SPEC CPU®2017 Floating Point Rate Result

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Cisco Systems

Cisco UCS C220 M5 (Intel Xeon Platinum 8280M, 2.70GHz)

$SPECrate®2017\_fp\_base = 270$
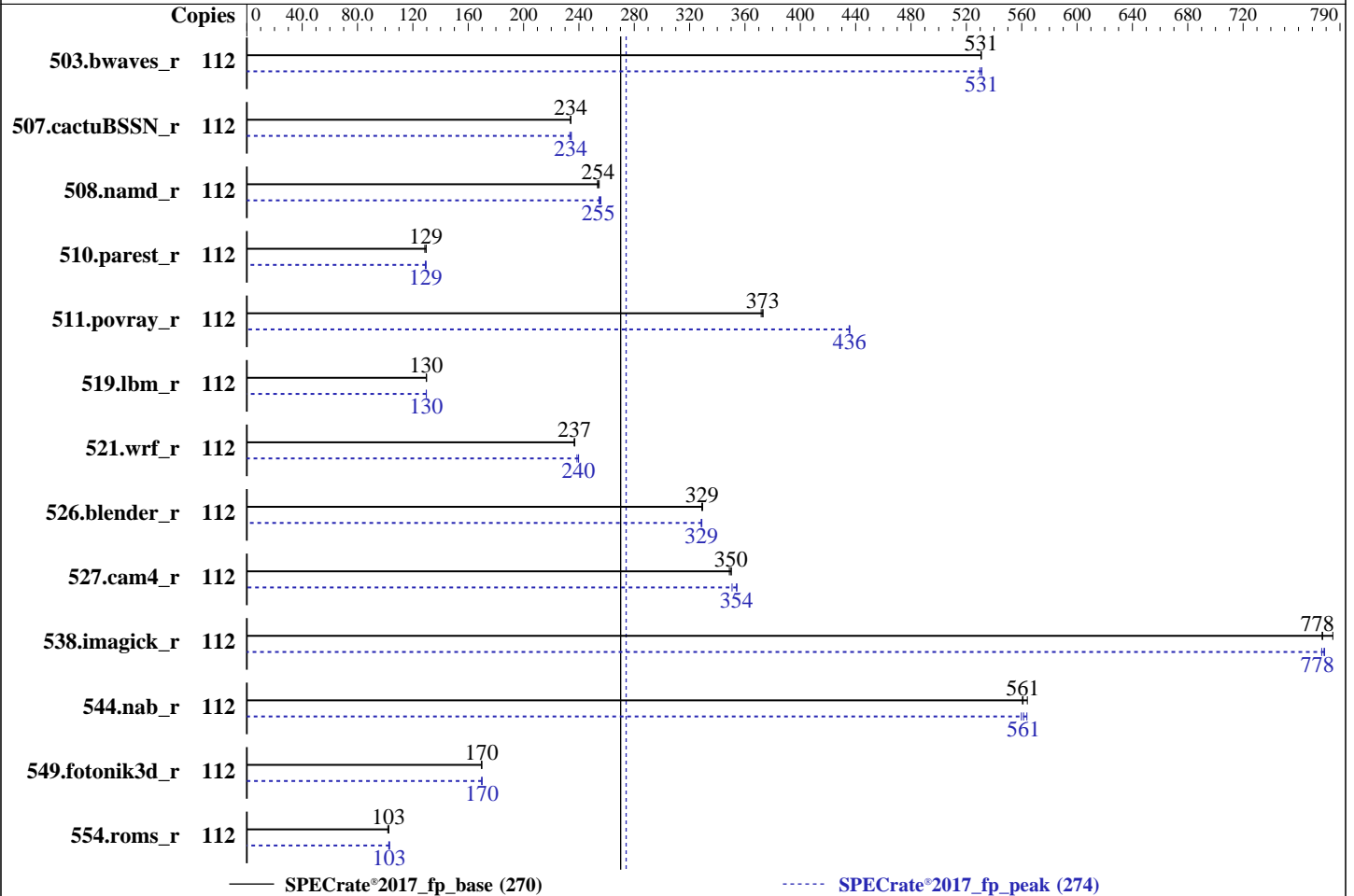
$SPECrate®2017\_fp\_peak = 274$

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

Test Date: Sep-2019
Hardware Availability: Apr-2019
Software Availability: May-2019

	Copies		
503.bwaves_r	112	base 531	peak 531
507.cactuBSSN_r	112	base 234	peak 234
508.namd_r	112	base 254	peak 255
510.parest_r	112	base 129	peak 129
511.povray_r	112	base 373	peak 436
519.lbm_r	112	base 130	peak 130
521.wrf_r	112	base 237	peak 240
526.blender_r	112	base 329	peak 329
527.cam4_r	112	base 350	peak 354
538.imagick_r	112	base 778	peak 778
544.nab_r	112	base 561	peak 561
549.fotonik3d_r	112	base 170	peak 170
554.roms_r	112	base 103	peak 103

