## Lenovo Global Technology

**ThinkSystem SR650 V2**

(2.60 GHz, Intel Xeon Gold 6348)

<table>
<thead>
<tr>
<th>SPECrate®2017_fp_base =</th>
<th>405</th>
</tr>
</thead>
</table>

**SPECrate®2017_fp_peak = Not Run**

---

### Hardware

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>CPU Name:</strong></td>
<td>Intel Xeon Gold 6348</td>
</tr>
<tr>
<td><strong>Max MHz:</strong></td>
<td>3500</td>
</tr>
<tr>
<td><strong>Nominal:</strong></td>
<td>2600</td>
</tr>
<tr>
<td><strong>Enabled:</strong></td>
<td>56 cores, 2 chips</td>
</tr>
<tr>
<td><strong>Orderable:</strong></td>
<td>1,2 chips</td>
</tr>
<tr>
<td><strong>Cache L1:</strong></td>
<td>32 KB I + 48 KB D on chip per core</td>
</tr>
<tr>
<td><strong>L2:</strong></td>
<td>1.25 MB I+D on chip per core</td>
</tr>
<tr>
<td><strong>L3:</strong></td>
<td>42 MB I+D on chip per chip</td>
</tr>
<tr>
<td><strong>Memory:</strong></td>
<td>1 TB (32 x 32 GB 2Rx8 PC4-3200AA-R)</td>
</tr>
<tr>
<td><strong>Storage:</strong></td>
<td>1 x 960 GB SATA SSD</td>
</tr>
<tr>
<td><strong>Other:</strong></td>
<td>None</td>
</tr>
</tbody>
</table>

### Software

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OS:</strong></td>
<td>SUSE Linux Enterprise Server 15 SP2 (x86_64)</td>
</tr>
<tr>
<td></td>
<td>Kernel 5.3.18-22-default</td>
</tr>
<tr>
<td><strong>Compiler:</strong></td>
<td>C/C++: Version 2021.1 of Intel oneAPI DPC++/C++</td>
</tr>
<tr>
<td></td>
<td>Compiler Build 20201113 for Linux;</td>
</tr>
<tr>
<td></td>
<td>Fortran: Version 2021.1 of Intel Fortran Compiler</td>
</tr>
<tr>
<td></td>
<td>Classic Build 20201112 for Linux;</td>
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<tr>
<td></td>
<td>C/C++: Version 2021.1 of Intel C/C++ Compiler</td>
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<td></td>
<td>Classic Build 20201112 for Linux</td>
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<tr>
<td><strong>Parallel:</strong></td>
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<tr>
<td><strong>Firmware:</strong></td>
<td>Lenovo BIOS Version AFE109PT1 1.00</td>
</tr>
<tr>
<td></td>
<td>released Apr-2021</td>
</tr>
<tr>
<td><strong>File System:</strong></td>
<td>xfs</td>
</tr>
<tr>
<td><strong>System State:</strong></td>
<td>Run level 3 (multi-user)</td>
</tr>
<tr>
<td><strong>Base Pointers:</strong></td>
<td>64-bit</td>
</tr>
<tr>
<td><strong>Peak Pointers:</strong></td>
<td>Not Applicable</td>
</tr>
<tr>
<td><strong>Other:</strong></td>
<td>jemalloc memory allocator V5.0.1</td>
</tr>
<tr>
<td><strong>Power Management:</strong></td>
<td>BIOS and OS set to prefer performance at the cost of additional power usage</td>
</tr>
</tbody>
</table>
## Lenovo Global Technology

ThinkSystem SR650 V2  
(2.60 GHz, Intel Xeon Gold 6348)

### CPU2017 License: 9017

Test Sponsor: Lenovo Global Technology  

Tested by: Lenovo Global Technology

---

### Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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<tbody>
<tr>
<td>503.bwaves_r</td>
<td>56</td>
<td>760</td>
<td>739</td>
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<td>761</td>
<td>738</td>
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<tr>
<td>507.cactuBSSN_r</td>
<td>56</td>
<td>122</td>
<td>583</td>
<td>121</td>
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<td>121</td>
<td>588</td>
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<tr>
<td>508.namd_r</td>
<td>56</td>
<td>166</td>
<td>321</td>
<td>166</td>
<td>321</td>
<td>166</td>
<td>320</td>
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<tr>
<td>510.parest_r</td>
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<tr>
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<td>257</td>
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<td>258</td>
<td>507</td>
<td>261</td>
<td>501</td>
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<tr>
<td>519.lbm_r</td>
<td>56</td>
<td>220</td>
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<td>221</td>
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<td>268</td>
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<tr>
<td>521.wrf_r</td>
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<td>357</td>
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<td>526.blender_r</td>
<td>56</td>
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<td>527.cam4_r</td>
<td>56</td>
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<td>424</td>
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<td>425</td>
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<tr>
<td>538.imagick_r</td>
<td>56</td>
<td>128</td>
<td>1080</td>
<td>133</td>
<td>1050</td>
<td>128</td>
<td>1080</td>
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<tr>
<td>544.nab_r</td>
<td>56</td>
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<td>604</td>
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<td>603</td>
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<tr>
<td>549.fotonik3d_r</td>
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<td>954</td>
<td>229</td>
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<tr>
<td>554.roms_r</td>
<td>56</td>
<td>458</td>
<td>194</td>
<td>459</td>
<td>194</td>
<td>458</td>
<td>194</td>
</tr>
</tbody>
</table>

