## SPEC CPU®2017 Floating Point Rate Result

### Cisco Systems

Cisco UCS C220 M7 (Intel Xeon Gold 6416H, 2.20GHz)

<table>
<thead>
<tr>
<th>CPU2017 License</th>
<th>9019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Sponsor</td>
<td>Cisco Systems</td>
</tr>
<tr>
<td>Tested by</td>
<td>Cisco Systems</td>
</tr>
<tr>
<td>Test Date</td>
<td>Oct-2023</td>
</tr>
<tr>
<td>Hardware Availability</td>
<td>Feb-2023</td>
</tr>
<tr>
<td>Software Availability</td>
<td>Dec-2022</td>
</tr>
</tbody>
</table>

### SPECrate®2017_fp_base = 438

### SPECrate®2017_fp_peak = 441

#### Hardware

<table>
<thead>
<tr>
<th>Component</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU Name</td>
<td>Intel Xeon Gold 6416H</td>
</tr>
<tr>
<td>Max MHz</td>
<td>4200</td>
</tr>
<tr>
<td>Nominal</td>
<td>2200</td>
</tr>
<tr>
<td>Enabled</td>
<td>36 cores, 2 chips, 2 threads/core</td>
</tr>
<tr>
<td>Orderable</td>
<td>1,2 Chips</td>
</tr>
<tr>
<td>Cache L1</td>
<td>32 KB I + 48 KB D on chip per core</td>
</tr>
<tr>
<td>Cache L2</td>
<td>2 MB I+D on chip per core</td>
</tr>
<tr>
<td>Cache L3</td>
<td>45 MB I+D on chip per chip</td>
</tr>
<tr>
<td>Other</td>
<td>None</td>
</tr>
<tr>
<td>Memory</td>
<td>1 TB (16 x 64 GB 2Rx4 PC5-4800B-R)</td>
</tr>
<tr>
<td>Storage</td>
<td>1 x 960 GB M.2 SSD SATA</td>
</tr>
<tr>
<td>Other</td>
<td>None</td>
</tr>
</tbody>
</table>

#### Software

<table>
<thead>
<tr>
<th>Component</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>OS</td>
<td>SUSE Linux Enterprise Server 15 SP4 5.14.21-150400.22-default</td>
</tr>
<tr>
<td>Compiler</td>
<td>C/C++: Version 2023.0 of Intel oneAPI DPC++/C++ Compiler for Linux; Fortran: Version 2023.0 of Intel Fortran Compiler for Linux;</td>
</tr>
<tr>
<td>Parallel</td>
<td>No</td>
</tr>
<tr>
<td>Firmware</td>
<td>Version 4.3.1b released Mar-2023</td>
</tr>
<tr>
<td>File System</td>
<td>btrfs</td>
</tr>
<tr>
<td>System State</td>
<td>Run level 3 (multi-user)</td>
</tr>
<tr>
<td>Base Pointers</td>
<td>64-bit</td>
</tr>
<tr>
<td>Peak Pointers</td>
<td>64-bit</td>
</tr>
<tr>
<td>Other</td>
<td>jemalloc memory allocator V5.0.1</td>
</tr>
<tr>
<td>Power Management</td>
<td>BIOS set to prefer performance at the cost of additional power usage</td>
</tr>
</tbody>
</table>

---

**Copies**

<table>
<thead>
<tr>
<th>Component</th>
<th>Copies</th>
<th>SPECrate®2017_fp_base</th>
<th>SPECrate®2017_fp_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>503.bwaves_r</td>
<td>72</td>
<td>515</td>
<td>515</td>
</tr>
<tr>
<td>507.cactuBSSN_r</td>
<td>36</td>
<td>231</td>
<td>231</td>
</tr>
<tr>
<td>508.namd_r</td>
<td>72</td>
<td>365</td>
<td>365</td>
</tr>
<tr>
<td>510.parest_r</td>
<td>72</td>
<td>286</td>
<td>286</td>
</tr>
<tr>
<td>511.povray_r</td>
<td>72</td>
<td>390</td>
<td>390</td>
</tr>
<tr>
<td>519.lbm_r</td>
<td>72</td>
<td>360</td>
<td>360</td>
</tr>
<tr>
<td>521.wrf_r</td>
<td>36</td>
<td>393</td>
<td>393</td>
</tr>
<tr>
<td>526.blender_r</td>
<td>72</td>
<td>461</td>
<td>461</td>
</tr>
<tr>
<td>527.cam4_r</td>
<td>36</td>
<td>230</td>
<td>230</td>
</tr>
<tr>
<td>538.imagick_r</td>
<td>72</td>
<td>1000</td>
<td>1000</td>
</tr>
<tr>
<td>544.nab_r</td>
<td>72</td>
<td>681</td>
<td>681</td>
</tr>
<tr>
<td>549.fotonik3d_r</td>
<td>36</td>
<td>241</td>
<td>241</td>
</tr>
<tr>
<td>554.roms_r</td>
<td>36</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Cisco Systems
Cisco UCS C220 M7 (Intel Xeon Gold 6416H, 2.20GHz)

