SPEC CPU®2017 Floating Point Speed Result

Copyright 2017-2021 Standard Performance Evaluation Corporation

Cisco Systems

Cisco UCS X210c M6 (Intel Xeon Silver 4314, 2.40GHz)

$SPECspeed®2017\_fp\_base = 151$
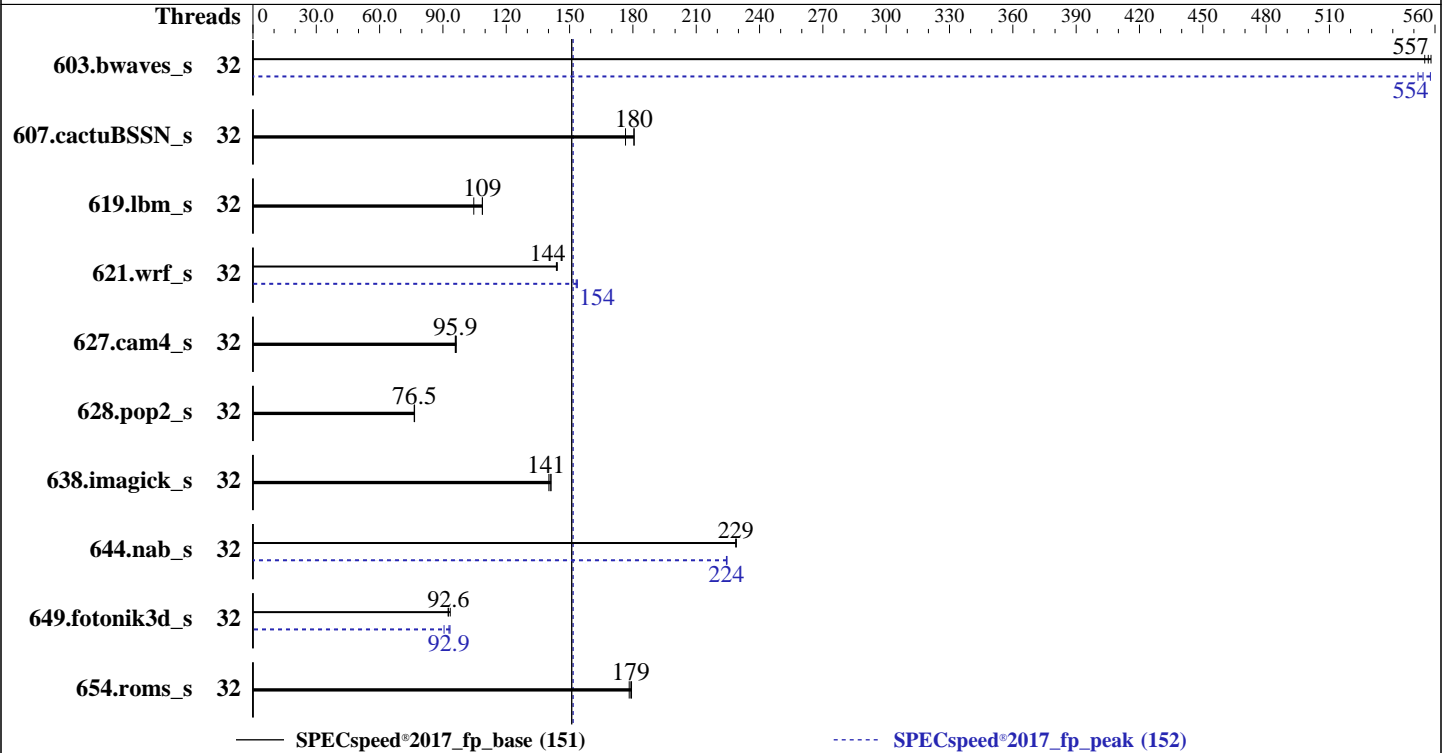
$SPECspeed®2017\_fp\_peak = 152$

CPU2017 License: 9019
Test Sponsor: Cisco Systems
Tested by: Cisco Systems

Test Date: Oct-2021
Hardware Availability: Sep-2021
Software Availability: Dec-2020

Threads

Benchmark	Threads	base	peak
603.bwaves_s	32	557	554
607.cactuBSSN_s	32	180	
619.lbm_s	32	109	
621.wrf_s	32	144	154
627.cam4_s	32	95.9	
628.pop2_s	32	76.5	
638.imagick_s	32	141	
644.nab_s	32	229	224
649.fotonik3d_s	32	92.6	92.9
654.roms_s	32	179	

