SPEC® CPU2017 Floating Point Rate Result

Hewlett Packard Enterprise

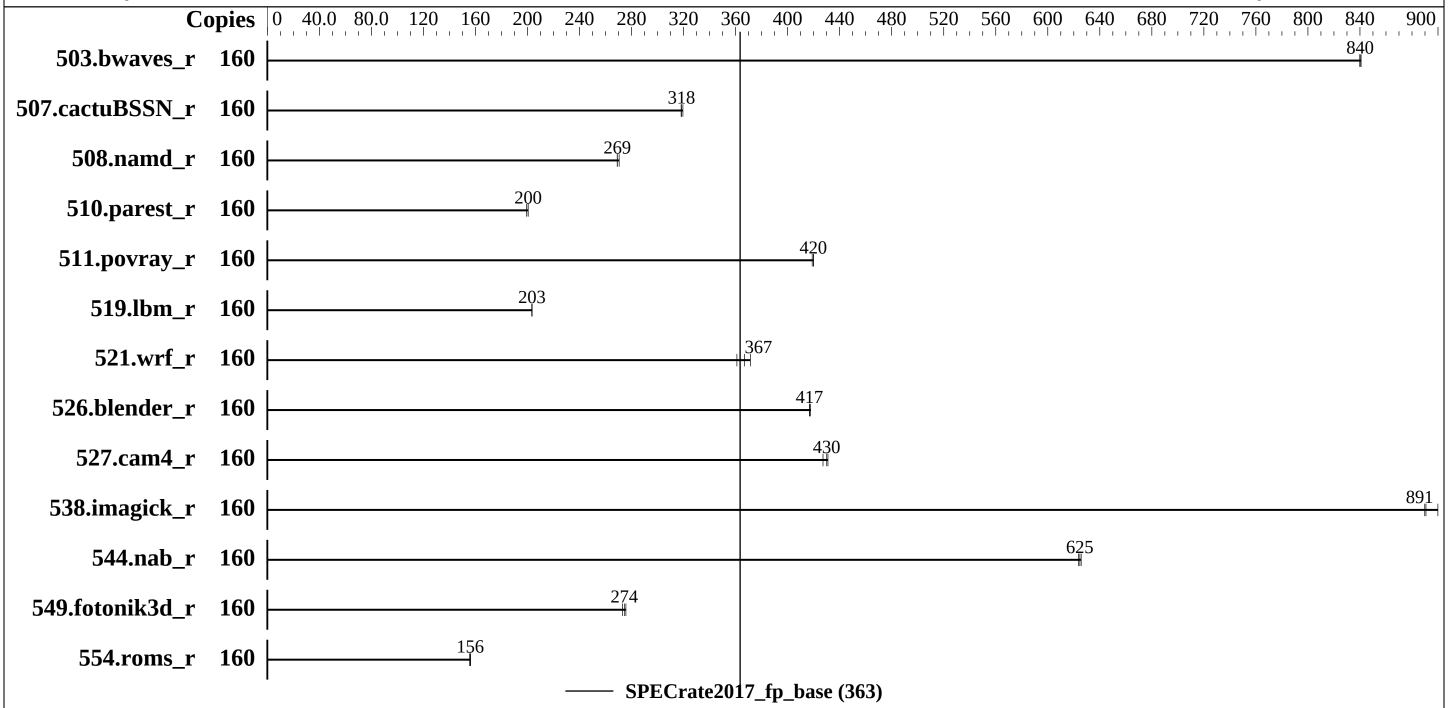
(Test Sponsor: HPE)

ProLiant DL560 Gen10
(1.80 GHz, Intel Xeon Gold 6222V)

SPECrate2017_fp_base = 363

SPECrate2017_fp_peak = Not Run

CPU2017 License:	3	**Test Date:**	Jun-2019
Test Sponsor:	HPE	**Hardware Availability:**	Apr-2019
Tested by:	HPE	**Software Availability:**	Feb-2019



Hardware

CPU Name:	Intel Xeon Gold 6222V
Max MHz.:	3600
Nominal:	1800
Enabled:	80 cores, 4 chips, 2 threads/core
Orderable:	1, 2, 4 chip(s)
Cache L1:	32 KB I + 32 KB D on chip per core
L2:	1 MB I+D on chip per core
L3:	27.5 MB I+D on chip per chip
Other:	None
Memory:	768 GB (24 x 32 GB 2Rx4 PC4-2933Y-R, running at 2400)
Storage:	1 x 400 GB SAS SSD, RAID 0
Other:	None

