**Lenovo Global Technology**

ThinkSystem SR650 V2
(2.40 GHz, Intel Xeon Platinum 8360Y)

<table>
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<tr>
<th>SPECrate®2017_fp_base</th>
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| CPU2017 License       | 9017    |
| Test Sponsor          | Lenovo Global Technology |
| Tested by             | Lenovo Global Technology |
| Test Date             | May-2021 |
| Hardware Availability | Jul-2021 |
| Software Availability | Feb-2021 |

<table>
<thead>
<tr>
<th>SPECrate®2017_fp_base (454)</th>
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<table>
<thead>
<tr>
<th>Software</th>
<th>OS: SUSE Linux Enterprise Server 15 SP2 (x86_64)</th>
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<tbody>
<tr>
<td></td>
<td>Kernel 5.3.18-22-default</td>
</tr>
<tr>
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<td>C/C++: Version 2021.1 of Intel oneAPI DPC++/C++</td>
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<tr>
<td></td>
<td>Compiler Build 20201113 for Linux;</td>
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<tr>
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<td>Fortran: Version 2021.1 of Intel Fortran Compiler</td>
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<td>Classic Build 20201112 for Linux;</td>
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<td>C/C++: Version 2021.1 of Intel C/C++ Compiler</td>
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<td>Classic Build 20201112 for Linux;</td>
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<tr>
<td>Parallel</td>
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<tr>
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<td>Lenovo BIOS Version AFE109PT1 1.00</td>
</tr>
<tr>
<td></td>
<td>released Apr-2021</td>
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<tr>
<td>File System</td>
<td>xfs</td>
</tr>
<tr>
<td>System State</td>
<td>Run level 3 (multi-user)</td>
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<tr>
<td>Base Pointers</td>
<td>64-bit</td>
</tr>
<tr>
<td>Peak Pointers</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Other:</td>
<td>jemalloc memory allocator V5.0.1</td>
</tr>
<tr>
<td>Power Management</td>
<td>BIOS and OS set to prefer performance</td>
</tr>
<tr>
<td></td>
<td>at the cost of additional power usage</td>
</tr>
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<table>
<thead>
<tr>
<th>Hardware</th>
<th>CPU Name: Intel Xeon Platinum 8360Y</th>
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<tbody>
<tr>
<td></td>
<td>Max MHz: 3500</td>
</tr>
<tr>
<td></td>
<td>Nominal: 2400</td>
</tr>
<tr>
<td></td>
<td>Enabled: 72 cores, 2 chips</td>
</tr>
<tr>
<td></td>
<td>Orderable: 1,2 chips</td>
</tr>
<tr>
<td></td>
<td>Cache L1: 32 KB I + 48 KB D on chip per core</td>
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<tr>
<td></td>
<td>Cache L2: 1.25 MB I+D on chip per core</td>
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<tr>
<td></td>
<td>Cache L3: 54 MB I+D on chip per chip</td>
</tr>
<tr>
<td></td>
<td>Other: None</td>
</tr>
<tr>
<td>Memory:</td>
<td>1 TB (32 x 32 GB 2Rx8 PC4-3200AA-R)</td>
</tr>
<tr>
<td>Storage:</td>
<td>1 x 960 GB SATA SSD</td>
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<tr>
<td>Other:</td>
<td>None</td>
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<table>
<thead>
<tr>
<th>Hardware</th>
<th>Software</th>
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<table>
<thead>
<tr>
<th>SPECrate®2017_fp_base (454)</th>
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- **503.bwaves_r** 72
- **507.cactuBSSN_r** 72
- **508.namd_r** 72
- **510.parest_r** 72
- **511.povray_r** 72
- **519.lbm_r** 72
- **521.wrf_r** 72
- **526.blender_r** 72
- **527.cam4_r** 72
- **538.imagick_r** 72
- **544.nab_r** 72
- **549.fotonik3d_r** 72
- **554.roms_r** 72
Lenovo Global Technology
ThinkSystem SR650 V2
(2.40 GHz, Intel Xeon Platinum 8360Y)

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

Results Table

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<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
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<tr>
<td>508.namd_r</td>
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<td>396</td>
<td>171</td>
<td>399</td>
<td>176</td>
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<td>510.parest_r</td>
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<td>526.blender_r</td>
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<td>527.cam4_r</td>
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<td>538.imagick_r</td>
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<td>544.nab_r</td>
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</tr>
<tr>
<td>549.fotonik3d_r</td>
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<tr>
<td>554.roms_r</td>
<td>72</td>
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<td>560</td>
<td>204</td>
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<td></td>
</tr>
</tbody>
</table>

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"
MALLOCONF = "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
(2.40 GHz, Intel Xeon Platinum 8360Y)

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

SPECrater®2017_fp_base = 454
SPECrater®2017_fp_peak = Not Run

Test Date: May-2021
Hardware Availability: Jul-2021
Software Availability: Feb-2021

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.:
umactl --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.

