



# SPEC® CPU2017 Floating Point Rate Result

Copyright 2017-2018 Standard Performance Evaluation Corporation

## Dell Inc.

SPECrate2017\_fp\_base = 113

PowerEdge T640 (Intel Xeon Silver 4116, 2.10 GHz)

SPECrate2017\_fp\_peak = 116

CPU2017 License: 55

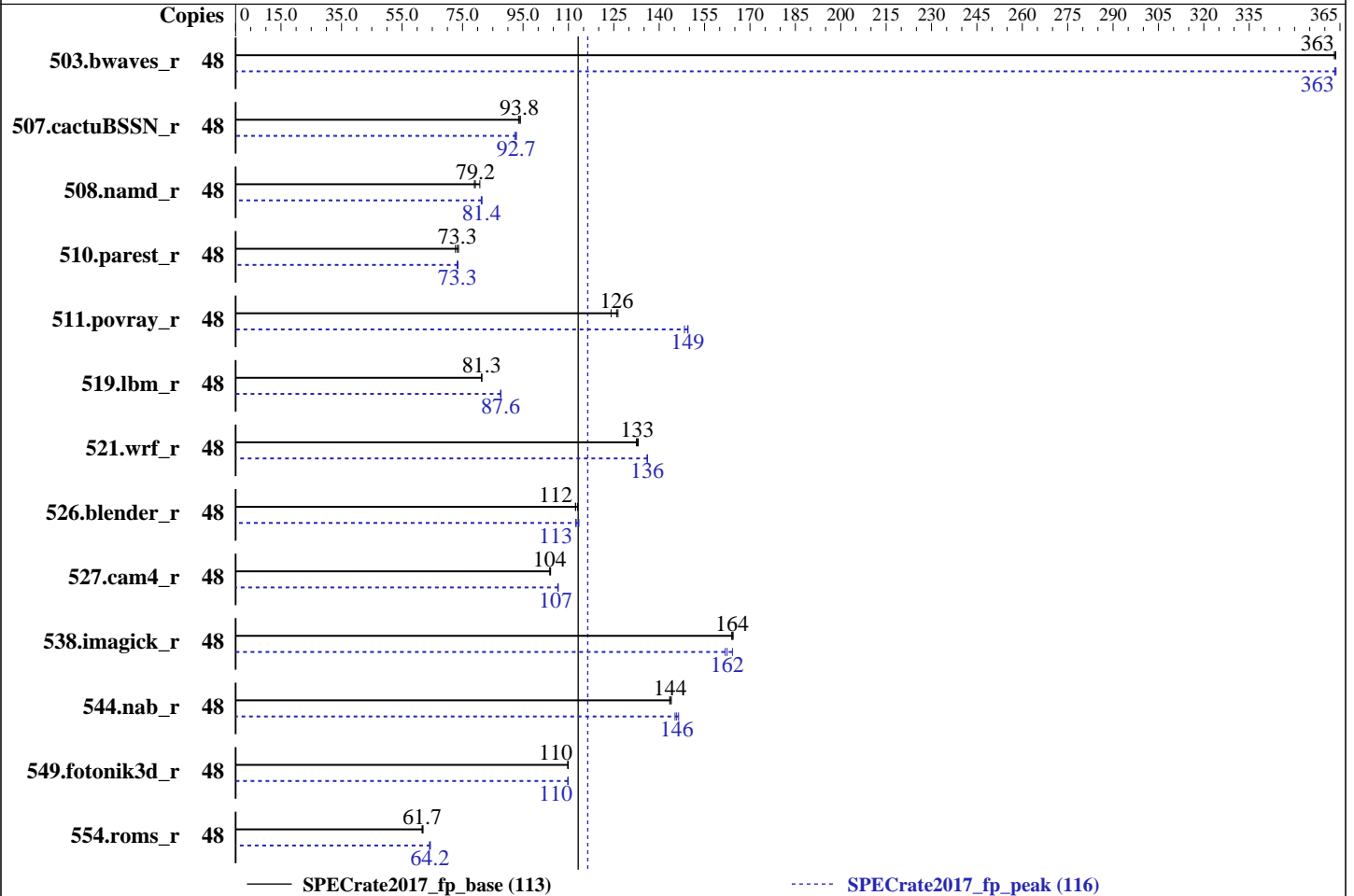
Test Date: Dec-2017

Test Sponsor: Dell Inc.

