SPEC CPU®2017 Integer Rate Result

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Supermicro
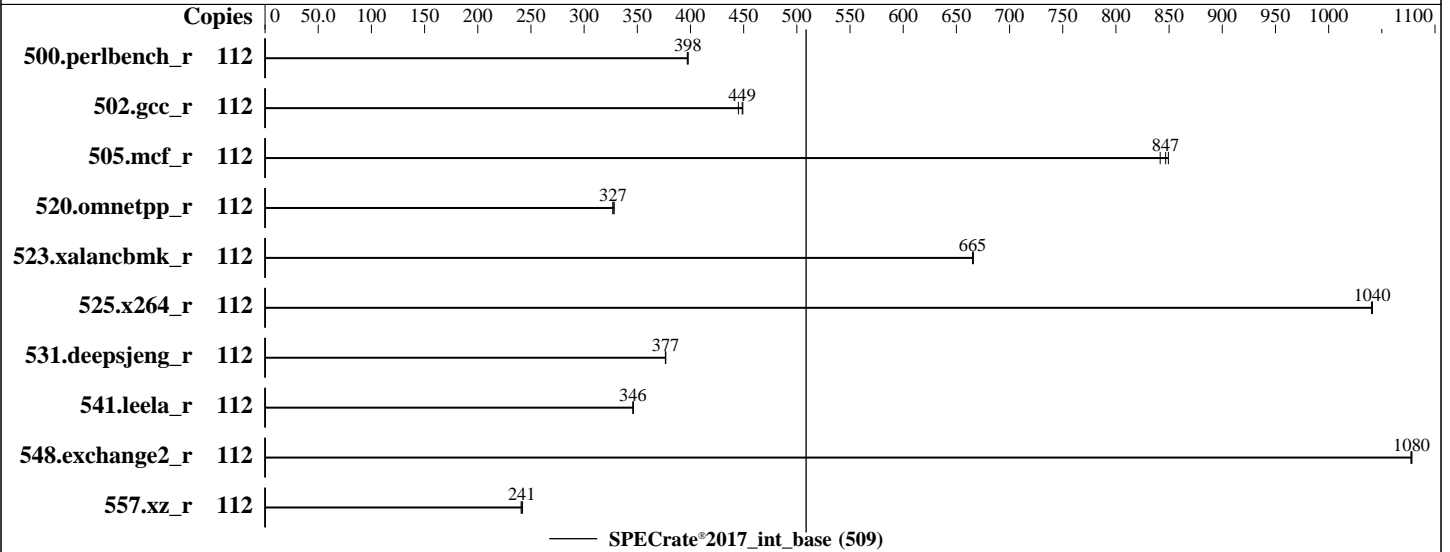
SuperServer SYS-621H-TN12R
(X13DEM , Intel Xeon Gold 5520+)

$SPECrate^{®}2017\_int\_base = \quad 509$

$SPECrate^{®}2017\_int\_peak = Not\ Run$

CPU2017 License: 001176	**Test Date:** Feb-2024
Test Sponsor: Supermicro	**Hardware Availability:** Oct-2023
Tested by: Supermicro	**Software Availability:** Dec-2023

Copies scale: 0 50.0 100 150 200 250 300 350 400 450 500 550 600 650 700 750 800 850 900 950 1000 1100

- 500.perlbench_r 112 — 398
- 502.gcc_r 112 — 449
- 505.mcf_r 112 — 847
- 520.omnetpp_r 112 — 327
- 523.xalancbmk_r 112 — 665
- 525.x264_r 112 — 1040
- 531.deepsjeng_r 112 — 377
- 541.leela_r 112 — 346
- 548.exchange2_r 112 — 1080
- 557.xz_r 112 — 241

——— **SPECrate®2017_int_base (509)**

Hardware

CPU Name: Intel Xeon Gold 5520+
  Max MHz: 4000
  Nominal: 2200
Enabled: 56 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: 52.5 MB I+D on chip per chip
  Other: None
Memory: 1 TB (16 x 64 GB 2Rx4 PC5-5600B-R, running at 4800)
Storage: 1 x 960 GB M.2 NVME SSD
Other: None

Software

OS: SUSE Linux Enterprise Server 15 SP5
5.14.21-150500.53-default
Compiler: C/C++: Version 2023.2.3 of Intel oneAPI DPC++/C++ Compiler for Linux;
Fortran: Version 2023.2.3 of Intel Fortran Compiler for Linux;
Parallel: No
Firmware: Version 2.1 released Oct-2023
File System: btrfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: Not Applicable
Other: None
Power Management: BIOS set to prefer performance at the cost of additional power usage.

