SPEC CPU®2017 Floating Point Rate Result

Lenovo Global Technology
ThinkSystem SR650 V3
(2.00 GHz, Intel Xeon Platinum 8480CL)

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

SPECrater®2017_fp_base = 895
SPECrater®2017_fp_peak = Not Run

CPU Name: Intel Xeon Platinum 8480CL
Max MHz: 3800
Nominal: 2000
Enabled: 112 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: 105 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: Red Hat Enterprise Linux 9.2 (Plow) (x86_64)
Compiler: C/C++: Version 2023.0 of Intel oneAPI DPC++/C++ Compiler for Linux;
Fortran: Version 2023.0 of Intel Fortran Compiler for Linux;
Parallel: No
Firmware: Lenovo BIOS Version ESE117F 2.22 released Aug-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
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<th>Ratio</th>
<th>Seconds</th>
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</tbody>
</table>

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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-ic2023.0-2/lib/intel64:/home/cpu2017-1.1.9-ic2023.0-2/je5.0.1-64"
MALLOCC_CONF = "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
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.

(Continued on next page)
Lenovo Global Technology

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SPECratenode®2017 fp_base = 895
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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.

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:
Operating Mode set to Maximum Performance
Hyper-Threading set to Disabled
SNC set to SNC4
LLC Prefetch set to Disabled
Sysinfo program /home/cpu2017-1.1.9-ic2023.0-2/bin/sysinfo
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
running on localhost.localdomain Sun Oct 8 05:00:52 2023

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

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23. BIOS

1. uname -a
Linux localhost.localdomain 5.14.0-284.11.1.el9_2.x86_64 #1 SMP PREEMPT_DYNAMIC Wed Apr 12 10:45:03 EDT 2023 x86_64 x86_64 x86_64 GNU/Linux

2. w
05:00:52 up 3 min,  1 user, load average: 0.15, 0.26, 0.12
USER    TTY LOGNAME   IDLE   JCPU   PCPU WHAT

(Continued on next page)
Platform Notes (Continued)

```
root     tty1     05:00    12.00s   1.09s    0.01s   -bash

------------------------------------------------------------------
3. Username
   From environment variable $USER: root

------------------------------------------------------------------
4. ulimit -a
   real-time non-blocking time (microseconds, -R) unlimited
   core file size            (blocks, -c) 0
   data seg size             (kbytes, -d) unlimited
   scheduling priority       (-e) 0
   file size                 (blocks, -f) unlimited
   pending signals           (-i) 2062592
   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) 2062592
   virtual memory            (kbytes, -v) unlimited
   file locks                (-x) unlimited

------------------------------------------------------------------
5. sysinfo process ancestry
   /usr/lib/systemd/systemd rhgb --switched-root --system --deserialize 31
   login -- root
     --bash
   runcpu --nobuild --action validate --define default-platform-flags --define numcopies=112 --c
   ic2023.0-lin-sapphirerapids-rate-20221201.cfg --define cores=112 --define physicalfirst --define
   invoke_with_interleave --define drop_caches --tune base -o all fprate
   runcpu --nobuild --action validate --define default-platform-flags --define numcopies=112 --configfile
   ic2023.0-lin-sapphirerapids-rate-20221201.cfg --define cores=112 --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/CPU2017.027/templogs/preenv.fprate.027.0.log --lognum 027.0 --from_runcpu 2
   specperl $SPEC/bin/sysinfo
   $SPEC = /home/cpu2017-1.1.9-ic2023.0-2

   specperl $SPEC/bin/sysinfo
   $SPEC = /home/cpu2017-1.1.9-ic2023.0-2

------------------------------------------------------------------
6. /proc/cpuinfo
   model name : Intel(R) Xeon(R) Platinum 8480CL
   vendor_id : GenuineIntel
   cpu family : 6
   model : 143
   stepping : 7
   microcode : 0x2b0004b1
   bugs : specstore_bypass swapgs eibrs_pbrsb
   cpu cores : 56
   siblings : 56
   2 physical ids (chips)
   112 processors (hardware threads)
   physical id 0: core ids 0-55
   physical id 1: core ids 0-55
   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
```

(Continued on next page)
CPU2017 License: 9017
Test Date: Oct-2023
Test Sponsor: Lenovo Global Technology
Hardware Availability: Nov-2023
Tested by: Lenovo Global Technology
Software Availability: May-2023

Platform Notes (Continued)