Hardware Availability: Sep-2017

Tested by: Dell Inc.

Software Availability: Sep-2017



### Hardware

CPU Name: Intel Xeon Silver 4116  
 Max MHz.: 3000  
 Nominal: 2100  
 Enabled: 24 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: 16.5 MB I+D on chip per chip  
 Other: None  
 Memory: 384 GB (24 x 16 GB 2Rx8 PC4-2666V-R, running at 2400)  
 Storage: 960 GB SATA SSD  
 Other: None

### Software

OS: SUSE Linux Enterprise Server 12 SP3 4.4.73-5-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 Aug-2017  
 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     | 1324       | 364         | <b>1324</b> | <b>363</b>  | 1326        | 363         | 48     | <b>1324</b> | <b>363</b>  | 1324        | 364         | 1325       | 363        |
| 507.cactuBSSN_r | 48     | 646        | 94.1        | <b>648</b>  | <b>93.8</b> | 650         | 93.5        | 48     | <b>655</b>  | <b>92.7</b> | 655         | 92.8        | 659        | 92.3       |
| 508.namd_r      | 48     | 578        | 78.9        | <b>576</b>  | <b>79.2</b> | 565         | 80.7        | 48     | 560         | 81.4        | <b>560</b>  | <b>81.4</b> | 562        | 81.2       |
| 510.parest_r    | 48     | 1704       | 73.7        | 1728        | 72.7        | <b>1713</b> | <b>73.3</b> | 48     | 1715        | 73.2        | <b>1713</b> | <b>73.3</b> | 1708       | 73.5       |
| 511.povray_r    | 48     | <b>890</b> | <b>126</b>  | 903         | 124         | 887         | 126         | 48     | <b>750</b>  | <b>149</b>  | 750         | 150         | 756        | 148        |
| 519.lbm_r       | 48     | <b>622</b> | <b>81.3</b> | 622         | 81.3        | 622         | 81.3        | 48     | <b>577</b>  | <b>87.6</b> | 577         | 87.6        | 577        | 87.7       |
| 521.wrf_r       | 48     | 812        | 132         | <b>810</b>  | <b>133</b>  | 808         | 133         | 48     | <b>790</b>  | <b>136</b>  | 790         | 136         | 790        | 136        |
| 526.blender_r   | 48     | 651        | 112         | <b>650</b>  | <b>112</b>  | 647         | 113         | 48     | <b>649</b>  | <b>113</b>  | 644         | 113         | 651        | 112        |
| 527.cam4_r      | 48     | 808        | 104         | <b>808</b>  | <b>104</b>  | 806         | 104         | 48     | <b>788</b>  | <b>107</b>  | 789         | 106         | 787        | 107        |
| 538.imagick_r   | 48     | <b>727</b> | <b>164</b>  | 728         | 164         | 726         | 164         | 48     | 738         | 162         | <b>735</b>  | <b>162</b>  | 727        | 164        |
| 544.nab_r       | 48     | <b>562</b> | <b>144</b>  | 563         | 143         | 561         | 144         | 48     | 556         | 145         | 552         | 146         | <b>554</b> | <b>146</b> |
| 549.fotonik3d_r | 48     | 1704       | 110         | <b>1703</b> | <b>110</b>  | 1701        | 110         | 48     | <b>1703</b> | <b>110</b>  | 1702        | 110         | 1703       | 110        |
| 554.roms_r      | 48     | 1231       | 61.9        | 1237        | 61.6        | <b>1236</b> | <b>61.7</b> | 48     | <b>1187</b> | <b>64.2</b> | 1185        | 64.4        | 1190       | 64.1       |

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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/ia32:/home/cpu2017/lib/intel64:/home/cpu2017/je5.0.1-32:/home/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

