# SPEC CPU®2017 Floating Point Rate Result

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## Nokia

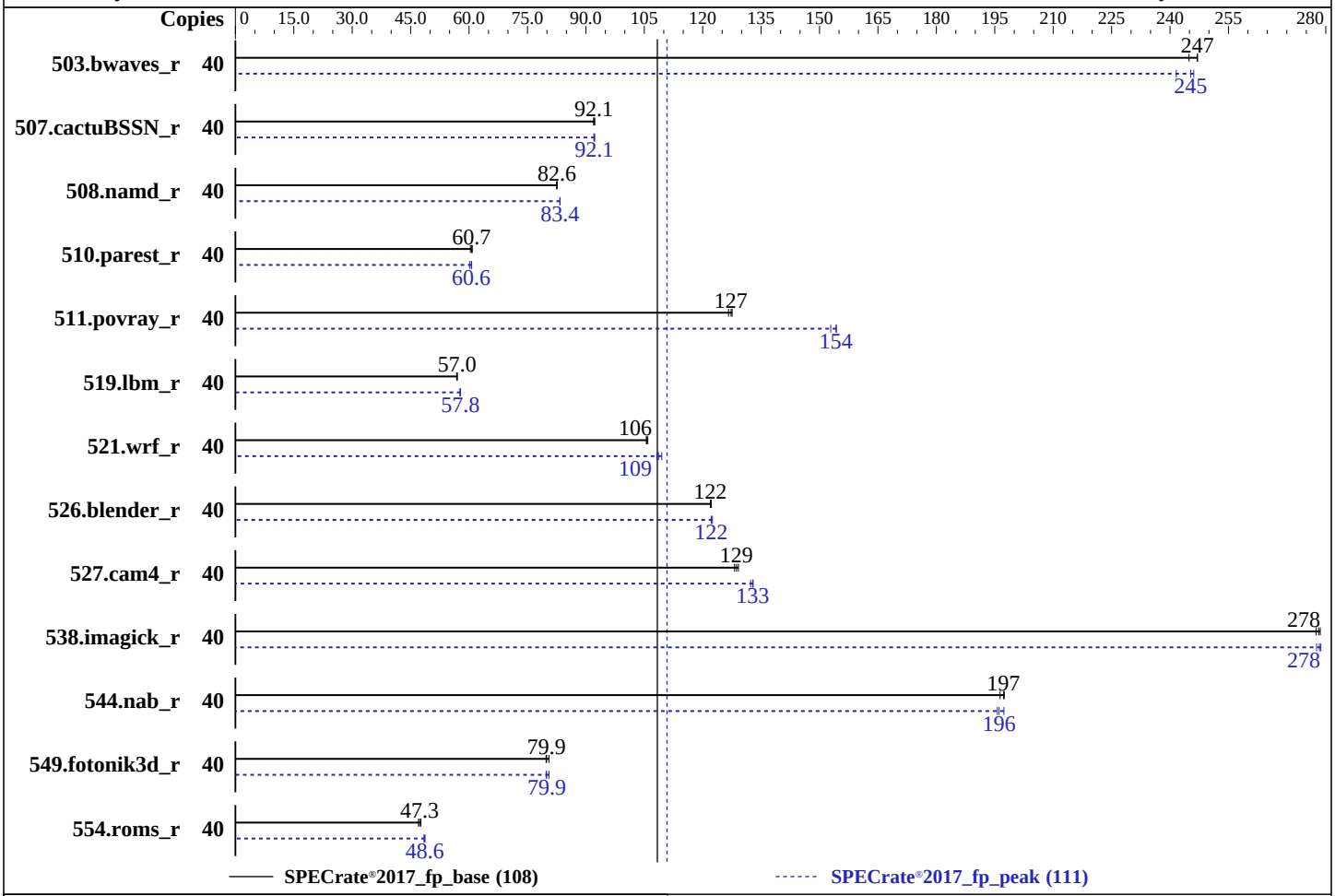
## OE19 (Intel Xeon Gold 6210U, 2.50GHz)