,74,76,78,80,82,84,86,88,90,92,94,96,98,100,102,104,106,108,110
physical id 1: apicids
80,182,184,186,188,190,192,194,196,198,200,202,204,206,208,210,212,214,216,218,220,222,224,226,228,230,23
2,234,236,238
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 2.37.4:

Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Address sizes: 46 bits physical, 57 bits virtual
Byte Order: Little Endian
CPU(s): 112
On-line CPU(s) list: 0-111
Vendor ID: GenuineIntel
BIOS Vendor ID: Intel(R) Corporation
Model name: Intel(R) Xeon(R) Platinum 8480CL
BIOS Model name: Intel(R) Xeon(R) Platinum 8480CL
CPU family: 6
Model: 143
Thread(s) per core: 1
Core(s) per socket: 56
Socket(s): 2
Stepping: 7
CPU max MHz: 3800.000
CPU min MHz: 800.000
BogoMIPS: 4000.00
Flags: fpu vme de pse cx8 apic sep mtrr pge mca cmov pat pse36
clf flush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtsscp
lm constant_tsc art arch_perfmon pebs bts rep_good nopl xtopology
nonstop_tsc cpuid aperfmperf tsc_known_freq pni pclmulqdq dtes64 ds_cpl
smx est tm2 ssse3 sse3 sse2 msr fma cx16 xtpr pdcm dca sse4_1 sse4_2 x2apic
movbe popcnt tsc_deadline_timer aes xsave avx f16c rdrand lahf_lm abm
3dnowprefetch cpuid_fault ebpf cat_l3 cat_l2 cdql cr3_csr
intel_pnپ cdql sbdb mba ibrs ibpb ibrs Enhanced FSGSBASE
tsc_adjust bmi1 avx2 smep bmi2 erms invpcid cqm rdtc_a avx512f avx512dq
rdseed adx smap avx512ifma clflushopt clwb intel_pt avx512cd sha ni
avx512bw avx512vl xsaveopt xsavec xgetbv1 xsaves cm31b l1c cm31b awq
avx512_mmm_total avx512_mmm_local split_lock_detect avx_vnni avx512_bf16
wbnoind vtlm dtherm ida arat pns avx512vbmi umip pku ospe waitpkg
avx512_vbmi2 gfni vaes vpclmulqdq avx512_vnni avx512_bitalg tme
avx512_vpopcntdq la57 rdpid bus_lock_detect coldmote movdiri movdir64b
engcmdl fshr mdisn xia serialized tskxtdtk pconfg arch_lbr ibt amx_bf16
avx512_fp16 amx_tile amx_int8 flush_lld arch_capabilities
L1d cache: 5.3 MiB (112 instances)
L1i cache: 3.5 MiB (112 instances)
L2 cache: 224 MiB (112 instances)
L3 cache: 210 MiB (2 instances)
NUMA node(s): 8
NUMA node0 CPU(s): 0-13
NUMA node1 CPU(s): 14-27
NUMA node2 CPU(s): 28-41
NUMA node3 CPU(s): 42-55
NUMA node4 CPU(s): 56-69
NUMA node5 CPU(s): 70-83
NUMA node6 CPU(s): 84-97

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<td>Software Availability:</td>
</tr>
<tr>
<td>Lenovo Global Technology</td>
<td>May-2023</td>
</tr>
</tbody>
</table>

Platform Notes (Continued)

NUMA node7 CPU(s): 98-111
Vulnerability Itlb multihit: Not affected
Vulnerability L1if: Not affected
Vulnerability Mds: Not affected
Vulnerability Meltdown: Not affected
Vulnerability Mmio stale data: Not affected
Vulnerability Retbleed: Not affected
Vulnerability Spec store bypass: Mitigation; Speculative Store Bypass disabled via prctl
Vulnerability Spectre v1: Mitigation; usercopy/swapgs barriers and _user pointer sanitization
Vulnerability Spectre v2: Mitigation; Enhanced IBRS, IBPB conditional, RSB filling, PBRSB-eIBRS SW sequence
Vulnerability Srbds: Not affected
Vulnerability Tax async abort: Not affected

From lscpu --cache:

```
NAME ONE-SIZE ALL-SIZE WAYS TYPE         LEVEL  SETS PHY-LINE COHERENCY-SIZE
L1d  48K   5.3M  12 Data            1   64      1  64
L1i  32K   3.5M   8 Instruction  1   64      1  64
L2  2M   224M   16 Unified       2 2048      1  64
L3 105M   210M   15 Unified       3 114688   1  64
```

