SPEC CPU®2017 Floating Point Rate Result

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Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant DL360 Gen10
(2.10 GHz, Intel Xeon Silver 4116)

$SPECrate^®2017\_fp\_base = \quad 116$

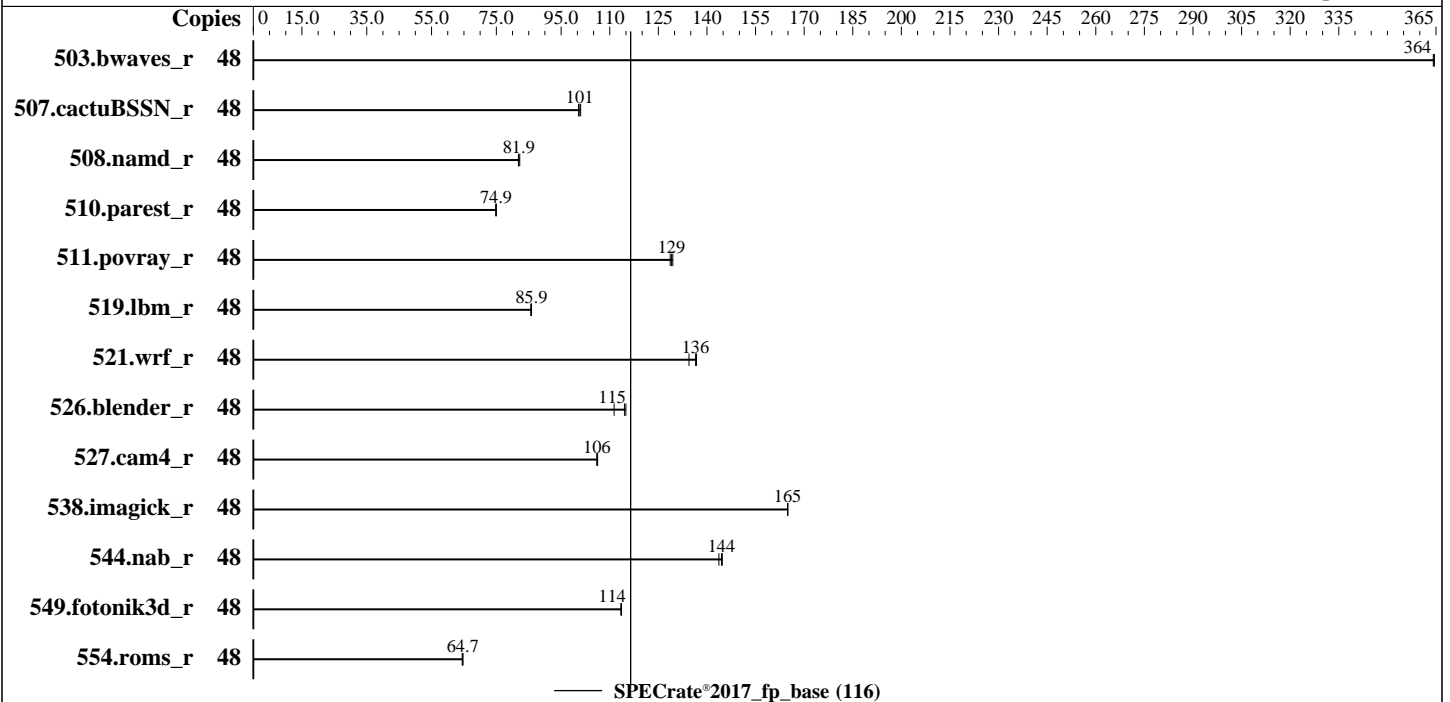$SPECrate^®2017\_fp\_peak = Not\ Run$

CPU2017 License: 3
Test Sponsor: HPE
Tested by: HPE

Test Date: Oct-2017
Hardware Availability: Oct-2017
Software Availability: Sep-2017

Benchmark	Copies	Result
503.bwaves_r	48	364
507.cactuBSSN_r	48	101
508.namd_r	48	81.9
510.parest_r	48	74.9
511.povray_r	48	129
519.lbm_r	48	85.9
521.wrf_r	48	136
526.blender_r	48	115
527.cam4_r	48	106
538.imagick_r	48	165
544.nab_r	48	144
549.fotonik3d_r	48	114
554.roms_r	48	64.7

SPECrate®2017_fp_base (116)

Hardware

CPU Name: Intel Xeon Silver 4116
  Max MHz: 3000
  Nominal: 2100
Enabled: 24 cores, 2 chips, 2 threads/core
Orderable: 1, 2 chip(s)
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: 192 GB (24 x 8 GB 2Rx8 PC4-2666V-R, running at 2400)
Storage: 1 x 600 GB SATA SSD, RAID 0
Other: None

Software

OS: SUSE Linux Enterprise Server 12 (x86_64) SP2 Kernel 4.4.21-68-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: HPE BIOS Version U32 released Oct-2017 (tested with U32 9/29/2017)
File System: xfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: Not Applicable
Other: None
Power Management: --

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SPECrate®2017_fp_peak = Not Run

