**Lenovo Global Technology**

**ThinkSystem SR650 V3**
*(2.70 GHz, Intel Xeon Platinum 8458P)*

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

**SPECrater®2017_fp_base = 825**
**SPECrater®2017_fp_peak = Not Run**

**CPU Name:** Intel Xeon Platinum 8458P
**Max MHz:** 3800
**Nominal:** 2700
**Enabled:** 88 cores, 2 chips
**Orderable:** 1,2 chips
**Cache L1:** 32 KB I + 48 KB D on chip per core
**L2:** 2 MB I+D on chip per core
**L3:** 82.5 MB I+D on chip per chip
**Memory:** 512 GB (16 x 32 GB 2Rx8 PC5-4800B-R)
**Storage:** 1 x 960 GB SATA SSD
**Other:** None

**OS:** SUSE Linux Enterprise Server 15 SP4 (x86_64)
**Kernel:** 5.14.21-150400.22-default

**Compiler:**
C/C++: Version 2022.1 of Intel oneAPI DPC++/C++ Compiler for Linux;
Fortran: Version 2022.1 of Intel Fortran Compiler for Linux;

**Parallel:** No

**Firmware:** Lenovo BIOS Version ESE109L 1.10 released Jan-2023
**File System:** xfs
**System State:** Run level 3 (multi-user)
**Base Pointers:** 64-bit
**Peak Pointers:** Not Applicable
**Other:** jemalloc memory allocator V5.0.1
**Power Management:** BIOS and OS set to prefer performance at the cost of additional power usage

---

### Hardware

<table>
<thead>
<tr>
<th>Copies</th>
<th>SPECrate®2017_fp_base (825)</th>
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<tr>
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<td>508.namd_r</td>
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<tr>
<td>510.parest_r</td>
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**Test Sponsor:** Lenovo Global Technology  
**Tested by:** Lenovo Global Technology  
**Test Date:** Jan-2023  
**Hardware Availability:** Feb-2023  
**Software Availability:** Jun-2022