Software

OS:	SUSE Linux Enterprise Server 15 (x86_64) Kernel 4.12.14-23-default
Compiler:	C/C++: Version 19.0.2.187 of Intel C/C++ Compiler Build 20190117 for Linux; Fortran: Version 19.0.2.187 of Intel Fortran Compiler Build 20190117 for Linux
Parallel:	No
Firmware:	HPE BIOS Version U34 05/21/2019 released May-2019
File System:	btrfs
System State:	Run level 3 (multi-user)
Base Pointers:	64-bit
Peak Pointers:	Not Applicable
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	160	1910	840	**1910**	**840**	1908	841							
507.cactuBSSN_r	160	634	319	**636**	**318**	637	318							
508.namd_r	160	**565**	**269**	562	270	565	269							
510.parest_r	160	**2088**	**200**	2102	199	2087	201							
511.povray_r	160	**890**	**420**	892	419	890	420							
519.lbm_r	160	**829**	**203**	828	204	830	203							
521.wrf_r	160	993	361	**977**	**367**	965	371							
526.blender_r	160	**585**	**417**	585	417	583	418							
527.cam4_r	160	655	427	**651**	**430**	649	431							
538.imagick_r	160	442	900	**447**	**891**	447	890							
544.nab_r	160	432	624	**431**	**625**	430	626							
549.fotonik3d_r	160	**2272**	**274**	2284	273	2262	276							
554.roms_r	160	**1629**	**156**	1637	155	1627	156							

SPECrate2017_fp_base = 363

SPECrate2017_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"
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>
```

General Notes

```
Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH = "/home/cpu2017_u2/lib/ia32:/home/cpu2017_u2/lib/intel64"

 Binaries compiled on a system with 1x Intel Core i9-7900X CPU + 32GB RAM
 memory using Redhat Enterprise Linux 7.5
NA: 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:
  Thermal Configuration set to Maximum Cooling
  Memory Patrol Scrubbing set to Disabled
  LLC Prefetch set to Enabled
  LLC Dead Line Allocation set to Disabled
  Enhanced Processor Performance set to Enabled
  Workload Profile set to General Throughput Compute
  Workload Profile set to Custom
   Energy/Performance Bias set to Balanced Performance
   Advanced Memory Protection set to Advanced ECC
 Sysinfo program /home/cpu2017_u2/bin/sysinfo
 Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
 running on linux-erfc Wed Jun 19 15:57:25 2019

 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 6222V CPU @ 1.80GHz
       4  "physical id"s (chips)
       160 "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 : 20
       siblings  : 40
       physical 0: cores 0 1 2 3 8 9 10 11 12 16 17 18 19 20 24 25 26 27 28
       physical 1: cores 0 1 2 3 8 9 10 11 12 16 17 18 19 20 24 25 26 27 28
       physical 2: cores 0 1 2 3 8 9 10 11 12 16 17 18 19 20 24 25 26 27 28
       physical 3: cores 0 1 2 3 8 9 10 11 12 16 17 18 19 20 24 25 26 27 28

 From lscpu:
      Architecture:        x86_64
      CPU op-mode(s):      32-bit, 64-bit
      Byte Order:          Little Endian
      CPU(s):              160
      On-line CPU(s) list: 0-159
      Thread(s) per core:  2
```

(Continued on next page)

Platform Notes (Continued)

```
      Core(s) per socket:  20
      Socket(s):           4
      NUMA node(s):        8
      Vendor ID:           GenuineIntel
      CPU family:          6
      Model:               85
      Model name:          Intel(R) Xeon(R) Gold 6222V CPU @ 1.80GHz
      Stepping:            7
      CPU MHz:             1800.000
      BogoMIPS:            3600.00
      Virtualization:      VT-x
      L1d cache:           32K
      L1i cache:           32K
      L2 cache:            1024K
      L3 cache:            28160K
      NUMA node0 CPU(s):   0-9,80-89
      NUMA node1 CPU(s):   10-19,90-99
      NUMA node2 CPU(s):   20-29,100-109
      NUMA node3 CPU(s):   30-39,110-119
      NUMA node4 CPU(s):   40-49,120-129
      NUMA node5 CPU(s):   50-59,130-139
      NUMA node6 CPU(s):   60-69,140-149
      NUMA node7 CPU(s):   70-79,150-159
      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 cpuid
      aperfmperf tsc_known_freq 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 cpuid_fault
      epb cat_l3 cdp_l3 invpcid_single intel_ppin mba tpr_shadow vnmi flexpriority ept
      vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm cqm mpx rdt_a
      avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd avx512bw avx512vl
      xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local
      ibpb ibrs stibp dtherm ida arat pln pts pku ospke avx512_vnni arch_capabilities ssbd

 /proc/cpuinfo cache data
    cache size : 28160 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 3 4 5 6 7 8 9 80 81 82 83 84 85 86 87 88 89
   node 0 size: 96349 MB
   node 0 free: 90576 MB
   node 1 cpus: 10 11 12 13 14 15 16 17 18 19 90 91 92 93 94 95 96 97 98 99
   node 1 size: 96764 MB
   node 1 free: 92782 MB
```

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Platform Notes (Continued)

