SPEC CPU®2017 Integer Rate Result

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Lenovo Global Technology

$SPECrate^{®}2017\_int\_base =$ 638

ThinkSystem SD520 V4
(1.90 GHz, Intel Xeon 6766E)

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

CPU2017 License: 9017	**Test Date:** Oct-2024
Test Sponsor: Lenovo Global Technology	**Hardware Availability:** Nov-2024
Tested by: Lenovo Global Technology	**Software Availability:** Jun-2024

Copies 0 100 200 300 400 500 600 700 800 900 1000 1150 1300 1450 1600 1750 1900 2150

Benchmark	Copies	Score
500.perlbench_r	144	512
502.gcc_r	144	374
505.mcf_r	144	821
520.omnetpp_r	144	299
523.xalancbmk_r	144	802
525.x264_r	144	1490
531.deepsjeng_r	144	636
541.leela_r	144	517
548.exchange2_r	144	2120
557.xz_r	144	285

SPECrate®2017_int_base (638)

Hardware

CPU Name: Intel Xeon 6766E
  Max MHz: 2700
  Nominal: 1900
Enabled: 144 cores, 1 chip
Orderable: 1 chip
Cache L1: 64 KB I + 32 KB D on chip per core
  L2: 4 MB I+D on chip per core
  L3: 108 MB I+D on chip per chip
  Other: None
Memory: 512 GB (8 x 64 GB 2Rx4 PC5-6400B-R)
Storage: 1 x 960 GB NVME SSD
Other: CPU Cooling: Air

Software

OS: SUSE Linux Enterprise Server 15 SP6
  Kernel 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: Lenovo BIOS Version DBE103L 1.10 released Sep-2024
File System: xfs
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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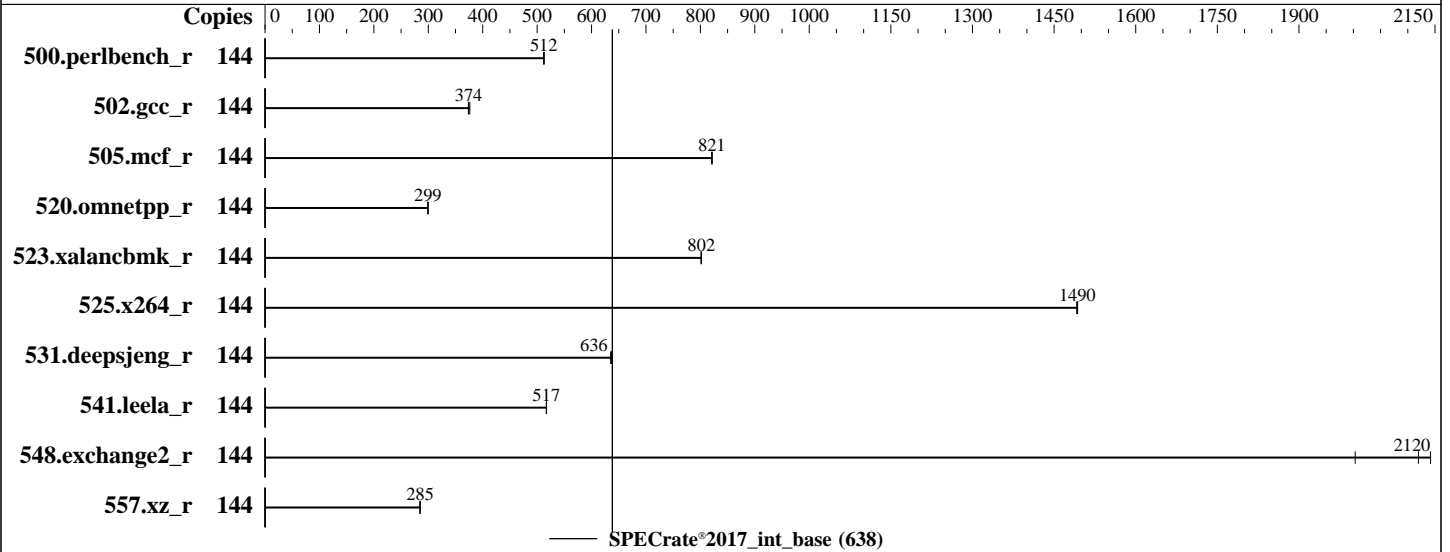
SPECrate®2017_int_peak = Not Run