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

Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Copies</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>503.bwaves_r</td>
<td>72</td>
<td>394</td>
<td>1830</td>
<td>394</td>
<td>1830</td>
<td>393</td>
<td>1840</td>
<td>72</td>
<td>394</td>
<td>1830</td>
<td>394</td>
<td>1830</td>
<td>393</td>
<td>1840</td>
</tr>
<tr>
<td>507.cactuBSSN_r</td>
<td>72</td>
<td>177</td>
<td>514</td>
<td>177</td>
<td>515</td>
<td>177</td>
<td>515</td>
<td>36</td>
<td>180</td>
<td>569</td>
<td>80.2</td>
<td>568</td>
<td>80.1</td>
<td>569</td>
</tr>
<tr>
<td>508.namd_r</td>
<td>72</td>
<td>295</td>
<td>232</td>
<td>296</td>
<td>231</td>
<td>296</td>
<td>231</td>
<td>72</td>
<td>295</td>
<td>232</td>
<td>296</td>
<td>231</td>
<td>296</td>
<td>231</td>
</tr>
<tr>
<td>510.parest_r</td>
<td>72</td>
<td>794</td>
<td>237</td>
<td>795</td>
<td>237</td>
<td>795</td>
<td>237</td>
<td>36</td>
<td>358</td>
<td>263</td>
<td>358</td>
<td>263</td>
<td>358</td>
<td>263</td>
</tr>
<tr>
<td>511.povray_r</td>
<td>72</td>
<td>459</td>
<td>366</td>
<td>461</td>
<td>365</td>
<td>461</td>
<td>364</td>
<td>72</td>
<td>445</td>
<td>378</td>
<td>445</td>
<td>378</td>
<td>446</td>
<td>377</td>
</tr>
<tr>
<td>519.lbm_r</td>
<td>72</td>
<td>265</td>
<td>286</td>
<td>265</td>
<td>286</td>
<td>265</td>
<td>286</td>
<td>72</td>
<td>265</td>
<td>286</td>
<td>265</td>
<td>286</td>
<td>265</td>
<td>286</td>
</tr>
<tr>
<td>521.wrf_r</td>
<td>72</td>
<td>414</td>
<td>390</td>
<td>414</td>
<td>390</td>
<td>412</td>
<td>391</td>
<td>36</td>
<td>220</td>
<td>366</td>
<td>221</td>
<td>364</td>
<td>226</td>
<td>358</td>
</tr>
<tr>
<td>526.blender_r</td>
<td>72</td>
<td>304</td>
<td>361</td>
<td>306</td>
<td>358</td>
<td>304</td>
<td>360</td>
<td>72</td>
<td>304</td>
<td>361</td>
<td>306</td>
<td>358</td>
<td>304</td>
<td>360</td>
</tr>
<tr>
<td>527.cam4_r</td>
<td>72</td>
<td>319</td>
<td>395</td>
<td>327</td>
<td>385</td>
<td>321</td>
<td>393</td>
<td>36</td>
<td>178</td>
<td>354</td>
<td>179</td>
<td>352</td>
<td>178</td>
<td>353</td>
</tr>
<tr>
<td>538.imagick_r</td>
<td>72</td>
<td>179</td>
<td>1000</td>
<td>179</td>
<td>1000</td>
<td>178</td>
<td>1000</td>
<td>72</td>
<td>179</td>
<td>1000</td>
<td>179</td>
<td>1000</td>
<td>178</td>
<td>1000</td>
</tr>
<tr>
<td>544.nab_r</td>
<td>72</td>
<td>178</td>
<td>680</td>
<td>178</td>
<td>681</td>
<td>178</td>
<td>682</td>
<td>72</td>
<td>178</td>
<td>680</td>
<td>178</td>
<td>681</td>
<td>178</td>
<td>682</td>
</tr>
<tr>
<td>549.fotonik3d_r</td>
<td>72</td>
<td>609</td>
<td>461</td>
<td>610</td>
<td>460</td>
<td>609</td>
<td>461</td>
<td>72</td>
<td>609</td>
<td>461</td>
<td>610</td>
<td>460</td>
<td>609</td>
<td>461</td>
</tr>
<tr>
<td>554.roms_r</td>
<td>72</td>
<td>500</td>
<td>229</td>
<td>498</td>
<td>230</td>
<td>498</td>
<td>230</td>
<td>36</td>
<td>237</td>
<td>241</td>
<td>238</td>
<td>241</td>
<td>238</td>
<td>241</td>
</tr>
</tbody>
</table>

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/je5.0.1-64"
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.

