



SPEC CPU®2017 Integer Rate Result

Copyright 2017-2024 Standard Performance Evaluation Corporation

Cisco Systems

Cisco UCS X210 M7 (Intel Xeon Gold 5512U, 2.10GHz)

SPECrate®2017_int_base = 253

SPECrate®2017_int_peak = 262

CPU2017 License: 9019

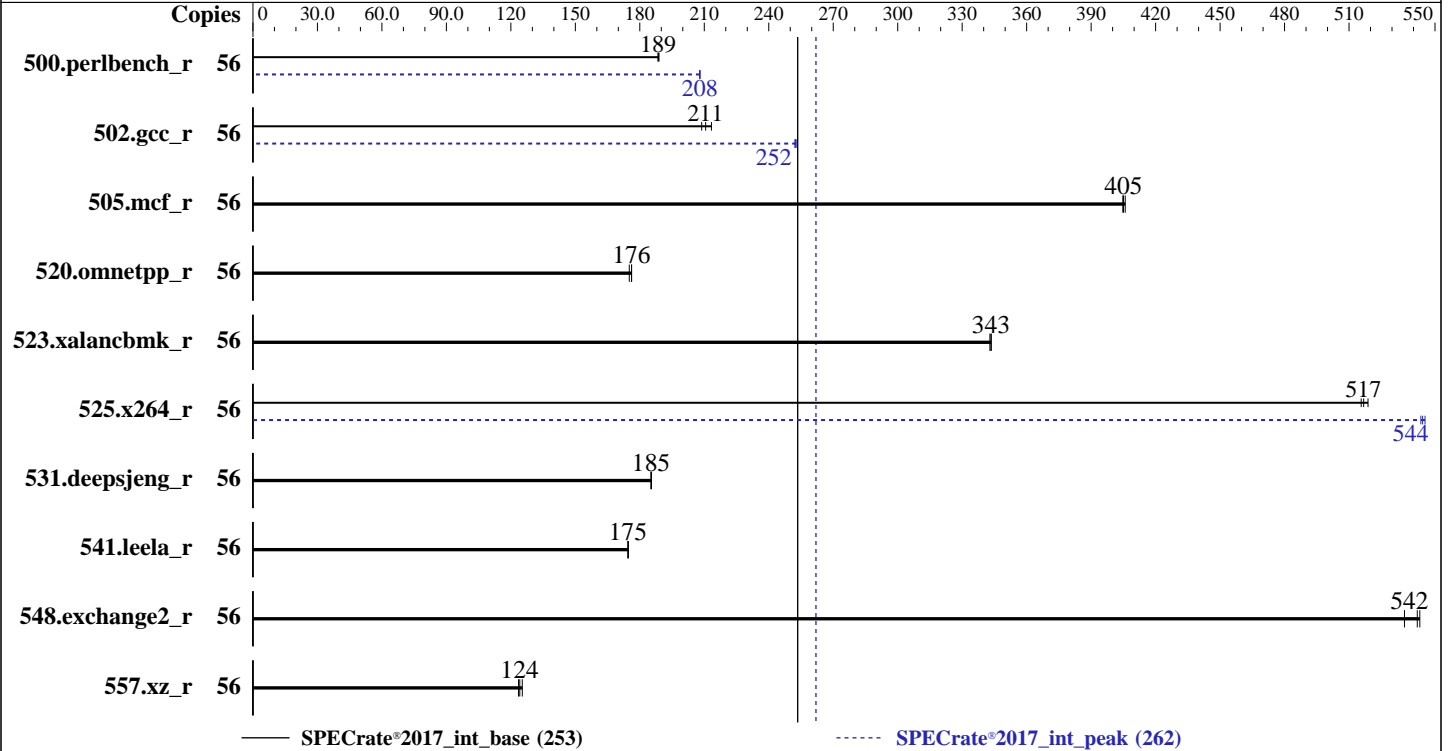
Test Sponsor: Cisco Systems

Tested by: Cisco Systems

Test Date: Apr-2024

Hardware Availability: Feb-2024

Software Availability: Dec-2023



Hardware

CPU Name: Intel Xeon Gold 5512U
 Max MHz: 3700
 Nominal: 2100
 Enabled: 28 cores, 1 chip, 2 threads/core
 Orderable: 1 Chips
 Cache L1: 32 KB I + 48 KB D on chip per core
 L2: 2 MB I+D on chip per core
 L3: 52.5 MB I+D on chip per chip
 Other: None
 Memory: 512 GB (8 x 64 GB 2Rx4 PC5-4800B-R)
 Storage: 1 x 960 GB M.2 SSD SATA
 Other: CPU Cooling: Air

Software

OS: SUSE Linux Enterprise Server 15 SP4
 5.14.21-150400.22-default
 Compiler: C/C++: Version 2024.0.2 of Intel oneAPI DPC++/C++
 Compiler for Linux;
 Fortran: Version 2024.0.2 of Intel Fortran
 Compiler for Linux;
 Parallel: No
 Firmware: Version 4.3.3a released Jan-2024
 File System: xfs
 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 Table

Benchmark	Base								Peak							
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio		
500.perlbench_r	56	473	188	472	189	473	189	56	429	208	429	208	429	208		
502.gcc_r	56	372	213	380	209	376	211	56	314	252	314	253	314	252		
505.mcf_r	56	224	405	223	406	223	405	56	224	405	223	406	223	405		
520.omnetpp_r	56	420	175	417	176	417	176	56	420	175	417	176	417	176		
523.xalancbmk_r	56	172	343	172	343	172	343	56	172	343	172	343	172	343		
525.x264_r	56	190	516	190	517	189	519	56	180	545	180	543	180	544		
531.deepsjeng_r	56	346	185	346	185	346	185	56	346	185	346	185	346	185		
541.leela_r	56	531	175	531	174	531	175	56	531	175	531	174	531	175		
548.exchange2_r	56	274	536	271	542	270	543	56	274	536	271	542	270	543		
557.xz_r	56	487	124	489	124	483	125	56	487	124	489	124	483	125		

