SPEC® CPU2017 Floating Point Rate Result

Copyright 2017-2018 Standard Performance Evaluation Corporation

Dell Inc.

PowerEdge MX740c (Intel Xeon Gold 5120 CPU, 2.20GHz)

SPECrate2017_fp_base = 138

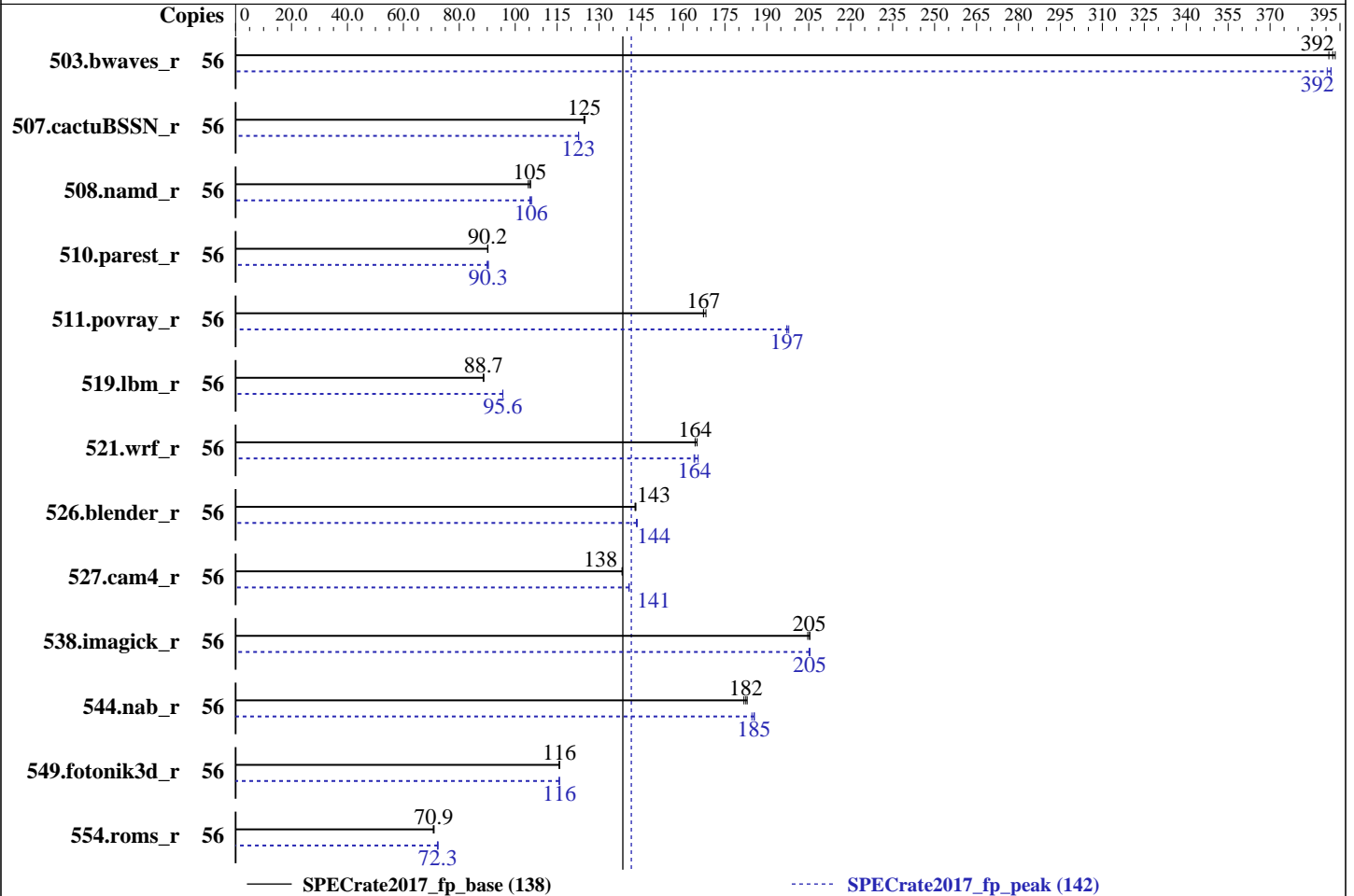SPECrate2017_fp_peak = 142

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

Test Date: Mar-2018
Hardware Availability: Sep-2017
Software Availability: Sep-2017

Benchmark	Copies	base	peak
503.bwaves_r	56	392	392
507.cactuBSSN_r	56	125	123
508.namd_r	56	105	106
510.parest_r	56	90.2	90.3
511.povray_r	56	167	197
519.lbm_r	56	88.7	95.6
521.wrf_r	56	164	164
526.blender_r	56	143	144
527.cam4_r	56	138	141
538.imagick_r	56	205	205
544.nab_r	56	182	185
549.fotonik3d_r	56	116	116
554.roms_r	56	70.9	72.3

—— SPECrate2017_fp_base (138)   ------ SPECrate2017_fp_peak (142)