(Continued on next page)
Cisco Systems
Cisco UCS C220 M7 (Intel Xeon Gold 6416H, 2.20GHz)

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

SPEC R2017_fp_base = 438
SPEC R2017_fp_peak = 441
Test Date: Oct-2023
Hardware Availability: Feb-2023
Software Availability: Dec-2022

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

Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
running on localhost Thu Oct  5 12:28:23 2023

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

Table of contents
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

(Continued on next page)
Cisco Systems
Cisco UCS C220 M7 (Intel Xeon Gold 6416H, 2.20GHz)

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

CPU2017 License: 9019
Test Date: Oct-2023
Hardware Availability: Feb-2023
Software Availability: Dec-2022

Platform Notes (Continued)

12:28:23 up 3 min, 1 user, load average: 0.08, 0.21, 0.10
USER TTY FROM LOGIN@ IDLE JCPU PCPU WHAT
root tty1 - 12:28 7.00s 1.05s 0.14s -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) 4126935
 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
 cpu time (seconds, -t) unlimited
 max user processes (-u) 4126935
 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 --action=build --action validate --define default-platform-flags --define numcopies=72 -c
ic2023.0-lin-sapphirerapids-rate-20221201.cfg --reportable --iterations 3 --define smt-on --define
cores=36 --define physfistfirst --define invoke_with_interleave --define drop_caches --tune all -- output_format all --nopower --runmode rate --tune base:peak --size refrate fprate --nopreenv
--note-prenv --logfile $SPEC/tmp/CPU2017.038/templogs/prenv.fprate.038.0.log --lognum 038.0
--from_runcpu 2
specperl $SPEC/bin/sysinfo
$SPEC = /home/cpu2017

6. /proc/cpuinfo
model name : Intel(R) Xeon(R) Gold 6416H
vendor_id : GenuineIntel
cpu family : 6
model : 143
stepping : 8
microcode : 0x2b000190
bugs : spectre_v1 spectre_v2 spec_store_bypass swapgs
cpu cores : 18
siblings : 36
2 physical ids (chips)
72 processors (hardware threads)
physical id 0: core ids 0-17

(Continued on next page)
## Platform Notes (Continued)

```
physical id 1: core ids 0-17
physical id 0: apicids 0-35
physical id 1: apicids 128-163
Caution: /proc/cpuinfo data regarding chips, cores, and threads is not necessarily reliable, especially for virtualized systems. Use the above data carefully.
```