CPU2017 License: 9017
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Test Date: Oct-2024
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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	144	448	512	447	513	**448**	**512**							
502.gcc_r	144	542	376	546	374	**545**	**374**							
505.mcf_r	144	**283**	**821**	283	821	283	821							
520.omnetpp_r	144	631	300	**631**	**299**	631	299							
523.xalancbmk_r	144	190	801	**190**	**802**	190	802							
525.x264_r	144	**169**	**1490**	169	1490	169	1490							
531.deepsjeng_r	144	260	635	**260**	**636**	259	636							
541.leela_r	144	461	517	461	517	**461**	**517**							
548.exchange2_r	144	**178**	**2120**	188	2000	176	2140							
557.xz_r	144	546	285	**546**	**285**	546	285							
SPECrate®2017_int_base =		**638**												
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 taskset mechanism was used to bind copies to processors. The config file option 'submit'
 was used to generate taskset 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-ic2024.1/lib/intel64:/home/cpu2017-1.1.9-ic2024.1/lib/ia32:/home/cpu2017-1.1.9-ic
    2024.1/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
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.

Standard Performance Evaluation Corporation (info@spec.org)
https://www.spec.org/

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Hardware Availability: Nov-2024
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Platform Notes

```
BIOS configuration:
Workload Profile set to High Performance Computing
DCU Streamer Prefetcher set to Disabled

 Sysinfo program /home/cpu2017-1.1.9-ic2024.1/bin/sysinfo
 Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
 running on localhost Thu Oct 24 13:24:36 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 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
    13:24:36 up 3 min,  1 user,  load average: 0.13, 0.15, 0.07
   USER     TTY      FROM             LOGIN@   IDLE   JCPU   PCPU WHAT

 ------------------------------------------------------------
 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) 2062020
   max locked memory       (kbytes, -l) 8192
   max memory size         (kbytes, -m) unlimited
```

(Continued on next page)

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Platform Notes (Continued)

```
   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) 2062020
   virtual memory       (kbytes, -v) unlimited
   file locks                   (-x) unlimited


   -----------------------------------------------------------
5. sysinfo process ancestry
 /usr/lib/systemd/systemd --switched-root --system --deserialize=42
 sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups
 sshd: root [priv]
 sshd: root@notty
 /bin/bash ./02.remote_local_SPECcpu_1.01.sh
 sh Run702-compliant-ic2024.1-lin-sierraforest-rateint-base-20240308.sh
 runcpu --nobuild --action validate --define default-platform-flags --define numcopies=144 -c
   ic2024.1-lin-sierraforest-rate-20240308.cfg --define smt-on --define cores=144 --define physicalfirst
   --define no-numa --reportable --tune base -o all --define drop_caches intrate
 runcpu --nobuild --action validate --define default-platform-flags --define numcopies=144 --configfile
   ic2024.1-lin-sierraforest-rate-20240308.cfg --define smt-on --define cores=144 --define physicalfirst
   --define no-numa --reportable --tune base --output_format all --define drop_caches --nopower --runmode
   rate --tune base --size refrate intrate --nopreenv --note-preenv --logfile
   $SPEC/tmp/CPU2017.305/templogs/preenv.intrate.305.0.log --lognum 305.0 --from_runcpu 2
 specperl $SPEC/bin/sysinfo
 $SPEC = /home/cpu2017-1.1.9-ic2024.1


   -----------------------------------------------------------
6. /proc/cpuinfo
   model name      : Intel(R) Xeon(R) 6766E
   vendor_id       : GenuineIntel
   cpu family      : 6
   model           : 175
   stepping        : 3
   microcode       : 0x3000270
   bugs            : spectre_v1 spectre_v2 spec_store_bypass swapgs bhi
   cpu cores       : 144
   siblings        : 144
   1 physical ids (chips)
   144 processors (hardware threads)
   physical id 0: core ids 0-143
   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
   ,74,76,78,80,82,84,86,88,90,92,94,96,98,100,102,104,106,108,110,112,114,116,118,120,122,124,126,128,130,1
   32,134,136,138,140,142,144,146,148,150,152,154,156,158,160,162,164,166,168,170,172,174,176,178,180,182,18
   4,186,188,190,192,194,196,198,200,202,204,206,208,210,212,214,216,218,220,222,224,226,228,230,232,234,236
   ,238,240,242,244,246,248,250,252,254,256,258,260,262,264,266,268,270,272,274,276,278,280,282,284,286
   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:              52 bits physical, 48 bits virtual
   Byte Order:                 Little Endian
```

(Continued on next page)

