## SPEC CPU®2017 Integer Rate Result

**Cisco Systems**
Cisco UCS X210c M7 (Intel Xeon Platinum 8450H, 2.00GHz)

**SPECrate®2017_int_base = 474**

**SPECrate®2017_int_peak = 488**

<table>
<thead>
<tr>
<th>CPU2017 License:</th>
<th>9019</th>
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<tbody>
<tr>
<td>Test Sponsor:</td>
<td>Cisco Systems</td>
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<td>Cisco Systems</td>
</tr>
<tr>
<td>Test Date:</td>
<td>Jun-2023</td>
</tr>
<tr>
<td>Hardware Availability:</td>
<td>Mar-2023</td>
</tr>
<tr>
<td>Software Availability:</td>
<td>Dec-2022</td>
</tr>
</tbody>
</table>

### Benchmark Results

<table>
<thead>
<tr>
<th>Benchmark</th>
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<th>SPECrate®2017_int_base</th>
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<td>557.xz_r</td>
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### Hardware

- **CPU Name:** Intel Xeon Platinum 8450H
- **Max MHz:** 3500
- **Nominal:** 2000
- **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:** 75 MB I+D on chip per chip
- **Other:** None
- **Memory:** 1 TB (16 x 64 GB 2Rx4 PC5-4800B-R)
- **Storage:** 1 x 960 GB M.2 SSD SATA
- **Other:** None

### Software

- **OS:** SUSE Linux Enterprise Server 15 SP4 5.14.21-150400.22-default
- **Compiler:** C/C++: Version 2023.0 of Intel oneAPI DPC++/C++ Compiler for Linux;
  Fortran: Version 2023.0 of Intel Fortran Compiler for Linux;
- **Parallel:** No
- **Firmware:** Version 5.1.1b released Mar-2023
- **File System:** btrfs
- **System State:** Run level 3 (multi-user)
- **Base Pointers:** 64-bit
- **Peak Pointers:** 32/64-bit
- **Other:** jemalloc memory allocator V5.0.1
- **Power Management:** BIOS set to prefer performance at the cost of additional power usage
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Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

Compiler Notes

SPEC has ruled that the compiler used for this result was performing a compilation that specifically improves the performance of the 523.xalancbmk_r / 623.xalancbmk_s benchmarks using a priori knowledge of the SPEC code and dataset to perform a transformation that has narrow applicability.

In order to encourage optimizations that have wide applicability (see rule 1.4 https://www.spec.org/cpu2017/Docs/runrules.html#rule_1.4), SPEC will no longer publish results using this optimization.

This result is left in the SPEC results database for historical reference.

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"
Cisco Systems
Cisco UCS X210c M7 (Intel Xeon Platinum 8450H, 2.00GHz)

SPEC CPU®2017 Integer Rate Result
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SPEC CPU®2017 int_base = 474
SPEC CPU®2017 int_peak = 488

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

Test Date: Jun-2023
Hardware Availability: Mar-2023
Software Availability: Dec-2022

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
Filesystem page cache synced and cleared with:
sync; echo 3> /proc/sys/vm/drop_caches
runcpu command invoked through numacl 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.
jemalloc, a general purpose malloc implementation
built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5

Platform Notes

BIOS Settings:
Adjacent Cache Line Prefetcher set to Disabled
DCU streamer Prefetch set to Disabled
Enhanced CPU Performance set to Auto
LLC Dead Line set to Disabled
ADDCS Sparing set to Disabled
Processor C6 Report set to Enabled

SysInfo program /home/cpu2017/bin/sysinfo
Rev: r6732 of 2022-11-07 fe91c89b7ed5c6a2c92cc97bec197
running on localhost Thu Jun 8 19:04:15 2023

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

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4. ulimit -a
5. sysinfo process ancestry
6. /proc/cpuinfo
7. lscpu
8. numacl --hardware
9. /proc/meminfo
10. who -r
11. Systemd service manager version: systemd 249 (249.1+stable.124.g2bc0b2c447)
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

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Platform Notes (Continued)