**SPECrate®2017_fp_base = 405**  
**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/cpu2017-1.1.5-ic2021.1-revA-update1/lib/intel64:/home/cpu2017-1.1.5-ic2021.1-revA-update1/je5.0.1-64"
MALLOC_CONF = "retain:true"
```

### General Notes

Binaries compiled on a system with 1x Intel Core i9-7940X CPU + 64GB RAM  
memory using openSUSE Leap 15.2  
Transparent Huge Pages enabled by default

(Continued on next page)
Lenovo Global Technology
ThinkSystem SR650 V2
(2.60 GHz, Intel Xeon Gold 6348)

SPECRate®2017_fp_base = 405
SPECRate®2017_fp_peak = Not Run

General Notes (Continued)

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.
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.

jemalloc, a general purpose malloc implementation
built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5

Platform Notes

BIOS configuration:
Choose Operating Mode set to Maximum Performance
Hyper-Threading set to Disabled
DCU Streamer Prefetcher set to Disabled
DCU IP Prefetcher set to Disabled
SNC set to Enabled
Patrol Scrub set to Disabled

Sysinfo program /home/cpu2017-1.1.5-ic2021.1-revA-updatel/bin/sysinfo
Rev: r6538 of 2020-09-24 e8664e66d2d7080afeaa89d4b38e2f1c
running on localhost Wed May 19 01:41:00 2021

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 6348 CPU @ 2.60GHz
  2 "physical id"s (chips)
  56 "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 : 28
siblings : 28
  physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27
  physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27
Lenovo Global Technology
ThinkSystem SR650 V2
(2.60 GHz, Intel Xeon Gold 6348)

SPECrate®2017_fp_base = 405
SPECrate®2017_fp_peak = Not Run

CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Test Date: May-2021
Tested by: Lenovo Global Technology
Hardware Availability: Jul-2021
Software Availability: Feb-2021

<table>
<thead>
<tr>
<th>Platform Notes (Continued)</th>
</tr>
</thead>
</table>

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
Address sizes: 46 bits physical, 57 bits virtual
CPU(s): 56
On-line CPU(s) list: 0-55
Thread(s) per core: 1
Core(s) per socket: 28
Socket(s): 2
NUMA node(s): 4
Vendor ID: GenuineIntel
CPU family: 6
Model: 106
Model name: Intel(R) Xeon(R) Gold 6348 CPU @ 2.60GHz
Stepping: 6
CPU MHz: 3400.000
BogoMIPS: 5200.00
Virtualization: VT-x
L1d cache: 48K
L1i cache: 32K
L2 cache: 1280K
L3 cache: 43008K
NUMA node0 CPU(s): 0-13
NUMA node1 CPU(s): 14-27
NUMA node2 CPU(s): 28-41
NUMA node3 CPU(s): 42-55
Flags: fpu vme de pse tsc msr pae mce cmx8 pat mtrr pge mca cmovpat pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtscp lm constant_tsc arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid aperfmpref perficient perf_nonstop tsc_deadline_timer aes xsave avx f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault epb cat_l3 invpcid_single ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vmi flexpriority ept vpid etd fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erna invpcid rtm cqm rdt_a avx512f avx512dq rdseed adx smap avx512fma clflushopt clwb intel_pt avx512cd sha_ni avx512bw avx512vl xsaveopt xsaves xsavec xgetbv1 xsaves cmq_llc cmq_occap_llc cmq_mbb_total cmq_mbb_local wbinvd dtherm ida arat pln pts avx512vmbi umip pkp ospke avx512_vbmi2 gfn vaes vpclmulqdq avx512_vnni avx512_vitalg tme avx512_vpoptdqv la57 rdpid md_clear pconflog flush_l1d arch_capabiliters

/proc/cpuinfo cache data
cache size: 43008 KB

From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a physical chip,
available: 4 nodes (0-3)
Lenovo Global Technology
ThinkSystem SR650 V2
(2.60 GHz, Intel Xeon Gold 6348)

SPECraten®2017_fp_base = 405
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CPU2017 License: 9017
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Test Date: May-2021
Hardware Availability: Jul-2021
Software Availability: Feb-2021

Platform Notes (Continued)

node 0 cpus: 0 1 2 3 4 5 6 7 8 9 10 11 12 13
node 0 size: 257635 MB
node 0 free: 257348 MB
node 1 cpus: 14 15 16 17 18 19 20 21 22 23 24 25 26 27
node 1 size: 258010 MB
node 1 free: 257787 MB
node 2 cpus: 28 29 30 31 32 33 34 35 36 37 38 39 40 41
node 2 size: 258044 MB
node 2 free: 257790 MB
node 3 cpus: 42 43 44 45 46 47 48 49 50 51 52 53 54 55
node 3 size: 258041 MB
node 3 free: 257617 MB
node distances:
node 0  1  2  3
0:  10 11 20 20
1:  11 10 20 20
2:  20 20 10 11