From lscpu --hardware

```
NOTE: a numaclt 'node' might or might not correspond to a physical chip.
available: 8 nodes (0-7)
node 0 cpus: 0-13
node 0 size: 64172 MB
node 0 free: 63758 MB
node 1 cpus: 14-27
node 1 size: 64508 MB
node 1 free: 64185 MB
node 2 cpus: 28-41
node 2 size: 64508 MB
node 2 free: 64149 MB
node 3 cpus: 42-55
node 3 size: 64508 MB
node 3 free: 64174 MB
node 4 cpus: 56-69
node 4 size: 64508 MB
node 4 free: 64206 MB
node 5 cpus: 70-83
node 5 size: 64508 MB
node 5 free: 64234 MB
node 6 cpus: 84-97
node 6 size: 64469 MB
node 6 free: 64168 MB
node 7 cpus: 98-111
node 7 size: 64503 MB
node 7 free: 64200 MB
node distances:
```

```
```
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Test Date: Oct-2023
Hardware Availability: Nov-2023
Software Availability: May-2023

Platform Notes (Continued)

9. /proc/meminfo
   MemTotal: 528066912 kB

10. who -r
    run-level 3 Oct 8 04:57

11. Systemd service manager version: systemd 252 (252-13.el9_2)
    Default Target Status
    multi-user running

12. Services, from systemctl list-unit-files
    STATE UNIT FILES
    enabled NetworkManager NetworkManager-dispatcher NetworkManager-wait-online atd auditd bluetooth
              chronyd crond dbus-broker firewalld getty@ insights-client-boot irqbalance iscsi
              iscsi-onboot kdump libstoragemgmt low-memory-monitor lvmd-monitor mdmonitor
              microcode multipathd nis-domainname nvme=boot-connections rhamcertd rsyslog rtkit-daemon
              selinux-autorelabel-mark smartd sshd ssd sd systemd-boot-update systemd-network-generator
              tuned udisks2 upower
    enabled-runtime systemd-remount-fs
    disabled arp-ethers blk-availability canberra-system-bootup canberra-system-shutdown
             canberra-system-shutdown-reboot chrony-wait console-getty cpupower debug-shell
             dnf-system-upgrade iprdump iprint init update iscsi iscsiuuid kpatch kvm_stat ledmon
             man-db-restart-cache-update nftables nvmf-autoconnect psacct rrdisc rhcd rham
             rhm-facts rpmdb-rebuild selinux-check-proper-disable serial-getty@ sshd-keygen@
             systemd-boot-check-no-failures systemd-pstore systemd-syskext
    indirect ssd-autofs ssd-kcm ssd-nss ssd-pac ssd-pam ssd-ssh ssd-sudo systemd-sysupdate
            systemd-sysupdate-reboot

13. Linux kernel boot-time arguments, from /proc/cmdline
    BOOT_IMAGE=(hd3,gpt2)/vmlinuz-5.14.0-284.11.1.el9_2.x86_64
    root=/dev/mapper/rhel-root
       ro
    resume=/dev/mapper/rhel-swap
    rd.lvm.lv=rhel/root
    rd.lvm.lv=rhel_swap
    rhgb
    quiet

14. cpupower frequency-info
    analyzing CPU 0:
       current policy: frequency should be within 3.80 GHz and 3.80 GHz.
       The governor "performance" may decide which speed to use
       within this range.
       boost state support:
          Supported: yes
          Active: yes

15. tuned-adm active
    Current active profile: throughput-performance

16. sysctl
    kernel.numa_balancing 1

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Platform Notes (Continued)

kernel.randomize_va_space           2
vm.compartment_proactiveness         20
vm.dirty_background_bytes            0
vm.dirty_background_ratio            10
vm.dirty_bytes                       0
vm.dirty_expire_centisecs            3000
vm.dirty_ratio                       40
vm.dirty_writeback_centisecs         500
vm.dirtytime_expire_seconds          43200
vm.extfrag_threshold                 500
vm.min_unmapped_ratio                1
vm.nr_hugepages                      0
vm.nr_hugepages_mempolicy            0
vm.nr_overcommit_hugepages           0
vm.swappiness                        10
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/krhugepaged
   alloc_sleep_millisecs   60000
   defrag                         1
   max_ptes_none                511
   max_ptes_shared             256
   max_ptes_swap                64
   pages_to_scan               4096
   scan_sleep_millisecs        10000

19. OS release
   From /etc/*-release /etc/*-version
   os-release     Red Hat Enterprise Linux 9.2 (Plow)
   redhat-release Red Hat Enterprise Linux release 9.2 (Plow)
   system-release Red Hat Enterprise Linux release 9.2 (Plow)

