SPEC® CPU2017 Floating Point Rate Result

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Lenovo Global Technology

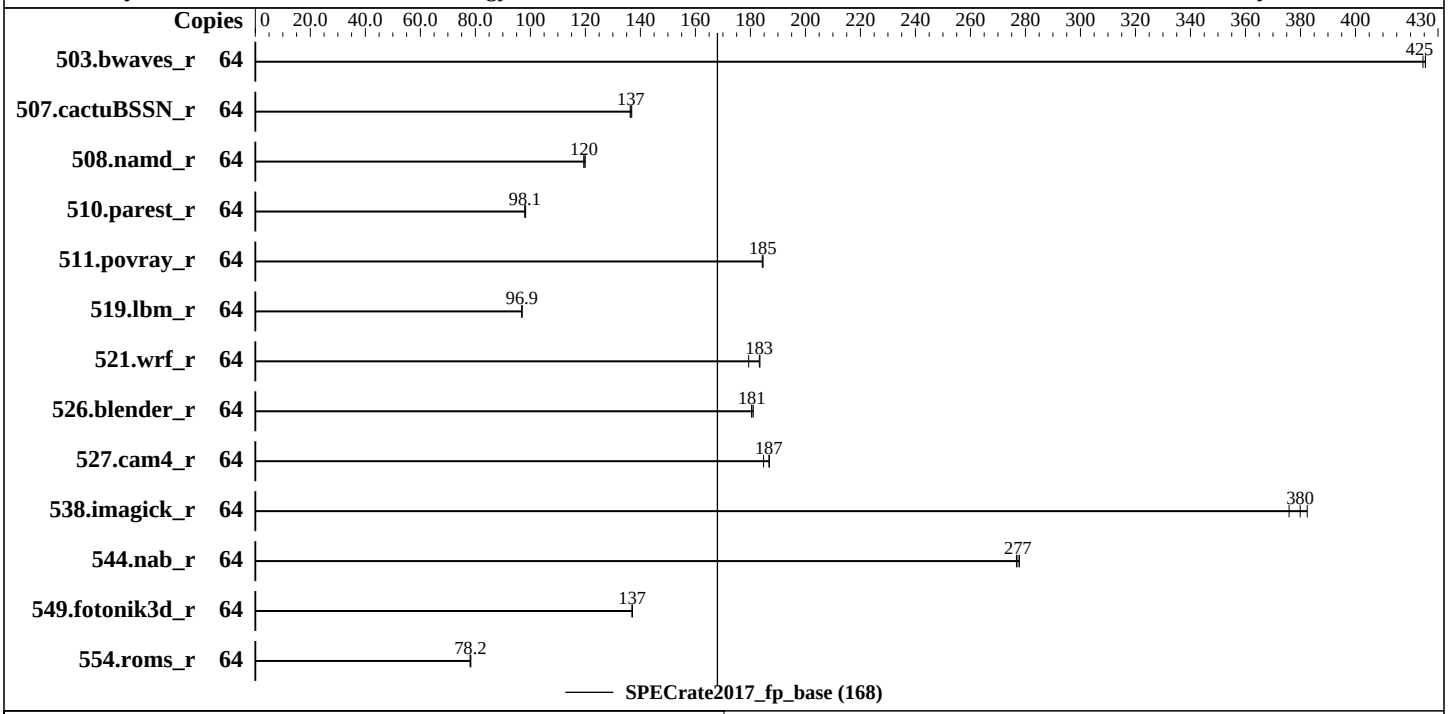
ThinkSystem SR650
(2.10 GHz, Intel Xeon Silver 4216)

SPECrate2017_fp_base = 168

SPECrate2017_fp_peak = Not Run

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

Test Date: Jun-2019
Hardware Availability: Apr-2019
Software Availability: Nov-2018



Hardware

CPU Name:	Intel Xeon Silver 4216
Max MHz.:	3200
Nominal:	2100
Enabled:	32 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:	22 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 800 GB SATA SSD
Other:	None