22. BIOS

1. uname -a
   Linux localhost 5.14.21-150400.22-default #1 SMP PREEMPT_DYNAMIC Wed May 11 06:57:18 UTC 2022 (49db222)
x86_64 x86_64 x86_64 GNU/Linux

2. w
   19:04:15 up 1 min,  1 user,  load average: 1.97, 0.75, 0.27
   USER     TTY      FROM             LOGIN@   IDLE   JCPU   PCPU WHAT
   root     tty1     -                19:03    7.00s  1.50s  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
   scheduling priority             (-e) 0
   file size               (blocks, -f) unlimited
   pending signals                 (-l) 4126901
   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) 4126901
   virtual memory          (kbytes, -v) unlimited
   file locks                      (-x) unlimited

5. sysinfo process ancestry
   /usr/lib/systemd/systemd --switched-root --system --deserialize 30
   loginsp -- root
   -bash
   -bash
   runcpu --action=build --action validate --define default-platform-flags --define numcopies=112 -c
   ic2023.0-lin-sapphirerapids-rate-20221201.cfg --reportable --iterations 3 --define smt-on --define
   cores=56 --define physicalfirst --define invoke_with_interleave --define drop_caches --tune all --o all
   intrate
   runcpu --action build --action validate --define default-platform-flags --define numcopies=112 --configfile
   ic2023.0-lin-sapphirerapids-rate-20221201.cfg --reportable --iterations 3 --define smt-on --define
   cores=56 --define physicalfirst --define invoke_with_interleave --define drop_caches --tune all
   --output_format all --nopower --runmode rate --tune base:peak --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
   $SPEC = /home/cpu2017

6. /proc/cpuinfo
   model name      : Intel(R) Xeon(R) Platinum 8450H
   vendor_id       : GenuineIntel
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Platform Notes (Continued)

- cpu family : 6
- model : 143
- stepping : 8
- microcode : 0x2b000190
- bugs : spectre_v1 spectre_v2 spec_store_bypass swapgs
- 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.

7. lscpu

From lscpu from util-linux 2.37.2:
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) Platinum 8450H
CPU family: 6
Model: 143
Thread(s) per core: 2
Core(s) per socket: 28
Socket(s): 2
Stepping: 8
CPU max MHz: 3500.0000
CPU min MHz: 800.0000
BogoMIPS: 4000.00

Flags:

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: 150 MiB (2 instances)

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Platform Notes (Continued)

NUMA node(s): 8
NUMA node0 CPU(s): 0-6,56-62
NUMA node1 CPU(s): 7-13,63-69
NUMA node2 CPU(s): 14-20,70-76
NUMA node3 CPU(s): 21-27,77-83
NUMA node4 CPU(s): 28-34,84-90
NUMA node5 CPU(s): 35-41,91-97
NUMA node6 CPU(s): 42-48,98-104
NUMA node7 CPU(s): 49-55,105-111
Vulnerability Itlb multihit: Not affected
Vulnerability L1tf: Not affected
Vulnerability Mds: Not affected
Vulnerability Meltdown: Not affected
Vulnerability Spec store bypass: Mitigation; Speculative Store Bypass disabled via prctl and seccomp
Vulnerability Spectre v1: Mitigation; usercopy/swaps barriers and __user pointer sanitization
Vulnerability Spectre v2: Mitigation; Enhanced IBRS, IBPB conditional, RSB filling
Vulnerability Srbds: Not affected
Vulnerability Tax async abort: Not affected

From lscpu --cache:
NAME ONE-SIZE ALL-SIZE WAYS TYPE LEVEL SETS PHY-LINE COHERENCY-SIZE
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 75M 150M 15 Unified 3 81920 1 64

node distances:
node 0 1 2 3 4 5 6 7
0: 10 12 12 12 21 21 21 21
1: 12 10 12 12 21 21 21 21
2: 12 12 10 12 21 21 21 21
3: 12 12 12 10 21 21 21 21

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Platform Notes (Continued)

4: 21 21 21 21 10 12 12 12
5: 21 21 21 21 12 10 12 12
6: 21 21 21 21 12 10 12 12
7: 21 21 21 21 12 12 12 10