SPECrate®2017_fp_base (270)
SPECrate®2017_fp_peak (274)

Hardware

CPU Name: Intel Xeon Platinum 8280M
 Max MHz: 4000
 Nominal: 2700
Enabled: 56 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: 38.5 MB I+D on chip per chip
 Other: None
Memory: 768 GB (24 x 32 GB 2Rx4 PC4-2933V-R)
Storage: 1 x 1.9 TB SSD SAS
Other: None

Software

OS: SUSE Linux Enterprise Server 15 (x86_64)
 4.12.14-23-default
Compiler: C/C++: Version 19.0.4.227 of Intel C/C++
 Compiler for Linux;
 Fortran: Version 19.0.4.227 of Intel Fortran
 Compiler for Linux
Parallel: No
Firmware: Version 4.0.4g released Jul-2019
File System: btrfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: 64-bit
Other: None
Power Management: --

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SPECrate®2017_fp_base = 270

SPECrate®2017_fp_peak = 274

CPU2017 License: 9019	**Test Date:**	Sep-2019
Test Sponsor: Cisco Systems	**Hardware Availability:**	Apr-2019
Tested by: Cisco Systems	**Software Availability:**	May-2019

Results Table

Benchmark	Base						Peak					
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
503.bwaves_r	112	2117	531	2116	531	**2116**	**531**	112	2120	530	**2115**	**531**	2115	531
507.cactuBSSN_r	112	606	234	606	234	**606**	**234**	112	605	235	607	233	**606**	**234**
508.namd_r	112	**419**	**254**	420	253	418	255	112	416	256	418	255	**417**	**255**
510.parest_r	112	2278	129	**2263**	**129**	2260	130	112	**2266**	**129**	2262	130	2271	129
511.povray_r	112	704	372	701	373	**701**	**373**	112	600	436	**600**	**436**	601	435
519.lbm_r	112	909	130	**910**	**130**	910	130	112	910	130	**910**	**130**	910	130
521.wrf_r	112	1060	237	1058	237	**1060**	**237**	112	1047	240	**1047**	**240**	1051	239
526.blender_r	112	518	329	**518**	**329**	519	329	112	519	329	519	328	**519**	**329**
527.cam4_r	112	**560**	**350**	560	350	562	349	112	559	351	553	354	**554**	**354**
538.imagick_r	112	358	777	355	785	**358**	**778**	112	359	777	358	779	**358**	**778**
544.nab_r	112	334	564	336	560	**336**	**561**	112	334	564	**336**	**561**	337	560
549.fotonik3d_r	112	2571	170	2573	170	**2572**	**170**	112	**2569**	**170**	2569	170	2570	170
554.roms_r	112	1747	102	**1735**	**103**	1734	103	112	1735	103	**1728**	**103**	1726	103

SPECrate®2017_fp_base = **270**

SPECrate®2017_fp_peak = **274**

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/intel64"

Binaries compiled on a system with 1x Intel Core i9-7900X CPU + 32GB RAM
memory using Redhat Enterprise Linux 7.5
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)

(Continued on next page)

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SPECrate®2017_fp_base = 270

SPECrate®2017_fp_peak = 274

CPU2017 License: 9019
Test Sponsor: Cisco Systems
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Hardware Availability: Apr-2019
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General Notes (Continued)

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.

Platform Notes

```
BIOS Settings:
Intel HyperThreading Technology set to Enabled
SNC set to Enabled
IMC Interleaving set to 1-way Interleave
Patrol Scrub set to Disabled
 Sysinfo program /home/cpu2017/bin/sysinfo
 Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
 running on linux-cud8 Sat Sep 28 04:39:35 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) Platinum 8280M CPU @ 2.70GHz
       2  "physical id"s (chips)
       112 "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 : 28
       siblings  : 56
       physical 0: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27
       28 29 30
       physical 1: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27
       28 29 30

 From lscpu:
      Architecture:        x86_64
      CPU op-mode(s):      32-bit, 64-bit
      Byte Order:          Little Endian
      CPU(s):              112
      On-line CPU(s) list: 0-111
      Thread(s) per core:  2
      Core(s) per socket:  28
      Socket(s):           2
      NUMA node(s):        4
      Vendor ID:           GenuineIntel
      CPU family:          6
```

(Continued on next page)

Cisco Systems

Cisco UCS C220 M5 (Intel Xeon Platinum 8280M, 2.70GHz)