3:  20 20 11 10

From /proc/meminfo
MemTotal: 1056493004 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

/usr/bin/lsb_release -d
SUSE Linux Enterprise Server 15 SP2

From /etc/*release* /etc/*version*
os-release:
NAME="SLES"
VERSION="15-SP2"
VERSION_ID="15.2"
PRETTY_NAME="SUSE Linux Enterprise Server 15 SP2"
ID="sles"
ID_LIKE="suse"
ANSI_COLOR="0;32"
CPE_NAME="cpe:/o:suse:sles:15:sp2"

uname -a:
Linux localhost 5.3.18-22-default #1 SMP Wed Jun 3 12:16:43 UTC 2020 (720aeba) x86_64
x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:

CVE-2018-12207 (iTLB Multihit): Not affected
CVE-2018-3620 (L1 Terminal Fault): Not affected
Microarchitectural Data Sampling: Not affected

(Continued on next page)
Lenovo Global Technology
ThinkSystem SR650 V2
(2.60 GHz, Intel Xeon Gold 6348)

SPEC CPU®2017 Floating Point Rate Result
Copyright 2017-2021 Standard Performance Evaluation Corporation

SPECrater®2017_fp_base =  405
SPECrater®2017_fp_peak = Not Run

CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Test Date: May-2021
Tested by: Lenovo Global Technology
Hardware Availability: Jul-2021
Software Availability: Feb-2021

Platform Notes (Continued)

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: usercopy/swapgs barriers and __user pointer sanitization

CVE-2017-5715 (Spectre variant 2):
Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling

CVE-2020-0543 (Special Register Buffer Data Sampling):
Not affected

CVE-2019-11135 (TSX Asynchronous Abort):
Not affected

run-level 3 May 19 01:37
SPEC is set to: /home/cpu2017-1.1.5-ic2021.1-revA-update1

Filesystem     Type  Size  Used Avail Use% Mounted on
/dev/sda3      xfs   891G   23G  868G   3% /

From /sys/devices/virtual/dmi/id
Vendor:         Lenovo
Product:        ThinkSystem SR650 V2 MB
Product Family: ThinkSystem
Serial:         1234567890

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:
32x Samsung M393A4G43AB3-CWE 32 GB 2 rank 3200

BIOS:
BIOS Vendor:   Lenovo
BIOS Version:  AFE109PT1-1.00
BIOS Date:     04/28/2021
BIOS Revision: 1.0
Firmware Revision: 1.0

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
C               | 519.lbm_r(base) 538.imagick_r(base) 544.nab_r(base)
------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
SPEC CPU®2017 Floating Point Rate Result

Lenovo Global Technology
ThinkSystem SR650 V2
(2.60 GHz, Intel Xeon Gold 6348)

<table>
<thead>
<tr>
<th>CPU2017 License:</th>
<th>9017</th>
<th>Test Sponsor:</th>
<th>Lenovo Global Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Date:</td>
<td></td>
<td>Hardware Availability:</td>
<td>Jul-2021</td>
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<td>Tested by:</td>
<td>Lenovo Global Technology</td>
<td>Software Availability:</td>
<td>Feb-2021</td>
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</table>

**SPECrater®2017_fp_base = 405**

**SPECrater®2017_fp_peak = Not Run**

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### Compiler Version Notes (Continued)

Version 2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

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<table>
<thead>
<tr>
<th>C++</th>
<th>508.namd_r(base) 510.parest_r(base)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,</td>
<td></td>
</tr>
<tr>
<td>Version 2021.1 Build 20201113</td>
<td></td>
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<tr>
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<thead>
<tr>
<th>C++, C</th>
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<td>Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,</td>
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<td></td>
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<td></td>
</tr>
</tbody>
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<table>
<thead>
<tr>
<th>C++, C, Fortran</th>
<th>507.cactuBSSN_r(base)</th>
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<tbody>
<tr>
<td>Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,</td>
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<thead>
<tr>
<th>Fortran</th>
<th>503.bwaves_r(base) 549.fotonik3d_r(base) 554.roms_r(base)</th>
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<tbody>
<tr>
<td>Intel(R) Fortran Intel(R) 64 Compiler Classic for applications running on</td>
<td></td>
</tr>
<tr>
<td>Intel(R) 64, Version 2021.1 Build 20201112_000000</td>