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Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
500.perlbench_r	112	**448**	**398**	449	397	448	398							
502.gcc_r	112	356	445	353	449	**354**	**449**							
505.mcf_r	112	215	842	213	849	**214**	**847**							
520.omnetpp_r	112	**449**	**327**	449	327	448	328							
523.xalancbmk_r	112	**178**	**665**	178	665	178	666							
525.x264_r	112	188	1040	**188**	**1040**	188	1040							
531.deepsjeng_r	112	341	376	341	377	**341**	**377**							
541.leela_r	112	536	346	536	346	**536**	**346**							
548.exchange2_r	112	272	1080	**272**	**1080**	272	1080							
557.xz_r	112	**501**	**241**	500	242	502	241							
SPECrate®2017_int_base =		**509**												
SPECrate®2017_int_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/lib/intel64:/home/cpu2017/lib/ia32:/home/cpu2017/je5.0.1-32"
MALLOC_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.
 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)

(Continued on next page)

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Hardware Availability: Oct-2023
Software Availability: Dec-2023

General Notes (Continued)

is mitigated in the system as tested and documented.

Platform Notes

```
BIOS Settings:
 Power Technology = Custom
 Power Performance Tuning = BIOS Controls EPB
 ENERGY_PERF_BIAS_CFG mode = Extreme Performance
 KTI Prefetch = Enable
 SNC = Enable SNC2 (2-clusters)
 DCU Streamer Prefetcher = Disable
 LLC Dead Line Alloc = Disable
 Fan Mode: Full Speed

 Sysinfo program /home/cpu2017/bin/sysinfo
 Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
 running on 155-139 Thu Feb 15 15:25:19 2024

 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 (249.16+suse.171.gdad0071f15)
 12. Services, from systemctl list-unit-files
 13. Linux kernel boot-time arguments, from /proc/cmdline
 14. cpupower frequency-info
 15. sysctl
 16. /sys/kernel/mm/transparent_hugepage
 17. /sys/kernel/mm/transparent_hugepage/khugepaged
 18. OS release
 19. Disk information
 20. /sys/devices/virtual/dmi/id
 21. dmidecode
 22. BIOS
 ------------------------------------------------------------


 ------------------------------------------------------------
 1. uname -a
   Linux 155-139 5.14.21-150500.53-default #1 SMP PREEMPT_DYNAMIC Wed May 10 07:56:26 UTC 2023 (b630043)
   x86_64 x86_64 x86_64 GNU/Linux


 ------------------------------------------------------------
 2. w
   15:25:19 up 22:35,  3 users,  load average: 0.02, 0.02, 0.00
   USER     TTY      FROM             LOGIN@   IDLE   JCPU   PCPU WHAT
   root     tty1     -                Wed16    7.00s  1.02s  0.01s -bash

 ------------------------------------------------------------
```

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Platform Notes (Continued)

```
 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) 4124963
   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) 4124963
   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
  runcpu --nobuild --action validate --define default-platform-flags --define numcopies=112 -c
    ic2023.2.3-lin-core-avx512-rate-20231121.cfg --define smt-on --define cores=56 --define physicalfirst
    --define invoke_with_interleave --define drop_caches --tune base -o all intrate
  runcpu --nobuild --action validate --define default-platform-flags --define numcopies=112 --configfile
    ic2023.2.3-lin-core-avx512-rate-20231121.cfg --define smt-on --define cores=56 --define physicalfirst
    --define invoke_with_interleave --define drop_caches --tune base --output_format all --nopower --runmode
    rate --tune base --size refrate intrate --nopreenv --note-preenv --logfile
    $SPEC/tmp/CPU2017.008/templogs/preenv.intrate.008.0.log --lognum 008.0 --from_runcpu 2
  specperl $SPEC/bin/sysinfo
  $SPEC = /home/cpu2017


   ------------------------------------------------------------
 6. /proc/cpuinfo
    model name        : INTEL(R) XEON(R) GOLD 5520+
    vendor_id         : GenuineIntel
    cpu family        : 6
    model             : 207
    stepping          : 2
    microcode         : 0x21000200
    bugs              : spectre_v1 spectre_v2 spec_store_bypass swapgs eibrs_pbrsb
    cpu cores         : 28
    siblings          : 56
    2 physical ids (chips)
    112 processors (hardware threads)
    physical id 0: core ids 0-27
    physical id 1: core ids 0-27
    physical id 0: apicids 0-55
    physical id 1: apicids 128-183
  Caution: /proc/cpuinfo data regarding chips, cores, and threads is not necessarily reliable, especially for
  virtualized systems.  Use the above data carefully.


   ------------------------------------------------------------
```

