SPEC CPU®2017 Integer Rate Result

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Supermicro

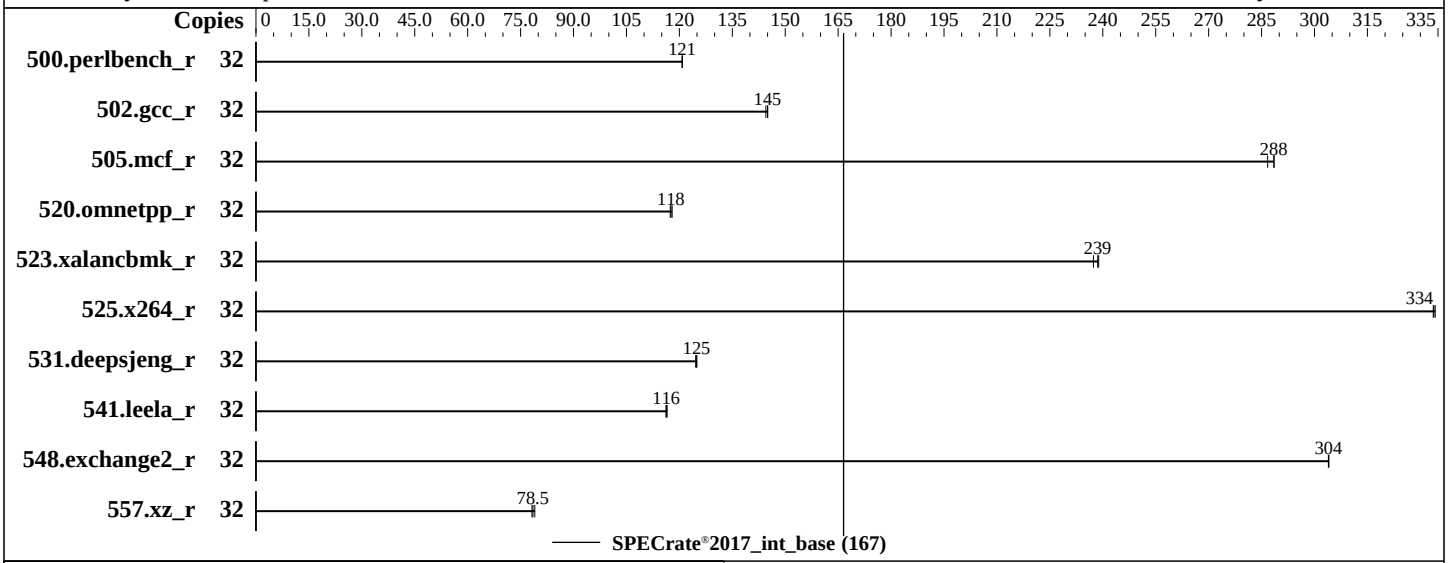
SuperServer SYS-121H-TNR
(X13DEM , Intel Xeon Silver 4509Y)

SPECrate®2017_int_base = 167

SPECrate®2017_int_peak = Not Run

CPU2017 License: 001176
Test Sponsor: Supermicro
Tested by: Supermicro

Test Date: May-2025
Hardware Availability: Nov-2023
Software Availability: Jun-2024



Hardware

CPU Name:	Intel Xeon Silver 4509Y
Max MHz:	4100
Nominal:	2600
Enabled:	16 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:	22.5 MB I+D on chip per chip
Other:	None
Memory:	1 TB (16 x 64 GB 2Rx4 PC5-5600B-R, running at 4400)
Storage:	1 x 1.6TB NVMe SSD
Other:	CPU Cooling: Air

Software

OS:	SUSE Linux Enterprise Server 15 SP6 6.4.0-150600.21-default
Compiler:	C/C++: Version 2024.1 of Intel oneAPI DPC++/C++ Compiler for Linux; Fortran: Version 2024.1 of Intel Fortran Compiler for Linux;
Parallel:	No
Firmware:	Version 2.6 released Apr-2025
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	32	422	121	422	121	**422**	**121**							
502.gcc_r	32	314	145	**312**	**145**	312	145							
505.mcf_r	32	179	289	**179**	**288**	180	287							
520.omnetpp_r	32	358	117	**357**	**118**	356	118							
523.xalancbmk_r	32	**142**	**239**	142	237	141	239							
525.x264_r	32	168	334	**168**	**334**	168	334							
531.deepsjeng_r	32	294	125	**294**	**125**	294	125							
541.leela_r	32	**456**	**116**	456	116	455	117							
548.exchange2_r	32	276	304	276	304	**276**	**304**							
557.xz_r	32	**440**	**78.5**	437	79.0	442	78.2							

SPECrate®2017_int_base = 167

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)
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

