SPEC® CPU2017 Floating Point Rate Result

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Lenovo Global Technology

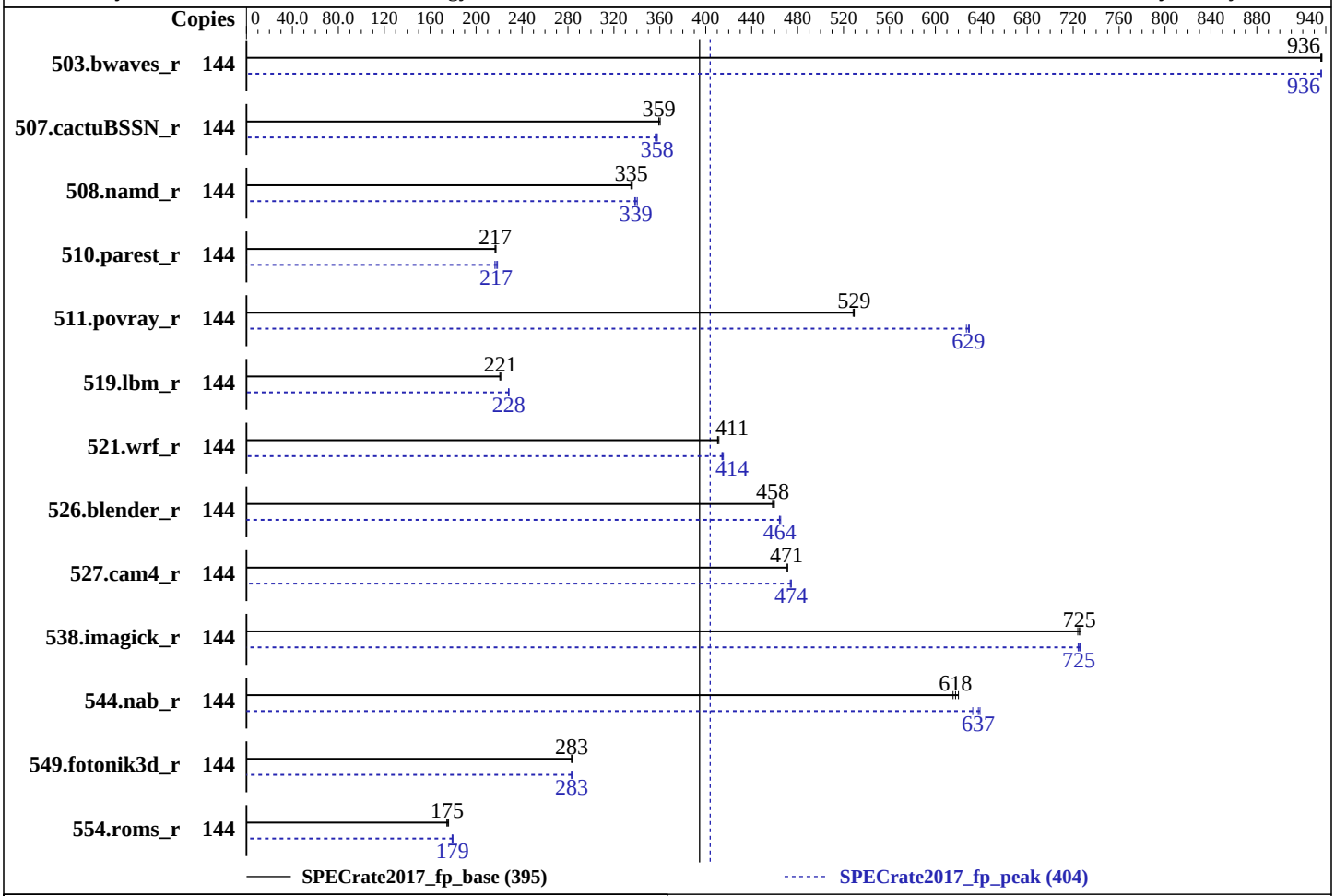
ThinkSystem SR850
(3.00 GHz, Intel Xeon Gold 6154)

SPECrate2017_fp_base = 395

SPECrate2017_fp_peak = 404

CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Tested by: Lenovo Global Technology

Test Date: Jul-2018
Hardware Availability: Aug-2017
Software Availability: May-2018



Hardware

CPU Name:	Intel Xeon Gold 6154
Max MHz.:	3700
Nominal:	3000
Enabled:	72 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:	24.75 MB I+D on chip per chip
Other:	None
Memory:	1536 GB (48 x 32 GB 2Rx4 PC4-2666V-R)
Storage:	1 x 800 GB SAS SSD
Other:	None

