SPEC CPU®2017 Integer Rate Result

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Cisco Systems

Cisco UCS C240 M7 (Intel Xeon Gold 6538N, 2.10GHz)

$SPECrate^{®}2017_int_base = $ 560

$SPECrate^{®}2017_int_peak = $ Not Run

CPU2017 License: 9019
Test Sponsor: Cisco Systems
Tested by: Cisco Systems

Test Date: Mar-2024
Hardware Availability: Feb-2024
Software Availability: Dec-2023

Copies		
500.perlbench_r	128	424
502.gcc_r	128	471
505.mcf_r	128	899
520.omnetpp_r	128	378
523.xalancbmk_r	128	743
525.x264_r	128	1140
531.deepsjeng_r	128	413
541.leela_r	128	389
548.exchange2_r	128	1190
557.xz_r	128	278

(Scale: 0 50.0 100 150 200 250 300 350 400 450 500 550 600 650 700 750 800 850 900 950 1050 1200)

—— SPECrate®2017_int_base (560)

Hardware

CPU Name: Intel Xeon Gold 6538N
 Max MHz: 4100
 Nominal: 2100
Enabled: 64 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: 60 MB I+D on chip per chip
 Other: None
Memory: 1 TB (16 x 64 GB 2Rx4 PC5-5600B-R, running at 5200)
Storage: 1 x 960 GB M.2 SSD SATA
Other: CPU Cooling: Air

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 4.3.3a released Jan-2024
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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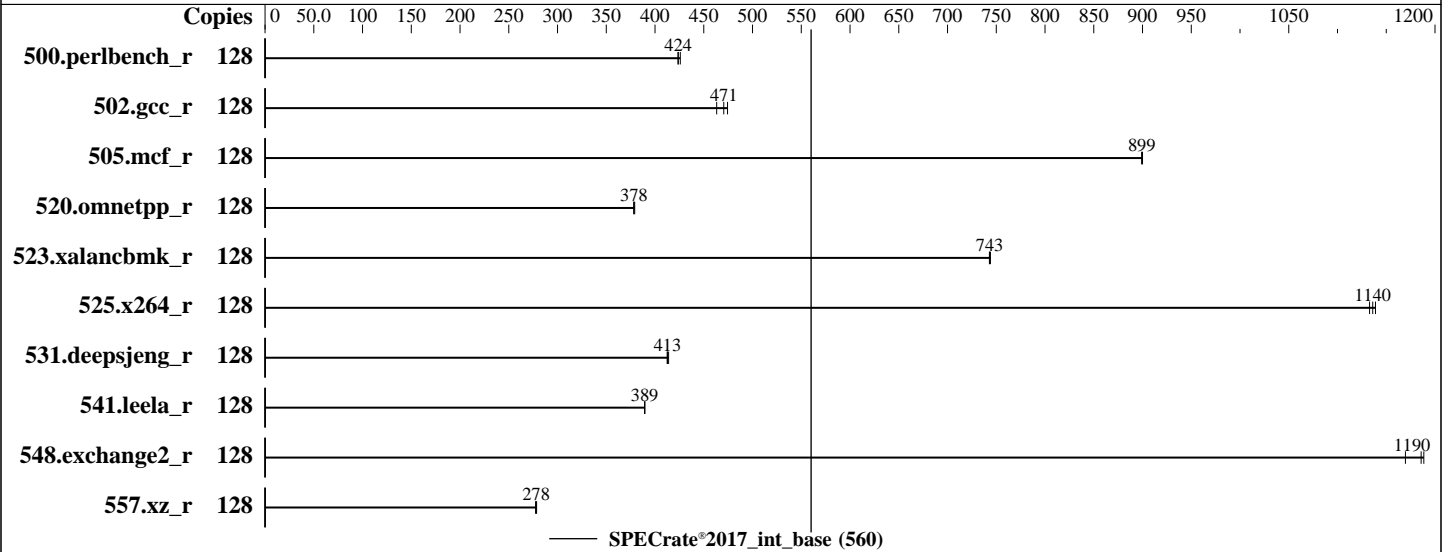
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Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
500.perlbench_r	128	481	424	478	426	**481**	**424**							
502.gcc_r	128	391	463	382	474	**385**	**471**							
505.mcf_r	128	230	899	230	900	**230**	**899**							
520.omnetpp_r	128	443	379	**444**	**378**	444	378							
523.xalancbmk_r	128	**182**	**743**	182	744	182	743							
525.x264_r	128	198	1130	197	1140	**197**	**1140**							
531.deepsjeng_r	128	**355**	**413**	354	414	356	412							
541.leela_r	128	544	389	**544**	**389**	544	389							
548.exchange2_r	128	282	1190	287	1170	**283**	**1190**							
557.xz_r	128	498	277	**497**	**278**	496	279							
SPECrate®2017_int_base =	**560**													
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.
```

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

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Platform Notes