 Sysinfo program /home/cpu2017/bin/sysinfo
 Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
 running on localhost Fri May  2 14:56:45 2025

 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 254 (254.10+suse.84.ge8d77af424)
 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 localhost 6.4.0-150600.21-default #1 SMP PREEMPT_DYNAMIC Thu May 16 11:09:22 UTC 2024 (36c1e09)
   x86_64 x86_64 x86_64 GNU/Linux

 ------------------------------------------------------------
 2. w
    14:56:45 up 1 min,  1 user,  load average: 0.58, 0.28, 0.10
   USER     TTY      FROM             LOGIN@   IDLE   JCPU   PCPU WHAT
   root     tty1     -                14:56   13.00s  0.85s  0.01s -bash

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

 ------------------------------------------------------------
 4. ulimit -a
   core file size          (blocks, -c) unlimited
```

(Continued on next page)

Platform Notes (Continued)

```
   data seg size           (kbytes, -d) unlimited
   scheduling priority             (-e) 0
   file size               (blocks, -f) unlimited
   pending signals                 (-i) 4126935
   max locked memory       (kbytes, -l) 8192
   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) 4126935
   virtual memory          (kbytes, -v) unlimited
   file locks                      (-x) unlimited

------------------------------------------------------------
5. sysinfo process ancestry
 /usr/lib/systemd/systemd --switched-root --system --deserialize=42
 login -- root
 -bash
 -bash
 runcpu --nobuild --action validate --define default-platform-flags --define numcopies=32 -c
   ic2024.1-lin-core-avx512-rate-20240308.cfg --define smt-on --define cores=16 --define physicalfirst
   --define invoke_with_interleave --define drop_caches --tune base -o all intrate
 runcpu --nobuild --action validate --define default-platform-flags --define numcopies=32 --configfile
   ic2024.1-lin-core-avx512-rate-20240308.cfg --define smt-on --define cores=16 --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/CPU2017.023/templogs/preenv.intrate.023.0.log --lognum 023.0 --from_runcpu 2
 specperl $SPEC/bin/sysinfo
$SPEC = /home/cpu2017

------------------------------------------------------------
6. /proc/cpuinfo
    model name      : INTEL(R) XEON(R) SILVER 4509Y
    vendor_id       : GenuineIntel
    cpu family      : 6
    model           : 143
    stepping        : 8
    microcode       : 0x2b000639
    bugs            : spectre_v1 spectre_v2 spec_store_bypass swapgs eibrs_pbrsb bhi
    cpu cores       : 8
    siblings        : 16
    2 physical ids (chips)
    32 processors (hardware threads)
    physical id 0: core ids 0-7
    physical id 1: core ids 0-7
    physical id 0: apicids 0-15
    physical id 1: apicids 64-79
  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 2.39.3:
  Architecture:                         x86_64
  CPU op-mode(s):                       32-bit, 64-bit
  Address sizes:                        46 bits physical, 57 bits virtual
```

(Continued on next page)

Platform Notes (Continued)

```
Byte Order:                          Little Endian
CPU(s):                              32
On-line CPU(s) list:                 0-31
Vendor ID:                           GenuineIntel
BIOS Vendor ID:                      Intel(R) Corporation
Model name:                          INTEL(R) XEON(R) SILVER 4509Y
BIOS Model name:                     INTEL(R) XEON(R) SILVER 4509Y  CPU @ 2.6GHz
BIOS CPU family:                     179
CPU family:                          6
Model:                               143
Thread(s) per core:                  2
Core(s) per socket:                  8
Socket(s):                           2
Stepping:                            8
CPU(s) scaling MHz:                  41%
CPU max MHz:                         4100.0000
CPU min MHz:                         800.0000
BogoMIPS:                            5200.00
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 intel_ppin cdp_l2
                                     ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow 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 user_shstk avx_vnni avx512_bf16 wbnoinvd dtherm ida
                                     arat pln pts hfi vnmi 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 ibt amx_bf16 avx512_fp16
                                     amx_tile amx_int8 flush_l1d arch_capabilities
Virtualization:                      VT-x
L1d cache:                           768 KiB (16 instances)
L1i cache:                           512 KiB (16 instances)
L2 cache:                            32 MiB (16 instances)
L3 cache:                            45 MiB (2 instances)
NUMA node(s):                        4
NUMA node0 CPU(s):                   0-3,16-19
NUMA node1 CPU(s):                   4-7,20-23
NUMA node2 CPU(s):                   8-11,24-27
NUMA node3 CPU(s):                   12-15,28-31
Vulnerability Gather data sampling:  Not affected
Vulnerability Itlb multihit:         Not affected
Vulnerability L1tf:                  Not affected
Vulnerability Mds:                   Not affected
Vulnerability Meltdown:              Not affected
Vulnerability Mmio stale data:       Not affected
Vulnerability Reg file data sampling: Not affected
Vulnerability Retbleed:              Not affected
Vulnerability Spec rstack overflow:  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 / Automatic IBRS; IBPB conditional; RSB filling;
                                     PBRSB-eIBRS SW sequence; BHI BHI_DIS_S
```

(Continued on next page)

Platform Notes (Continued)

