# SPEC CPU®2017 Floating Point Rate Result

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## Dell Inc.

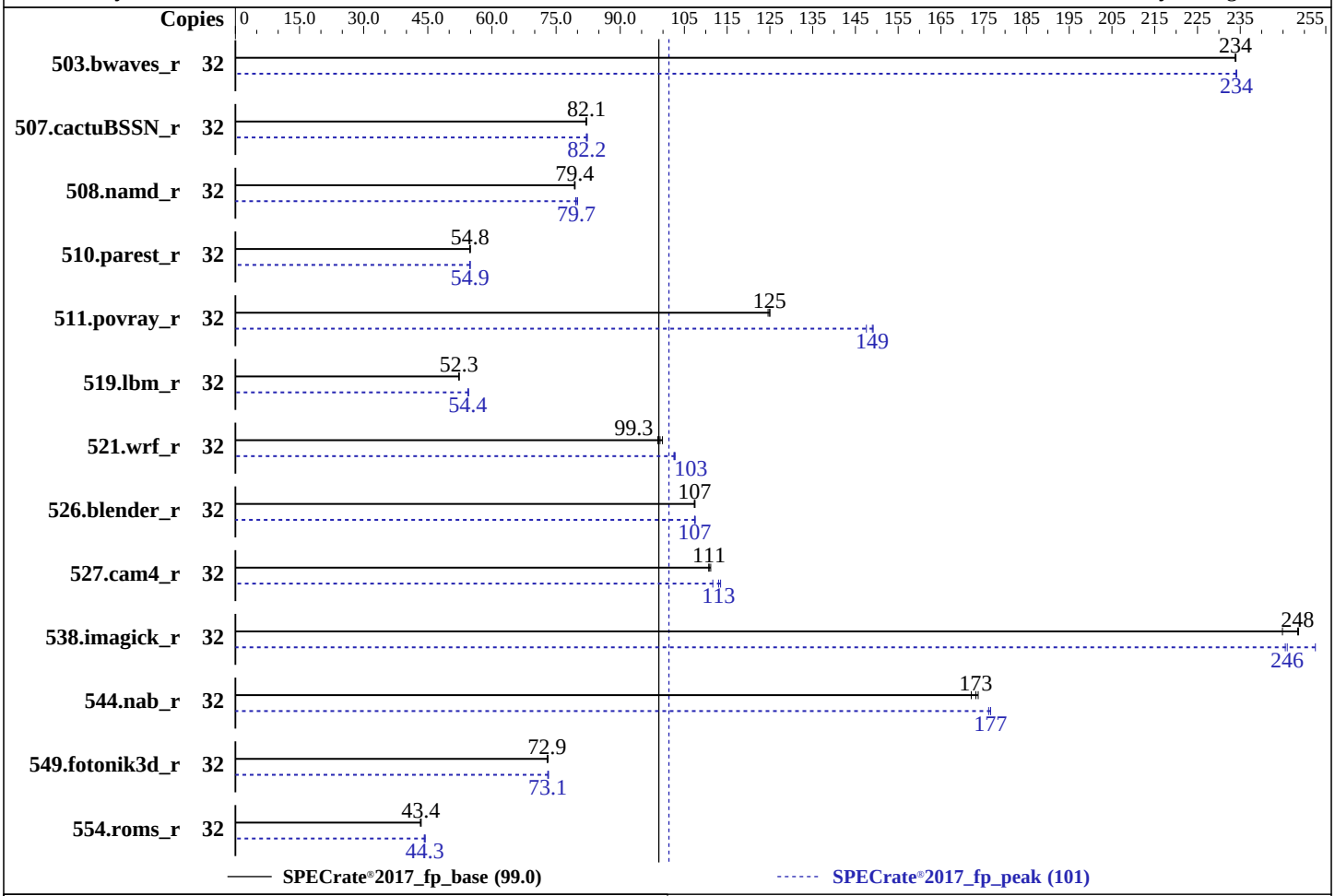
PowerEdge M640 (Intel Xeon Gold 5217, 3.00GHz)