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Platform Notes (Continued)

```
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
  Model name:              INTEL(R) XEON(R) GOLD 5520+
  CPU family:              6
  Model:                   207
  Thread(s) per core:      2
  Core(s) per socket:      28
  Socket(s):               2
  Stepping:                2
  BogoMIPS:                4400.00
  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 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_l3 cat_l2 cdp_l3
                           invpcid_single 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 avx_vnni avx512_bf16 wbnoinvd dtherm ida arat pln pts
                           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_l1d arch_capabilities
  Virtualization:          VT-x
  L1d cache:               2.6 MiB (56 instances)
  L1i cache:               1.8 MiB (56 instances)
  L2 cache:                112 MiB (56 instances)
  L3 cache:                105 MiB (2 instances)
  NUMA node(s):            4
  NUMA node0 CPU(s):       0-13,56-69
  NUMA node1 CPU(s):       14-27,70-83
  NUMA node2 CPU(s):       28-41,84-97
  NUMA node3 CPU(s):       42-55,98-111
  Vulnerability Itlb multihit:    Not affected
  Vulnerability L1tf:             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 and seccomp
  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 Tsx async abort:  Not affected

 From lscpu --cache:
      NAME ONE-SIZE ALL-SIZE WAYS TYPE        LEVEL  SETS PHY-LINE COHERENCY-SIZE
```

(Continued on next page)

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Platform Notes (Continued)

```
     L1d      48K     2.6M   12 Data          1    64    1        64
     L1i      32K     1.8M    8 Instruction   1    64    1        64
     L2        2M     112M   16 Unified       2  2048    1        64
     L3     52.5M     105M   15 Unified       3 57344    1        64


     ------------------------------------------------------------
  8. numactl --hardware
  NOTE: a numactl 'node' might or might not correspond to a physical chip.
     available: 4 nodes (0-3)
     node 0 cpus: 0-13,56-69
     node 0 size: 257606 MB
     node 0 free: 248305 MB
     node 1 cpus: 14-27,70-83
     node 1 size: 258006 MB
     node 1 free: 251675 MB
     node 2 cpus: 28-41,84-97
     node 2 size: 258040 MB
     node 2 free: 251371 MB
     node 3 cpus: 42-55,98-111
     node 3 size: 257616 MB
     node 3 free: 251630 MB
     node distances:
     node   0   1   2   3
       0:  10  12  21  21
       1:  12  10  21  21
       2:  21  21  10  12
       3:  21  21  12  10


     ------------------------------------------------------------
  9. /proc/meminfo
     MemTotal:      1056021644 kB


     ------------------------------------------------------------
 10. who -r
    run-level 3 Feb 14 16:50 last=5


     ------------------------------------------------------------
 11. Systemd service manager version: systemd 249 (249.16+suse.171.gdad0071f15)
    Default Target  Status
    graphical       running


     ------------------------------------------------------------
 12. Services, from systemctl list-unit-files
    STATE           UNIT FILES
    enabled         YaST2-Firstboot YaST2-Second-Stage apparmor appstream-sync-cache auditd bluetooth cron
                    display-manager firewalld getty@ irqbalance issue-generator kbdsettings kdump kdump-early
                    klog lvm2-monitor nscd nvmefc-boot-connections postfix purge-kernels rollback rsyslog
                    smartd sshd systemd-pstore wicked wickedd-auto4 wickedd-dhcp4 wickedd-dhcp6 wickedd-nanny
    enabled-runtime systemd-remount-fs
    disabled        accounts-daemon autofs autoyast-initscripts blk-availability bluetooth-mesh boot-sysctl
                    ca-certificates chrony-wait chronyd console-getty cups cups-browsed debug-shell ebtables
                    exchange-bmc-os-info gpm grub2-once haveged haveged-switch-root ipmi ipmievd
                    issue-add-ssh-keys kexec-load lunmask man-db-create multipathd nfs nfs-blkmap nmb
                    nvmf-autoconnect ostree-remount rpcbind rpmconfigcheck rsyncd rtkit-daemon serial-getty@
                    smartd_generate_opts smb snmpd snmptrapd speech-dispatcherd systemd-boot-check-no-failures
                    systemd-network-generator systemd-sysext systemd-time-wait-sync systemd-timesyncd udisks2
                    update-system-flatpaks upower vncserver@
    indirect        wickedd


     ------------------------------------------------------------
```

