SPEC® CPU2017 Floating Point Rate Result

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Dell Inc.

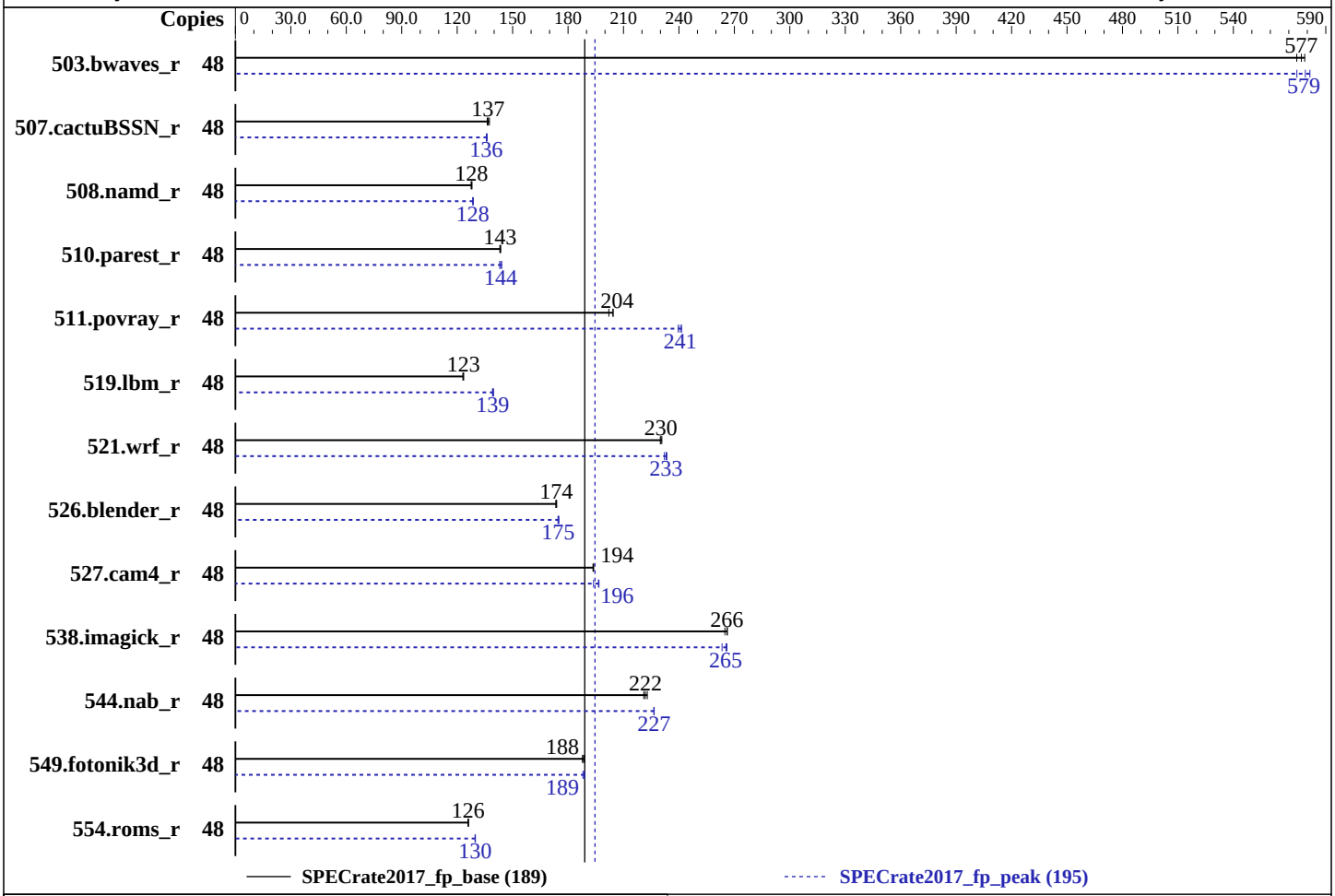
PowerEdge R940xa (Intel Xeon Gold 6128, 3.40GHz)

SPECrate2017_fp_base = 189

SPECrate2017_fp_peak = 195

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

Test Date: Mar-2018
Hardware Availability: May-2018
Software Availability: Feb-2018