### Results Table

<table>
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</table>

**SPECrate®2017_fp_base =** 825  
**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/cpu2017-1.1.9-ic2022.1/lib/intel64:/home/cpu2017-1.1.9-ic2022.1/j 
e5.0.1-64"
MALLOCCONF = "retain: true"
```

### General Notes

Binaries compiled on a system with 2x Intel Xeon Platinum 8280M CPU + 384GB RAM memory using Red Hat Enterprise Linux 8.4  
Transparent Huge Pages enabled by default

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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.

Platform Notes

BIOS configuration:
Operating Mode set to Maximum Performance and then set it to Custom Mode
MONITOR/MWAIT set to Enabled
Hyper-Threading set to Disabled
SNC set to SNC4
LLC Prefetch set to Disabled
XPT Prefetcher set to Disabled

Sysinfo program /home/cpu2017-1.1.9-ic2022.1/bin/sysinfo
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
running on localhost Tue Jan 31 04:04:52 2023

SUT (System Under Test) info as seen by some common utilities.

------------------------------------------------------------------------
Table of contents
------------------------------------------------------------------------
1. uname -a
2. w
3. Username
4. ulimit -a
5. sysinfo process ancestry
6. /proc/cpuinfo
7. lscpu
8. numactl --hardware
9. /proc/meminfo
10. who -r
11. Systemd service manager version: systemd 249 (249.11+suse.124.g2bc0b2c447)
12. Services, from systemctl list-unit-files

(Continued on next page)
Platform Notes (Continued)

13. Linux kernel boot-time arguments, from /proc/cmdline
14. cpupower frequency-info
15. tuned-adm active
16. sysctl
17. /sys/kernel/mm/transparent_hugepage
18. /sys/kernel/mm/transparent_hugepage/khugepaged
19. OS release
20. Disk information
21. /sys/devices/virtual/dmi/id
22. dmidecode
23. BIOS

1. uname -a
   Linux localhost 5.14.21-150400.22-default #1 SMP PREEMPT_DYNAMIC Wed May 11 06:57:18 UTC 2022 (49db222)
   x86_64 x86_64 x86_64 GNU/Linux

2. w
   04:04:52 up  2:59,  1 user, load average: 56.84, 79.11, 82.85
   USER     TTY      FROM             LOGIN@   IDLE   JCPU   PCPU WHAT
   root     tty1     -                01:06    2:57m  0.99s  0.01s -bash

3. Username
   From environment variable $USER: root

4. ulimit -a
   core file size  (blocks, -c) unlimited
   data seg size   (kbytes, -d) unlimited
   scheduling priority  (-e) 0
   file size      (blocks, -f) unlimited
   pending signals (-i) 2062594
   max locked memory (kbytes, -l) 64
   max memory size  (kbytes, -m) unlimited
   open files     (-n) 1024
   pipe size      (512 bytes, -p) 8
   POSIX message queues (bytes, -q) 819200
   real-time priority (-r) 0
   stack size     (kbytes, -s) unlimited
   cpu time       (seconds, -t) unlimited
   max user processes (-u) 2062594
   virtual memory (kbytes, -v) unlimited
   file locks     (-x) unlimited

(Continued on next page)
Platform Notes (Continued)

5. sysinfo process ancestry
/usr/lib/systemd/systemd --switched-root --system --deserialize 30
login -- root
  -bash
  -bash
  -bash
runcpu --nobuild --action validate --define default-platform-flags --define numcopies=88 --c
ic2022.1-lin-core-avx512-rate-20220316.cfg --define cores=88 --define physicalfirst --define
invoke_with_interleave --define drop_caches --tune base --o all fprate
runcpu --nobuild --action validate --define default-platform-flags --define numcopies=88 --configfile
ic2022.1-lin-core-avx512-rate-20220316.cfg --define cores=88 --define physicalfirst --define
invoke_with_interleave --define drop_caches --tune base --output_format all --nopower --runmode rate
--tune base --size refrate fprate --nopreenv --note-preenv --logfile
$SPEC/tmp/CPU2017.009/templogs/preenv.fprate.009.0.log --lognum 009.0 --from_runcpu 2
specperl $SPEC/bin/sysinfo
$SPEC = /home/cpu2017-1.1.9-ic2022.1

6. /proc/cpuinfo
model name      : Intel(R) Xeon(R) Platinum 8458P
vendor_id       : GenuineIntel
cpu family      : 6
model           : 143
stepping        : 8
microcode       : 0x2b000161
