# SPEC CPU®2017 Floating Point Rate Result

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## Lenovo Global Technology

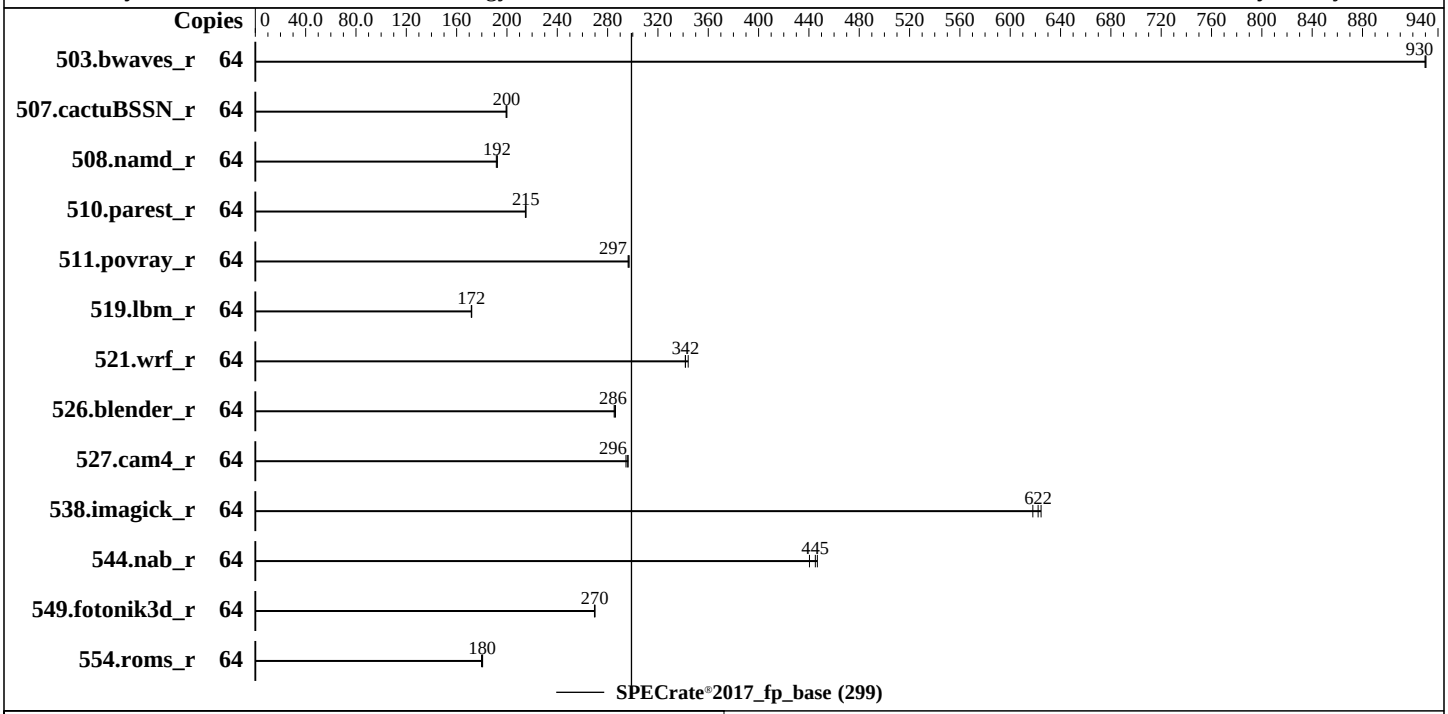
ThinkSystem SR950
(3.60 GHz, Intel Xeon Gold 6244)

SPECrate®2017_fp_base = 299

SPECrate®2017_fp_peak = Not Run

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

**Test Date:** Nov-2019
**Hardware Availability:** Apr-2019
**Software Availability:** May-2019




## Hardware

| | |
|---|---|
| CPU Name: | Intel Xeon Gold 6244 |
| Max MHz: | 4400 |
| Nominal: | 3600 |
| Enabled: | 32 cores, 4 chips, 2 threads/core |
| Orderable: | 2,3,4 chips |
| Cache L1: | 32 KB I + 32 KB D on chip per core |
| L2: | 1 MB I+D on chip per core |
| L3: | 24.75 MB I+D on chip per chip |
| Other: | None |
| Memory: | 768 GB (48 x 16 GB 2Rx8 PC4-2933Y-R) |
| Storage: | 1 x 800 GB SATA SSD |
| Other: | None |