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Platform Notes (Continued)

```
   13. Linux kernel boot-time arguments, from /proc/cmdline
      BOOT_IMAGE=/boot/vmlinuz-5.14.21-150500.53-default
      root=UUID=8e8c0749-cfeb-4341-986b-68d8b0a3fed1
      splash=silent
      mitigations=auto
      quiet
      security=apparmor
      crashkernel=403M,high
      crashkernel=72M,low

     ----------------------------------------------------------
   14. cpupower frequency-info
      analyzing CPU 0:
        Unable to determine current policy
        boost state support:
          Supported: yes
          Active: yes

     ----------------------------------------------------------
   15. 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

     ----------------------------------------------------------
   16. /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

     ----------------------------------------------------------
   17. /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

     ----------------------------------------------------------
   18. OS release
      From /etc/*-release /etc/*-version
```

(Continued on next page)

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Platform Notes (Continued)

```
  os-release SUSE Linux Enterprise Server 15 SP5


  ----------------------------------------------------------
  19. Disk information
  SPEC is set to: /home/cpu2017
    Filesystem      Type   Size  Used Avail Use% Mounted on
    /dev/nvme0n1p5 btrfs  563G   40G  523G   7% /home


  ----------------------------------------------------------
  20. /sys/devices/virtual/dmi/id
      Vendor:         Supermicro
      Product:        Super Server
      Product Family: Family
      Serial:         0123456789


  ----------------------------------------------------------
  21. dmidecode
    Additional information from dmidecode 3.4 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:
      15x Samsung M321R8GA0PB0-CWMKH 64 GB 2 rank 5600, configured at 4800
      1x Samsung M321R8GA0PB0-CWMXH 64 GB 2 rank 5600, configured at 4800


  ----------------------------------------------------------
  22. BIOS
  (This section combines info from /sys/devices and dmidecode.)
    BIOS Vendor:      American Megatrends International, LLC.
    BIOS Version:     2.1
    BIOS Date:        12/07/2023
    BIOS Revision:    5.32
```

Compiler Version Notes

```
==============================================================================
C       | 500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base) 525.x264_r(base) 557.xz_r(base)
------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.2.3 Build x
Copyright (C) 1985-2023 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------


==============================================================================
C++     | 520.omnetpp_r(base) 523.xalancbmk_r(base) 531.deepsjeng_r(base) 541.leela_r(base)
------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.2.3 Build x
Copyright (C) 1985-2023 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------


==============================================================================
Fortran | 548.exchange2_r(base)
------------------------------------------------------------------------------
Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2023.2.3 Build x
Copyright (C) 1985-2023 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------
```

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Base Compiler Invocation

C benchmarks:
```
icx
```

C++ benchmarks:
```
icpx
```

Fortran benchmarks:
```
ifx
```

Base Portability Flags

500.perlbench_r: `-DSPEC_LP64 -DSPEC_LINUX_X64`
502.gcc_r: `-DSPEC_LP64`
505.mcf_r: `-DSPEC_LP64`
520.omnetpp_r: `-DSPEC_LP64`
523.xalancbmk_r: `-DSPEC_LP64 -DSPEC_LINUX`
525.x264_r: `-DSPEC_LP64`
531.deepsjeng_r: `-DSPEC_LP64`
541.leela_r: `-DSPEC_LP64`
548.exchange2_r: `-DSPEC_LP64`
557.xz_r: `-DSPEC_LP64`

Base Optimization Flags

C benchmarks:
```
-w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-L/home/specdev/new_compilers/ic2023.2.3/compiler/lib/intel64_lin
-lqkmalloc
```

C++ benchmarks:
```
-w -std=c++14 -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-L/home/specdev/new_compilers/ic2023.2.3/compiler/lib/intel64_lin
-lqkmalloc
```

Fortran benchmarks:
```
-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ffast-math -flto
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-nostandard-realloc-lhs -align array32byte -auto
-L/home/specdev/new_compilers/ic2023.2.3/compiler/lib/intel64_lin
-lqkmalloc
```

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Tested by:	Supermicro	**Software Availability:**	Dec-2023

The flags files that were used to format this result can be browsed at
`http://www.spec.org/cpu2017/flags/Intel-ic2023p2-official-linux64.html`
`http://www.spec.org/cpu2017/flags/Supermicro-Platform-Settings-V1.2-SPR-revG.html`

You can also download the XML flags sources by saving the following links:
`http://www.spec.org/cpu2017/flags/Intel-ic2023p2-official-linux64.xml`
`http://www.spec.org/cpu2017/flags/Supermicro-Platform-Settings-V1.2-SPR-revG.xml`

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

Tested with SPEC CPU®2017 v1.1.9 on 2024-02-15 18:25:18-0500.
Report generated on 2024-03-14 10:56:50 by CPU2017 PDF formatter v6716.
Originally published on 2024-03-13.