20. Disk information
    SPEC is set to: /home/cpu2017-1.1.9-ic2023.0-2
    Filesystem            Type  Size  Used Avail Use% Mounted on
    /dev/mapper/rhel-home xfs   819G   22G  797G   3% /home

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 3.3 follows. WARNING: Use caution when you interpret this section.
    The 'dmidecode' program reads system data which is "intended to allow hardware to be accurately..."
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Platform Notes (Continued)

determined", but the intent may not be met, as there are frequent changes to hardware, firmware, and the "DMTF SMBIOS" standard.
Memory:
8x Samsung M321R4GA3BB0-CQKEG 32 GB 2 rank 4800
8x Samsung M321R4GA3BB0-CQKV2 32 GB 2 rank 4800

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23. BIOS
(This section combines info from /sys/devices and dmidecode.)
BIOS Vendor: Lenovo
BIOS Version: ESE117F-2.22
BIOS Date: 08/29/2023
BIOS Revision: 2.22
Firmware Revision: 3.13

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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, Version 2023.0.0 Build 20221201
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
============================================================================================================

C++             | 508.namd_r(base) 510.parest_r(base)
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
Copyright (C) 1985-2022 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 2023.0.0 Build 20221201
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Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
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C++, C, Fortran | 507.cactuBSSN_r(base)
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
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Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
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Fortran         | 503.bwaves_r(base) 549.fotonik3d_r(base) 554.roms_r(base)
Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
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(Continued on next page)
## 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.libm_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`
SPEC CPU®2017 Floating Point Rate Result

Lenovo Global Technology
ThinkSystem SR650 V3
(2.00 GHz, Intel Xeon Platinum 8480CL)

SPECraten®2017_fp_base = 895
SPECraten®2017_fp_peak = Not Run

CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Test Date: Oct-2023
Tested by: Lenovo Global Technology
Hardware Availability: Nov-2023
Software Availability: May-2023

Base Optimization Flags

C benchmarks:
- w -std=c11 -m64 -Wl,-z,muldefs -xsapphirerapids -Ofast -ffast-math
- flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
- Wno-implicit-int -mprefer-vector-width=512 -ljemalloc
- L/usr/local/jemalloc64-5.0.1/lib

C++ benchmarks:
- w -std=c++14 -m64 -Wl,-z,muldefs -xsapphirerapids -Ofast
- ffast-math -flto -mfpmath=sse -funroll-loops
- qopt-mem-layout-trans=4 -mprefer-vector-width=512 -ljemalloc
- L/usr/local/jemalloc64-5.0.1/lib

Fortran benchmarks:
- w -m64 -Wl,-z,muldefs -xsapphirerapids -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 -xsapphirerapids -Ofast -ffast-math
- flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
- Wno-implicit-int -mprefer-vector-width=512 -nostandard-realloc-lhs
- align array32byte -auto -ljemalloc -L/usr/local/jemalloc64-5.0.1/lib

Benchmarks using both C and C++:
- w -std=c++14 -m64 -std=c11 -Wl,-z,muldefs -xsapphirerapids -Ofast
- ffast-math -flto -mfpmath=sse -funroll-loops
- qopt-mem-layout-trans=4 -Wno-implicit-int -mprefer-vector-width=512
- ljemalloc -L/usr/local/jemalloc64-5.0.1/lib

Benchmarks using Fortran, C, and C++:
- w -m64 -std=c++14 -std=c11 -Wl,-z,muldefs -xsapphirerapids -Ofast
- ffast-math -flto -mfpmath=sse -funroll-loops
- qopt-mem-layout-trans=4 -Wno-implicit-int -mprefer-vector-width=512
- 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-Z.html

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-Z.xml
### Lenovo Global Technology

**ThinkSystem SR650 V3**  
(2.00 GHz, Intel Xeon Platinum 8480CL)

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<th>Specification</th>
<th>Value</th>
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<td>895</td>
</tr>
<tr>
<td>SPECrate\textsuperscript{®}2017\textsubscript{fp} peak</td>
<td>Not Run</td>
</tr>
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- **CPU2017 License**: 9017
- **Test Sponsor**: Lenovo Global Technology
- **Tested by**: Lenovo Global Technology
- **Test Date**: Oct-2023
- **Hardware Availability**: Nov-2023
- **Software Availability**: May-2023

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

Tested with SPEC CPU\textsuperscript{*}2017 v1.1.9 on 2023-10-08 05:00:51-0400.  
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