—— SPECspeed®2017_fp_base (151)   ----- SPECspeed®2017_fp_peak (152)

Hardware

CPU Name: Intel Xeon Silver 4314
  Max MHz: 3400
  Nominal: 2400
Enabled: 32 cores, 2 chips
Orderable: 1,2 Chips
Cache L1: 32 KB I + 48 KB D on chip per core
  L2: 1.25 MB I+D on chip per core
  L3: 24 MB I+D on chip per chip
  Other: None
Memory: 2 TB (32 x 64 GB 2Rx4 PC4-3200AA-R, running at 2666)
Storage: 1 x 240 GB M.2 SSD SATA
Other: None

Software

OS: SUSE Linux Enterprise Server 15 SP2
5.3.18-22-default
Compiler: C/C++: Version 2021.1 of Intel oneAPI DPC++/C++ Compiler Build 20201113 for Linux;
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: Version 5.0.1d released Aug-2021
File System: btrfs
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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CPU2017 License: 9019	**Test Date:** Oct-2021
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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	32	106	555	**106**	**557**	106	558	32	**106**	**554**	107	552	106	558
607.cactuBSSN_s	32	**92.4**	**180**	94.4	176	92.3	181	32	**92.4**	**180**	94.4	176	92.3	181
619.lbm_s	32	48.2	109	**48.2**	**109**	50.1	105	32	48.2	109	**48.2**	**109**	50.1	105
621.wrf_s	32	91.8	144	**91.9**	**144**	92.0	144	32	**86.1**	**154**	86.1	154	86.4	153
627.cam4_s	32	92.4	95.9	92.0	96.3	**92.4**	**95.9**	32	92.4	95.9	92.0	96.3	**92.4**	**95.9**
628.pop2_s	32	155	76.5	155	76.4	**155**	**76.5**	32	155	76.5	155	76.4	**155**	**76.5**
638.imagick_s	32	103	140	102	141	**102**	**141**	32	103	140	102	141	**102**	**141**
644.nab_s	32	76.4	229	**76.4**	**229**	76.3	229	32	**77.9**	**224**	77.9	224	77.8	225
649.fotonik3d_s	32	98.6	92.5	97.5	93.5	**98.4**	**92.6**	32	97.7	93.4	**98.2**	**92.9**	101	90.5
654.roms_s	32	87.8	179	**87.9**	**179**	88.3	178	32	87.8	179	**87.9**	**179**	88.3	178
SPECspeed®2017_fp_base =		**151**												
SPECspeed®2017_fp_peak =		**152**												

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/lib/intel64:/home/cpu2017/je5.0.1-64"
MALLOC_CONF = "retain:true"
OMP_STACKSIZE = "192M"
```

General Notes

```
 Binaries compiled on a system with 1x Intel Core i9-7940X CPU + 64GB RAM
 memory using openSUSE Leap 15.2
 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
 runcpu command invoked through numactl i.e.:
 numactl --interleave=all runcpu <etc>
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.
```

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General Notes (Continued)

```
 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 Settings:
Intel Hyper-Threading Technology set to Disabled
DCU Streamer Prefetch set to Disabled
LLC Dead Line set to Disabled
Memory Refresh Rate set to 1x Refresh
ADDDC Sparing set to Disabled
Patrol Scrub set to Disabled
Processor C6 Report set to Enabled

 Sysinfo program /home/cpu2017/bin/sysinfo
 Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acafc64d
 running on perf-blade5 Sun Oct 24 18:27:03 2021

 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) Silver 4314 CPU @ 2.40GHz
       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 : 16
       siblings  : 16
       physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
       physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

 From lscpu from util-linux 2.33.1:
      Architecture:        x86_64
      CPU op-mode(s):      32-bit, 64-bit
      Byte Order:          Little Endian
      Address sizes:       46 bits physical, 57 bits virtual
      CPU(s):              32
      On-line CPU(s) list: 0-31
      Thread(s) per core:  1
      Core(s) per socket:  16
      Socket(s):           2
      NUMA node(s):        2
      Vendor ID:           GenuineIntel
```

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Platform Notes (Continued)