SPECrate®2017_fp_base = 99.0

SPECrate®2017_fp_peak = 101

**CPU2017 License:** 55
**Test Sponsor:** Dell Inc.
**Tested by:** Dell Inc.

**Test Date:** Mar-2019
**Hardware Availability:** Apr-2019
**Software Availability:** Aug-2019




## Hardware

| | |
|---|---|
| CPU Name: | Intel Xeon Gold 5217 |
| Max MHz: | 3700 |
| Nominal: | 3000 |
| Enabled: | 16 cores, 2 chips, 2 threads/core |
| Orderable: | 1,2 chips |
| Cache L1: | 32 KB I + 32 KB D on chip per core |
| L2: | 1 MB I+D on chip per core |
| L3: | 11 MB I+D on chip per chip |
| Other: | None |
| Memory: | 384 GB (12 x 32 GB 2Rx4 PC4-2933Y-R, running at 2666) |
| Storage: | 1 x 480 GB SATA SSD |
| Other: | None |

## Software

| | |
|---|---|
| OS: | Ubuntu 18.04.2 LTS 4.15.0-60-generic |
| Compiler: | C/C++: Version 19.0.4.227 of Intel C/C++ Compiler Build 20190416 for Linux; Fortran: Version 19.0.4.227 of Intel Fortran Compiler Build 20190416 for Linux |
| Parallel: | No |
| Firmware: | Version 2.2.11 released Jun-2019 |
| File System: | ext4 |
| System State: | Run level 3 (multi-user) |
| Base Pointers: | 64-bit |
| Peak Pointers: | 64-bit |
| Other: | None |
| Power Management: | -- |

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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 | 32 | **1372** | **234** | 1373 | 234 | 1371 | 234 | 32 | 1370 | 234 | **1371** | **234** | 1371 | 234 |
| 507.cactuBSSN_r | 32 | 493 | 82.2 | 494 | 82.0 | **493** | **82.1** | 32 | 492 | 82.3 | **493** | **82.2** | 494 | 82.1 |
| 508.namd_r | 32 | 383 | 79.3 | **383** | **79.4** | 383 | 79.4 | 32 | 380 | 80.0 | 382 | 79.6 | **381** | **79.7** |
| 510.parest_r | 32 | 1523 | 55.0 | **1526** | **54.8** | 1528 | 54.8 | 32 | 1525 | 54.9 | 1526 | 54.9 | **1525** | **54.9** |
| 511.povray_r | 32 | 598 | 125 | **598** | **125** | 600 | 125 | 32 | 506 | 148 | **502** | **149** | 501 | 149 |
| 519.lbm_r | 32 | 645 | 52.3 | **645** | **52.3** | 645 | 52.3 | 32 | 620 | 54.4 | 618 | 54.5 | **620** | **54.4** |
| 521.wrf_r | 32 | 726 | 98.8 | **722** | **99.3** | 718 | 99.9 | 32 | **698** | **103** | 697 | 103 | 699 | 103 |
| 526.blender_r | 32 | 453 | 107 | **454** | **107** | 454 | 107 | 32 | 454 | 107 | 453 | 108 | **454** | **107** |
| 527.cam4_r | 32 | 503 | 111 | **505** | **111** | 506 | 111 | 32 | **495** | **113** | 501 | 112 | 493 | 113 |
| 538.imagick_r | 32 | **320** | **248** | 325 | 245 | 320 | 249 | 32 | **324** | **246** | 315 | 253 | 324 | 246 |
| 544.nab_r | 32 | 310 | 174 | **311** | **173** | 313 | 172 | 32 | 305 | 177 | **305** | **177** | 306 | 176 |
| 549.fotonik3d_r | 32 | 1710 | 72.9 | 1706 | 73.1 | **1709** | **72.9** | 32 | **1706** | **73.1** | 1703 | 73.2 | 1706 | 73.1 |
| 554.roms_r | 32 | 1176 | 43.3 | **1172** | **43.4** | 1171 | 43.4 | 32 | **1148** | **44.3** | 1151 | 44.2 | 1145 | 44.4 |

**SPECrate®2017_fp_base = 99.0**

**SPECrate®2017_fp_peak = 101**

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

## 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"
```

## 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/je5.0.1-32:/home/cpu2017/je5.0.1-64"

 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
```

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## General Notes (Continued)

```
Filesystem page cache synced and cleared with:
sync; echo 3>       /proc/sys/vm/drop_caches
runcpu command invoked through numactl i.e.:
numactl --interleave=all runcpu <etc>
```