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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	1321	364	1322	364	**1321**	**364**							
507.cactuBSSN_r	48	606	100	**603**	**101**	602	101							
508.namd_r	48	**557**	**81.9**	555	82.2	557	81.8							
510.parest_r	48	1674	75.0	**1676**	**74.9**	1679	74.8							
511.povray_r	48	866	129	**868**	**129**	871	129							
519.lbm_r	48	591	85.6	589	85.9	**589**	**85.9**							
521.wrf_r	48	786	137	800	134	**788**	**136**							
526.blender_r	48	657	111	**638**	**115**	636	115							
527.cam4_r	48	792	106	790	106	**791**	**106**							
538.imagick_r	48	**724**	**165**	724	165	724	165							
544.nab_r	48	**559**	**144**	558	145	562	144							
549.fotonik3d_r	48	1646	114	1649	113	**1647**	**114**							
554.roms_r	48	**1180**	**64.7**	1180	64.7	1183	64.4							
SPECrate®2017_fp_base =			**116**											
SPECrate®2017_fp_peak =			**Not Run**											

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"
Prior to runcpu invocation
Filesystem page cache synced and cleared with:
 sync; echo 3>   /proc/sys/vm/drop_caches
runspec command invoked through numactl i.e.:
 numactl --interleave=all runspec <etc>
irqbalance disabled with "service irqbalance stop"
tuned profile set wtih "tuned-adm profile throughput-performance"
VM Dirty ratio was set to 40 using "echo 40 > /proc/sys/vm/dirty_ratio"
Numa balancing was disabled using "echo 0 > /proc/sys/kernel/numa_balancing"

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"
LD_LIBRARY_PATH = "$LD_LIBRARY_PATH:/home/cpu2017/je5.0.1-64"

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Software Availability: Sep-2017

General Notes (Continued)

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

Platform Notes

```
 BIOS Configuration:
 Thermal Configuration set to Maximum Cooling
 LLC Prefetcher set to Enabled
 LLC Dead Line Allocation set to Disabled
 Stale A to S set to Disabled
 Memory Patrol Scrubbing set to disabled
 Workload Profile set to General Throughput Compute
  Minimum Processor Idle Power Core C-State set to C1E
 Sysinfo program /home/cpu2017/bin/sysinfo
 Rev: r5797 of 2017-06-14 96c45e4568ad54c135fd618bcc091c0f
 running on linux-perm Thu Oct 12 19:53:58 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
```

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Tested by:	HPE	**Software Availability:**	Sep-2017

Platform Notes (Continued)

```
       Stepping:               4
       CPU MHz:                2095.089
       BogoMIPS:               4190.17
       Virtualization:         VT-x
       L1d cache:              32K
       L1i cache:              32K
       L2 cache:               1024K
       L3 cache:               16896K
       NUMA node0 CPU(s):      0-5,24-29
       NUMA node1 CPU(s):      6-11,30-35
       NUMA node2 CPU(s):      12-17,36-41
       NUMA node3 CPU(s):      18-23,42-47
       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 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

 /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 1 2 3 4 5 24 25 26 27 28 29
   node 0 size: 47965 MB
   node 0 free: 42761 MB
   node 1 cpus: 6 7 8 9 10 11 30 31 32 33 34 35
   node 1 size: 48382 MB
   node 1 free: 45077 MB
   node 2 cpus: 12 13 14 15 16 17 36 37 38 39 40 41
   node 2 size: 48382 MB
   node 2 free: 45043 MB
   node 3 cpus: 18 19 20 21 22 23 42 43 44 45 46 47
   node 3 size: 48381 MB
   node 3 free: 45128 MB
   node distances:
   node   0   1   2   3
     0:  10  21  31  31
     1:  21  10  31  31
     2:  31  31  10  21
     3:  31  31  21  10
```

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Software Availability: Sep-2017

Platform Notes (Continued)

```
  From /proc/meminfo
     MemTotal:        197745864 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"
        CPE_NAME="cpe:/o:suse:sles:12:sp2"

  uname -a:
     Linux linux-perm 4.4.21-68-default #1 SMP Tue Oct 18 18:19:37 UTC 2016 (63cf368)
     x86_64 x86_64 x86_64 GNU/Linux

  run-level 3 Oct 12 14:05

  SPEC is set to: /home/cpu2017
     Filesystem      Type  Size  Used Avail Use% Mounted on
     /dev/sda4       xfs   517G  119G  399G  23% /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 HPE U32 09/29/2017
    Memory:
     24x UNKNOWN NOT AVAILABLE 8 GB 2 rank 2666, configured at 2400

  (End of data from sysinfo program)
```

Compiler Version Notes

```
==============================================================================
C                | 519.lbm_r(base) 538.imagick_r(base) 544.nab_r(base)
------------------------------------------------------------------------------
```

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Compiler Version Notes (Continued)

```
 icc (ICC) 18.0.0 20170811
 Copyright (C) 1985-2017 Intel Corporation.  All rights reserved.
 ------------------------------------------------------------------------


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


 ==============================================================================
 C++, C           | 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.
 ------------------------------------------------------------------------


 ==============================================================================
 C++, C, Fortran | 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.
 ------------------------------------------------------------------------


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


 ==============================================================================
 Fortran, C       | 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
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 ------------------------------------------------------------------------
```

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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`

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`

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Base Optimization Flags (Continued)

C++ benchmarks (continued):
```
-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++:
```
-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/HPE-Platform-Flags-Intel-V1.2-SKX-revD.html

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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/HPE-Platform-Flags-Intel-V1.2-SKX-revD.xml

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