```
    node 2 cpus: 20 21 22 23 24 25 26 27 28 29 100 101 102 103 104 105 106 107 108 109
    node 2 size: 96764 MB
    node 2 free: 92339 MB
    node 3 cpus: 30 31 32 33 34 35 36 37 38 39 110 111 112 113 114 115 116 117 118 119
    node 3 size: 96764 MB
    node 3 free: 92551 MB
    node 4 cpus: 40 41 42 43 44 45 46 47 48 49 120 121 122 123 124 125 126 127 128 129
    node 4 size: 96764 MB
    node 4 free: 92773 MB
    node 5 cpus: 50 51 52 53 54 55 56 57 58 59 130 131 132 133 134 135 136 137 138 139
    node 5 size: 96735 MB
    node 5 free: 92752 MB
    node 6 cpus: 60 61 62 63 64 65 66 67 68 69 140 141 142 143 144 145 146 147 148 149
    node 6 size: 96764 MB
    node 6 free: 92724 MB
    node 7 cpus: 70 71 72 73 74 75 76 77 78 79 150 151 152 153 154 155 156 157 158 159
    node 7 size: 96762 MB
    node 7 free: 92781 MB
    node distances:
    node   0   1   2   3   4   5   6   7
      0:  10  21  31  31  31  31  31  31
      1:  21  10  31  31  31  31  31  31
      2:  31  31  10  21  31  31  31  31
      3:  31  31  21  10  31  31  31  31
      4:  31  31  31  31  10  21  31  31
      5:  31  31  31  31  21  10  31  31
      6:  31  31  31  31  31  31  10  21
      7:  31  31  31  31  31  31  21  10

  From /proc/meminfo
     MemTotal:       792235344 kB
     HugePages_Total:       0
     Hugepagesize:       2048 kB

  From /etc/*release* /etc/*version*
     os-release:
        NAME="SLES"
        VERSION="15"
        VERSION_ID="15"
        PRETTY_NAME="SUSE Linux Enterprise Server 15"
        ID="sles"
        ID_LIKE="suse"
        ANSI_COLOR="0;32"
        CPE_NAME="cpe:/o:suse:sles:15"

  uname -a:
     Linux linux-erfc 4.12.14-23-default #1 SMP Tue May 29 21:04:44 UTC 2018 (cd0437b)
```

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Platform Notes (Continued)

```
   x86_64 x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:

CVE-2017-5754 (Meltdown):          Not affected
CVE-2017-5753 (Spectre variant 1): Mitigation: __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Indirect Branch Restricted Speculation,
IBPB, IBRS_FW

run-level 3 Jun 19 01:55

SPEC is set to: /home/cpu2017_u2
   Filesystem     Type   Size  Used Avail Use% Mounted on
   /dev/sda2      btrfs  371G  133G  237G  36% /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 U34 05/21/2019
  Memory:
   24x UNKNOWN NOT AVAILABLE
   24x UNKNOWN NOT AVAILABLE 32 GB 2 rank 2933, configured at 2400

(End of data from sysinfo program)
```

Compiler Version Notes

```
==============================================================================
 CC  519.lbm_r(base) 538.imagick_r(base) 544.nab_r(base)
------------------------------------------------------------------------------
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.2.187 Build 20190117
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------

==============================================================================
 CXXC 508.namd_r(base) 510.parest_r(base)
------------------------------------------------------------------------------
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.2.187 Build 20190117
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------

==============================================================================
 CC  511.povray_r(base) 526.blender_r(base)
```

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Compiler Version Notes (Continued)

```
------------------------------------------------------------------------------
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.2.187 Build 20190117
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.2.187 Build 20190117
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------

==============================================================================
 FC  507.cactuBSSN_r(base)
------------------------------------------------------------------------------
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.2.187 Build 20190117
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.2.187 Build 20190117
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
  64, Version 19.0.2.187 Build 20190117
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------

==============================================================================
 FC  503.bwaves_r(base) 549.fotonik3d_r(base) 554.roms_r(base)
------------------------------------------------------------------------------
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
  64, Version 19.0.2.187 Build 20190117
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------

==============================================================================
 CC  521.wrf_r(base) 527.cam4_r(base)
------------------------------------------------------------------------------
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
  64, Version 19.0.2.187 Build 20190117
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.2.187 Build 20190117
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------
```

Base Compiler Invocation

C benchmarks:
`icc -m64 -std=c11`

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Base Compiler Invocation (Continued)

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`

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=4`

C++ benchmarks:
`-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only`
`-qopt-mem-layout-trans=4`

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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=4 -auto -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=4 -auto -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=4`

Benchmarks using Fortran, C, and C++:
`-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4 -auto -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/HPE-ic19.0u1-flags-linux64.html
http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-V1.2-CLX-revB.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/HPE-ic19.0u1-flags-linux64.xml
http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-V1.2-CLX-revB.xml

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

Tested with SPEC CPU2017 v1.0.5 on 2019-06-19 06:27:24-0400.
Report generated on 2019-07-22 11:43:04 by CPU2017 PS formatter v6067.
Originally published on 2019-07-21.