```
  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
     L1d       48K     768K   12 Data            1    64        1             64
     L1i       32K     512K    8 Instruction     1    64        1             64
     L2         2M      32M   16 Unified         2  2048        1             64
     L3      22.5M      45M   15 Unified         3 24576        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: 0-3,16-19
  node 0 size: 257677 MB
  node 0 free: 257219 MB
  node 1 cpus: 4-7,20-23
  node 1 size: 258045 MB
  node 1 free: 257583 MB
  node 2 cpus: 8-11,24-27
  node 2 size: 258007 MB
  node 2 free: 257459 MB
  node 3 cpus: 12-15,28-31
  node 3 size: 258033 MB
  node 3 free: 257576 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:       1056525780 kB

------------------------------------------------------------
10. who -r
  run-level 3 May 2 14:56

------------------------------------------------------------
11. Systemd service manager version: systemd 254 (254.10+suse.84.ge8d77af424)
  Default Target  Status
  multi-user      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 getty@ irqbalance issue-generator kbdsettings klog lvm2-monitor nscd
                   nvmefc-boot-connections nvmf-autoconnect 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 firewalld fsidd gpm grub2-once haveged ipmi ipmievd
                   issue-add-ssh-keys kexec-load lunmask man-db-create multipathd nfs nfs-blkmap nmb
                   ostree-remount rpcbind rpmconfigcheck rsyncd rtkit-daemon serial-getty@
                   smartd_generate_opts smb snmpd snmptrapd speech-dispatcherd systemd-boot-check-no-failures
```

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Platform Notes (Continued)

```
                  systemd-confext systemd-network-generator systemd-sysext systemd-time-wait-sync
                  systemd-timesyncd udisks2 update-system-flatpaks upower vncserver@
  indirect        systemd-userdbd wickedd

------------------------------------------------------------
13. Linux kernel boot-time arguments, from /proc/cmdline
  BOOT_IMAGE=/boot/vmlinuz-6.4.0-150600.21-default
  root=UUID=20c8215f-5b7d-42b7-9845-6378c2804b5e
  splash=silent
  mitigations=auto
  quiet
  security=apparmor

------------------------------------------------------------
14. cpupower frequency-info
  analyzing CPU 2:
    current policy: frequency should be within 800 MHz and 4.10 GHz.
                    The governor "powersave" may decide which speed to use
                    within this range.
    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
```

(Continued on next page)

Platform Notes (Continued)

```
  scan_sleep_millisecs    10000

------------------------------------------------------------
18. OS release
  From /etc/*-release /etc/*-version
  os-release SUSE Linux Enterprise Server 15 SP6

------------------------------------------------------------
19. Disk information
SPEC is set to: /home/cpu2017
  Filesystem     Type   Size  Used Avail Use% Mounted on
  /dev/nvme1n1p2 btrfs  1.5T  350G  1.2T  24% /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 4400
    1x Samsung M321R8GA0PB0-CWMXH 64 GB 2 rank 5600, configured at 4400


------------------------------------------------------------
22. BIOS
(This section combines info from /sys/devices and dmidecode.)
   BIOS Vendor:       American Megatrends International, LLC.
   BIOS Version:      2.6
   BIOS Date:         04/04/2025
   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 2024.1.0 Build 20240308
Copyright (C) 1985-2024 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 2024.1.0 Build 20240308
Copyright (C) 1985-2024 Intel Corporation. All rights reserved.
--------------------------------------------------------------------------------------------------------------

==============================================================================================================
Fortran | 548.exchange2_r(base)
--------------------------------------------------------------------------------------------------------------
Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2024.1.0 Build 20240308
```

(Continued on next page)

Compiler Version Notes (Continued)

```
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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/opt/intel/oneapi/compiler/2024.1/lib -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/opt/intel/oneapi/compiler/2024.1/lib -lqkmalloc

Fortran benchmarks:
-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ffast-math -flto
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4

(Continued on next page)

Base Optimization Flags (Continued)

Fortran benchmarks (continued):
-nostandard-realloc-lhs -align array32byte -auto
-L/opt/intel/oneapi/compiler/2024.1/lib -lqkmalloc

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/Supermicro-Platform-Settings-V1.2-SPR-revG.html
http://www.spec.org/cpu2017/flags/Intel-ic2024-official-linux64.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/Supermicro-Platform-Settings-V1.2-SPR-revG.xml
http://www.spec.org/cpu2017/flags/Intel-ic2024-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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