks:

```
-m64
```

Benchmarks using both Fortran and C:

```
-m64 -std=c11
```

Benchmarks using Fortran, C, and C++:

```
-m64 -std=c11
```

The flags files that were used to format this result can be browsed at

<http://www.spec.org/cpu2017/flags/Intel-ic18.0-official-linux64.html>

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

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

<http://www.spec.org/cpu2017/flags/Intel-ic18.0-official-linux64.xml>

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

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