## Software

| | |
|---|---|
| OS: | SUSE Linux Enterprise Server 15 (x86_64) Kernel 4.12.14-25.13-default |
| Compiler: | C/C++: Version 19.0.4.227 of Intel C/C++ Compiler for Linux; Fortran: Version 19.0.4.227 of Intel Fortran Compiler for Linux |
| Parallel: | No |
| Firmware: | Lenovo BIOS Version PSE122R 1.53 released Aug-2019 tested as PSE121R 1.53 Jul-2019 |
| File System: | xfs |
| System State: | Run level 3 (multi-user) |
| Base Pointers: | 64-bit |
| Peak Pointers: | Not Applicable |
| Other: | None |
| Power Management: | BIOS set to prefer performance at the cost of additional power usage |

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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 | **690** | **930** | 690 | 930 | 690 | 930 | | | | | | | |
| 507.cactuBSSN_r | 64 | **406** | **200** | 405 | 200 | 407 | 199 | | | | | | | |
| 508.namd_r | 64 | 317 | 192 | 316 | 192 | **316** | **192** | | | | | | | |
| 510.parest_r | 64 | 779 | 215 | **779** | **215** | 780 | 215 | | | | | | | |
| 511.povray_r | 64 | 503 | 297 | **503** | **297** | 504 | 296 | | | | | | | |
| 519.lbm_r | 64 | 392 | 172 | **393** | **172** | 393 | 172 | | | | | | | |
| 521.wrf_r | 64 | **419** | **342** | 419 | 342 | 417 | 344 | | | | | | | |
| 526.blender_r | 64 | **341** | **286** | 340 | 286 | 342 | 285 | | | | | | | |
| 527.cam4_r | 64 | 378 | 296 | 380 | 295 | **379** | **296** | | | | | | | |
| 538.imagick_r | 64 | **256** | **622** | 255 | 625 | 258 | 618 | | | | | | | |
| 544.nab_r | 64 | **242** | **445** | 245 | 440 | 241 | 447 | | | | | | | |
| 549.fotonik3d_r | 64 | 924 | 270 | **924** | **270** | 925 | 270 | | | | | | | |
| 554.roms_r | 64 | 563 | 181 | **564** | **180** | 566 | 180 | | | | | | | |

**SPECrate®2017_fp_base = 299**

**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"
```

## Environment Variables Notes

```
Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH = "/home/cpu2017-1.1.0-ic19.0u4/lib/intel64"
```

## General Notes

```
Binaries compiled on a system with 1x Intel Core i9-799X 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
```

**(Continued on next page)**

## General Notes (Continued)

```
 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.
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 and then set it to Custom Mode
Intel Virtualization Technology set to Disable
MONITOR/MWAIT set to Enable
SNC set to Enable

 Sysinfo program /home/cpu2017-1.1.0-ic19.0u4/bin/sysinfo
 Rev: r6365 of 2019-08-21 295195f888a3d7edb1e6e46a485a0011
 running on linux-u1b8 Sat Nov  9 16:23:55 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 6244 CPU @ 3.60GHz
       4  "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 : 8
       siblings  : 16
       physical 0: cores 2 3 17 18 19 20 24 25
       physical 1: cores 2 4 9 20 24 25 26 27
       physical 2: cores 4 8 17 18 19 24 25 27
       physical 3: cores 2 3 4 8 17 20 24 26

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

**(Continued on next page)**

## Platform Notes (Continued)

```
      CPU(s):              64
      On-line CPU(s) list: 0-63
      Thread(s) per core:  2
      Core(s) per socket:  8
      Socket(s):           4
      NUMA node(s):        8
      Vendor ID:           GenuineIntel
      CPU family:          6
      Model:               85
      Model name:          Intel(R) Xeon(R) Gold 6244 CPU @ 3.60GHz
      Stepping:            6
      CPU MHz:             3600.000
      CPU max MHz:         4400.0000
      CPU min MHz:         1200.0000
      BogoMIPS:            7200.00
      Virtualization:      VT-x
      L1d cache:           32K
      L1i cache:           32K
      L2 cache:            1024K
      L3 cache:            25344K
      NUMA node0 CPU(s):   0,2,6,7,32,34,38,39
      NUMA node1 CPU(s):   1,3-5,33,35-37
      NUMA node2 CPU(s):   8,10,12,13,40,42,44,45
      NUMA node3 CPU(s):   9,11,14,15,41,43,46,47
      NUMA node4 CPU(s):   16,19,20,23,48,51,52,55
      NUMA node5 CPU(s):   17,18,21,22,49,50,53,54
      NUMA node6 CPU(s):   24,27,28,30,56,59,60,62
      NUMA node7 CPU(s):   25,26,29,31,57,58,61,63
      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 cpuid
      aperfmperf 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 ssbd mba ibrs ibpb stibp 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
      dtherm ida arat pln pts pku ospke avx512_vnni flush_l1d arch_capabilities

  /proc/cpuinfo cache data
     cache size : 25344 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 2 6 7 32 34 38 39
```

