



SPEC CPU®2017 Integer Speed Result

Copyright 2017-2024 Standard Performance Evaluation Corporation

Lenovo Global Technology

ThinkSystem SD650 V3
(1.90 GHz, Intel Xeon Max 9480)

SPECspeed®2017_int_base = 13.5

SPECspeed®2017_int_peak = Not Run

CPU2017 License: 9017

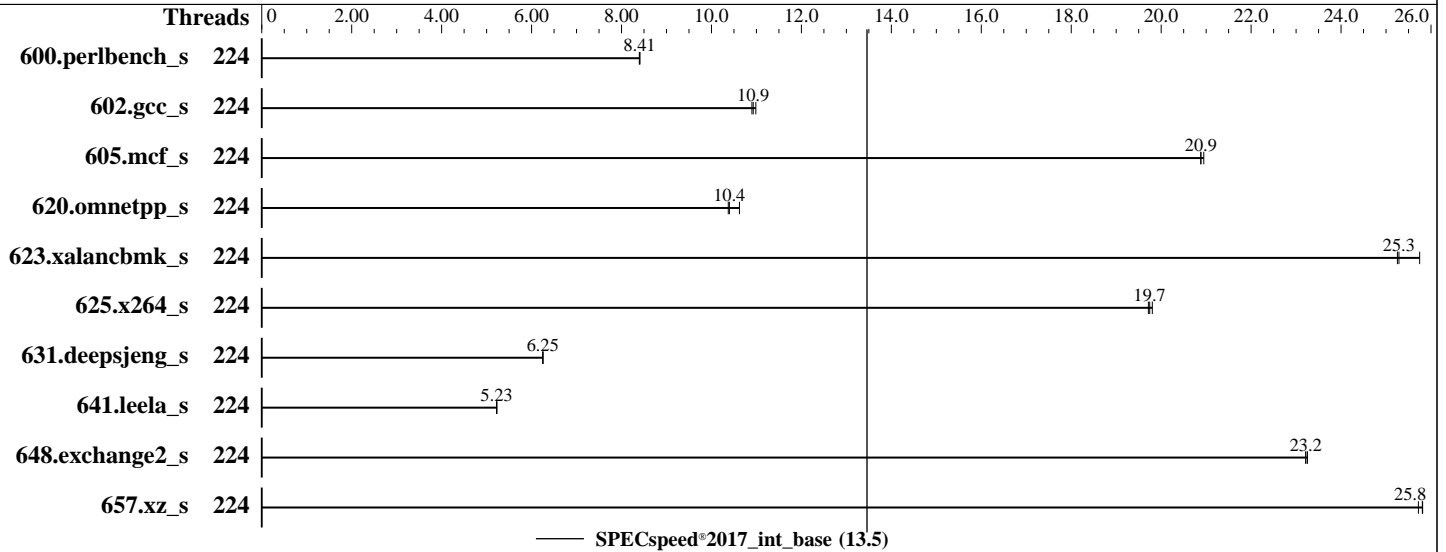
Test Sponsor: Lenovo Global Technology

Tested by: Lenovo Global Technology

Test Date: May-2023

Hardware Availability: May-2023

Software Availability: Dec-2022



Hardware

CPU Name: Intel Xeon Max 9480
 Max MHz: 3500
 Nominal: 1900
 Enabled: 112 cores, 2 chips, 2 threads/core
 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: 112.5 MB I+D on chip per chip
 Other: None
 Memory: 640 GB (16 x 32 GB 2Rx8 PC5-4800B-R +
 2 x 64 GB HBM)
 Storage: 1 x 960 GB SATA SSD
 Other: None