bugs            : spectre_v1 spectre_v2 spec_store_bypass swapgs
cpu cores       : 44
siblings        : 44
2 physical ids (chips)
88 processors (hardware threads)
physical id 0: core ids 0-43
physical id 1: core ids 0-43
physical id 0: apicids
0,2,4,6,8,10,12,14,16,18,20,22,24,26,28,30,32,34,36,38,40,42,44,46,48,50,52,54,56,58,60,62,64,66,68,70,72
,74,76,78,80,82,84,86
physical id 1: apicids
80,182,184,186,188,190,192,194,196,198,200,202,204,206,208,210,212,214
Caution: /proc/cpuinfo data regarding chips, cores, and threads is not necessarily reliable, especially for
virtualized systems. Use the above data carefully.

7. lscpu
From lscpu from util-linux 2.37.2:
Architecture:       x86_64
(Continued on next page)
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<tr>
<th>SPEC CPU 2017 License:</th>
<th>9017</th>
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<tr>
<td>Tested by:</td>
<td>Lenovo Global Technology</td>
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<td>Test Date:</td>
<td>Jan-2023</td>
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<tr>
<td>Hardware Availability:</td>
<td>Feb-2023</td>
</tr>
<tr>
<td>Software Availability:</td>
<td>Jun-2022</td>
</tr>
</tbody>
</table>

#### Platform Notes (Continued)

- CPU op-mode(s): 32-bit, 64-bit
- Address sizes: 46 bits physical, 57 bits virtual
- Byte Order: Little Endian
- Vendor ID: GenuineIntel
- Model name: Intel(R) Xeon(R) Platinum 8458P
- CPU family: 6
- Model: 143
- Thread(s) per core: 1
- Core(s) per socket: 44
- Socket(s): 2
- Stepping: 8
- BogoMIPS: 5400.00

- Flags:
  - fpu vme de pse ts cmov ms cmov pdcm x87 amx 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_13 cat_12 cdip_13
  - invpcid_single intel_pni cdip_12 ssbd mba ibpb stibp ibrs_enhanced
  - tpr_shadow vmmi flexpriority ept vpid ept_ad fsgsbase tsc_adjust bml1 hle
  - avx2 smep bmi2 erms invpcid rtm cmqm rdt_a avx512f avx512dq rdseed adx smap
  - avx512ifma clflushopt clwb intel_pt avx512cd sha_ni avx512bw avx512vl
  - xsaveopt xsavec xsetbv xsavees cmqm_llc cmqm_occup_llc cmqm_mbb_total
  - cmqm_mbb_local split_lock_detect avx_vnni avx512bff16 wboinvd dtherm ida
  - arat pln pts avx512vbmi umip pkum ospke waltpkg avx512_vbmi2 gfni vaes
  - vpclmulqdq avx512_vnni avx512_bitalg tme avx512_vpopcntdq la57 rdpid
  - bus_lock_detect cldemote movdird movdir64b enqcmd fscr md_clear serialize
  - tsxidtrk pconfign arch_lbr avx512_fp16 amx_tile flush_lld arch_capabilities

- Virtualization: VT-x
- L1d cache: 4.1 MiB (88 instances)
- L1i cache: 2.8 MiB (88 instances)
- L2 cache: 176 MiB (88 instances)
- L3 cache: 165 MiB (2 instances)
- NUMA node(s): 8
- NUMA node 0 CPU(s): 0-10
- NUMA node 1 CPU(s): 11-21
- NUMA node 2 CPU(s): 22-32
- NUMA node 3 CPU(s): 33-43
- NUMA node 4 CPU(s): 44-54
- NUMA node 5 CPU(s): 55-65
- NUMA node 6 CPU(s): 66-76
- NUMA node 7 CPU(s): 77-87

Vulnerability Itlb multihit: Not affected
Vulnerability L1tf: Not affected

(Continued on next page)
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SPECrater®2017_fp_peak = Not Run

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Platform Notes (Continued)

Vulnerability Mds: Not affected
Vulnerability Meltdown: Not affected
Vulnerability Spectre v1: Mitigation; usercopy/swapgs barriers and __user pointer sanitization
Vulnerability Spectre v2: Mitigation; Enhanced IBRS, IBPB conditional, RSB filling
Vulnerability Srbd: Not affected
Vulnerability Txs async abort: Not affected

From lscpu --cache:

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<th>ALL-SIZE</th>
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-----------------------------------------------

8. numactl --hardware

NOTE: a numactl 'node' might or might not correspond to a physical chip.

available: 8 nodes (0-7)
node 0 cpus: 0-10
node 0 size: 64172 MB
node 0 free: 63321 MB
node 1 cpus: 11-21
node 1 size: 64509 MB
node 1 free: 63964 MB
node 2 cpus: 22-32
node 2 size: 64509 MB
node 2 free: 63964 MB
node 3 cpus: 33-43
node 3 size: 64509 MB
node 3 free: 63973 MB
node 4 cpus: 44-54
node 4 size: 64509 MB