Hardware

CPU Name: Intel Xeon Gold 5120
Max MHz.: 3200
Nominal: 2200
Enabled: 28 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: 19.25 MB I+D on chip per chip
Other: None
Memory: 192 GB (12 x 16 GB 2Rx8 PC4-2666V-R, running at 2400)
Storage: 960 GB SAS 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 0.3.12 released Feb-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	56	1436	391	1428	393	**1431**	**392**	56	**1433**	**392**	1438	390	1433	392
507.cactuBSSN_r	56	569	125	568	125	**568**	**125**	56	**578**	**123**	578	123	578	123
508.namd_r	56	508	105	504	106	**506**	**105**	56	505	105	503	106	**503**	**106**
510.parest_r	56	1623	90.3	**1625**	**90.2**	1625	90.2	56	**1622**	**90.3**	1621	90.4	1629	89.9
511.povray_r	56	781	167	777	168	**781**	**167**	56	661	198	**663**	**197**	663	197
519.lbm_r	56	667	88.5	665	88.8	**665**	**88.7**	56	**618**	**95.6**	618	95.5	617	95.6
521.wrf_r	56	**763**	**164**	763	164	760	165	56	765	164	758	165	**764**	**164**
526.blender_r	56	596	143	597	143	**597**	**143**	56	595	143	594	144	**594**	**144**
527.cam4_r	56	708	138	709	138	**708**	**138**	56	696	141	696	141	**696**	**141**
538.imagick_r	56	**678**	**205**	678	205	681	205	56	**678**	**205**	678	205	679	205
544.nab_r	56	**516**	**182**	518	182	515	183	56	508	186	510	185	**508**	**185**
549.fotonik3d_r	56	**1884**	**116**	1886	116	1884	116	56	**1885**	**116**	1885	116	1885	116
554.roms_r	56	**1255**	**70.9**	1259	70.7	1254	71.0	56	1233	72.2	**1230**	**72.3**	1229	72.4
SPECrate2017_fp_base =	**138**											
SPECrate2017_fp_peak =	**142**											

Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

Submit Notes

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
Prior to runcpu invocation

(Continued on next page)

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General Notes (Continued)

```
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>
```

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-kuth Wed Mar  7 21:26:20 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 5120 CPU @ 2.20GHz
      2  "physical id"s (chips)
      56 "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 : 14
      siblings  : 28
      physical 0: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14
      physical 1: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14

From lscpu:
      Architecture:          x86_64
      CPU op-mode(s):        32-bit, 64-bit
      Byte Order:            Little Endian
      CPU(s):                56
      On-line CPU(s) list:   0-55
      Thread(s) per core:    2
```

(Continued on next page)

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Platform Notes (Continued)

```
        Core(s) per socket:    14
        Socket(s):             2
        NUMA node(s):          4
        Vendor ID:             GenuineIntel
        CPU family:            6
        Model:                 85
        Model name:            Intel(R) Xeon(R) Gold 5120 CPU @ 2.20GHz
        Stepping:              4
        CPU MHz:               2194.946
        BogoMIPS:              4389.89
        Virtualization:        VT-x
        L1d cache:             32K
        L1i cache:             32K
        L2 cache:              1024K
        L3 cache:              19712K
        NUMA node0 CPU(s):     0,4,8,12,16,20,24,28,32,36,40,44,48,52
        NUMA node1 CPU(s):     1,5,9,13,17,21,25,29,33,37,41,45,49,53
        NUMA node2 CPU(s):     2,6,10,14,18,22,26,30,34,38,42,46,50,54
        NUMA node3 CPU(s):     3,7,11,15,19,23,27,31,35,39,43,47,51,55
        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: 4 nodes (0-3)
   node 0 cpus: 0 4 8 12 16 20 24 28 32 36 40 44 48 52
   node 0 size: 46977 MB
   node 0 free: 46698 MB
   node 1 cpus: 1 5 9 13 17 21 25 29 33 37 41 45 49 53
   node 1 size: 48374 MB
   node 1 free: 48157 MB
   node 2 cpus: 2 6 10 14 18 22 26 30 34 38 42 46 50 54
   node 2 size: 48374 MB
   node 2 free: 48174 MB
   node 3 cpus: 3 7 11 15 19 23 27 31 35 39 43 47 51 55
   node 3 size: 48372 MB
```

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Software Availability: Sep-2017

Platform Notes (Continued)

```
   node 3 free: 48174 MB
   node distances:
   node   0   1   2   3
     0:  10  21  11  21
     1:  21  10  21  11
     2:  11  21  10  21
     3:  21  11  21  10

 From /proc/meminfo
    MemTotal:       196709700 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
       # 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-kuth 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 7 10:47

 SPEC is set to: /root/cpu2017
    Filesystem      Type  Size  Used Avail Use% Mounted on
    /dev/sda2       xfs   890G   16G  874G   2% /

 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. 0.3.12 02/06/2018
```

(Continued on next page)

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Platform Notes (Continued)

```
    Memory:
     12x 00AD063200AD HMA82GR7AFR8N-VK 16 GB 2 rank 2666, configured at 2400
     12x Not Specified Not Specified

   (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.
------------------------------------------------------------------------------


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


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

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Software Availability: Sep-2017

Compiler Version Notes (Continued)

```
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
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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)
-------------------------------------------------------------------------
```

(Continued on next page)

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Compiler Version Notes (Continued)

```
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
```

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`

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Standard Performance Evaluation Corporation (info@spec.org) https://www.spec.org/

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Base Portability Flags (Continued)

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 -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`

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Base Other Flags (Continued)

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
```

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:

(Continued on next page)

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Peak Optimization Flags (Continued)

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:

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

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SPECrate2017_fp_base =   138

SPECrate2017_fp_peak =   142

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
```

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
```

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

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