```
BIOS Settings:
Sub NUMA Clustering set to Enable SNC2(2-clusters)
ADDDC Sparing set to Disabled
DCU Streamer Prefetch set to Disabled
Enhanced CPU performance set to Auto
LLC Dead Line set to Disabled
Processor C6 Report set to Enabled

 Sysinfo program /home/cpu2017/bin/sysinfo
 Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
 running on localhost Wed Mar  6 21:27:27 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 localhost 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
    21:27:27 up 1 min,  1 user,  load average: 0.29, 0.16, 0.06
    USER     TTY      FROM             LOGIN@   IDLE   JCPU   PCPU WHAT
    root     tty1     -                21:27    7.00s  1.27s  0.21s -bash

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

 ----------------------------------------------------------
 4. ulimit -a
   core file size          (blocks, -c) unlimited
   data seg size           (kbytes, -d) unlimited
```

(Continued on next page)

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Platform Notes (Continued)

```
   scheduling priority          (-e) 0
   file size            (blocks, -f) unlimited
   pending signals              (-i) 4126818
   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) 4126818
   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=128 -c
   ic2023.2.3-lin-sapphirerapids-rate-20231121.cfg --reportable --iterations 3 --define smt-on --define
   cores=64 --define physicalfirst --define invoke_with_interleave --define drop_caches --tune base -o all
   intrate
 runcpu --nobuild --action validate --define default-platform-flags --define numcopies=128 --configfile
   ic2023.2.3-lin-sapphirerapids-rate-20231121.cfg --reportable --iterations 3 --define smt-on --define
   cores=64 --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/CPU2017.042/templogs/preenv.intrate.042.0.log --lognum 042.0 --from_runcpu 2
 specperl $SPEC/bin/sysinfo
 $SPEC = /home/cpu2017


   ------------------------------------------------------------
6. /proc/cpuinfo
   model name      : INTEL(R) XEON(R) GOLD 6538N
   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       : 32
   siblings        : 64
   2 physical ids (chips)
   128 processors (hardware threads)
   physical id 0: core ids 0-31
   physical id 1: core ids 0-31
   physical id 0: apicids 0-63
   physical id 1: apicids 128-191
 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
```

(Continued on next page)

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Platform Notes (Continued)