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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.

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General Notes (Continued)

jemalloc, a general purpose malloc implementation
built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5
sources available from jemalloc.net or <https://github.com/jemalloc/jemalloc/releases>

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 emr-x210-spec Fri Apr 19 11:33:29 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 (249.11+suse.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
22. BIOS

```

1. uname -a
Linux emr-x210-spec 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
11:33:29 up 1 min, 1 user, load average: 0.13, 0.05, 0.01
USER  TTY  FROM          LOGIN@  IDLE   JCPU   PCPU WHAT
root  tty1  -             11:32   8.00s  1.07s  0.16s -bash

```

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Platform Notes (Continued)

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) 2062556
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) 2062556
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
sh runrate.ic2024.sh
runcpu --nobuild --action validate --define default-platform-flags --define numcopies=56 -c
  ic2024.0.2-lin-sapphirerapids-rate-20231213.cfg --reportable --iterations 3 --define smt-on --define
  cores=28 --define physicalfirst --define invoke_with_interleave --define drop_caches --tune all -o all
  intrate
runcpu --nobuild --action validate --define default-platform-flags --define numcopies=56 --configfile
  ic2024.0.2-lin-sapphirerapids-rate-20231213.cfg --reportable --iterations 3 --define smt-on --define
  cores=28 --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/CPU2017.032/templogs/preenv.intrate.032.0.log --lognum 032.0
  --from_runcpu 2
specperl $SPEC/bin/sysinfo
$SPEC = /home/cpu2017

```

6. /proc/cpuinfo