9. /proc/meminfo
   MemTotal: 1056511124 kB

10. who -r
    run-level 3 Jun 8 19:03

11. Systemd service manager version: systemd 249 (249.11+suse.124.g2bc0b2c447)
    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@ haveged
                irqbalance issue-generator kbdsettings lkm2-monitor nscd postfix purge-kernels
                rollback rsyslog smartd sshd wicked wicked-auto4 wicked-dhcp4 wicked-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
                firewall gpm grub2-once haveged-switch-root ipmi ipmiedv issue-add-ssh-keys kexec-load
                lnnmask man-db-create multipathd nfs nfs-bḷkmap rdisc rsyslog rpmconfigcheck rsyncd
                serial-getty@ smartd_generate_opts snmpd snmptrapd systemd-boot-check-no-failures
                systemd-network-generator systemd-sysext systemd-time-wait-sync systemd-timesyncd udisks2
                indirect wicked

13. Linux kernel boot-time arguments, from /proc/cmdline
    BOOT_IMAGE=/boot/vmlinuz-5.14.21-150400.22-default
    root=UUID=155d53d1-2428-4816-a80b-8d0438d0586b
    splash=silent
    mitigations=auto
    quiet
    security=apparmor

14. cpupower frequency-info
    analyzing CPU 0:
    current policy: frequency should be within 800 MHz and 3.50 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.compartment_proactivity 20
    vm.dirty_background_bytes 0
    vm.dirty_background_ratio 10

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### Platform Notes (Continued)

```
vm.dirty_bytes                      0
vm.dirty_expire_centisecs        3000
vm.dirty_ratio                     20
vm.dirty_writeback_centisecs      500
vm.dirtytime_expire_seconds     43200
vm.extrfrag_threshold            500
vm.min_unmapped_ratio             1
vm.nr_hugepages                   0
vm.nr_hugepages_mempolicy         0
vm.nr_overcommit_hugepages        0
vm.swapiness                      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
   - hpaged_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 SP4

19. Disk information
   - SPEC is set to: /home/cpu2017
   - Filesistem: Type Size Used Avail Use% Mounted on
   - /dev/sdb2: btrfs 892G 9.4G 882G 2% /home

20. `/sys/devices/virtual/dmi/id`
   - Vendor: Cisco Systems Inc
   - Product: UCSX-210C-M7
   - Serial: FCH270978F5

21. dmidecode
   - Additional information from dmidecode 3.2 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 0xAD00 HMCG94MEBRA109N 64 GB 2 rank 4800
```
(Continued on next page)
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Platform Notes (Continued)

22. BIOS
(This section combines info from /sys/devices and dmidecode.)
    BIOS Vendor: Cisco Systems, Inc.
    BIOS Version: X210W7.5.1.1b.0.0308231534
    BIOS Date: 03/08/2023
    BIOS Revision: 5.29

Compiler Version Notes

------------------------------------------------------------------------------------------------------------------
C       | 502.gcc_r(peak)
------------------------------------------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on IA-32, Version 2023.0.0 Build 20221201
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------------------------------------------
C       | 500.perlbench_r(base, peak) 502.gcc_r(base) 505.mcf_r(base, peak) 525.x264_r(base, peak)
          | 557.xz_r(base, peak)
------------------------------------------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------------------------------------------
C       | 502.gcc_r(peak)
------------------------------------------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on IA-32, Version 2023.0.0 Build 20221201
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------------------------------------------------------------------------------------------------------------------
C       | 500.perlbench_r(base, peak) 502.gcc_r(base) 505.mcf_r(base, peak) 525.x264_r(base, peak)
          | 557.xz_r(base, peak)
------------------------------------------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
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------------------------------------------------------------------------------------------------------------------
C++      | 520.omnetpp_r(base, peak) 523.xalancbmk_r(base, peak) 531.deepsjeng_r(base, peak)
          | 541.leela_r(base, peak)
------------------------------------------------------------------------------------------------------------------
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------------------------------------------------------------------------------------------------------------------
Fortran  | 548.exchange2_r(base, peak)
------------------------------------------------------------------------------------------------------------------
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Cisco Systems
Cisco UCS X210c M7 (Intel Xeon Platinum 8450H, 2.00GHz)  

