# SPEC CPU®2017 Floating Point Speed Result

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## Dell Inc.

PowerEdge FC640 (Intel Xeon Gold 6212U, 2.40GHz)

$SPECspeed®2017\_fp\_base = 91.1$
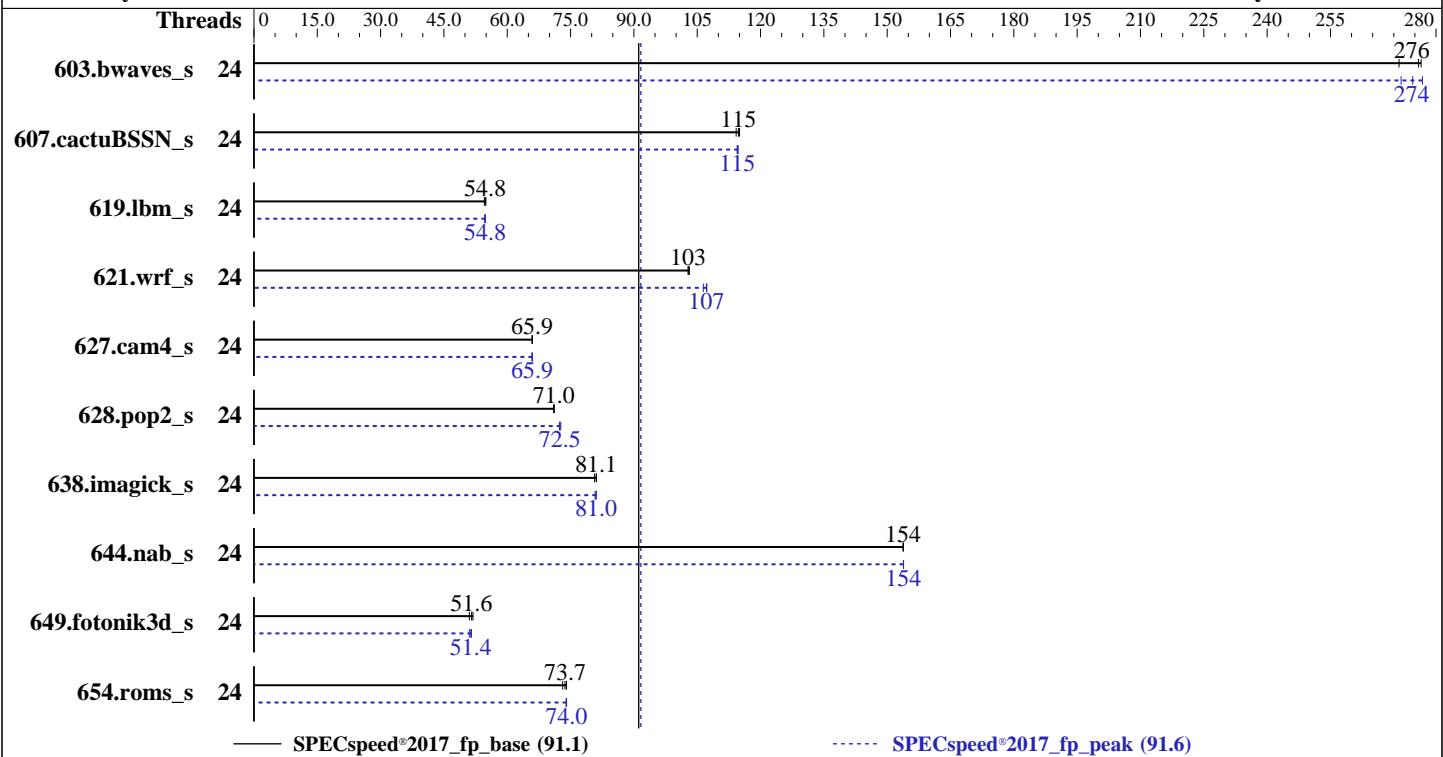
$SPECspeed®2017\_fp\_peak = 91.6$

**CPU2017 License:** 55

**Test Sponsor:** Dell Inc.

**Tested by:** Dell Inc.

**Test Date:** Aug-2019

**Hardware Availability:** Apr-2019

**Software Availability:** Jul-2019

| Benchmark | Threads | base | peak |
|---|---|---|---|
| 603.bwaves_s | 24 | 276 | 274 |
| 607.cactuBSSN_s | 24 | 115 | 115 |
| 619.lbm_s | 24 | 54.8 | 54.8 |
| 621.wrf_s | 24 | 103 | 107 |
| 627.cam4_s | 24 | 65.9 | 65.9 |
| 628.pop2_s | 24 | 71.0 | 72.5 |
| 638.imagick_s | 24 | 81.1 | 81.0 |
| 644.nab_s | 24 | 154 | 154 |
| 649.fotonik3d_s | 24 | 51.6 | 51.4 |
| 654.roms_s | 24 | 73.7 | 74.0 |