```

model name      : INTEL(R) XEON(R) GOLD 5512U
vendor_id      : GenuineIntel
cpu family     : 6
model          : 207
stepping      : 2
microcode     : 0x21000200
bugs          : spectre_v1 spectre_v2 spec_store_bypass swapgs
cpu cores     : 28
siblings      : 56
1 physical ids (chips)
56 processors (hardware threads)
physical id 0: core ids 0-27
physical id 0: apicids 0-55

```

Caution: /proc/cpuinfo data regarding chips, cores, and threads is not necessarily reliable, especially for virtualized systems. Use the above data carefully.

(Continued on next page)



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Platform Notes (Continued)

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):                 56
On-line CPU(s) list:   0-55
Vendor ID:              GenuineIntel
Model name:             INTEL(R) XEON(R) GOLD 5512U
CPU family:             6
Model:                  207
Thread(s) per core:    2
Core(s) per socket:    28
Socket(s):              1
Stepping:               2
CPU max MHz:            3700.0000
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 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 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 avx_vnni avx512_bf16 wbnoinvd dtherm ida arat pln pts hwp
                        hwp_act_window hwp_epp hwp_pkg_req 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_lld arch_capabilities

```

Virtualization: VT-x

```

L1d cache:             1.3 MiB (28 instances)
L1i cache:             896 KiB (28 instances)
L2 cache:              56 MiB (28 instances)
L3 cache:              52.5 MiB (1 instance)

```

```

NUMA node(s):          2
NUMA node0 CPU(s):    0-13,28-41
NUMA node1 CPU(s):    14-27,42-55
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/swapgs barriers and __user pointer sanitization
Vulnerability Spectre v2: Mitigation; Enhanced IBRS, IBPB conditional, RSB filling
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	1.3M	12	Data	1	64	1	64

(Continued on next page)



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Platform Notes (Continued)

L1i	32K	896K	8 Instruction	1	64	1	64
L2	2M	56M	16 Unified	2	2048	1	64
L3	52.5M	52.5M	15 Unified	3	57344	1	64

8. numactl --hardware

NOTE: a numactl 'node' might or might not correspond to a physical chip.

```

available: 2 nodes (0-1)
node 0 cpus: 0-13,28-41
node 0 size: 257676 MB
node 0 free: 256801 MB
node 1 cpus: 14-27,42-55
node 1 size: 257986 MB
node 1 free: 257466 MB
node distances:
node  0  1
  0: 10 12
  1: 12 10

```

9. /proc/meminfo

MemTotal: 528038912 kB

10. who -r

run-level 3 Apr 19 11:32

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 auditd cron getty@ haveged irqbalance issue-generator
                kbdsettings klog lvm2-monitor nscd nvme-fc-boot-connections postfix purge-kernels rollback
                rsyslog smartd sshd 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 ebttables exchange-bmc-os-info
                firewallld gpm grub2-once haveged-switch-root ipmi ipmievd issue-add-ssh-keys kexec-load
                lunmask man-db-create multipathd nfs nfs-blkmap nvme-f-autoconnect rdisc rpcbind
                rpmconfigcheck rsyncd serial-getty@ smartd_generate_opts snmpd snmptrapd svnservice
                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-5.14.21-150400.22-default
root=UUID=72058f1f-355b-4421-909c-1facaea01bdc
splash=silent
mitigations=auto
quiet
security=

```

14. cpupower frequency-info

analyzing CPU 0:

(Continued on next page)



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Platform Notes (Continued)

current policy: frequency should be within 800 MHz and 3.70 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+madvice [madvice] never
enabled        [always] madvice 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 SP4
-----

```

```

-----
19. Disk information
SPEC is set to: /home/cpu2017
Filesystem  Type  Size  Used Avail Use% Mounted on
/dev/sdb2   xfs   893G  20G  874G  3% /
-----

```