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Platform Notes (Continued)

```
CPU(s):                          144
On-line CPU(s) list:             0-143
Vendor ID:                       GenuineIntel
BIOS Vendor ID:                  Intel(R) Corporation
Model name:                      Intel(R) Xeon(R) 6766E
BIOS Model name:                 Intel(R) Xeon(R) 6766E UNKNOWN CPU @ 1.9GHz
BIOS CPU family:                 179
CPU family:                      6
Model:                           175
Thread(s) per core:              1
Core(s) per socket:              144
Socket(s):                       1
Stepping:                        3
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 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 avx2 smep bmi2 erms invpcid cqm
                                 rdt_a rdseed adx smap clflushopt clwb intel_pt sha_ni xsaveopt xsavec
                                 xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local
                                 split_lock_detect user_shstk avx_vnni lam wbnoinvd dtherm ida arat
                                 pln pts vnmi umip pku ospke waitpkg gfni vaes vpclmulqdq tme rdpid
                                 bus_lock_detect cldemote movdiri movdir64b enqcmd fsrm md_clear
                                 serialize pconfig arch_lbr ibt flush_l1d arch_capabilities
Virtualization:                  VT-x
L1d cache:                       4.5 MiB (144 instances)
L1i cache:                       9 MiB (144 instances)
L2 cache:                        144 MiB (36 instances)
L3 cache:                        108 MiB (1 instance)
NUMA node(s):                    1
NUMA node0 CPU(s):               0-143
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 Not affected; BHI BHI_DIS_S
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       32K     4.5M    8 Data            1     64        1             64
    L1i       64K       9M    8 Instruction     1    128        1             64
    L2         4M     144M   16 Unified         2   4096        1             64
    L3       108M     108M   12 Unified         3 147456        1             64
```

(Continued on next page)

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Platform Notes (Continued)

```
----------------------------------------------------------
8. numactl --hardware
NOTE: a numactl 'node' might or might not correspond to a physical chip.
  available: 1 nodes (0)
  node 0 cpus: 0-143
  node 0 size: 515531 MB
  node 0 free: 514247 MB
  node distances:
  node   0
    0:  10


----------------------------------------------------------
9. /proc/meminfo
   MemTotal:       527904280 kB


----------------------------------------------------------
10. who -r
  run-level 3 Oct 24 13:22


----------------------------------------------------------
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 auditd cron 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        autofs autoyast-initscripts blk-availability 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 rpcbind rpmconfigcheck rsyncd serial-getty@
                  smartd_generate_opts snmpd snmptrapd systemd-boot-check-no-failures systemd-confext
                  systemd-network-generator systemd-sysext systemd-time-wait-sync systemd-timesyncd udisks2
  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=003918da-aeca-4208-af37-126b2acc4e65
   splash=silent
   mitigations=auto
   quiet
   security=apparmor


----------------------------------------------------------
14. cpupower frequency-info
   analyzing CPU 15:
     Unable to determine current policy
     boost state support:
       Supported: yes
       Active: yes


----------------------------------------------------------
15. sysctl
   kernel.numa_balancing            0
```

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Platform Notes (Continued)

```
    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
  os-release SUSE Linux Enterprise Server 15 SP6


  ----------------------------------------------------------
19. Disk information
SPEC is set to: /home/cpu2017-1.1.9-ic2024.1
  Filesystem     Type  Size  Used Avail Use% Mounted on
  /dev/nvme0n1p3 xfs   893G   48G  846G   6% /


  ----------------------------------------------------------
20. /sys/devices/virtual/dmi/id
    Vendor:          Lenovo
    Product:         ThinkSystem SD520 V4 Planar
    Product Family: ThinkSystem
    Serial:          1234567890


  ----------------------------------------------------------
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.
```

(Continued on next page)

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Platform Notes (Continued)

```
   Memory:
     6x Samsung M321R8GA0PB2-CCPKC 64 GB 2 rank 6400
     2x Samsung M321R8GA0PB2-CCPWC 64 GB 2 rank 6400


   ------------------------------------------------------------
   22. BIOS
   (This section combines info from /sys/devices and dmidecode.)
     BIOS Vendor:
     BIOS Version:       DBE103L-1.10
     BIOS Date:          09/12/2024
     BIOS Revision:      1.10
     Firmware Revision:  1.10
```

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
Copyright (C) 1985-2024 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------
```

Base Compiler Invocation

C benchmarks:
```
icx
```

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

Fortran benchmarks:
```
ifx
```

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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 -xsierraforest -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 -xsierraforest -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 -xsierraforest -O3 -ffast-math -flto
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-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/Lenovo-Platform-SPECcpu2017-Flags-V1.2-Birchstream-B.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/Lenovo-Platform-SPECcpu2017-Flags-V1.2-Birchstream-B.xml
http://www.spec.org/cpu2017/flags/Intel-ic2024-official-linux64.xml

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

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