```
Byte Order:                 Little Endian
CPU(s):                     128
On-line CPU(s) list:        0-127
Vendor ID:                  GenuineIntel
Model name:                 INTEL(R) XEON(R) GOLD 6538N
CPU family:                 6
Model:                      207
Thread(s) per core:         2
Core(s) per socket:         32
Socket(s):                  2
Stepping:                   2
CPU max MHz:                4100.0000
CPU min MHz:                800.0000
BogoMIPS:                   4200.00
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 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 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 hwp
                            hwp_act_window hwp_epp hwp_pkg_req hfi 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
L1d cache:                  3 MiB (64 instances)
L1i cache:                  2 MiB (64 instances)
L2 cache:                   128 MiB (64 instances)
L3 cache:                   120 MiB (2 instances)
NUMA node(s):               4
NUMA node0 CPU(s):          0-15,64-79
NUMA node1 CPU(s):          16-31,80-95
NUMA node2 CPU(s):          32-47,96-111
NUMA node3 CPU(s):          48-63,112-127
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
    L1d       48K       3M   12 Data              1    64        1             64
    L1i       32K       2M    8 Instruction       1    64        1             64
    L2         2M     128M   16 Unified           2  2048        1             64
    L3        60M     120M   15 Unified           3 65536        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: 4 nodes (0-3)
  node 0 cpus: 0-15,64-79
  node 0 size: 257653 MB
  node 0 free: 256888 MB
  node 1 cpus: 16-31,80-95
  node 1 size: 258039 MB
  node 1 free: 257551 MB
  node 2 cpus: 32-47,96-111
  node 2 size: 258039 MB
  node 2 free: 257537 MB
  node 3 cpus: 48-63,112-127
  node 3 size: 258000 MB
  node 3 free: 257505 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:       1056496044 kB


----------------------------------------------------------
10. who -r
   run-level 3 Mar 6 21:26


----------------------------------------------------------
11. Systemd service manager version: systemd 249 (249.16+suse.171.gdad0071f15)
   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 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 gpm grub2-once haveged haveged-switch-root ipmi ipmievd issue-add-ssh-keys
                   kexec-load ksm kvm_stat lunmask man-db-create multipathd nfs nfs-blkmap rpcbind
                   rpmconfigcheck rsyncd serial-getty@ smartd_generate_opts snmpd snmptrapd svnserve
                   systemd-boot-check-no-failures systemd-network-generator systemd-sysext
                   systemd-time-wait-sync systemd-timesyncd udisks2
   indirect        wickedd


----------------------------------------------------------
13. Linux kernel boot-time arguments, from /proc/cmdline
   BOOT_IMAGE=/boot/vmlinuz-5.14.21-150500.53-default
   root=UUID=ec07819c-bf3e-428b-8399-e735655f61af
   splash=silent
   mitigations=auto
   quiet
   security=apparmor
```

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Platform Notes (Continued)

```
  -----------------------------------------------------------
  14. cpupower frequency-info
    analyzing CPU 0:
      current policy: frequency should be within 800 MHz and 4.10 GHz.
                      The governor "performance" 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                      1
    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 SP5


  -----------------------------------------------------------
  19. Disk information
  SPEC is set to: /home/cpu2017
    Filesystem      Type   Size  Used Avail Use% Mounted on
    /dev/sdb5       btrfs   60G   11G   46G  20% /home
```

(Continued on next page)

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Platform Notes (Continued)

```
      ------------------------------------------------------------
   20. /sys/devices/virtual/dmi/id
       Vendor:         Cisco Systems Inc
       Product:        UCSC-C240-M7SX
       Serial:         WZP26330JLV


      ------------------------------------------------------------
   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:
       16x 0xCE00 M321R8GA0PB0-CWMCH 64 GB 2 rank 5600, configured at 5200



      ------------------------------------------------------------
   22. BIOS
   (This section combines info from /sys/devices and dmidecode.)
       BIOS Vendor:       Cisco Systems, Inc.
       BIOS Version:      C240M7.4.3.3a.0.0118241337
       BIOS Date:         01/18/2024
       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.
------------------------------------------------------------------------------
```

Base Compiler Invocation

C benchmarks:
icx

C++ benchmarks:
icpx

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Base Compiler Invocation (Continued)

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 -xsapphirerapids -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 -xsapphirerapids -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 -xsapphirerapids -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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The flags files that were used to format this result can be browsed at

http://www.spec.org/cpu2017/flags/Intel-ic2024-official-linux64.html
http://www.spec.org/cpu2017/flags/Cisco-Platform-Settings-V1.0-EMR-revD.html

You can also download the XML flags sources by saving the following links:

http://www.spec.org/cpu2017/flags/Intel-ic2024-official-linux64.xml
http://www.spec.org/cpu2017/flags/Cisco-Platform-Settings-V1.0-EMR-revD.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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