—— SPECspeed®2017_fp_base (91.1)        ----- SPECspeed®2017_fp_peak (91.6)

## Hardware

CPU Name: Intel Xeon Gold 6212U
 Max MHz: 3900
 Nominal: 2400
Enabled: 24 cores, 1 chip
Orderable: 1 chips
Cache L1: 32 KB I + 32 KB D on chip per core
 L2: 1 MB I+D on chip per core
 L3: 35.75 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: Ubuntu 18.04.2 LTS
 kernel 4.15.0-55-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: Yes
Firmware: Version 2.2.11 released Jun-2019
File System: ext4
System State: Run level 5 (multi-user)
Base Pointers: 64-bit
Peak Pointers: 64-bit
Other: None
Power Management: --

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$SPECspeed^{®}2017\_fp\_base = 91.1$

$SPECspeed^{®}2017\_fp\_peak = 91.6$

| | |
|---|---|
| **CPU2017 License:** 55 | **Test Date:** Aug-2019 |
| **Test Sponsor:** Dell Inc. | **Hardware Availability:** Apr-2019 |
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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 | 24 | **214** | **276** | 213 | 276 | 218 | 271 | 24 | 217 | 272 | **215** | **274** | 213 | 277 |
| 607.cactuBSSN_s | 24 | 145 | 115 | **145** | **115** | 146 | 114 | 24 | 146 | 114 | 145 | 115 | **146** | **115** |
| 619.lbm_s | 24 | 95.4 | 54.9 | **95.7** | **54.8** | 96.0 | 54.6 | 24 | **95.6** | **54.8** | 95.8 | 54.7 | 95.6 | 54.8 |
| 621.wrf_s | 24 | **129** | **103** | 128 | 103 | 129 | 103 | 24 | **123** | **107** | 124 | 106 | 123 | 107 |
| 627.cam4_s | 24 | **134** | **65.9** | 134 | 66.0 | 135 | 65.9 | 24 | 135 | 65.9 | **134** | **65.9** | 134 | 66.0 |
| 628.pop2_s | 24 | 167 | 71.1 | 167 | 71.0 | **167** | **71.0** | 24 | 164 | 72.3 | 163 | 72.7 | **164** | **72.5** |
| 638.imagick_s | 24 | **178** | **81.1** | 178 | 81.1 | 179 | 80.7 | 24 | **178** | **81.0** | 178 | 81.1 | 179 | 80.8 |
| 644.nab_s | 24 | **114** | **154** | 114 | 154 | 114 | 154 | 24 | 114 | 154 | 114 | 154 | **114** | **154** |
| 649.fotonik3d_s | 24 | 176 | 51.9 | **177** | **51.6** | 179 | 51.0 | 24 | **177** | **51.4** | 177 | 51.5 | 179 | 51.0 |
| 654.roms_s | 24 | 213 | 74.0 | **214** | **73.7** | 215 | 73.1 | 24 | 213 | 74.0 | 213 | 73.9 | **213** | **74.0** |
| **SPECspeed®2017_fp_base =** | | | **91.1** | | | | | | | | | | | |
| **SPECspeed®2017_fp_peak =** | | | **91.6** | | | | | | | | | | | |

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:
KMP_AFFINITY = "granularity=fine,scatter"
LD_LIBRARY_PATH = "/home/cpu2017/lib/ia32:/home/cpu2017/lib/intel64"
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
```

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$SPECspeed®2017\_fp\_base = 91.1$

$SPECspeed®2017\_fp\_peak = 91.6$

| | | | |
|---|---|---|---|
| **CPU2017 License:** | 55 | **Test Date:** | Aug-2019 |
| **Test Sponsor:** | Dell Inc. | **Hardware Availability:** | Apr-2019 |
| **Tested by:** | Dell Inc. | **Software Availability:** | Jul-2019 |

## Platform Notes (Continued)

```
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
Logical Processor disabled
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 Sun Aug 11 21:53:01 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 6212U CPU @ 2.40GHz
      1  "physical id"s (chips)
      24 "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 6 8 9 10 11 12 13 16 17 18 19 20 21 25 26 27 28 29