node 4 free: 63951 MB
node 5 cpus: 55-65
node 5 size: 64509 MB
node 5 free: 63887 MB
node 6 cpus: 66-76
node 6 size: 64474 MB
node 6 free: 63917 MB
node 7 cpus: 77-87
node 7 size: 64480 MB
node 7 free: 63940 MB
node distances:
node 0 1 2 3 4 5 6 7
0: 10 12 12 12 21 21 21
1: 12 10 12 12 21 21 21

(Continued on next page)
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Platform Notes (Continued)

2: 12 12 10 12 21 21 21 21
3: 12 12 12 10 21 21 21 21
4: 21 21 21 21 10 12 12 12
5: 21 21 21 21 12 10 12 12
6: 21 21 21 21 12 12 12 12
7: 21 21 21 21 12 12 12 12

9. /proc/meminfo
   MemTotal: 528048704 kB

10. who -r
    run-level 3 Jan 31 01:06

11. Systemd service manager version: systemd 249 (249.11+suse.124.g2bc0b2c447)
    Default Target Status
    multi-user running

12. Services, from systemctl list-unit-files
    STATE UNIT FILES
    enabled YaST2-Firstboot YaST2-Second-Stage apparmor auditd cron getty@ haveged irqbalance
    issue-generator kbdsettings klog lvm2-monitor nscd postfix purge-kernels rollback rsyslog
    smartd sshd wicked wickedd-auto4 wickedd-dhcp4 wickedd-dhcp6 wickedd-nanny
    enabled-runtime systemd-remount-fs
    disabled autosf autoyast-initscripts blk-availability boot-sysctl ca-certificates chrony-wait
    chronyd console-getty cups cups-browsed debug-shell ebtables exchange-bmc-os-info
    firewalld gpm grub2-once haveged-switch-root ipmi ipmiévdi issue-add-ssh-keys kexec-load
    lvmmask man-db-create multipathd nfs nfs-bkmap rdisc rpbind rpmconfigcheck rsyncdc
    sapconf serial-getty@ smartd_generate_opts snmpd snmptrapd sysstat
    systemd-boot-check-no-failures systemd-network-generator systemd-sysext
    systemd-time-wait-sync systemd-timesyncd tuned
    indirect uuidd wickedd

13. Linux kernel boot-time arguments, from /proc/cmdline
    BOOT_IMAGE=/boot/vmlinuz-5.14.21-150400.22-default
    root=UUID=461ffbd6-8da0-4c20-adb7-d9d3143b6aa5
    splash=silent
    mitigations=auto
    quiet
    security=apparmor

14. cpupower frequency-info

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SPECrate®2017_fp_base = 825
SPECrate®2017_fp_peak = Not Run

Platform Notes (Continued)

analyzing CPU 0:
   Unable to determine current policy
boost state support:
   Supported: yes
   Active: yes

------------------------------------------------------------
15. tuned-adm active
   It seems that tuned daemon is not running, preset profile is not activated.
   Preset profile: virtual-guest

------------------------------------------------------------
16. sysctl
   kernel.numa_balancing               1
   kernel.randomize_va_space            2
   vm.compaction_proactiveness          20
   vm.dirty_background_bytes            0
   vm.dirty_background_ratio            10
   vm.dirty_bytes                       0
   vm.dirty_expire_centisecs            3000
   vm.dirty_ratio                       20
   vm.dirty_writeback_centisecs         500
   vm.dirtytime_expire_seconds          43200
   vm.extrfag_threshold                500
   vm.min_unmapped_ratio                1
   vm.nr_hugepages                      0
   vm.nr_hugepages_mempolicy           0
   vm.nr_overcommit_hugepages         0
   vm.swappiness                        60
   vm.watermark_boost_factor           15000
   vm.watermark_scale_factor           10
   vm.zone_reclaim_mode                 0

------------------------------------------------------------
17. /sys/kernel/mm/transparent_hugepage
   defrag always defer defer+madvise [madvise] never
   enabled [always] madvise never
   hpage_pmd_size 2097152
   shmem_enabled always within_size advise [never] deny force

------------------------------------------------------------
18. /sys/kernel/mm/transparent_hugepage/khugepaged
   alloc_sleep_millisecs 60000
   defrag 1
   max_ptes_none 511
   max_ptes_shared 256
   max_ptes_swap 64

(Continued on next page)
Platform Notes (Continued)

pages_to_scan 4096
scan_sleep_millisecs 10000

19. OS release
   From /etc/*-release /etc/*-version
   os-release SUSE Linux Enterprise Server 15 SP4