Software

OS:	Red Hat Enterprise Linux Server release 7.6 (Maipo) Kernel 3.10.0-957.el7.x86_64
Compiler:	C/C++: Version 19.0.1.144 of Intel C/C++ Compiler Build 20181018 for Linux; Fortran: Version 19.0.1.144 of Intel Fortran Compiler Build 20181018 for Linux
Parallel:	No
Firmware:	Lenovo BIOS Version IVE142E 2.30 released Aug-2019 tested as IVE135R 2.10 Feb-2019
File System:	xfs
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	64	1512	425	1508	425	**1509**	**425**							
507.cactuBSSN_r	64	594	136	592	137	**593**	**137**							
508.namd_r	64	507	120	**509**	**120**	509	119							
510.parest_r	64	1704	98.3	1709	98.0	**1707**	**98.1**							
511.povray_r	64	810	185	**810**	**185**	811	184							
519.lbm_r	64	696	96.9	696	96.9	**696**	**96.9**							
521.wrf_r	64	781	183	799	179	**782**	**183**							
526.blender_r	64	538	181	**540**	**181**	540	180							
527.cam4_r	64	**599**	**187**	599	187	606	185							
538.imagick_r	64	**419**	**380**	416	382	423	376							
544.nab_r	64	389	277	**388**	**277**	388	278							
549.fotonik3d_r	64	**1820**	**137**	1819	137	1821	137							
554.roms_r	64	1298	78.4	1302	78.1	**1300**	**78.2**							

SPECrate2017_fp_base = 168

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"
```

General Notes

```
Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH = "/home/cpu2017-1.0.5-ic19.0u1/lib/intel64"

 Binaries compiled on a system with 1x Intel Core i9-7900X CPU + 32GB RAM
 memory using Redhat Enterprise Linux 7.5
 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>
NA: The test sponsor attests, as of date of publication, that CVE-2017-5754 (Meltdown)
is mitigated in the system as tested and documented.
```

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General Notes (Continued)

```
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.
Yes: The test sponsor attests, as of date of publication, that CVE-2018-3640 (Spectre variant 3a)
is mitigated in the system as tested and documented.
Yes: The test sponsor attests, as of date of publication, that CVE-2018-3639 (Spectre variant 4)
is mitigated in the system as tested and documented.
```

Platform Notes

```
BIOS configuration:
Choose Operating Mode set to Maximum Performance
Choose Operating Mode set to Custom Mode
C-states set to Legacy
SNC set to Enable
DCU Streamer Prefetcher set to Disable
Trusted Execution Technology set to Enable
Stale AtoS set to Enable
LLC dead line alloc set to Disable
Patrol Scrub set to Disable
 Sysinfo program /home/cpu2017-1.0.5-ic19.0u1/bin/sysinfo
 Rev: r5974 of 2018-05-19 9bcde8f2999c33d61f64985e45859ea9
 running on localhost.localdomain Fri Jun 28 21:02:33 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) Silver 4216 CPU @ 2.10GHz
       2  "physical id"s (chips)
       64 "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 : 16
       siblings  : 32
       physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
       physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

 From lscpu:
      Architecture:          x86_64
      CPU op-mode(s):        32-bit, 64-bit
      Byte Order:            Little Endian
      CPU(s):                64
      On-line CPU(s) list:   0-63
```

(Continued on next page)

Platform Notes (Continued)

