Cisco Systems
Cisco UCS X210 M7 (Intel Xeon Gold 6548N, 2.80GHz)

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

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

SPECrater®2017_int_base = 632
SPECrater®2017_int_peak = 653

SPEC CPU®2017 Integer Rate Result
Copyright 2017-2024 Standard Performance Evaluation Corporation

Hardware
CPU Name: Intel Xeon Gold 6548N
Max MHz: 4100
Nominal: 2800
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: Cooling: Air

Software
OS: SUSE Linux Enterprise Server 15 SP4 5.14.21-150400.22-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: 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
## Results Table

<table>
<thead>
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<th>Ratio</th>
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<td>313</td>
<td>451</td>
<td>307</td>
<td>450</td>
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</tr>
</tbody>
</table>

### 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

Platform Notes

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

Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r6732 of 2022-11-07 fe91c89b7a45c6e2c92ecc097bec197
running on emr-x210-spec Fri Mar  8 19:28:36 2024

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

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2. w
3. Username
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 (249.11+suse.124.g2bc0b2c447)
12. Services, from systemctl list-unit-files
13. Linux kernel boot-time arguments, from /proc/cmdline
14. cpupower frequency-info
15. sysct1
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
19:28:36 up 1 min, 1 user, load average: 3.72, 2.17, 0.84
USER TTY FROM LOGIN% IDLE JCPU PCPU WHAT
root tty1 - 19:27 12.00s 1.13s 0.19s -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 (--l) 4126759
   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) 4126759
   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.ic2023.sh
   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 all 0 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 all
   --output_format all --nopower --runmode rate --tune base:peak --size referate intrate --nopreenv
   --note-preenv --logfile $SPEC/tmp/CPU2017.026/templogs/preenv.intrate.026.0.log --lognum 026.0
   --from_runcpu 2
   specperl $SPEC/bin/sysinfo
   $SPEC = /home/cpu2017

6. /proc/cpuinfo
   model name : INTEL(R) XEON(R) GOLD 6548N
   vendor_id : GenuineIntel
   cpu family : 6
   model : 207
   stepping : 2
   microcode : 0x21000200
   bugs : spectre_v1 spectre_v2 spec_store_bypass swaps
   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

(Continued on next page)
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Platform Notes (Continued)

virtualized systems. Use the above data carefully.

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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): 128
On-line CPU(s) list: 0-127
Vendor ID: GenuineIntel
Model name: INTEL(R) XEON(R) GOLD 6548N
CPU family: 6
Model: 207
Thread(s) per core: 2
Core(s) per socket: 32
Stepping: 2
CPU max MHz: 4100.0000
CPU min MHz: 800.0000
BogoMIPS: 5600.00

Flags:

fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36
clflush dts acpi mmx fxsr mpx setmmx pat pse36
lm constant_tsc art arch_perfmon pebs bts rep_good nopl xapic efer 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 cdg
invpcid_single cdp_12 ssbd mba ibrs ibpb ibrs_enhanced tpr_shadow
vmx flexpriority vhdmi fmar rdtscp

Virtualization: VT-x
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 L1i: 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 Tsa async abort: Not affected

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Cisco Systems
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<table>
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<tr>
<th>CPU2017 License</th>
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<td>653</td>
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Test Date: Mar-2024
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Platform Notes (Continued)

From lscpu --cache:

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<td>L3</td>
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<td>3</td>
<td>65536</td>
<td>1</td>
<td>64</td>
</tr>
</tbody>
</table>

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: 257675 MB
node 0 free: 256635 MB
node 1 cpus: 16-31,80-95
node 1 size: 258039 MB
node 1 free: 257538 MB
node 2 cpus: 32-47,96-111
node 2 size: 258005 MB
node 2 free: 257331 MB
node 3 cpus: 48-63,112-127
node 3 size: 257992 MB
node 3 free: 257482 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: 1056474728 kB

10. who -r

run-level 3 Mar 8 19:27

11. Systemd service manager version: systemd 249 (249.11+suse.124.q2bc0b2c447)

Default Target Status
multi-user running

12. Services, from systemctl list-unit-files

<table>
<thead>
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<th>STATE</th>
<th>UNIT FILES</th>
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</thead>
<tbody>
<tr>
<td>enabled</td>
<td>YaST2-Firstboot YaST2-Second-Stage auditd cron getty@ havedeg irqbalance issue-generator kbdsettings klog lvm2-monitor ncmd nvme-fc-boot-connections postfix purge-kernels rollback rsyslog smartd sshd wicked wicked-fed-auto4 wicked-fed-dhcpd wicked-fed-dhcp6 wicked-fed-nanny</td>
</tr>
<tr>
<td>enabled-runtime</td>
<td>systemd-remount-fs</td>
</tr>
<tr>
<td>indirect</td>
<td>wickedd</td>
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### Platform Notes (Continued)