Hardware

CPU Name:	Intel Xeon Gold 6128
Max MHz.:	3700
Nominal:	3400
Enabled:	24 cores, 4 chips, 2 threads/core
Orderable:	2,4 chips
Cache L1:	32 KB I + 32 KB D on chip per core
L2:	1 MB I+D on chip per core
L3:	19.25 MB I+D on chip per chip
Other:	None
Memory:	768 GB (48 x 16 GB 2Rx8 PC4-2666V-R)
Storage:	1 x 400 GB SATA SSD
Other:	None

Software

OS:	SUSE Linux Enterprise Server 12 SP3 4.4.114-94.11-default
Compiler:	C/C++: Version 18.0.0.128 of Intel C/C++ Compiler for Linux; Fortran: Version 18.0.0.128 of Intel Fortran Compiler for Linux
Parallel:	No
Firmware:	Version 1.0.0 released Mar-2018
File System:	xfs
System State:	Run level 3 (multi-user)
Base Pointers:	64-bit
Peak Pointers:	64-bit
Other:	None

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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	48	832	579	**835**	**577**	838	574	48	838	574	**831**	**579**	828	581
507.cactuBSSN_r	48	442	137	446	136	**444**	**137**	48	446	136	448	136	**447**	**136**
508.namd_r	48	357	128	**357**	**128**	356	128	48	**355**	**128**	354	129	355	128
510.parest_r	48	878	143	874	144	**877**	**143**	48	**875**	**144**	878	143	871	144
511.povray_r	48	**549**	**204**	555	202	548	204	48	**466**	**241**	464	241	468	240
519.lbm_r	48	**410**	**123**	411	123	410	123	48	364	139	**363**	**139**	362	140
521.wrf_r	48	**467**	**230**	468	230	466	231	48	**461**	**233**	463	232	461	233
526.blender_r	48	**421**	**174**	420	174	422	173	48	**419**	**175**	419	175	418	175
527.cam4_r	48	**434**	**194**	433	194	434	193	48	427	197	433	194	**427**	**196**
538.imagick_r	48	451	265	**449**	**266**	448	266	48	453	263	**450**	**265**	449	266
544.nab_r	48	366	221	362	223	**364**	**222**	48	356	227	357	226	**357**	**227**
549.fotonik3d_r	48	**995**	**188**	991	189	996	188	48	995	188	**991**	**189**	990	189
554.roms_r	48	**606**	**126**	606	126	604	126	48	588	130	**587**	**130**	587	130

SPECrate2017_fp_base = 189

SPECrate2017_fp_peak = 195

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 = "/root/cpu2017/lib/ia32:/root/cpu2017/lib/intel64:/root/cpu2017/je5.0.1-32:/root/cpu2017/je5.0.1-64"

 Binaries compiled on a system with 1x Intel Core i7-4790 CPU + 32GB RAM
 memory using Redhat Enterprise Linux 7.4
 Yes: 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
```

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General Notes (Continued)

```
 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>

Dell PowerEdge R840 and PowerEdge R940xa are electronically equivalent.
This result was measured on Dell PowerEdge R840.
```

Platform Notes

```
 BIOS settings:
 Sub NUMA Cluster enabled
 Virtualization Technology 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 enabled
 CPU Interconnect Bus Link Power Management disabled
 PCI ASPM L1 Link Power Management disabled
 Sysinfo program /root/cpu2017/bin/sysinfo
 Rev: r5797 of 2017-06-14 96c45e4568ad54c135fd618bcc091c0f
 running on linux-tjqj Wed Mar 28 19:58:55 2018

 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 6128 CPU @ 3.40GHz
       4  "physical id"s (chips)
       48 "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 : 6
       siblings  : 12
       physical 0: cores 0 3 4 9 12 14
       physical 1: cores 0 3 4 9 12 14
       physical 2: cores 0 1 4 5 8 12
       physical 3: cores 0 6 9 10 11 13

 From lscpu:
```

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Platform Notes (Continued)