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<th>SPECrate®2017_int_base = 474</th>
<th>SPECrate®2017_int_peak = 488</th>
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<td>Test Date: Jun-2023</td>
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<tr>
<td>Test Sponsor: Cisco Systems</td>
<td>Hardware Availability: Mar-2023</td>
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<tr>
<td>Tested by: Cisco Systems</td>
<td>Software Availability: Dec-2022</td>
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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 -xsapphirerapids -O3 -ffast-math
-fflto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-L/usr/local/intel/compiler/2023.0.0/linux/compiler/lib/intel64_lin
-lqkmalloc

C++ benchmarks:
-w -std=c++14 -m64 -Wl,-z,muldefs -xsapphirerapids -O3 -ffast-math
-fflto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-L/usr/local/intel/compiler/2023.0.0/linux/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/usr/local/intel/compiler/2023.0.0/linux/compiler/lib/intel64_lin
-lqkmalloc
## Cisco Systems
Cisco UCS X210c M7 (Intel Xeon Platinum 8450H, 2.00GHz)

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### Peak Compiler Invocation

C benchmarks:
- icx

C++ benchmarks:
- icpx

Fortran benchmarks:
- ifx

### Peak Portability Flags

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<thead>
<tr>
<th>Benchmark</th>
<th>Flags</th>
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<tr>
<td>perlbench_r</td>
<td>-DSPEC_LP64 -DSPEC_LINUX_X64</td>
</tr>
<tr>
<td>gcc_r</td>
<td>-D_FILE_OFFSET_BITS=64</td>
</tr>
<tr>
<td>mcf_r</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>omnetpp_r</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>xalancbmk_r</td>
<td>-DSPEC_LP64 -DSPEC_LINUX</td>
</tr>
<tr>
<td>x264_r</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>deepsjeng_r</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>leela_r</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>exchange2_r</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>xz_r</td>
<td>-DSPEC_LP64</td>
</tr>
</tbody>
</table>

### Peak Optimization Flags

C benchmarks:

500.perlbench_r:
- -w -std=c11 -m64 -Wl,-z,muldefs
- -fprofile-generate(pass 1)
- -fprofile-use=default.profdata(pass 2) -xCORE-AVX2(pass 1)
- -flto -Ofast -xCORE-AVX512 -ffast-math -mfpmath=sse
- -funroll-loops -gopt-mem-layout-trans=4
- -fno-strict-overflow
- -L/usr/local/intel/compiler/2023.0.0/linux/compiler/lib/intel64_lin
- -lqkmalloc

502.gcc_r:
- -m32
- -L/usr/local/intel/compiler/2023.0.0/linux/compiler/lib/ia32_lin
- -std=gnu89 -Wl,-z,muldefs -fprofile-generate(pass 1)
- -fprofile-use=default.profdata(pass 2) -xCORE-AVX2(pass 1)
- -flto -Ofast -xCORE-AVX512 -ffast-math -mfpmath=sse
- -funroll-loops -gopt-mem-layout-trans=4
- -L/usr/local/jemalloc32-5.0.1/lib -ljemalloc

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SPECrate®2017_int_base = 474
SPECrate®2017_int_peak = 488

Peak Optimization Flags (Continued)

505.mcf_r: basepeak = yes

525.x264_r: -w -std=c11 -m64 -Wl,-z,muldefs -xsapphirerapid -Ofast
-ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -fno-alias
-L/usr/local/intel/compiler/2023.0.0/linux/compiler/lib/intel64_lin
-lqkmalloc

557.xz_r: basepeak = yes

C++ benchmarks:

520.omnetpp_r: basepeak = yes
523.xalancbmk_r: basepeak = yes
531.deepsjeng_r: basepeak = yes
541.leela_r: basepeak = yes

Fortran benchmarks:

548.exchange2_r: basepeak = yes

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/Intel-ic2023-official-linux64.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/Intel-ic2023-official-linux64.xml

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