## Platform Notes

```
BIOS settings:
ADDDC setting disabled
Sub NUMA Cluster enabled
Virtualization Technology disabled
DCU Streamer Prefetcher enabled
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
Logical Processor enabled
CPU Interconnect Bus Link Power Management disabled
PCI ASPM L1 Link Power Management disabled
Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
running on intel-sut Wed Sep 11 03:45:07 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 5217 CPU @ 3.00GHz
      2  "physical id"s (chips)
      32 "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 : 8
      siblings  : 16
      physical 0: cores 0 1 2 3 4 5 6 7
      physical 1: cores 0 1 2 3 4 5 6 7

From lscpu:
     Architecture:        x86_64
     CPU op-mode(s):      32-bit, 64-bit
     Byte Order:          Little Endian
     CPU(s):              32
```

**(Continued on next page)**

## Platform Notes (Continued)

```
      On-line CPU(s) list: 0-31
      Thread(s) per core:  2
      Core(s) per socket:  8
      Socket(s):           2
      NUMA node(s):        2
      Vendor ID:           GenuineIntel
      CPU family:          6
      Model:               85
      Model name:          Intel(R) Xeon(R) Gold 5217 CPU @ 3.00GHz
      Stepping:            6
      CPU MHz:             2289.072
      BogoMIPS:            6000.00
      Virtualization:      VT-x
      L1d cache:           32K
      L1i cache:           32K
      L2 cache:            1024K
      L3 cache:            11264K
      NUMA node0 CPU(s):   0,2,4,6,8,10,12,14,16,18,20,22,24,26,28,30
      NUMA node1 CPU(s):   1,3,5,7,9,11,13,15,17,19,21,23,25,27,29,31
      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 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 dtherm ida arat pln pts pku ospke avx512_vnni md_clear flush_l1d
      arch_capabilities

  /proc/cpuinfo cache data
     cache size : 11264 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 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30
    node 0 size: 192836 MB
    node 0 free: 191820 MB
    node 1 cpus: 1 3 5 7 9 11 13 15 17 19 21 23 25 27 29 31
    node 1 size: 193532 MB
    node 1 free: 192569 MB
    node distances:
    node   0   1
      0:  10  21
```

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## Platform Notes (Continued)

```
     1:  21  10

From /proc/meminfo
   MemTotal:       395641916 kB
   HugePages_Total:       0
   Hugepagesize:       2048 kB

/usr/bin/lsb_release -d
   Ubuntu 18.04.2 LTS

From /etc/*release* /etc/*version*
   debian_version: buster/sid
   os-release:
      NAME="Ubuntu"
      VERSION="18.04.2 LTS (Bionic Beaver)"
      ID=ubuntu
      ID_LIKE=debian
      PRETTY_NAME="Ubuntu 18.04.2 LTS"
      VERSION_ID="18.04"
      HOME_URL="https://www.ubuntu.com/"
      SUPPORT_URL="https://help.ubuntu.com/"

uname -a:
   Linux intel-sut 4.15.0-60-generic #67-Ubuntu SMP Thu Aug 22 16:55:30 UTC 2019 x86_64
   x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:

CVE-2017-5754 (Meltdown):          Not affected
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

run-level 3 Sep 10 19:55

SPEC is set to: /home/cpu2017
   Filesystem     Type  Size  Used Avail Use% Mounted on
   /dev/sda2      ext4  439G   32G  385G   8% /

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 Dell Inc. 2.2.11 06/14/2019
  Memory:
   6x 00AD00B300AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933, configured at 2666
```

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## Platform Notes (Continued)

```
    3x 00AD063200AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933, configured at 2666
    3x 00AD069D00AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933, configured at 2666
    4x Not Specified Not Specified

 (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 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------

==============================================================================
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 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------

==============================================================================
C++, C          | 511.povray_r(base, peak) 526.blender_r(base, peak)
------------------------------------------------------------------------------
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------

==============================================================================
C++, C, Fortran | 507.cactuBSSN_r(base, peak)
------------------------------------------------------------------------------
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
```

**(Continued on next page)**

## Compiler Version Notes (Continued)

```
  64, Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------

==============================================================================
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 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------

==============================================================================
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 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------
```

## 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

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

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## Peak Optimization Flags (Continued)

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`

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-linux64.2019-07-09.html
http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge14G-revE3.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/Intel-ic19.0u1-official-linux64.2019-07-09.xml
http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge14G-revE3.xml

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For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

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