```
      Architecture:          x86_64
      CPU op-mode(s):        32-bit, 64-bit
      Byte Order:            Little Endian
      CPU(s):                48
      On-line CPU(s) list:   0-47
      Thread(s) per core:    2
      Core(s) per socket:    6
      Socket(s):             4
      NUMA node(s):          8
      Vendor ID:             GenuineIntel
      CPU family:            6
      Model:                 85
      Model name:            Intel(R) Xeon(R) Gold 6128 CPU @ 3.40GHz
      Stepping:              4
      CPU MHz:               3392.057
      BogoMIPS:              6784.11
      Virtualization:        VT-x
      L1d cache:             32K
      L1i cache:             32K
      L2 cache:              1024K
      L3 cache:              19712K
      NUMA node0 CPU(s):     0,8,16,24,32,40
      NUMA node1 CPU(s):     1,9,17,25,33,41
      NUMA node2 CPU(s):     2,10,18,26,34,42
      NUMA node3 CPU(s):     3,11,19,27,35,43
      NUMA node4 CPU(s):     4,12,20,28,36,44
      NUMA node5 CPU(s):     5,13,21,29,37,45
      NUMA node6 CPU(s):     6,14,22,30,38,46
      NUMA node7 CPU(s):     7,15,23,31,39,47
      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
      aperfmperf eagerfpu 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 ida arat epb invpcid_single pln pts
      dtherm intel_pt rsb_ctxsw spec_ctrl retpoline kaiser tpr_shadow vnmi flexpriority
      ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm cqm mpx
      avx512f avx512dq rdseed adx smap clflushopt clwb avx512cd avx512bw avx512vl xsaveopt
      xsavec xgetbv1 cqm_llc cqm_occup_llc pku ospke

  /proc/cpuinfo cache data
     cache size : 19712 KB

  From numactl --hardware  WARNING: a numactl 'node' might or might not correspond to a
  physical chip.
    available: 8 nodes (0-7)
    node 0 cpus: 0 8 16 24 32 40
```

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Platform Notes (Continued)

```
   node 0 size: 95361 MB
   node 0 free: 95191 MB
   node 1 cpus: 1 9 17 25 33 41
   node 1 size: 96763 MB
   node 1 free: 96631 MB
   node 2 cpus: 2 10 18 26 34 42
   node 2 size: 96763 MB
   node 2 free: 96628 MB
   node 3 cpus: 3 11 19 27 35 43
   node 3 size: 96763 MB
   node 3 free: 96624 MB
   node 4 cpus: 4 12 20 28 36 44
   node 4 size: 96763 MB
   node 4 free: 96617 MB
   node 5 cpus: 5 13 21 29 37 45
   node 5 size: 96763 MB
   node 5 free: 96619 MB
   node 6 cpus: 6 14 22 30 38 46
   node 6 size: 96763 MB
   node 6 free: 96616 MB
   node 7 cpus: 7 15 23 31 39 47
   node 7 size: 96760 MB
   node 7 free: 96629 MB
   node distances:
   node   0   1   2   3   4   5   6   7
     0:  10  21  21  21  11  21  21  21
     1:  21  10  21  21  21  11  21  21
     2:  21  21  10  21  21  21  11  21
     3:  21  21  21  10  21  21  21  11
     4:  11  21  21  21  10  21  21  21
     5:  21  11  21  21  21  10  21  21
     6:  21  21  11  21  21  21  10  21
     7:  21  21  21  11  21  21  21  10

 From /proc/meminfo
    MemTotal:       791247684 kB
    HugePages_Total:       0
    Hugepagesize:       2048 kB

 /usr/bin/lsb_release -d
    SUSE Linux Enterprise Server 12 SP3

 From /etc/*release* /etc/*version*
    SuSE-release:
       SUSE Linux Enterprise Server 12 (x86_64)
       VERSION = 12
       PATCHLEVEL = 3
```

(Continued on next page)

Platform Notes (Continued)

```
       # 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-SP3"
       VERSION_ID="12.3"
       PRETTY_NAME="SUSE Linux Enterprise Server 12 SP3"
       ID="sles"
       ANSI_COLOR="0;32"
       CPE_NAME="cpe:/o:suse:sles:12:sp3"

 uname -a:
    Linux linux-tjqj 4.4.114-94.11-default #1 SMP Thu Feb 1 19:28:26 UTC 2018 (4309ff9)
    x86_64 x86_64 x86_64 GNU/Linux

 run-level 3 Mar 28 12:15

 SPEC is set to: /root/cpu2017
    Filesystem     Type  Size  Used Avail Use% Mounted on
    /dev/sda3      xfs   395G   28G  367G   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. 1.0.0 03/20/2018
   Memory:
    23x 00AD00B300AD HMA82GR7AFR8N-VK 16 GB 2 rank 2666
    1x 00AD063200AD HMA82GR7AFR8N-VK 16 GB 2 rank 2666
    24x 00CE063200CE M393A2K43BB1-CTD 16 GB 2 rank 2666

 (End of data from sysinfo program)
```

Compiler Version Notes

```
==============================================================================
 CC  519.lbm_r(base) 538.imagick_r(base, peak) 544.nab_r(base)
------------------------------------------------------------------------------
icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------