**(Continued on next page)**

## Platform Notes (Continued)

```
   node 0 size: 96358 MB
   node 0 free: 95868 MB
   node 1 cpus: 1 3 4 5 33 35 36 37
   node 1 size: 96757 MB
   node 1 free: 93500 MB
   node 2 cpus: 8 10 12 13 40 42 44 45
   node 2 size: 96728 MB
   node 2 free: 96353 MB
   node 3 cpus: 9 11 14 15 41 43 46 47
   node 3 size: 96757 MB
   node 3 free: 96530 MB
   node 4 cpus: 16 19 20 23 48 51 52 55
   node 4 size: 96757 MB
   node 4 free: 96509 MB
   node 5 cpus: 17 18 21 22 49 50 53 54
   node 5 size: 96757 MB
   node 5 free: 96529 MB
   node 6 cpus: 24 27 28 30 56 59 60 62
   node 6 size: 96757 MB
   node 6 free: 96504 MB
   node 7 cpus: 25 26 29 31 57 58 61 63
   node 7 size: 96754 MB
   node 7 free: 96513 MB
   node distances:
   node   0   1   2   3   4   5   6   7
     0:  10  11  21  21  21  21  21  21
     1:  11  10  21  21  21  21  21  21
     2:  21  21  10  11  21  21  21  21
     3:  21  21  11  10  21  21  21  21
     4:  21  21  21  21  10  11  21  21
     5:  21  21  21  21  11  10  21  21
     6:  21  21  21  21  21  21  10  11
     7:  21  21  21  21  21  21  11  10

  From /proc/meminfo
     MemTotal:       792196724 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"
```

**(Continued on next page)**

## Platform Notes (Continued)

```
      ANSI_COLOR="0;32"
      CPE_NAME="cpe:/o:suse:sles:15"

 uname -a:
    Linux linux-u1b8 4.12.14-25.13-default #1 SMP Tue Aug 14 15:07:35 UTC 2018 (947aa51)
    x86_64 x86_64 x86_64 GNU/Linux

 Kernel self-reported vulnerability status:

 CVE-2018-3620 (L1 Terminal Fault):        Not affected
 Microarchitectural Data Sampling:         No status reported
 CVE-2017-5754 (Meltdown):                 Not affected
 CVE-2018-3639 (Speculative Store Bypass): Mitigation: Speculative Store Bypass disabled
                                           via prctl and seccomp
 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 Nov 8 17:53

 SPEC is set to: /home/cpu2017-1.1.0-ic19.0u4
    Filesystem     Type  Size  Used Avail Use% Mounted on
    /dev/sda2      xfs   744G   75G  670G  10% /

 From /sys/devices/virtual/dmi/id
     BIOS:    Lenovo -[PSE121R-1.53]- 07/03/2019
     Vendor:  Lenovo
     Product: ThinkSystem SR950 -[7X12ABC1WW]-
     Product Family: ThinkSystem
     Serial:  none

 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.
   Memory:
     48x NO DIMM NO DIMM
     48x Samsung M393A2K43CB2-CVF 16 GB 2 rank 2933

 (End of data from sysinfo program)
```

## Compiler Version Notes

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


**(Continued on next page)**

## Compiler Version Notes (Continued)

```
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------

==============================================================================
C++             | 508.namd_r(base) 510.parest_r(base)
------------------------------------------------------------------------------
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------

==============================================================================
C++, C          | 511.povray_r(base) 526.blender_r(base)
------------------------------------------------------------------------------
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------

==============================================================================
C++, C, Fortran | 507.cactuBSSN_r(base)
------------------------------------------------------------------------------
Intel(R) C++ Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
  64, Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------

==============================================================================
Fortran         | 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 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------

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

**(Continued on next page)**

## Compiler Version Notes (Continued)

```
Fortran, C      | 521.wrf_r(base) 527.cam4_r(base)
------------------------------------------------------------------------------
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
  64, Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 Intel Corporation.  All rights reserved.
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.0.4.227 Build 20190416
Copyright (C) 1985-2019 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`

**(Continued on next page)**

## Base Portability Flags (Continued)

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-ic19.0u1-official-linux64.2019-07-09.html
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-CLX-F.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/Intel-ic19.0u1-official-linux64.2019-07-09.xml
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-CLX-F.xml

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

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