Cisco Systems
Cisco UCS X210 M7 (Intel Xeon Gold 6538Y+, 2.20GHz)

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

SPECrater®2017_int_base = 604
SPECrater®2017_int_peak = 624

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

Hardware
CPU Name: Intel Xeon Gold 6538Y+
Max MHz: 4000
Nominal: 2200
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 TB SATA SSDs 6Gb/s
Other: None

Software
OS: SUSE Linux Enterprise Server 15 SP4
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;
Firmware: Version 4.3.3a released Jan-2024
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 and OS set to prefer performance at the cost of additional power usage.

<table>
<thead>
<tr>
<th>Benchmark</th>
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<td>128</td>
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SPECrate\textsuperscript{2017 int base} = 604
SPECrate\textsuperscript{2017 int peak} = 624

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>
jemalloc, a general purpose malloc implementation
  built with the Red Hat Enterprise 7.5, and the system compiler gcc 4.8.5
NA: The test sponsor attests, as of date of publication, that CVE-2017-5754 (Meltdown) is mitigated in the system as tested and documented.

(Continued on next page)
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General Notes (Continued)
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.

Platform Notes

BIOS Settings:
Sub NUMA Clustering set to Enable SNC2(2-clusters)
Adjacent cache line prefetcher set to Enabled
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 fe91c89b7e5c36ae2c92cc097bec197
running on speccpu-EMR Wed Feb 21 23:59:14 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 speccpu-EMR 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
23:59:14 up 4 min, 1 user, load average: 0.11, 0.19, 0.09
USER   TTY      FROM LOGIN@   IDLE   JCPU   PCPU WHAT
(Continued on next page)
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 --action=build --action=validate --define=default-platform-flags --define=numcopies=128 --configfile ic2023.2.3-lin-sapphireraids-rate-20231121.cfg --reportable --iterations 3 --define=smt-on --define cores=64 --define=physicalfirst --define=invoke_with_interleave --define=drop_caches --tune all --o intrate
runcpu --action=build --action=validate --define=default-platform-flags --define=numcopies=128 --configfile ic2023.2.3-lin-sapphireraids-rate-20231121.cfg --reportable --iterations 3 --define=smt-on --define cores=64 --define=physicalfirst --define=invoke_with_interleave --define=drop_caches --tune all --o intrate
--output_format all --nopower --runmode rate --tune base:peak --size intrate --nopreenv --note-preenv --logfile $SPEC/tmp/CPU2017.010/templogs/preenv.intrate.010.0.log --lognum 010.0
--from_runcpu 2
specperl $SPEC/bin/sysinfo
$SPEC = /home/cpu2017

6. /proc/cpuinfo
- model name: INTEL(R) XEON(R) GOLD 6538Y+
- vendor_id: GenuineIntel
- cpu family: 6
- model: 207
- stepping: 2
- microcode: 0x21000200
- bugs: spectre_v1 spectre_v2 spec_store_bypass swapgs
- 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

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Platform Notes (Continued)

physical id 1: apicid 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 2.37.2:
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 6538Y+
CPU family: 6
Model: 207
Thread(s) per core: 2
Core(s) per socket: 32
Socket(s): 2
Stepping: 2
CPU max MHz: 4000.0000
CPU min MHz: 800.0000
BogoMFPS: 4000.00
Flags: fpu vme de pse tsc msr pae mce cmov pat pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtscp lm constant_tsc arch_perfmon pebs bts rep_good nopl xtopology
Virtualization: VT-x

L1d cache: 3 MiB (64 instances)
L1i cache: 2 MiB (64 instances)
L2 cache: 120 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 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

(Continued on next page)
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Platform Notes (Continued)

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 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

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: 256491 MB
node 1 cpus: 16-31,80-95
node 1 size: 258005 MB
node 1 free: 257464 MB
node 2 cpus: 32-47,96-111
node 2 size: 258039 MB
node 2 free: 257538 MB
node 3 cpus: 48-63,112-127
node 3 size: 257992 MB
node 3 free: 257510 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: 1056474664 kB

10. who -r
run-level 3 Feb 21 23:55

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 audid cron display-manager getty@ haveged
irqbalance issue-generator kbdsettings klog lvm2-monitor nscd postfix purge-kernels
rollback rsyslog smartd sshd wicked wickedd-auto4 wickeddd-dhcp4 wickeddd-dhcp6
wickedd-nanny

disabled systemd-remount-fs
enabled-runtime systemd-boot-chck-no-failures

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SPEC CPU®2017 Integer Rate Result

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Platform Notes (Continued)

indirect wickedd

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 4.00 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.swap_max_dic                    15000
   vm.swap_max_dic                     10
   vm.zone_reclaim_mode                0

16. /sys/kernel/mm/transparent_hugepage
   defrag                             always defer defer+madvice [madvice] never
   enabled                            [always] madvice never
   hpage_pmd_size                     2097152
   shm_mmp_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

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**Platform Notes (Continued)**

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      btrfs  892G   21G  871G   3% /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 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:      X210M7.4.3.3a.0.0118241337
   BIOS Date:         01/18/2024
   BIOS Revision:     5.32

**Compiler Version Notes**

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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  
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</thead>
<tbody>
<tr>
<td>Spec CPU®2017 int_peak</td>
<td>SPECrate®2017_int_peak = 624</td>
</tr>
</tbody>
</table>

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### Cisco Systems
Cisco UCS X210 M7 (Intel Xeon Gold 6538Y+, 2.20GHz)

**CPU2017 License:** 9019  
**Test Sponsor:** Cisco Systems  
**Tested by:** Cisco Systems  
**Test Date:** Feb-2024  
**Hardware Availability:** Feb-2024  
**Software Availability:** Dec-2023

### Base Optimization Flags
C benchmarks:
- `-w -std=c11 -m64 -W1,-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 -W1,-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 -W1,-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 6538Y+, 2.20GHz)

SPECrate®2017_int_base = 604
SPECrate®2017_int_peak = 624

Peak Portability Flags (Continued)

557.xz_r: -DSPEC_LP64

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/home/specdev/new_compilers/ic2023.2.3/compiler/lib/intel64_lin
   -ljmalloc

502.gcc_r: -m32
   -L/home/specdev/new_compilers/ic2023.2.3/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 -ljmalloc

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
   -ljmalloc

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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| SPECrate®2017_int_base | 604 |
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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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