20. Disk information
   SPEC is set to: /home/cpu2017-1.1.9-ic2022.1
   Filesystem Type Size Used Avail Use% Mounted on
   /dev/sda3 xfs 889G 66G 823G 8% /

21. /sys/devices/virtual/dmi/id
   Vendor: Lenovo
   Product: ThinkSystem SR650 V3 MB,EGS,DDR5,SH,2U
   Product Family: ThinkSystem
   Serial: 1234567890

22. dmidecode
   Additional information from dmidecode 3.2 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:
   16x Samsung M321R4GA3BB0-CQKVG 32 GB 2 rank 4800

23. BIOS
   (This section combines info from /sys/devices and dmidecode.)
   BIOS Vendor: Lenovo
   BIOS Version: ESE109L-1.10
   BIOS Date: 01/07/2023
   BIOS Revision: 1.10
   Firmware Revision: 1.0

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,
## Compiler Version Notes (Continued)

Version 2022.1.0 Build 20220316  
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<table>
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<th>C++</th>
<th>508.namd_r(base) 510.parest_r(base)</th>
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<th>C++, C</th>
<th>511.povray_r(base) 526.blender_r(base)</th>
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<tr>
<th>C++, C, Fortran</th>
<th>507.cactuBSSN_r(base)</th>
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<tr>
<th>Fortran</th>
<th>503.bwaves_r(base) 549.fotonik3d_r(base) 554.roms_r(base)</th>
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<tr>
<th>Fortran, C</th>
<th>521.wrf_r(base) 527.cam4_r(base)</th>
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</table>

(Continued on next page)
Lenovo Global Technology
ThinkSystem SR650 V3
(2.70 GHz, Intel Xeon Platinum 8458P)

SPECrate®2017_fp_base = 825
SPECrate®2017_fp_peak = Not Run

CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Test Date: Jan-2023
Tested by: Lenovo Global Technology
Hardware Availability: Feb-2023
Software Availability: Jun-2022

Compiler Version Notes (Continued)

Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version
2022.1.0 Build 20220316
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Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
Version 2022.1.0 Build 20220316
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Base Compiler Invocation

C benchmarks:
icx

C++ benchmarks:
icpx

Fortran benchmarks:
ifx

Benchmarks using both Fortran and C:
ifx icx

Benchmarks using both C and C++:
icpx icx

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

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)
Lenovo Global Technology

ThinkSystem SR650 V3 (2.70 GHz, Intel Xeon Platinum 8458P)  

SPEC CPU®2017 Floating Point Rate Result
Copyright 2017-2023 Standard Performance Evaluation Corporation

Lenovo Global Technology
Test Date: Jan-2023

Test Sponsor: Lenovo Global Technology
Hardware Availability: Feb-2023

Tested by: Lenovo Global Technology
Software Availability: Jun-2022

SPECrates:
SPECrate®2017_fp_base = 825
SPECrate®2017_fp_peak = Not Run

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 -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 -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib

Fortran benchmarks:
-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math -flto
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-nostandard-realloc-lhs -align array32byte -auto -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
-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 -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
-nostandard-realloc-lhs -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
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-Eaglestream-N.html
Lenovo Global Technology
ThinkSystem SR650 V3
(2.70 GHz, Intel Xeon Platinum 8458P)

| SPECrate®2017_fp_base = 825 |
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CPU2017 License: 9017
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Test Date: Jan-2023
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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-Eaglestream-N.xml

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