Software

OS: SUSE Linux Enterprise Server 15 SP4 (x86_64)
 Kernel 5.14.21-150400.22-default
 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: Yes
 Firmware: Lenovo BIOS Version USE117T 3.10 released Apr-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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Results Table

| Benchmark | Base | | | | | | | Peak | | | | | | |
|-----------------|---------|------------|-------------|-------------|-------------|------------|-------------|---------|---------|-------|---------|-------|---------|-------|
| | Threads | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio | Threads | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio |
| 600.perlbench_s | 224 | 211 | 8.41 | 211 | 8.40 | <u>211</u> | <u>8.41</u> | | | | | | | |
| 602.gcc_s | 224 | 364 | <u>10.9</u> | 365 | 10.9 | 362 | 11.0 | | | | | | | |
| 605.mcf_s | 224 | <u>226</u> | 20.9 | 226 | 20.9 | 225 | 20.9 | | | | | | | |
| 620.omnetpp_s | 224 | 157 | 10.4 | <u>157</u> | 10.4 | 154 | 10.6 | | | | | | | |
| 623.xalancbmk_s | 224 | 56.1 | 25.3 | 56.0 | <u>25.3</u> | 55.0 | 25.7 | | | | | | | |
| 625.x264_s | 224 | 89.5 | 19.7 | <u>89.3</u> | 19.7 | 89.1 | 19.8 | | | | | | | |
| 631.deepsjeng_s | 224 | <u>229</u> | 6.25 | 229 | 6.25 | 229 | 6.25 | | | | | | | |
| 641.leela_s | 224 | 326 | 5.23 | <u>326</u> | 5.23 | 327 | 5.22 | | | | | | | |
| 648.exchange2_s | 224 | <u>127</u> | 23.2 | 127 | 23.2 | 126 | 23.3 | | | | | | | |
| 657.xz_s | 224 | 239 | 25.8 | <u>240</u> | 25.8 | 240 | 25.7 | | | | | | | |

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Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

Compiler Notes

SPEC has ruled that the compiler used for this result was performing a compilation that specifically improves the performance of the 523.xalancbmk_r / 623.xalancbmk_s benchmarks using a priori knowledge of the SPEC code and dataset to perform a transformation that has narrow applicability.

In order to encourage optimizations that have wide applicability (see rule 1.4 https://www.spec.org/cpu2017/Docs/runrules.html#rule_1.4), SPEC will no longer publish results using this optimization.

This result is left in the SPEC results database for historical reference.

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:

```
KMP_AFFINITY = "granularity=fine,scatter"
LD_LIBRARY_PATH = "/home/cpu2017-1.1.9-ic2023.0/lib/intel64:/home/cpu2017-1.1.9-ic2023.0/je5.0.1-64"
MALLOCONF = "retain:true"
OMP_STACKSIZE = "192M"
```

General Notes

Binaries compiled on a system with 2x Intel Xeon Platinum 8280M CPU + 384GB RAM memory using Redhat Enterprise Linux 8.0
Transparent Huge Pages enabled by default
Prior to runcpu invocation

(Continued on next page)



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General Notes (Continued)

Filesystem page cache synced and cleared with:

```
sync; echo 3> /proc/sys/vm/drop_caches
```

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

sources available from jemalloc.net or <https://github.com/jemalloc/jemalloc/releases>

Platform Notes

BIOS configuration:

Choose Operating Mode set to Custom Mode

CPU P-state Control set to Cooperative with Legacy

Sysinfo program /home/cpu2017-1.1.9-ic2023.0/bin/sysinfo

Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197

running on Perf-Seoul2-L Mon May 8 06:53:51 2023

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

Table of contents

1. uname -a
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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
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
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21. /sys/devices/virtual/dmi/id
22. dmidecode
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```
1. uname -a
Linux Perf-Seoul2-L 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