**SPECrate®2017_fp_base = 108**

**SPECrate®2017_fp_peak = 111**

**CPU2017 License:** 6037
**Test Sponsor:** Nokia
**Tested by:** Nokia

**Test Date:** Dec-2019
**Hardware Availability:** Apr-2019
**Software Availability:** Dec-2019




### Hardware

| | |
|---|---|
| CPU Name: | Intel Xeon Gold 6210U |
| Max MHz: | 3900 |
| Nominal: | 2500 |
| Enabled: | 20 cores, 1 chip, 2 threads/core |
| Orderable: | 1 chip |
| Cache L1: | 32 KB I + 32 KB D on chip per core |
| L2: | 1 MB I+D on chip per core |
| L3: | 27.5 MB I+D on chip per chip |
| Other: | None |
| Memory: | 192 GB (6 x 32 GB 2Rx4 PC4-2933Y-R) |
| Storage: | 1 x 480 GB SATA SSD |
| Other: | None |

### Software

| | |
|---|---|
| OS: | SUSE Linux Enterprise Server 12 SP4 4.12.14-94.41-default |
| Compiler: | C/C++: Version 19.1.0.166 of Intel C/C++ Compiler for Linux; Fortran: Version 19.1.0.166 of Intel Fortran Compiler for Linux |
| Parallel: | No |
| Firmware: | Version 3B17 released Dec-2019 |
| File System: | xfs |
| System State: | Run level 5 (multi-user with network and display manager) |
| Base Pointers: | 64-bit |
| Peak Pointers: | 64-bit |
| Other: | None |
| Power Management: | BIOS set to prefer performance at the cost of additional power usage |

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## Results Table

| Benchmark | Base | | | | | | | Peak | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Copies | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio | Copies | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio |
| 503.bwaves_r | 40 | 1624 | 247 | **1624** | **247** | 1638 | 245 | 40 | 1660 | 242 | 1630 | 246 | **1635** | **245** |
| 507.cactuBSSN_r | 40 | 549 | 92.3 | 550 | 92.0 | **550** | **92.1** | 40 | **550** | **92.1** | 550 | 92.1 | 549 | 92.3 |
| 508.namd_r | 40 | 460 | 82.6 | **460** | **82.6** | 461 | 82.5 | 40 | 456 | 83.3 | 456 | 83.4 | **456** | **83.4** |
| 510.parest_r | 40 | 1720 | 60.8 | 1734 | 60.3 | **1725** | **60.7** | 40 | 1740 | 60.1 | 1725 | 60.7 | **1728** | **60.6** |
| 511.povray_r | 40 | 732 | 128 | 738 | 127 | **734** | **127** | 40 | **606** | **154** | 605 | 154 | 611 | 153 |
| 519.lbm_r | 40 | **740** | **57.0** | 740 | 57.0 | 742 | 56.8 | 40 | **729** | **57.8** | 729 | 57.8 | 731 | 57.6 |
| 521.wrf_r | 40 | 849 | 106 | **849** | **106** | 846 | 106 | 40 | 818 | 109 | 828 | 108 | **825** | **109** |
| 526.blender_r | 40 | **499** | **122** | 499 | 122 | 498 | 122 | 40 | 497 | 122 | 499 | 122 | **499** | **122** |
| 527.cam4_r | 40 | **544** | **129** | 546 | 128 | 542 | 129 | 40 | 526 | 133 | **527** | **133** | 529 | 132 |
| 538.imagick_r | 40 | 357 | 279 | **358** | **278** | 358 | 278 | 40 | **357** | **278** | 358 | 278 | 357 | 279 |
| 544.nab_r | 40 | 341 | 197 | **341** | **197** | 343 | 196 | 40 | 341 | 197 | **343** | **196** | 344 | 196 |
| 549.fotonik3d_r | 40 | 1954 | 79.8 | 1936 | 80.5 | **1950** | **79.9** | 40 | **1950** | **79.9** | 1936 | 80.5 | 1954 | 79.8 |
| 554.roms_r | 40 | **1344** | **47.3** | 1334 | 47.6 | 1352 | 47.0 | 40 | 1306 | 48.7 | 1312 | 48.4 | **1307** | **48.6** |