```
        CPU family:          6
        Model:               106
        Model name:          Intel(R) Xeon(R) Silver 4314 CPU @ 2.40GHz
        Stepping:            6
        CPU MHz:             799.893
        CPU max MHz:         3400.0000
        CPU min MHz:         800.0000
        BogoMIPS:            4800.00
        Virtualization:      VT-x
        L1d cache:           48K
        L1i cache:           32K
        L2 cache:            1280K
        L3 cache:            24576K
        NUMA node0 CPU(s):   0-15
        NUMA node1 CPU(s):   16-31
        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 invpcid_single ssbd
    mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vnmi flexpriority ept vpid ept_ad
    fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm cqm rdt_a avx512f
    avx512dq rdseed adx smap avx512ifma clflushopt clwb intel_pt avx512cd sha_ni
    avx512bw avx512vl xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbm_total
    cqm_mbm_local wbnoinvd dtherm ida arat pln pts hwp hwp_act_window hwp_epp
    hwp_pkg_req avx512vbmi umip pku ospke avx512_vbmi2 gfni vaes vpclmulqdq avx512_vnni
    avx512_bitalg tme avx512_vpopcntdq la57 rdpid md_clear pconfig flush_l1d
    arch_capabilities

 /proc/cpuinfo cache data
    cache size : 24576 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 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
   node 0 size: 1031747 MB
   node 0 free: 1026833 MB
   node 1 cpus: 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
   node 1 size: 1032184 MB
   node 1 free: 1028556 MB
   node distances:
   node   0   1
     0:  10  20
     1:  20  10
```

(Continued on next page)

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Platform Notes (Continued)

```
From /proc/meminfo
   MemTotal:       2113466248 kB
   HugePages_Total:        0
   Hugepagesize:        2048 kB

/sys/devices/system/cpu/cpu*/cpufreq/scaling_governor has
   performance

From /etc/*release* /etc/*version*
   os-release:
      NAME="SLES"
      VERSION="15-SP2"
      VERSION_ID="15.2"
      PRETTY_NAME="SUSE Linux Enterprise Server 15 SP2"
      ID="sles"
      ID_LIKE="suse"
      ANSI_COLOR="0;32"
      CPE_NAME="cpe:/o:suse:sles:15:sp2"

uname -a:
   Linux perf-blade5 5.3.18-22-default #1 SMP Wed Jun 3 12:16:43 UTC 2020 (720aeba)
   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 Oct 24 09:58

SPEC is set to: /home/cpu2017
   Filesystem      Type   Size  Used Avail Use% Mounted on
   /dev/sdb2       btrfs  224G   34G  189G  15% /home

From /sys/devices/virtual/dmi/id
```

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Platform Notes (Continued)

```
       Vendor:          Cisco Systems Inc
       Product:         UCSX-210C-M6
       Serial:          FCH250671LG

  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:
      32x 0xCE00 M393A8G40AB2-CWE 64 GB 2 rank 3200, configured at 2666

  BIOS:
     BIOS Vendor:     Cisco Systems, Inc.
     BIOS Version:    X210M6.5.0.1d.0.0816211754
     BIOS Date:       08/16/2021
     BIOS Revision:   5.22

  (End of data from sysinfo program)
```

Compiler Version Notes

```
================================================================================
C                    | 619.lbm_s(base, peak) 638.imagick_s(base, peak)
                     | 644.nab_s(base)
--------------------------------------------------------------------------------
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                    | 644.nab_s(peak)
--------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
  Version 2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
--------------------------------------------------------------------------------


================================================================================
C                    | 619.lbm_s(base, peak) 638.imagick_s(base, peak)
                     | 644.nab_s(base)
--------------------------------------------------------------------------------
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.
--------------------------------------------------------------------------------
```

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Compiler Version Notes (Continued)

```
==============================================================================
C                     | 644.nab_s(peak)
------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
  Version 2021.1 Build 20201113
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
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.
------------------------------------------------------------------------------
```

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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:
`-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`

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SPECspeed®2017_fp_base = 151

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Base Optimization Flags (Continued)

Benchmarks using both Fortran and C (continued):
```
-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 (except as noted below):
```
icc
```

644.nab_s: `icx`

Fortran benchmarks:
```
ifort
```

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: `-m64 -Wl,-z,muldefs -xCORE-AVX2 -Ofast -ffast-math`
`-flto -mfpmath=sse -funroll-loops -fiopenmp`

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Peak Optimization Flags (Continued)

644.nab_s (continued):
```
-DSPEC_OPENMP -qopt-mem-layout-trans=4
-fimf-accuracy-bits=14:sqrt
-mbranches-within-32B-boundaries
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

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
```

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/Intel-ic2021-official-linux64_revA.html
http://www.spec.org/cpu2017/flags/Cisco-Platform-Settings-V1.0-ICX-revJ.html

---

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/Intel-ic2021-official-linux64_revA.xml
http://www.spec.org/cpu2017/flags/Cisco-Platform-Settings-V1.0-ICX-revJ.xml

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Software Availability: Dec-2020

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