Software

OS:	SUSE Linux Enterprise Server 12 SP2 (x86_64) Kernel 4.4.121-92.80-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:	Lenovo BIOS Version TEE123N 1.40 released Jun-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	144	1542	937	**1542**	**936**	1543	936	144	1543	936	**1543**	**936**	1543	936
507.cactuBSSN_r	144	508	359	**507**	**359**	506	360	144	510	358	512	356	**510**	**358**
508.namd_r	144	**408**	**335**	409	335	407	336	144	402	340	405	338	**403**	**339**
510.parest_r	144	1733	217	1739	217	**1738**	**217**	144	**1732**	**217**	1723	219	1741	216
511.povray_r	144	**635**	**529**	636	528	635	529	144	534	630	**535**	**629**	536	627
519.lbm_r	144	686	221	688	221	**686**	**221**	144	**664**	**228**	664	229	665	228
521.wrf_r	144	784	411	786	410	**786**	**411**	144	777	415	779	414	**778**	**414**
526.blender_r	144	477	460	479	458	**478**	**458**	144	**472**	**464**	472	464	471	465
527.cam4_r	144	536	470	**535**	**471**	534	471	144	531	474	532	474	**531**	**474**
538.imagick_r	144	**494**	**725**	495	724	493	726	144	493	726	**494**	**725**	494	724
544.nab_r	144	391	620	394	615	**392**	**618**	144	**380**	**637**	383	633	379	639
549.fotonik3d_r	144	**1981**	**283**	1981	283	1980	283	144	1980	283	1982	283	**1981**	**283**
554.roms_r	144	1300	176	**1307**	**175**	1311	175	144	1278	179	**1275**	**179**	1272	180

SPECrate2017_fp_base = 395

SPECrate2017_fp_peak = 404

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/cpu2017.1.0.2.ic18.0/lib/ia32:/home/cpu2017.1.0.2.ic18.0/lib/intel64"
LD_LIBRARY_PATH = "$LD_LIBRARY_PATH:/home/cpu2017.1.0.2.ic18.0/je5.0.1-32:/home/cpu2017.1.0.2.ic18.0/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
 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>
Yes: The test sponsor attests, as of date of publication, that CVE-2017-5754 (Meltdown)
```

(Continued on next page)

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 configuration:
Choose Operating Mode set to Custom Mode
CPU P-state Control set to None
Page Policy set to Adaptive
C-States set to Legacy
Energy Efficient Turbo set to Disable
Platform Controlled Type set to Maximum Performance
SNC set to Enable
Execute Disable Bit set to Disable
DCA set to Enable
 Sysinfo program /home/cpu2017.1.0.2.ic18.0/bin/sysinfo
 Rev: r5797 of 2017-06-14 96c45e4568ad54c135fd618bcc091c0f
 running on Electron-node-01 Fri Jul 27 10:12:02 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 6154 CPU @ 3.00GHz
       4  "physical id"s (chips)
       144 "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 : 18
       siblings  : 36
       physical 0: cores 0 1 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27
       physical 1: cores 0 1 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27
       physical 2: cores 0 1 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27
       physical 3: cores 0 1 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27

 From lscpu:
      Architecture:          x86_64
      CPU op-mode(s):        32-bit, 64-bit
      Byte Order:            Little Endian
      CPU(s):                144
      On-line CPU(s) list:   0-143
      Thread(s) per core:    2
```

(Continued on next page)

Platform Notes (Continued)

```
      Core(s) per socket:    18
      Socket(s):             4
      NUMA node(s):          8
      Vendor ID:             GenuineIntel
      CPU family:            6
      Model:                 85
      Model name:            Intel(R) Xeon(R) Gold 6154 CPU @ 3.00GHz
      Stepping:              4
      CPU MHz:               2992.959
      BogoMIPS:              5985.91
      Virtualization:        VT-x
      L1d cache:             32K
      L1i cache:             32K
      L2 cache:              1024K
      L3 cache:              25344K
      NUMA node0 CPU(s):     0-2,5,6,9,10,14,15,72-74,77,78,81,82,86,87
      NUMA node1 CPU(s):     3,4,7,8,11-13,16,17,75,76,79,80,83-85,88,89
      NUMA node2 CPU(s):     18-20,23,24,27,28,32,33,90-92,95,96,99,100,104,105
      NUMA node3 CPU(s):     21,22,25,26,29-31,34,35,93,94,97,98,101-103,106,107
      NUMA node4 CPU(s):     36-38,41,42,45,46,50,51,108-110,113,114,117,118,122,123
      NUMA node5 CPU(s):     39,40,43,44,47-49,52,53,111,112,115,116,119-121,124,125
      NUMA node6 CPU(s):     54-56,59,60,63,64,68,69,126-128,131,132,135,136,140,141
      NUMA node7 CPU(s):     57,58,61,62,65-67,70,71,129,130,133,134,137-139,142,143
      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 stibp ssbd 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

  /proc/cpuinfo cache data
     cache size : 25344 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 1 2 5 6 9 10 14 15 72 73 74 77 78 81 82 86 87
    node 0 size: 193128 MB
    node 0 free: 192888 MB
    node 1 cpus: 3 4 7 8 11 12 13 16 17 75 76 79 80 83 84 85 88 89
    node 1 size: 193527 MB
    node 1 free: 193334 MB
    node 2 cpus: 18 19 20 23 24 27 28 32 33 90 91 92 95 96 99 100 104 105
```