**SPECrate®2017_fp_base = 108**

**SPECrate®2017_fp_peak = 111**

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

## Compiler Notes

SPEC has learned that this result, which used an evaluation compiler, was submitted contrary to the compiler license terms.
Intel has granted a one-time waiver for this result.

## 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"

## Environment Variables Notes

Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH = "/home/cpu2017/lib/intel64"

## General Notes

```
Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH = "/home/cpu2017/lib/ia32:/home/cpu2017/lib/intel64:/home/cpu2017/je5.2.1-32:/home/cpu2017/je5.2.1-64"
OMP_STACKSIZE = "192M"
 Binaries compiled on a system with 1x Intel Core i9-7900X CPU + 32GB RAM
 memory using Redhat Enterprise Linux 7.5
 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.
 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
```

## Platform Notes

```
 BIOS settings:
 ADDDC setting disabled
 Sub NUMA Cluster disabled
 Virtualization Technology disabled
 DCU Streamer Prefetcher disabled
 System Profile set to Custom
 CPU Performance set to Maximum Performance
 C States set to Autonomous
 C1E disabled
 Uncore Frequency set to Dynamic
 Energy Efficiency Policy set to Performance
 Memory Patrol Scrub disabled

 Sysinfo program /home/cpu2017/bin/sysinfo
 Rev: r6365 of 2019-08-21 295195f888a3d7edb1e6e46a485a0011
 running on linux-2yq5 Tue Dec 24 10:24:43 2019

 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) Gold 6210U CPU @ 2.50GHz
       1  "physical id"s (chips)
       40 "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 : 20
```

**(Continued on next page)**

## Platform Notes (Continued)

```
       siblings  : 40
       physical 0: cores 0 1 2 3 4 8 9 10 11 12 16 17 18 19 20 24 25 26 27 28

 From lscpu:
      Architecture:          x86_64
      CPU op-mode(s):        32-bit, 64-bit
      Byte Order:            Little Endian
      CPU(s):                40
      On-line CPU(s) list:   0-39
      Thread(s) per core:    2
      Core(s) per socket:    20
      Socket(s):             1
      NUMA node(s):          1
      Vendor ID:             GenuineIntel
      CPU family:            6
      Model:                 85
      Model name:            Intel(R) Xeon(R) Gold 6210U CPU @ 2.50GHz
      Stepping:              6
      CPU MHz:               2500.000
      CPU max MHz:           3900.0000
      CPU min MHz:           1000.0000
      BogoMIPS:              5000.00
      Virtualization:        VT-x
      L1d cache:             32K
      L1i cache:             32K
      L2 cache:              1024K
      L3 cache:              28160K
      NUMA node0 CPU(s):     0-39
      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 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 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
      dtherm ida arat pln pts pku ospke avx512_vnni flush_l1d arch_capabilities

 /proc/cpuinfo cache data
    cache size : 28160 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 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27
```