==============================================================================
CC   519.lbm_r(peak) 544.nab_r(peak)
------------------------------------------------------------------------------
icc (ICC) 18.0.0 20170811
```


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Compiler Version Notes (Continued)

```
Copyright (C) 1985-2017 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------

==============================================================================
 CXXC 508.namd_r(base) 510.parest_r(base)
------------------------------------------------------------------------------
icpc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------

==============================================================================
CXXC 508.namd_r(peak) 510.parest_r(peak)
------------------------------------------------------------------------------
icpc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------

==============================================================================
 CC  511.povray_r(base) 526.blender_r(base)
------------------------------------------------------------------------------
icpc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation.  All rights reserved.
icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------

==============================================================================
CC   511.povray_r(peak) 526.blender_r(peak)
------------------------------------------------------------------------------
icpc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation.  All rights reserved.
icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------

==============================================================================
 FC  507.cactuBSSN_r(base)
------------------------------------------------------------------------------
icpc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation.  All rights reserved.
icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation.  All rights reserved.
ifort (IFORT) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------

==============================================================================
```

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Compiler Version Notes (Continued)

```
FC   507.cactuBSSN_r(peak)
------------------------------------------------------------------------------
icpc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation.  All rights reserved.
icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation.  All rights reserved.
ifort (IFORT) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------

==============================================================================
 FC  503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak) 554.roms_r(base)
------------------------------------------------------------------------------
ifort (IFORT) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------

==============================================================================
FC   554.roms_r(peak)
------------------------------------------------------------------------------
ifort (IFORT) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------

==============================================================================
 CC  521.wrf_r(base) 527.cam4_r(base)
------------------------------------------------------------------------------
ifort (IFORT) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation.  All rights reserved.
icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------

==============================================================================
CC   521.wrf_r(peak) 527.cam4_r(peak)
------------------------------------------------------------------------------
ifort (IFORT) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation.  All rights reserved.
icc (ICC) 18.0.0 20170811
Copyright (C) 1985-2017 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------
```

Base Compiler Invocation

C benchmarks:
icc

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Base Compiler Invocation (Continued)

C++ benchmarks:
icpc

Fortran benchmarks:
ifort

Benchmarks using both Fortran and C:
ifort icc

Benchmarks using both C and C++:
icpc icc

Benchmarks using Fortran, C, and C++:
icpc icc ifort

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=3

C++ benchmarks:
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=3

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Base Optimization Flags (Continued)

Fortran benchmarks:
`-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=3 -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=3 -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=3`

Benchmarks using Fortran, C, and C++:
`-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=3 -nostandard-realloc-lhs -align array32byte`

Base Other Flags

C benchmarks:
`-m64 -std=c11`

C++ benchmarks:
`-m64`

Fortran benchmarks:
`-m64`

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

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

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

Peak Compiler Invocation

C benchmarks:
`icc`

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Peak Compiler Invocation (Continued)

C++ benchmarks:
icpc

Fortran benchmarks:
ifort

Benchmarks using both Fortran and C:
ifort icc

Benchmarks using both C and C++:
icpc icc

Benchmarks using Fortran, C, and C++:
icpc icc ifort

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=3

538.imagick_r: -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=3

544.nab_r: Same as 519.lbm_r

C++ benchmarks:
-prof-gen(pass 1) -prof-use(pass 2) -ipo -xCORE-AVX2 -O3
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-mem-layout-trans=3

Fortran benchmarks:

(Continued on next page)

Peak Optimization Flags (Continued)

503.bwaves_r: `-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=3 -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=3 -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=3 -nostandard-realloc-lhs -align array32byte`

Benchmarks using both C 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=3`

Benchmarks using Fortran, C, 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=3 -nostandard-realloc-lhs -align array32byte`

Peak Other Flags

C benchmarks:
`-m64 -std=c11`

C++ benchmarks:
`-m64`

Fortran benchmarks:
`-m64`

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

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

(Continued on next page)

Peak Other Flags (Continued)

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

The flags files that were used to format this result can be browsed at
`http://www.spec.org/cpu2017/flags/Intel-ic18.0-official-linux64.2017-10-19.html`
`http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge14G-revC.html`

You can also download the XML flags sources by saving the following links:
`http://www.spec.org/cpu2017/flags/Intel-ic18.0-official-linux64.2017-10-19.xml`
`http://www.spec.org/cpu2017/flags/Dell-Platform-Flags-PowerEdge14G-revC.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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