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:
   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.extr frag_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

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**Platform Notes (Continued)**

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   16G  878G   2% /

20. /sys/devices/virtual/dmi/id
Vendor:         Cisco Systems Inc
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 "DfTF 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: X2IOM7.4.3.3a.0.018241337
BIOS Date: 01/18/2024
BIOS Revision: 5.32

---

**Compiler Version Notes**

<table>
<thead>
<tr>
<th></th>
<th>500.gcc_r(peak)</th>
</tr>
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<tbody>
<tr>
<td>Intel(R) oneAPI DPC++/C++ Compiler for applications running on IA-32, Version 2023.2.3 Build x</td>
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<td>Copyright (C) 1985-2023 Intel Corporation. All rights reserved.</td>
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<td>Intel(R) oneAPI DPC++/C++ Compiler for applications running on IA-32, Version 2023.2.3 Build x</td>
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<tr>
<td>Copyright (C) 1985-2023 Intel Corporation. All rights reserved.</td>
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<tr>
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<th>500.perlbench_r(base, peak) 502.gcc_r(base) 505.mcf_r(base, peak) 525.x264_r(base, peak)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Continued on next page)</td>
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</tbody>
</table>
Cisco Systems
Cisco UCS X210 M7 (Intel Xeon Gold 6548N, 2.80GHz)

**SPEC CPU®2017 Integer Rate Result**

| Spec CPU®2017 int_base = 632 |
| Spec CPU®2017 int_peak = 653 |

**CPU2017 License:** 9019  
**Test Sponsor:** Cisco Systems  
**Test Date:** Mar-2024  
**Hardware Availability:** Feb-2024

**CPU2017 License:** 9019  
**Test Sponsor:** Cisco Systems  
**Test Date:** Mar-2024  
**Software Availability:** Dec-2023

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**Compiler Version Notes (Continued)**

| 557.xz_r(base, peak) |
| 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.  |

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| C++ | 520.omnetpp_r(base, peak) 523.xalancbmk_r(base, peak) 531.deepsjeng_r(base, peak) |
| 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.  |

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| Fortran | 548.exchange2_r(base, peak) |
| Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2023.2.3 Build x  |
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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 |
Cisco Systems
Cisco UCS X210 M7 (Intel Xeon Gold 6548N, 2.80GHz)

SPEC CPU®2017 Integer Rate Result
Copyright 2017-2024 Standard Performance Evaluation Corporation

SPECrate®2017_int_base = 632
SPECrate®2017_int_peak = 653

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

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

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

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

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Cisco Systems
Cisco UCS X210 M7 (Intel Xeon Gold 6548N, 2.80GHz)

| SPECrate®2017_int_base = 632 |
| SPECrate®2017_int_peak = 653 |

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

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

Peak Portability Flags (Continued)

557.xz_r: -DSPEC_LP64

Peak Optimization Flags

C benchmarks:

500.perlbench_r: -w -std=c11 -m64 -Wl,-z,muldefs
-ffp-profile-generate(pass 1)
-ffp-profile-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/home/specdev/new_compilers/ic2023.2.3/compiler/lib/intel64_lin
-lqkmalloc

502.gcc_r: -m32
-L/home/specdev/new_compilers/ic2023.2.3/compiler/lib/ia32_lin
-std=gnu89 -Wl,-z,muldefs -ffp-profile-generate(pass 1)
-ffp-profile-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

505.mcf_r: basepeak = yes

525.x264_r: -w -std=c11 -m64 -Wl,-z,muldefs -xsapphirerapids -Ofast
-ffast-math -flto -mfpmath=sse -funroll-loops
-gopt-mem-layout-trans=4 -fno-alias
-L/home/specdev/new_compilers/ic2023.2.3/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

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Cisco Systems
Cisco UCS X210 M7 (Intel Xeon Gold 6148N, 2.80GHz)

SPECrate®2017_int_base = 632
SPECrate®2017_int_peak = 653

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

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

Peak Optimization Flags (Continued)

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-ic2023p2-official-linux64.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/Cisco-Platform-Settings-V1.0-EMR-revB.xml

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

Tested with SPEC CPU®2017 v1.1.9 on 2024-03-08 22:28:35-0500.
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