SPEC CPU®2017 Integer Rate Result

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Fujitsu

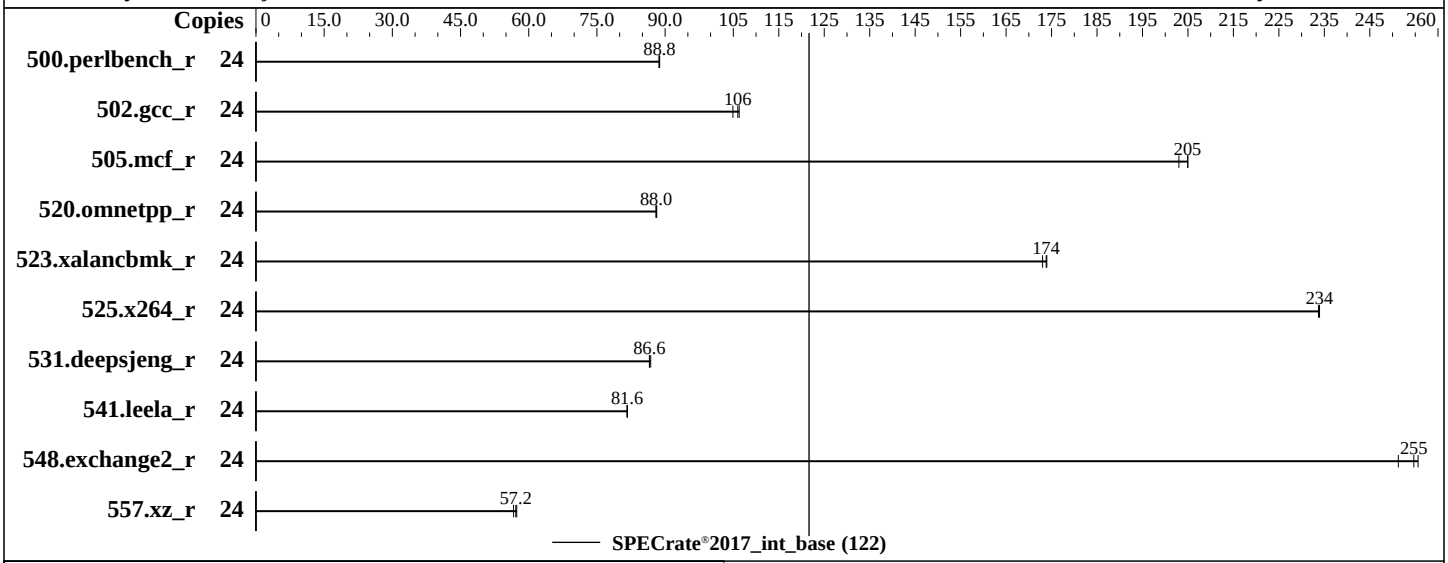
PRIMERGY TX2550 M7, Intel Xeon Silver 4510, 2.40GHz

SPECrate®2017_int_base = 122

SPECrate®2017_int_peak = Not Run

CPU2017 License: 19
Test Sponsor: Fujitsu
Tested by: Fujitsu

Test Date: Aug-2024
Hardware Availability: May-2024
Software Availability: Dec-2023



Hardware

CPU Name:	Intel Xeon Silver 4510
Max MHz:	4100
Nominal:	2400
Enabled:	12 cores, 1 chip, 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:	30 MB I+D on chip per chip
Other:	None
Memory:	512 GB (8 x 64 GB 2Rx4 PC5-4800B-R, running at 4400)
Storage:	1 x SATA M.2, 960GB
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:	Fujitsu BIOS Version V1.0.0.0 R2.3.0 for D3985-A1x. Released Apr-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

Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
500.perlbench_r	24	430	88.8	431	88.6	**430**	**88.8**							
502.gcc_r	24	320	106	**321**	**106**	324	105							
505.mcf_r	24	**189**	**205**	191	203	189	205							
520.omnetpp_r	24	**358**	**88.0**	358	88.0	357	88.2							
523.xalancbmk_r	24	146	173	**146**	**174**	146	174							
525.x264_r	24	**180**	**234**	180	234	180	234							
531.deepsjeng_r	24	318	86.5	317	86.8	**318**	**86.6**							
541.leela_r	24	486	81.7	**487**	**81.6**	487	81.6							
548.exchange2_r	24	250	251	**247**	**255**	246	256							
557.xz_r	24	**454**	**57.2**	457	56.7	452	57.4							

SPECrate®2017_int_base = 122

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/benchmark/speccpu-23.2/lib/intel64:/home/benchmark/speccpu-23.2/lib/ia32:/home/benchmark/speccp
     u-23.2/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)
```

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General Notes (Continued)

```
is mitigated in the system as tested and documented.
```

Platform Notes

```
BIOS configuration:
DCU Streamer Prefetcher = Disabled
CPU Performance Boost = Aggressive
SNC (Sub NUMA) = Enable SNC2
Fan Control = Full
HWPM Support = Disabled

Sysinfo program /home/benchmark/speccpu-23.2/bin/sysinfo
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
running on localhost Wed Aug 28 05:35:50 2024

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

------------------------------------------------------------
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 2. w
 3. Username
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 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
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15. sysctl
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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
   05:35:50 up 11:17,  1 user,  load average: 0.12, 8.28, 16.93
  USER     TTY      FROM             LOGIN@   IDLE   JCPU   PCPU WHAT
  root     tty1     -                18:19   11:15m  1.42s  0.40s -bash

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


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Platform Notes (Continued)

```
------------------------------------------------------------
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) 2060789
  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) 2060789
  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=24 -c
   ic2023.2.3-lin-sapphirerapids-rate-20231121.cfg --define smt-on --define cores=12 --define physicalfirst
   --define invoke_with_interleave --define drop_caches --tune base -o all intrate
 runcpu --nobuild --action validate --define default-platform-flags --define numcopies=24 --configfile
   ic2023.2.3-lin-sapphirerapids-rate-20231121.cfg --define smt-on --define cores=12 --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/CPU2017.001/templogs/preenv.intrate.001.0.log --lognum 001.0 --from_runcpu 2
 specperl $SPEC/bin/sysinfo
$SPEC = /home/benchmark/speccpu-23.2

------------------------------------------------------------
6. /proc/cpuinfo
    model name      : INTEL(R) XEON(R) SILVER 4510
    vendor_id       : GenuineIntel
    cpu family      : 6
    model           : 143
    stepping        : 8
    microcode       : 0x2b000590
    bugs            : spectre_v1 spectre_v2 spec_store_bypass swapgs eibrs_pbrsb
    cpu cores       : 12
    siblings        : 24
    1 physical ids (chips)
    24 processors (hardware threads)
    physical id 0: core ids 0-11
    physical id 0: apicids 0-23
  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
```

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Platform Notes (Continued)

```
  Address sizes:                    46 bits physical, 57 bits virtual
  Byte Order:                       Little Endian
  CPU(s):                           24
  On-line CPU(s) list:              0-23
  Vendor ID:                        GenuineIntel
  Model name:                       INTEL(R) XEON(R) SILVER 4510
  CPU family:                       6
  Model:                            143
  Thread(s) per core:               2
  Core(s) per socket:               12
  Socket(s):                        1
  Stepping:                         8
  CPU max MHz:                      4100.0000
  CPU min MHz:                      800.0000
  BogoMIPS:                         4800.00
  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 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 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:                        576 KiB (12 instances)
  L1i cache:                        384 KiB (12 instances)
  L2 cache:                         24 MiB (12 instances)
  L3 cache:                         30 MiB (1 instance)
  NUMA node(s):                     2
  NUMA node0 CPU(s):                0-5,12-17
  NUMA node1 CPU(s):                6-11,18-23
  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     576K   12 Data            1    64        1             64
      L1i       32K     384K    8 Instruction     1    64        1             64
      L2         2M      24M   16 Unified         2  2048        1             64
      L3        30M      30M   15 Unified         3 32768        1             64
```