SPECrate®2017_fp_base = 270

SPECrate®2017_fp_peak = 274

CPU2017 License: 9019

Test Sponsor: Cisco Systems

Tested by: Cisco Systems

Test Date: Sep-2019

Hardware Availability: Apr-2019

Software Availability: May-2019

Platform Notes (Continued)

```
        Model:                  85
        Model name:             Intel(R) Xeon(R) Platinum 8280M CPU @ 2.70GHz
        Stepping:               7
        CPU MHz:                2700.000
        CPU max MHz:            4000.0000
        CPU min MHz:            1000.0000
        BogoMIPS:               5400.00
        Virtualization:         VT-x
        L1d cache:              32K
        L1i cache:              32K
        L2 cache:               1024K
        L3 cache:               39424K
        NUMA node0 CPU(s):      0-3,7-9,14-17,21-23,56-59,63-65,70-73,77-79
        NUMA node1 CPU(s):      4-6,10-13,18-20,24-27,60-62,66-69,74-76,80-83
        NUMA node2 CPU(s):      28-31,35-37,42-45,49-51,84-87,91-93,98-101,105-107
        NUMA node3 CPU(s):      32-34,38-41,46-48,52-55,88-90,94-97,102-104,108-111
        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 tsc_known_freq 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 mba 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
    ibpb ibrs stibp dtherm ida arat pln pts hwp hwp_act_window hwp_epp hwp_pkg_req pku
    ospke avx512_vnni arch_capabilities ssbd

 /proc/cpuinfo cache data
    cache size : 39424 KB

 From numactl --hardware  WARNING: a numactl 'node' might or might not correspond to a
 physical chip.
   available: 4 nodes (0-3)
   node 0 cpus: 0 1 2 3 7 8 9 14 15 16 17 21 22 23 56 57 58 59 63 64 65 70 71 72 73 77 78
   79
   node 0 size: 192101 MB
   node 0 free: 176826 MB
   node 1 cpus: 4 5 6 10 11 12 13 18 19 20 24 25 26 27 60 61 62 66 67 68 69 74 75 76 80 81
   82 83
   node 1 size: 193525 MB
   node 1 free: 182231 MB
   node 2 cpus: 28 29 30 31 35 36 37 42 43 44 45 49 50 51 84 85 86 87 91 92 93 98 99 100
   101 105 106 107
   node 2 size: 193496 MB
   node 2 free: 182144 MB
```

(Continued on next page)

Cisco Systems

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SPECrate®2017_fp_base = 270

SPECrate®2017_fp_peak = 274

Platform Notes (Continued)

```
   node 3 cpus: 32 33 34 38 39 40 41 46 47 48 52 53 54 55 88 89 90 94 95 96 97 102 103 104
   108 109 110 111
   node 3 size: 193522 MB
   node 3 free: 182180 MB
   node distances:
   node   0   1   2   3
     0:  10  11  21  21
     1:  11  10  21  21
     2:  21  21  10  11
     3:  21  21  11  10

 From /proc/meminfo
    MemTotal:       791189892 kB
    HugePages_Total:        0
    Hugepagesize:        2048 kB

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

 uname -a:
    Linux linux-cud8 4.12.14-23-default #1 SMP Tue May 29 21:04:44 UTC 2018 (cd0437b)
    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: Indirect Branch Restricted Speculation,
 IBPB, IBRS_FW

 run-level 3 Sep 27 19:45

 SPEC is set to: /home/cpu2017
    Filesystem     Type   Size  Used Avail Use% Mounted on
    /dev/sda2      btrfs  224G   64G  160G  29% /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
```

(Continued on next page)

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CPU2017 License: 9019　　　　　　　　　　　　　　　　**Test Date:** Sep-2019
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Platform Notes (Continued)

```
 frequent changes to hardware, firmware, and the "DMTF SMBIOS" standard.
   BIOS Cisco Systems, Inc. C220M5.4.0.4g.0.0712190011 07/12/2019
   Memory:
    24x 0xCE00 M393A4K40CB2-CVF 32 GB 2 rank 2933, configured at 2934

 (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.
```

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Compiler Version Notes (Continued)

```
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       | 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
```

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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-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch`
`-ffinite-math-only -qopt-mem-layout-trans=4`

C++ benchmarks:
`-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch`
`-ffinite-math-only -qopt-mem-layout-trans=4`

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

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

538.imagick_r: `-xCORE-AVX512 -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-AVX512 -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-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4`

Fortran benchmarks:

503.bwaves_r: `-xCORE-AVX512 -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-AVX512 -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-AVX512 -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-AVX512 -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4`

526.blender_r: `-xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4`

Benchmarks using Fortran, C, and C++:
`-xCORE-AVX512 -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/Cisco-Platform-Settings-V1.2-revJ.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/Cisco-Platform-Settings-V1.2-revJ.xml

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

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