```

-----
20. /sys/devices/virtual/dmi/id
Vendor:      Cisco Systems Inc
-----

```

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Platform Notes (Continued)

Product: UCSX-210C-M7
Serial: FCH270177DF

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:

7x 0xCE00 M321R8GA0BB0-CQKDG 64 GB 2 rank 4800
1x 0xCE00 M321R8GA0BB0-CQKMG 64 GB 2 rank 4800

22. BIOS

(This section combines info from /sys/devices and dmidecode.)

BIOS Vendor: Cisco Systems, Inc.
BIOS Version: X210M7.4.3.3a.0.0118241337
BIOS Date: 01/18/2024
BIOS Revision: 5.32

Compiler Version Notes

C | 502.gcc_r(peak)

Intel(R) oneAPI DPC++/C++ Compiler for applications running on IA-32, Version 2024.0.2 Build 20231213
Copyright (C) 1985-2023 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 2024.0.2 Build 20231213
Copyright (C) 1985-2023 Intel Corporation. All rights reserved.

C | 502.gcc_r(peak)

Intel(R) oneAPI DPC++/C++ Compiler for applications running on IA-32, Version 2024.0.2 Build 20231213
Copyright (C) 1985-2023 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 2024.0.2 Build 20231213
Copyright (C) 1985-2023 Intel Corporation. All rights reserved.

C++ | 520.omnetpp_r(base, peak) 523.xalancbnk_r(base, peak) 531.deepsjeng_r(base, peak)
| 541.leela_r(base, peak)

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2024.0.2 Build 20231213

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Compiler Version Notes (Continued)

Copyright (C) 1985-2023 Intel Corporation. All rights reserved.

Fortran | 548.exchange2_r(base, peak)

Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2024.0.2 Build 20231213
Copyright (C) 1985-2023 Intel Corporation. All rights reserved.

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 -xsaphirerapids -O3 -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-L/opt/intel/oneapi/compiler/2024.0/lib -lqkmalloc

C++ benchmarks:

-w -std=c++14 -m64 -Wl,-z,muldefs -xsaphirerapids -O3 -ffast-math

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Base Optimization Flags (Continued)

C++ benchmarks (continued):

```
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4  
-L/opt/intel/oneapi/compiler/2024.0/lib -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/opt/intel/oneapi/compiler/2024.0/lib -lqkmalloc
```

Peak Compiler Invocation

C benchmarks:

```
icx
```

C++ benchmarks:

```
icpx
```

Fortran benchmarks:

```
ifx
```

Peak Portability Flags

```
500.perlbench_r: -DSPEC_LP64 -DSPEC_LINUX_X64  
502.gcc_r: -D_FILE_OFFSET_BITS=64  
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
```

Peak Optimization Flags

C benchmarks:

```
500.perlbench_r: -w -std=c11 -m64 -Wl,-z,muldefs  
-fprofile-generate(pass 1)
```

(Continued on next page)



SPEC CPU®2017 Integer Rate Result

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Cisco Systems

Cisco UCS X210 M7 (Intel Xeon Gold 5512U, 2.10GHz)

SPECrate®2017_int_base = 253

SPECrate®2017_int_peak = 262

CPU2017 License: 9019

Test Sponsor: Cisco Systems

Tested by: Cisco Systems

Test Date: Apr-2024

Hardware Availability: Feb-2024

Software Availability: Dec-2023

Peak Optimization Flags (Continued)

500.perlbench_r (continued):

```
-fprofile-use=default.profddata(pass 2) -xCORE-AVX2(pass 1)
-flto -Ofast -xCORE-AVX512 -ffast-math -mfpmath=sse
-funroll-loops -qopt-mem-layout-trans=4
-fno-strict-overflow
-L/opt/intel/oneapi/compiler/2024.0/lib -lqkmalloc
```

```
502.gcc_r: -m32 -L/opt/intel/oneapi/compiler/2024.0/lib32 -std=gnu89
-Wl,-z,muldefs -fprofile-generate(pass 1)
-fprofile-use=default.profddata(pass 2) -xCORE-AVX2(pass 1)
-flto -Ofast -xCORE-AVX512 -ffast-math -mfpmath=sse
-funroll-loops -qopt-mem-layout-trans=4
-L/usr/local/jemalloc32-5.0.1/lib -ljemalloc
```

505.mcf_r: basepeak = yes

```
525.x264_r: -w -std=c11 -m64 -Wl,-z,muldefs -xsapphirerapids -Ofast
-ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -fno-alias
-L/opt/intel/oneapi/compiler/2024.0/lib -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-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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