**(Continued on next page)**

## Platform Notes (Continued)

```
  28 29 30 31 32 33 34 35 36 37 38 39
  node 0 size: 192481 MB
  node 0 free: 191061 MB
  node distances:
  node   0
    0:  10

From /proc/meminfo
   MemTotal:       197100796 kB
   HugePages_Total:       0
   Hugepagesize:       2048 kB

/usr/bin/lsb_release -d
   SUSE Linux Enterprise Server 12 SP4

From /etc/*release* /etc/*version*
   SuSE-release:
      SUSE Linux Enterprise Server 12 (x86_64)
      VERSION = 12
      PATCHLEVEL = 4
      # 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-SP4"
      VERSION_ID="12.4"
      PRETTY_NAME="SUSE Linux Enterprise Server 12 SP4"
      ID="sles"
      ANSI_COLOR="0;32"
      CPE_NAME="cpe:/o:suse:sles:12:sp4"

uname -a:
   Linux linux-2yq5 4.12.14-94.41-default #1 SMP Wed Oct 31 12:25:04 UTC 2018 (3090901)
   x86_64 x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:

CVE-2018-3620 (L1 Terminal Fault):        Not affected
Microarchitectural Data Sampling:         No status reported
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: __user pointer sanitization
CVE-2017-5715 (Spectre variant 2):        Mitigation: Indirect Branch Restricted
                                          Speculation, IBPB, IBRS_FW

run-level 5 Dec 24 10:20
```

**(Continued on next page)**

## Platform Notes (Continued)

```
 SPEC is set to: /home/cpu2017
    Filesystem              Type  Size  Used Avail Use% Mounted on
    /dev/mapper/vg00-lv_root xfs   436G  185G  252G  43% /

 From /sys/devices/virtual/dmi/id
     BIOS:    American Megatrends Inc. 3B17 10/09/2019
     Vendor:  Nokia Solutions and Networks
     Product: AE-SER1U-B/AF1802.01
     Product Family: AirFrame
     Serial:  QTFCWN8460001

 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:
     2x NO DIMM NO DIMM
     6x Samsung M393A4K40CB2-CVF 32 GB 2 rank 2933

 (End of data from sysinfo program)
```

## Compiler Version Notes

```
==============================================================================
C               | 519.lbm_r(base, peak) 538.imagick_r(base, peak)
                | 544.nab_r(base, peak)
------------------------------------------------------------------------------
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.1.0.166 Build 20191121
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
icc: NOTE: The evaluation period for this product ends on 21-jan-2020 UTC.
------------------------------------------------------------------------------

==============================================================================
C++             | 508.namd_r(base, peak) 510.parest_r(base, peak)
------------------------------------------------------------------------------
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.1.0.166 Build 20191121
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
icpc: NOTE: The evaluation period for this product ends on 21-jan-2020 UTC.
------------------------------------------------------------------------------

==============================================================================
C++, C          | 511.povray_r(base, peak) 526.blender_r(base, peak)
------------------------------------------------------------------------------
```

**(Continued on next page)**

## Compiler Version Notes (Continued)

```
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.1.0.166 Build 20191121
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icpc: NOTE: The evaluation period for this product ends on 21-jan-2020 UTC.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.1.0.166 Build 20191121
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
icc: NOTE: The evaluation period for this product ends on 21-jan-2020 UTC.
------------------------------------------------------------------------------

==============================================================================
C++, C, Fortran | 507.cactuBSSN_r(base, peak)
------------------------------------------------------------------------------
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.1.0.166 Build 20191121
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
icpc: NOTE: The evaluation period for this product ends on 21-jan-2020 UTC.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.1.0.166 Build 20191121
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
icc: NOTE: The evaluation period for this product ends on 21-jan-2020 UTC.
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
  64, Version 19.1.0.166 Build 20191121
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
ifort: NOTE: The evaluation period for this product ends on 21-jan-2020 UTC.
------------------------------------------------------------------------------

==============================================================================
Fortran         | 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak)
                | 554.roms_r(base, peak)
------------------------------------------------------------------------------
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
  64, Version 19.1.0.166 Build 20191121
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
ifort: NOTE: The evaluation period for this product ends on 21-jan-2020 UTC.
------------------------------------------------------------------------------

==============================================================================
Fortran, C      | 521.wrf_r(base, peak) 527.cam4_r(base, peak)
------------------------------------------------------------------------------
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
  64, Version 19.1.0.166 Build 20191121
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
ifort: NOTE: The evaluation period for this product ends on 21-jan-2020 UTC.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.1.0.166 Build 20191121
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
```