```
      Thread(s) per core:    2
      Core(s) per socket:    16
      Socket(s):             2
      NUMA node(s):          4
      Vendor ID:             GenuineIntel
      CPU family:            6
      Model:                 85
      Model name:            Intel(R) Xeon(R) Silver 4216 CPU @ 2.10GHz
      Stepping:              6
      CPU MHz:               2100.000
      BogoMIPS:              4200.00
      Virtualization:        VT-x
      L1d cache:             32K
      L1i cache:             32K
      L2 cache:              1024K
      L3 cache:              22528K
      NUMA node0 CPU(s):     0-3,8-11,32-35,40-43
      NUMA node1 CPU(s):     4-7,12-15,36-39,44-47
      NUMA node2 CPU(s):     16-19,24-27,48-51,56-59
      NUMA node3 CPU(s):     20-23,28-31,52-55,60-63
      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 epb cat_l3 cdp_l3 intel_pt ssbd mba
      ibrs ibpb stibp ibrs_enhanced 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 avx512cd avx512bw avx512vl xsaveopt xsavec xgetbv1
      cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local dtherm ida arat pln pts pku ospke
      avx512_vnni spec_ctrl intel_stibp flush_l1d arch_capabilities

  /proc/cpuinfo cache data
     cache size : 22528 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 8 9 10 11 32 33 34 35 40 41 42 43
    node 0 size: 196221 MB
    node 0 free: 191441 MB
    node 1 cpus: 4 5 6 7 12 13 14 15 36 37 38 39 44 45 46 47
    node 1 size: 196608 MB
    node 1 free: 191640 MB
    node 2 cpus: 16 17 18 19 24 25 26 27 48 49 50 51 56 57 58 59
    node 2 size: 196608 MB
    node 2 free: 191985 MB
```

(Continued on next page)

Platform Notes (Continued)

```
   node 3 cpus: 20 21 22 23 28 29 30 31 52 53 54 55 60 61 62 63
   node 3 size: 196608 MB
   node 3 free: 191937 MB
   node distances:
   node   0   1   2   3
     0:  10  11  21  21
     1:  11  10  21  21
     2:  21  21  10  11
     3:  21  21  11  10

From /proc/meminfo
   MemTotal:       792179288 kB
   HugePages_Total:       0
   Hugepagesize:       2048 kB

From /etc/*release* /etc/*version*
   os-release:
      NAME="Red Hat Enterprise Linux Server"
      VERSION="7.6 (Maipo)"
      ID="rhel"
      ID_LIKE="fedora"
      VARIANT="Server"
      VARIANT_ID="server"
      VERSION_ID="7.6"
      PRETTY_NAME="Red Hat Enterprise Linux Server 7.6 (Maipo)"
   redhat-release: Red Hat Enterprise Linux Server release 7.6 (Maipo)
   system-release: Red Hat Enterprise Linux Server release 7.6 (Maipo)
   system-release-cpe: cpe:/o:redhat:enterprise_linux:7.6:ga:server

uname -a:
   Linux localhost.localdomain 3.10.0-957.el7.x86_64 #1 SMP Thu Oct 4 20:48:51 UTC 2018
   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: Load fences, __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Enhanced IBRS

run-level 3 Jun 28 11:02

SPEC is set to: /home/cpu2017-1.0.5-ic19.0u1
   Filesystem     Type  Size  Used Avail Use% Mounted on
   /dev/sdb2      xfs   689G  116G  573G  17% /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
```

(Continued on next page)

Platform Notes (Continued)

```
 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 -[IVE135R-2.10]- 02/27/2019
   Memory:
    24x Samsung M393A4K40CB2-CVF 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 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 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 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------

==============================================================================
 CC  511.povray_r(base) 526.blender_r(base)
------------------------------------------------------------------------------
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation.  All rights reserved.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 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 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation.  All rights reserved.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation.  All rights reserved.
```

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Compiler Version Notes (Continued)

```
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
  64, Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 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 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 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 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 Intel Corporation.  All rights reserved.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.1.144 Build 20181018
Copyright (C) 1985-2018 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`

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

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/Intel-ic18.0-official-linux64.2019-04-02.html
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-CLX-D.html

You can also download the XML flags sources by saving the following links:

http://www.spec.org/cpu2017/flags/Intel-ic18.0-official-linux64.2019-04-02.xml
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-CLX-D.xml

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