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Platform Notes (Continued)

```
------------------------------------------------------------
8. numactl --hardware
NOTE: a numactl 'node' might or might not correspond to a physical chip.
  available: 2 nodes (0-1)
  node 0 cpus: 0-5,12-17
  node 0 size: 257590 MB
  node 0 free: 256864 MB
  node 1 cpus: 6-11,18-23
  node 1 size: 257636 MB
  node 1 free: 256930 MB
  node distances:
  node   0   1
    0:  10  12
    1:  12  10

------------------------------------------------------------
9. /proc/meminfo
   MemTotal:       527592648 kB

------------------------------------------------------------
10. who -r
  run-level 3 Aug 27 18:19

------------------------------------------------------------
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 display-manager getty@ irqbalance
                   iscsi issue-generator kbdsettings kdump kdump-early klog libvirtd 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 dnsmasq ebtables exchange-bmc-os-info
                   firewalld gpm grub2-once haveged haveged-switch-root ipmi ipmievd iscsi-init iscsid
                   issue-add-ssh-keys kexec-load ksm kvm_stat libvirt-guests lunmask man-db-create multipathd
                   nfs nfs-blkmap nfs-server nfsserver rpcbind rpmconfigcheck rsyncd serial-getty@
                   smartd_generate_opts snmpd snmptrapd strongswan strongswan-starter svnserve
                   systemd-boot-check-no-failures systemd-network-generator systemd-nspawn@ systemd-sysext
                   systemd-time-wait-sync systemd-timesyncd tcsd udisks2 virtinterfaced virtnetworkd
                   virtnodedevd virtnwfilterd virtproxyd virtqemud virtsecretd virtstoraged vncserver@
  indirect         pcscd virtlockd virtlogd wickedd

------------------------------------------------------------
13. Linux kernel boot-time arguments, from /proc/cmdline
  BOOT_IMAGE=/boot/vmlinuz-5.14.21-150500.53-default
  root=UUID=9c131c09-0ac8-4880-b3dc-37fa10c43cda
  splash=silent
  quiet
  security=apparmor
  crashkernel=401M,high
  crashkernel=72M,low
  mitigations=auto

------------------------------------------------------------
14. cpupower frequency-info
```

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Platform Notes (Continued)

```
  analyzing CPU 0:
    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
  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/benchmark/speccpu-23.2
  Filesystem     Type   Size  Used Avail Use% Mounted on
  /dev/sda2      btrfs  892G   41G  851G   5% /home

------------------------------------------------------------
20. /sys/devices/virtual/dmi/id
```

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Platform Notes (Continued)

```
     Vendor:          FUJITSU
     Product:         PRIMERGY TX2550 M7
     Product Family: SERVER
     Serial:          EWCCxxxxxx

 ------------------------------------------------------------
 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:
     3x Samsung M321R8GA0BB0-CQKDG 64 GB 2 rank 4800, configured at 4400
     2x Samsung M321R8GA0BB0-CQKEG 64 GB 2 rank 4800, configured at 4400
     3x Samsung M321R8GA0BB0-CQKVG 64 GB 2 rank 4800, configured at 4400


 ------------------------------------------------------------
 22. BIOS
 (This section combines info from /sys/devices and dmidecode.)
    BIOS Vendor:       FUJITSU
    BIOS Version:      V1.0.0.0 R2.3.0 for D3985-A1x
    BIOS Date:         03/11/2024
    BIOS Revision:     2.3
    Firmware Revision: 2.38
```

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

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Base Compiler Invocation (Continued)

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 -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

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/Fujitsu-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-ic2023p2-official-linux64.xml
http://www.spec.org/cpu2017/flags/Fujitsu-Platform-Settings-V1.0-EMR-RevD.xml

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