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Platform Notes (Continued)

```
06:53:51 up 3 min, 1 user, load average: 1.41, 4.17, 2.14
USER      TTY      FROM          LOGIN@      IDLE        JCPU        PCPU        WHAT
root      tty1     -             06:53      7.00s      1.06s      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) 2062392
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) 2062392
virtual memory (kbytes, -v) unlimited
file locks (-x) unlimited

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 -c
ic2023.0-lin-sapphirerapids-speed-20221201.cfg --define cores=112 --tune base -o all --define
intspeedaffinity --define smt-on --define drop_caches intspeed
runcpu --nobuild --action validate --define default-platform-flags --configfile
ic2023.0-lin-sapphirerapids-speed-20221201.cfg --define cores=112 --tune base --output_format all --define
intspeedaffinity --define smt-on --define drop_caches --nopower --runmode speed --tune base --size
refspeed intspeed --nopreenv --note-preenv --logfile
\$SPEC/tmp/CPU2017.083/templogs/preenv.intspeed.083.0.log --lognum 083.0 --from_runcpu 2
specperl \$SPEC/bin/sysinfo
\$SPEC = /home/cpu2017-1.1.9-ic2023.0

6. /proc/cpuinfo
model name : Intel (R) Xeon (R) CPU Max 9480
vendor_id : GenuineIntel
cpu family : 6
model : 143
stepping : 8
microcode : 0x2c0001d1
bugs : spectre_v1 spectre_v2 spec_store_bypass swapgs
cpu cores : 56
siblings : 112
2 physical ids (chips)
224 processors (hardware threads)
physical id 0: core ids 0-55
physical id 1: core ids 0-55

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Platform Notes (Continued)

physical id 0: apicids 0-111
physical id 1: apicids 128-239

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
CPU op-mode(s):              32-bit, 64-bit
Address sizes:               46 bits physical, 57 bits virtual
Byte Order:                  Little Endian
CPU(s):                       224
On-line CPU(s) list:         0-223
Vendor ID:                   GenuineIntel
Model name:                   Intel (R) Xeon (R) CPU Max 9480
CPU family:                   6
Model:                        143
Thread(s) per core:          2
Core(s) per socket:          56
Socket(s):                    2
Stepping:                     8
CPU max MHz:                  3500.0000
CPU min MHz:                  800.0000
BogoMIPS:                     3800.00
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 aperfperf 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_l3 cat_l2 cdp_l3
                                invpcid_single intel_ppin cdp_l2 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 adx smap
                                avx512ifma clflushopt clwb intel_pt avx512cd sha_ni avx512bw avx512vl
                                xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbm_total
                                cqm_mbm_local split_lock_detect avx_vnni avx512_bf16 wbnoinvd dtherm ida
                                arat pln pts hwp hwp_act_window hwp_epp hwp_pkg_req avx512vbmi umip pku
                                ospke waitpkg avx512_vbmi2 gfni vaes vpclmulqdq avx512_vnni avx512_bitalg
                                tme avx512_vpopcntdq la57 rdpid bus_lock_detect cldemote movdiri movdir64b
                                enqcmd fsrm md_clear serialize tsxldtrk pconfig arch_lbr avx512_fp16
                                amx_tile flush_lld arch_capabilities
Virtualization:              VT-x
L1d cache:                   5.3 MiB (112 instances)
L1i cache:                   3.5 MiB (112 instances)
L2 cache:                     224 MiB (112 instances)
L3 cache:                     225 MiB (2 instances)
NUMA node(s):                2
NUMA node0 CPU(s):           0-55,112-167
NUMA node1 CPU(s):           56-111,168-223
Vulnerability Itlb multihit: Not affected
Vulnerability L1tf:          Not affected
Vulnerability Mds:           Not affected
Vulnerability Meltdown:     Not affected
Vulnerability Spec store bypass: Mitigation; Speculative Store Bypass disabled via prctl and seccomp
Vulnerability Spectre v1:    Mitigation; usercopy/swapgs barriers and __user pointer sanitization
Vulnerability Spectre v2:    Mitigation; Enhanced IBRS, IBPB conditional, RSB filling
Vulnerability Srbds:         Not affected

```

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Platform Notes (Continued)

Vulnerability Tsx 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 | 112.5M | 225M | 15 | Unified | 3 | 122880 | 1 | 64 |

8. numactl --hardware

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

```

available: 2 nodes (0-1)
node 0 cpus: 0-55,112-167
node 0 size: 257683 MB
node 0 free: 255740 MB
node 1 cpus: 56-111,168-223
node 1 size: 257938 MB
node 1 free: 255720 MB
node distances:
node  0  1
  0:  10  21
  1:  21  10