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</tr>
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<table>
<thead>
<tr>
<th>Fortran, C</th>
<th>521.wrf_r(base) 527.cam4_r(base)</th>
</tr>
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</table>

(Continued on next page)
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SPECrater\textsuperscript{2017\textunderscore fp\textunderscore base} = 405
SPECrater\textsuperscript{2017\textunderscore fp\textunderscore peak} = Not Run

Compiler Version Notes (Continued)

Intel(R) Fortran Intel(R) 64 Compiler Classic for applications running on
Intel(R) 64, Version 2021.1 Build 20201112_000000
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
Version 2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

Base Compiler Invocation

C benchmarks:
icx

C++ benchmarks:
icpx

Fortran benchmarks:
ifort

Benchmarks using both Fortran and C:
ifort icx

Benchmarks using both C and C++:
icpx icx

Benchmarks using Fortran, C, and C++:
icpx icx ifort

Base Portability Flags

503.bwaves\textunderscore r: -DSPEC\_LP64
507.cactuBSSN\textunderscore r: -DSPEC\_LP64
508.namd\textunderscore r: -DSPEC\_LP64
510.parest\textunderscore r: -DSPEC\_LP64
511.povray\textunderscore r: -DSPEC\_LP64
519.ibm\textunderscore r: -DSPEC\_LP64
521.wrf\textunderscore r: -DSPEC\_LP64 -DSPEC\_CASE\_FLAG -convert big\_Endian
526.blender\textunderscore r: -DSPEC\_LP64 -DSPEC\_LINUX -funsigned\_char
527.cam4\textunderscore r: -DSPEC\_LP64 -DSPEC\_CASE\_FLAG
538.imagick\textunderscore r: -DSPEC\_LP64
544.nab\textunderscore r: -DSPEC\_LP64
549.fotonik3d\textunderscore r: -DSPEC\_LP64

(Continued on next page)
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SPECrate®2017_fp_base = 405
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CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Test Date: May-2021
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Hardware Availability: Jul-2021
Software Availability: Feb-2021

Base Portability Flags (Continued)
554.roms_r: -DSPEC_LP64

Base Optimization Flags

C benchmarks:
-w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-mbranches-within-32B-boundaries -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib

C++ benchmarks:
-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math -flto
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-mbranches-within-32B-boundaries -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib

Fortran benchmarks:
-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ipo -no-prec-div
-qopt-prefetch -ffinite-math-only
-qopt-multiple-gather-scatter-by-shuffles -qopt-mem-layout-trans=4
-nostandard-realloc-lhs -align array32byte -auto
-mbranches-within-32B-boundaries -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib

Benchmarks using both Fortran and C:
-w -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -O3 -ipo
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-multiple-gather-scatter-by-shuffles
-mbranches-within-32B-boundaries -nostandard-realloc-lhs
-align array32byte -auto -ljemalloc -L/usr/local/jemalloc64-5.0.1/lib

Benchmarks using both C and C++:
-w -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-mbranches-within-32B-boundaries -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib

Benchmarks using Fortran, C, and C++:
-w -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -O3
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-multiple-gather-scatter-by-shuffles
-mbranches-within-32B-boundaries -nostandard-realloc-lhs

(Continued on next page)
**Lenovo Global Technology**

ThinkSystem SR650 V2  
(2.60 GHz, Intel Xeon Gold 6348)

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**Test Date:** May-2021  
**Test Sponsor:** Lenovo Global Technology  
**Tested by:** Lenovo Global Technology  
**Hardware Availability:** Jul-2021  
**Software Availability:** Feb-2021

### Base Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++ (continued):

- `align array32byte -auto -ljemalloc -L/usr/local/jemalloc64-5.0.1/lib`

The flags files that were used to format this result can be browsed at:


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

- [http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-ICElake-D.xml](http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-ICElake-D.xml)

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