(Continued on next page)

Platform Notes (Continued)

```
   node 2 size: 193527 MB
   node 2 free: 193353 MB
   node 3 cpus: 21 22 25 26 29 30 31 34 35 93 94 97 98 101 102 103 106 107
   node 3 size: 193527 MB
   node 3 free: 193334 MB
   node 4 cpus: 36 37 38 41 42 45 46 50 51 108 109 110 113 114 117 118 122 123
   node 4 size: 193527 MB
   node 4 free: 193373 MB
   node 5 cpus: 39 40 43 44 47 48 49 52 53 111 112 115 116 119 120 121 124 125
   node 5 size: 193527 MB
   node 5 free: 193387 MB
   node 6 cpus: 54 55 56 59 60 63 64 68 69 126 127 128 131 132 135 136 140 141
   node 6 size: 193527 MB
   node 6 free: 193352 MB
   node 7 cpus: 57 58 61 62 65 66 67 70 71 129 130 133 134 137 138 139 142 143
   node 7 size: 193525 MB
   node 7 free: 193297 MB
   node distances:
   node   0   1   2   3   4   5   6   7
     0:  10  11  21  21  21  21  31  31
     1:  11  10  21  21  21  21  31  31
     2:  21  21  10  11  31  31  21  21
     3:  21  21  11  10  31  31  21  21
     4:  21  21  31  31  10  11  21  21
     5:  21  21  31  31  11  10  21  21
     6:  31  31  21  21  21  21  10  11
     7:  31  31  21  21  21  21  11  10

 From /proc/meminfo
    MemTotal:       1584966572 kB
    HugePages_Total:       0
    Hugepagesize:       2048 kB

 From /etc/*release* /etc/*version*
    SuSE-release:
       SUSE Linux Enterprise Server 12 (x86_64)
       VERSION = 12
       PATCHLEVEL = 2
       # 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-SP2"
       VERSION_ID="12.2"
       PRETTY_NAME="SUSE Linux Enterprise Server 12 SP2"
       ID="sles"
       ANSI_COLOR="0;32"
```

(Continued on next page)

Platform Notes (Continued)

```
      CPE_NAME="cpe:/o:suse:sles:12:sp2"

 uname -a:
    Linux Electron-node-01 4.4.121-92.80-default #1 SMP Mon May 21 14:40:10 UTC 2018
    (2afdd00) x86_64 x86_64 x86_64 GNU/Linux

 run-level 3 Jul 27 10:11

 SPEC is set to: /home/cpu2017.1.0.2.ic18.0
    Filesystem     Type  Size  Used Avail Use% Mounted on
    /dev/sda4      xfs   688G  217G  472G  32% /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
 frequent changes to hardware, firmware, and the "DMTF SMBIOS" standard.
   BIOS Lenovo -[TEE123N-1.40]- 06/12/2018
   Memory:
    48x Samsung M393A4K40BB2-CTD 32 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
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.
------------------------------------------------------------------------------

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

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Compiler Version Notes (Continued)

```
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.
------------------------------------------------------------------------------

==============================================================================
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.
------------------------------------------------------------------------------

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

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Compiler Version Notes (Continued)

```
 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 -m64 -std=c11`

C++ benchmarks:
`icpc -m64`

Fortran benchmarks:
`ifort -m64`

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

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Base Compiler Invocation (Continued)

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=3

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

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

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Base Optimization Flags (Continued)

Benchmarks using both C and C++ (continued):
-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

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=3

(Continued on next page)

Peak Optimization Flags (Continued)

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:

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

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/Intel-ic18.0-official-linux64.2017-12-21.html
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-SKL-G.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/Intel-ic18.0-official-linux64.2017-12-21.xml
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-SKL-G.xml

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