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-update1/bin/sysinfo
Rev: r6538 of 2020-09-24 e8664e66d2d7080afeaa89d4b38e2f1c
running on localhost Tue May 11 01:53:03 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) Platinum 8360Y CPU @ 2.40GHz
  2 "physical id"s (chips)
  72 "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 : 36
siblings : 36
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 28 29 30 31 32 33 34 35
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 28 29 30 31 32 33 34 35

(Continued on next page)
Lenovo Global Technology
ThinkSystem SR650 V2
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**SPECrate®2017_fp_base** = 454
**SPECrate®2017_fp_peak** = Not Run

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<td>Lenovo Global Technology</td>
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<td>Test Date:</td>
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<tr>
<td>Hardware Availability:</td>
<td>Jul-2021</td>
</tr>
<tr>
<td>Software Availability:</td>
<td>Feb-2021</td>
</tr>
</tbody>
</table>

Platform Notes (Continued)

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): 72
- On-line CPU(s) list: 0-71
- Thread(s) per core: 1
- Core(s) per socket: 36
- Socket(s): 2
- NUMA node(s): 4
- Vendor ID: GenuineIntel
- CPU family: 6
- Model: 106
- Model name: Intel(R) Xeon(R) Platinum 8360Y CPU @ 2.40GHz
- Stepping: 6
- CPU MHz: 3096.412
- BogoMIPS: 4800.00
- Virtualization: VT-x
- L1d cache: 48K
- L1i cache: 32K
- L2 cache: 1280K
- L3 cache: 55296K
- Flags: fpu vme de pse tsc msr pae mce cmov pat pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpes gb rdtscp lm constant_tsc arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid aperfmpref pni pclmulqdq dtes64 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 xsaves avx f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault epb cat_l3 invpcid_single ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vnmi flexpriority ept vpid ept_ad fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm cqm rdt_a avx512f avx512dq rdseed advx smap avx512ifma clflushopt clwb intel_pt avx512cd sha ni avx512bw avx512vl xsaveopt xsaves xSaving xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mmb_total cqm_mmb_local wbnoind dtherm ida arat pln pts avx512vBMI umip kpu ospke avx512_vBMI2 gfn fva vpcmullqdq avx512_vnni avx512_bitalg tme avx512 vpopcode la57 rdpid md_clear pconf gflush lid arch_capabilities

From `numactl --hardware` WARNING: a numactl 'node' might or might not correspond to a physical chip.

- available: 4 nodes (0-3)

(Continued on next page)
Lenovo Global Technology
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SPECrates:
- **SPECrates®2017_fp_base = 454**
- **SPECrates®2017_fp_peak = Not Run**

**Platform Notes (Continued)**

node 0 cpus: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17
node 0 size: 257600 MB
node 0 free: 257255 MB
node 1 cpus: 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35
node 1 size: 258043 MB
node 1 free: 257775 MB
node 2 cpus: 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53
node 2 size: 258043 MB
node 2 free: 257671 MB
node 3 cpus: 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71
node 3 size: 258039 MB
node 3 free: 257769 MB
node distances:

0:  10  11  20  20
1:  11  10  20  20
2:  20  20  10  11
3:  20  20  11  10

From /proc/meminfo
   MemTotal:       1056488900 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
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SPECrates

| SPECrates | 
|-------------------|-------------------|
| SPECrates\(^\text{2017\_fp\_peak}\) | Not Run |
| SPECrates\(^\text{2017\_fp\_base}\) | 454 |

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Test Date: May-2021
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---

**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/swaps 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 11 01:51

SPEC is set to: /home/cpu2017-1.1.5-ic2021.1-revA-update1

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)

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**Compiler Version Notes**

<table>
<thead>
<tr>
<th>Compiler Version</th>
<th>Notes</th>
</tr>
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<tbody>
<tr>
<td>C</td>
<td>519.lbm_r(base) 538.imagick_r(base) 544.nab_r(base)</td>
</tr>
<tr>
<td>Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,</td>
<td></td>
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Compiled Version Notes (Continued)

Copyright 2021-2021 Standard Performance Evaluation Corporation

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Compiler Version Notes (Continued)

Copyright 2021-2021 Standard Performance Evaluation Corporation. All rights reserved.

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C++ | 508.namd_r(base) 510.parest_r(base)

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.

---

C++, C | 511.povray_r(base) 526.blender_r(base)

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.

---

C++, C, Fortran | 507.cactuBSSN_r(base)

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.

---

Fortran | 503.bwaves_r(base) 549.fotonik3d_r(base) 554.roms_r(base)

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.

---

Fortran, C | 521.wrf_r(base) 527.cam4_r(base)

(Continued on next page)
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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_r: -DSPEC_LP64
507.cactuBSSN_r: -DSPEC_LP64
508.namd_r: -DSPEC_LP64
510.parest_r: -DSPEC_LP64
511.povray_r: -DSPEC_LP64
519.ibm_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

(Continued on next page)
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Test Sponsor: Lenovo Global Technology
Tested by: Lenovo Global Technology

Test Date: May-2021
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

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Lenovo Global Technology
ThinkSystem SR650 V2
(2.40 GHz, Intel Xeon Platinum 8360Y)

**SPECraten 2017 fp_base = 454**

**SPECraten 2017 fp_peak = Not Run**

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**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)