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## Compiler Version Notes (Continued)

```
icc: NOTE: The evaluation period for this product ends on 21-jan-2020 UTC.
------------------------------------------------------------------------------
```

## Base Compiler Invocation

C benchmarks:
`icc -m64 -std=c11`

C++ benchmarks:
`icpc -m64`

Fortran benchmarks:
`ifort -m64`

Benchmarks using both Fortran and C:
`ifort -m64 icc -m64 -std=c11`

Benchmarks using both C and C++:
`icpc -m64 icc -m64 -std=c11`

Benchmarks using Fortran, C, and C++:
`icpc -m64 icc -m64 -std=c11 ifort -m64`

## Base Portability Flags

503.bwaves_r: `-DSPEC_LP64`
507.cactuBSSN_r: `-DSPEC_LP64`
508.namd_r: `-DSPEC_LP64`
510.parest_r: `-DSPEC_LP64`
511.povray_r: `-DSPEC_LP64`
519.lbm_r: `-DSPEC_LP64`
521.wrf_r: `-DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian`
526.blender_r: `-DSPEC_LP64 -DSPEC_LINUX -funsigned-char`
527.cam4_r: `-DSPEC_LP64 -DSPEC_CASE_FLAG`
538.imagick_r: `-DSPEC_LP64`
544.nab_r: `-DSPEC_LP64`
549.fotonik3d_r: `-DSPEC_LP64`
554.roms_r: `-DSPEC_LP64`

## Base Optimization Flags

C benchmarks:
```
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4
```

C++ benchmarks:
```
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4
```

Fortran benchmarks:
```
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs
-align array32byte
```

Benchmarks using both Fortran and C:
```
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs
-align array32byte
```

Benchmarks using both C and C++:
```
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4
```

Benchmarks using Fortran, C, and C++:
```
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs
-align array32byte
```

## Peak Compiler Invocation

C benchmarks:
```
icc -m64 -std=c11
```

C++ benchmarks:
```
icpc -m64
```

Fortran benchmarks:
```
ifort -m64
```

Benchmarks using both Fortran and C:
```
ifort -m64 icc -m64 -std=c11
```

Benchmarks using both C and C++:
```
icpc -m64 icc -m64 -std=c11
```

**(Continued on next page)**

## Peak Compiler Invocation (Continued)

Benchmarks using Fortran, C, and C++:
icpc -m64 icc -m64 -std=c11 ifort -m64

## Peak Portability Flags

Same as Base Portability Flags

## Peak Optimization Flags

C benchmarks:

519.lbm_r: -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

538.imagick_r: -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4

544.nab_r: Same as 538.imagick_r

C++ benchmarks:

508.namd_r: -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

510.parest_r: -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4

Fortran benchmarks:

503.bwaves_r: -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs -align array32byte

549.fotonik3d_r: Same as 503.bwaves_r

554.roms_r: -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 -auto -nostandard-realloc-lhs -align array32byte

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# Peak Optimization Flags (Continued)

Benchmarks using both Fortran and C:
`-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 -auto -nostandard-realloc-lhs`
`-align array32byte`

Benchmarks using both C and C++:

511.povray_r: `-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`

526.blender_r: `-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch`
`-ffinite-math-only -qopt-mem-layout-trans=4`

Benchmarks using Fortran, C, and C++:
`-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only`
`-qopt-mem-layout-trans=4 -auto -nostandard-realloc-lhs`
`-align array32byte`

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/Intel-ic19.0u1-official-linux64.html
http://www.spec.org/cpu2017/flags/Nokia-Platform-Flags-OE19.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/Intel-ic19.0u1-official-linux64.xml
http://www.spec.org/cpu2017/flags/Nokia-Platform-Flags-OE19.xml


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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 2019-12-23 21:24:42-0500.
Report generated on 2020-10-29 16:34:52 by CPU2017 PS formatter v6255.
Originally published on 2020-02-12.