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>
```



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Test Date: Dec-2017

Hardware Availability: Sep-2017

Software Availability: Sep-2017

## 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 /home/cpu2017/bin/sysinfo
Rev: r5797 of 2017-06-14 96c45e4568ad54c135fd618bcc091c0f
running on linux-3eul Mon Dec 18 18:04:42 2017

```

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 4116 CPU @ 2.10GHz
 2 "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 : 12
siblings : 24
physical 0: cores 0 1 2 3 4 5 8 9 10 11 12 13
physical 1: cores 0 1 2 3 4 5 8 9 10 11 12 13

```

From lscpu:

```

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:    12
Socket(s):             2
NUMA node(s):         4
Vendor ID:             GenuineIntel
CPU family:            6
Model:                 85
Model name:            Intel(R) Xeon(R) Silver 4116 CPU @ 2.10GHz
Stepping:              4

```

(Continued on next page)



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## Platform Notes (Continued)

```

CPU MHz:                2095.107
BogoMIPS:               4190.21
Virtualization:         VT-x
L1d cache:              32K
L1i cache:              32K
L2 cache:               1024K
L3 cache:               16896K
NUMA node0 CPU(s):     0,4,8,12,16,20,24,28,32,36,40,44
NUMA node1 CPU(s):     1,5,9,13,17,21,25,29,33,37,41,45
NUMA node2 CPU(s):     2,6,10,14,18,22,26,30,34,38,42,46
NUMA node3 CPU(s):     3,7,11,15,19,23,27,31,35,39,43,47
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
aperfmpperf 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 pln pts dtherm intel_pt
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 : 16896 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
node 0 size: 95358 MB
node 0 free: 95119 MB
node 1 cpus: 1 5 9 13 17 21 25 29 33 37 41 45
node 1 size: 96759 MB
node 1 free: 96511 MB
node 2 cpus: 2 6 10 14 18 22 26 30 34 38 42 46
node 2 size: 96759 MB
node 2 free: 96494 MB
node 3 cpus: 3 7 11 15 19 23 27 31 35 39 43 47
node 3 size: 96756 MB
node 3 free: 96563 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

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## Platform Notes (Continued)

MemTotal: 394888100 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-3eul 4.4.73-5-default #1 SMP Tue Jul 4 15:33:39 UTC 2017 (b7ce4e4) x86_64
x86_64 x86_64 GNU/Linux
```

```
run-level 3 Dec 18 06:40 last=5
```

```
SPEC is set to: /home/cpu2017
```

```
Filesystem      Type  Size  Used Avail Use% Mounted on
/dev/sda3        xfs   890G   66G  825G   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 08/09/2017

Memory:

8x 002C00B3002C 18ASF2G72PDZ-2G6D1 16 GB 2 rank 2666, configured at 2400  
4x 002C0632002C 18ASF2G72PDZ-2G6D1 16 GB 2 rank 2666, configured at 2400  
12x 00AD00B300AD HMA82GR7AFR8N-VK 16 GB 2 rank 2666, configured at 2400

(End of data from sysinfo program)



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## 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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CC 511.povray\_r(peak) 526.blender\_r(peak)  
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## Compiler Version Notes (Continued)

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.  
-----

=====  
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.  
-----

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FC 554.roms\_r(peak)

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Copyright (C) 1985-2017 Intel Corporation. All rights reserved.  
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=====  
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.  
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CC 521.wrf\_r(peak) 527.cam4\_r(peak)

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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.

## 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

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





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## 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`

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++:

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## 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:

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)



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## 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)



# SPEC CPU2017 Floating Point Rate Result

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Dell Inc.

SPECrate2017\_fp\_base = 113

PowerEdge T640 (Intel Xeon Silver 4116, 2.10 GHz)

SPECrate2017\_fp\_peak = 116

CPU2017 License: 55

Test Sponsor: Dell Inc.

Tested by: Dell Inc.

Test Date: Dec-2017

Hardware Availability: Sep-2017

Software Availability: Sep-2017

## 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](mailto:info@spec.org).

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