```

9. /proc/meminfo

MemTotal: 527996976 kB

10. who -r

run-level 3 May 8 06:51

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 display-manager 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 autofs autoyast-initscripts blk-availability boot-sysctl ca-certificates chrony-wait
chronyd console-getty cups cups-browsed debug-shell ebttables exchange-bmc-os-info
firewalld gpm grub2-once haveged-switch-root ipmi ipmievdev issue-add-ssh-keys kexec-load
lunmask man-db-create multipathd nfs nfs-blkmap rdisc rpcbind rpmconfigcheck rsyncd
serial-getty@ smartd_generate_opts snmpd snmptrapd systemd-boot-check-no-failures
systemd-network-generator systemd-sysext systemd-time-wait-sync systemd-timesyncd tuned
indirect wickedd

```

13. Linux kernel boot-time arguments, from /proc/cmdline

```

BOOT_IMAGE=/boot/vmlinuz-5.14.21-150400.22-default
root=UUID=5f8bfd2f-a83f-41d5-8917-33e974e2f5bd
splash=silent
mitigations=auto
quiet

```

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Platform Notes (Continued)

security=apparmor

14. cpupower frequency-info

analyzing CPU 0:

current policy: frequency should be within 800 MHz and 3.50 GHz.

The governor "performance" may decide which speed to use within this range.

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: powersave

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.extfrag_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 |
| pages_to_scan | 4096 |
| scan_sleep_millisecs | 10000 |

19. OS release

From /etc/*-release /etc/*-version

os-release SUSE Linux Enterprise Server 15 SP4

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Platform Notes (Continued)

20. Disk information

SPEC is set to: /home/cpu2017-1.1.9-ic2023.0
Filesystem Type Size Used Avail Use% Mounted on
/dev/sda3 xfs 889G 42G 848G 5% /

21. /sys/devices/virtual/dmi/id

Vendor: Lenovo
Product: ThinkSystem SD650 V3
Product Family: ThinkSystem
Serial: 9999999999

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:
8x Intel 16 GB 1 rank 3200
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: USE117T-3.10
BIOS Date: 04/17/2023
BIOS Revision: 3.10
Firmware Revision: 2.10

Each Intel Xeon CPU Max processor is configured with 64 GB of High Bandwidth Memory (HBM) in-package. dmidecode is additionally reporting the capacity of the CPU in-package HBM stack as: '8x Intel 16 GB 1 rank 3200'

Compiler Version Notes

=====
C | 600.perlbench_s(base) 602.gcc_s(base) 605.mcf_s(base) 625.x264_s(base) 657.xz_s(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++ | 620.omnetpp_s(base) 623.xalancbmk_s(base) 631.deepsjeng_s(base) 641.leela_s(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.

=====
Fortran | 648.exchange2_s(base)

Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.



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Base Compiler Invocation

C benchmarks:

icx

C++ benchmarks:

icpx

Fortran benchmarks:

ifx

Base Portability Flags

```
600.perlbench_s: -DSPEC_LP64 -DSPEC_LINUX_X64
602.gcc_s: -DSPEC_LP64
605.mcf_s: -DSPEC_LP64
620.omnetpp_s: -DSPEC_LP64
623.xalancbmk_s: -DSPEC_LP64 -DSPEC_LINUX
625.x264_s: -DSPEC_LP64
631.deepsjeng_s: -DSPEC_LP64
641.leela_s: -DSPEC_LP64
648.exchange2_s: -DSPEC_LP64
657.xz_s: -DSPEC_LP64
```

Base Optimization Flags

C benchmarks:

```
-m64 -std=c11 -Wl,-z,muldefs -xsapphirerapids -O3 -ffast-math -flto
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -fiopenmp
-DSPEC_OPENMP -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

C++ benchmarks:

```
-m64 -std=c++14 -Wl,-z,muldefs -xsapphirerapids -O3 -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

Fortran benchmarks:

```
-m64 -Wl,-z,muldefs -xsapphirerapids -O3 -ffast-math -flto
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-nostandard-realloc-lhs -align array32byte
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```



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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-P.html>

<http://www.spec.org/cpu2017/flags/Intel-ic2023-official-linux64.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-P.xml>

<http://www.spec.org/cpu2017/flags/Intel-ic2023-official-linux64.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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