From lscpu:
      Architecture:        x86_64
      CPU op-mode(s):      32-bit, 64-bit
      Byte Order:          Little Endian
      CPU(s):              24
      On-line CPU(s) list: 0-23
      Thread(s) per core:  1
      Core(s) per socket:  24
      Socket(s):           1
      NUMA node(s):        1
      Vendor ID:           GenuineIntel
      CPU family:          6
      Model:               85
      Model name:          Intel(R) Xeon(R) Gold 6212U CPU @ 2.40GHz
      Stepping:            6
      CPU MHz:             2509.357
      BogoMIPS:            4800.00
      Virtualization:      VT-x
```

**(Continued on next page)**

## Dell Inc.

PowerEdge FC640 (Intel Xeon Gold 6212U, 2.40GHz)

$SPECspeed®2017\_fp\_base = 91.1$

$SPECspeed®2017\_fp\_peak = 91.6$

**CPU2017 License:** 55
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## Platform Notes (Continued)

```
      L1d cache:             32K
      L1i cache:             32K
      L2 cache:              1024K
      L3 cache:              36608K
      NUMA node0 CPU(s):     0-23
      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 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 : 36608 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
   node 0 size: 191890 MB
   node 0 free: 183967 MB
   node distances:
   node   0
     0:  10

 From /proc/meminfo
    MemTotal:       196496000 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"
```

**(Continued on next page)**

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SPECspeed®2017_fp_base = 91.1

SPECspeed®2017_fp_peak = 91.6

| | | | |
|---|---|---|---|
| **CPU2017 License:** | 55 | **Test Date:** | Aug-2019 |
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## Platform Notes (Continued)

```
        HOME_URL="https://www.ubuntu.com/"
        SUPPORT_URL="https://help.ubuntu.com/"

 uname -a:
    Linux intel-sut 4.15.0-55-generic #60-Ubuntu SMP Tue Jul 2 18:22:20 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: __user pointer sanitization
 CVE-2017-5715 (Spectre variant 2): Mitigation: Enhanced IBRS, IBPB: conditional, RSB
 filling

 run-level 5 Aug 11 17:08

 SPEC is set to: /home/cpu2017
    Filesystem      Type  Size  Used Avail Use% Mounted on
    /dev/sda2       ext4  439G   41G  376G  10% /

 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 00AD063200AD HMA84GR7CJR4N-WM 32 GB 2 rank 2933
    10x Not Specified Not Specified

 (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 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 | 607.cactuBSSN_s(base, peak)
------------------------------------------------------------------------------
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
```

**(Continued on next page)**

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**Hardware Availability:** Apr-2019
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## Compiler Version Notes (Continued)

```
  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)
  64, Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 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 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       | 621.wrf_s(base, peak) 627.cam4_s(base, peak)
                 | 628.pop2_s(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
```

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

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

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

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# 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`
`-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP`

Fortran benchmarks:
`-DSPEC_OPENMP -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch`
`-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp`
`-nostandard-realloc-lhs`

Benchmarks using both Fortran and C:
`-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch`
`-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP`
`-nostandard-realloc-lhs`

Benchmarks using Fortran, C, and C++:
`-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch`
`-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP`
`-nostandard-realloc-lhs`

# Peak Compiler Invocation

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

Fortran benchmarks:
`ifort -m64`

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SPECspeed®2017_fp_base = 91.1

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## Peak Compiler Invocation (Continued)

Benchmarks using both Fortran and C:
```
ifort -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:
```
-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
```

Fortran benchmarks:

603.bwaves_s: `-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=4`
`-qopenmp -nostandard-realloc-lhs`

649.fotonik3d_s: `Same as 603.bwaves_s`

654.roms_s: `-DSPEC_OPENMP -xCORE-AVX512 -ipo -O3 -no-prec-div`
`-qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4`
`-qopenmp -nostandard-realloc-lhs`

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=4 -DSPEC_SUPPRESS_OPENMP -qopenmp`
`-DSPEC_OPENMP -nostandard-realloc-lhs`

627.cam4_s: `-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch`
`-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp`
`-DSPEC_OPENMP -nostandard-realloc-lhs`

628.pop2_s: `Same as 621.wrf_s`

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# Peak Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++:

```
-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
-nostandard-realloc-lhs
```

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

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

Tested with SPEC CPU®2017 v1.0.5 on 2019-08-11 17:53:00-0400.
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