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): 72
On-line CPU(s) list: 0-71
Vendor ID: GenuineIntel
Model name: Intel(R) Xeon(R) Gold 6416H
CPU family: 6
Model: 143
Thread(s) per core: 2
Core(s) per socket: 18
Socket(s): 2
Stepping: 8
CPU max MHz: 4200.0000
CPU min MHz: 800.0000
BogoMIPS: 4400.00
Flags: fpu vme de pse tsc msr pae mca cmov pat pse36 vm x2apic msr aarch64 hvm redir bit8
CPU MHz: 3300.000
```

Virtualization: VT-x

<table>
<thead>
<tr>
<th>Cache Level</th>
<th>Size</th>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1d cache</td>
<td>1.7 MiB</td>
<td>(36 instances)</td>
</tr>
<tr>
<td>L1i cache</td>
<td>1.1 MiB</td>
<td>(36 instances)</td>
</tr>
<tr>
<td>L2 cache</td>
<td>72 MiB</td>
<td>(36 instances)</td>
</tr>
<tr>
<td>L3 cache</td>
<td>90 MiB</td>
<td>(2 instances)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NUMA Node(s)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>NUMA node0 CPU(s)</td>
<td>0-8,36-44</td>
</tr>
<tr>
<td>NUMA node1 CPU(s)</td>
<td>9-17,45-53</td>
</tr>
<tr>
<td>NUMA node2 CPU(s)</td>
<td>18-26,54-62</td>
</tr>
<tr>
<td>NUMA node3 CPU(s)</td>
<td>27-35,63-71</td>
</tr>
</tbody>
</table>

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

---

(Continued on next page)
Cisco Systems

Cisco UCS C220 M7 (Intel Xeon Gold 6416H, 2.20GHz)

SPECrate®2017_fp_base = 438
SPECrate®2017_fp_peak = 441

Platform Notes (Continued)

Vulnerability Spectre v1: Mitigation; usercopy/swappgs 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:

<table>
<thead>
<tr>
<th>NAME</th>
<th>ONE-SIZE</th>
<th>ALL-SIZE</th>
<th>WAYS</th>
<th>TYPE</th>
<th>LEVEL</th>
<th>SETS</th>
<th>PHY-LINE</th>
<th>COHERENCY-SIZE</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1d</td>
<td>48K</td>
<td>1.7M</td>
<td>12</td>
<td>Data</td>
<td>1</td>
<td>64</td>
<td>1</td>
<td>64</td>
</tr>
<tr>
<td>L1i</td>
<td>32K</td>
<td>1.1M</td>
<td>8</td>
<td>Instruction</td>
<td>1</td>
<td>64</td>
<td>1</td>
<td>64</td>
</tr>
<tr>
<td>L2</td>
<td>2M</td>
<td>72M</td>
<td>16</td>
<td>Unified</td>
<td>2</td>
<td>2048</td>
<td>1</td>
<td>64</td>
</tr>
<tr>
<td>L3</td>
<td>45M</td>
<td>90M</td>
<td>15</td>
<td>Unified</td>
<td>3</td>
<td>49152</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: 0-8,36-44
node 0 size: 257691 MB
node 0 free: 253649 MB
node 1 cpus: 9-17,45-53
node 1 size: 258043 MB
node 1 free: 257612 MB
node 2 cpus: 18-26,54-62
node 2 size: 258043 MB
node 2 free: 257612 MB
node 3 cpus: 27-35,63-71
node 3 size: 258043 MB
node 3 free: 257549 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: 1056519984 kB

10. who -r
run-level 3 Oct 5 12:25

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 getty@ haveged irqbalance
issue-generator kbdsettings klog lvm2-monitor nscd postfix purge-kernels rollback rayslog
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
cronyd console-getty cups cups-browsed debug-shell ebtap exac bmc-os-info
groupfirewall gpm grub2-0ne haveged-switch-root ipmi ipmiutils issue-add-ssh-keys keexec-load
ksm kvm_stat lowntask man-db-create multipathd nfs nfs-bkmap rdisc rpcbind rpmconfigcheck
rsyncd serial-getty@ smartd_generate_opts snmpd snmptrapd svserve

(Continued on next page)
## SPEC CPU®2017 Floating Point Rate Result

**Cisco Systems**  
Cisco UCS C220 M7 (Intel Xeon Gold 6416H, 2.20GHz)  

<table>
<thead>
<tr>
<th><strong>SPECrate®2017_fp_base</strong></th>
<th>438</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>SPECrate®2017_fp_peak</strong></td>
<td>441</td>
</tr>
</tbody>
</table>

**CPU2017 License:** 9019  
**Test Date:** Oct-2023  
**Test Sponsor:** Cisco Systems  
**Tested by:** Cisco Systems

### CPU2017 License Notes

- Hardware Availability: Feb-2023
- Software Availability: Dec-2022

### Platform Notes (Continued)

- indirect
- wickedd

---

13. Linux kernel boot-time arguments, from /proc/cmdline

```bash
BOOT_IMAGE=/boot/vmlinuz-5.14.21-150400.22-default
root=UUID=8f9e43e2-fda4-40e4-86e9-bcd4f62756aa
splash=silent
mitigations=auto
quiet
security=apparmor
```

---

14. cpupower frequency-info

- analyzing CPU 0:
  - current policy: frequency should be within 800 MHz and 4.20 GHz. The governor "performance" may decide which speed to use within this range.
  - Supported: yes
  - Active: yes

---

15. sysctl

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>kernel.numa_balancing</td>
<td>1</td>
</tr>
<tr>
<td>kernel.randomize_va_space</td>
<td>2</td>
</tr>
<tr>
<td>vm.compaction_proactiveness</td>
<td>20</td>
</tr>
<tr>
<td>vm.dirty_background_bytes</td>
<td>0</td>
</tr>
<tr>
<td>vm.dirty_background_ratio</td>
<td>10</td>
</tr>
<tr>
<td>vm.dirty_bytes</td>
<td>0</td>
</tr>
<tr>
<td>vm.dirty_expire_centisecs</td>
<td>3000</td>
</tr>
<tr>
<td>vm.dirty_ratio</td>
<td>20</td>
</tr>
<tr>
<td>vm.dirty_writeback_centisecs</td>
<td>500</td>
</tr>
<tr>
<td>vm.dirtytime_expire_seconds</td>
<td>43200</td>
</tr>
<tr>
<td>vm.extfrag_threshold</td>
<td>500</td>
</tr>
<tr>
<td>vm.min_unmapped_ratio</td>
<td>1</td>
</tr>
<tr>
<td>vm.nr_hugepages</td>
<td>0</td>
</tr>
<tr>
<td>vm.nr_hugepages_mempolicy</td>
<td>0</td>
</tr>
<tr>
<td>vm.nr_overcommit_hugepages</td>
<td>0</td>
</tr>
<tr>
<td>vm.swappiness</td>
<td>1</td>
</tr>
<tr>
<td>vm.watermark_boost_factor</td>
<td>15000</td>
</tr>
<tr>
<td>vm.watermark_scale_factor</td>
<td>10</td>
</tr>
<tr>
<td>vm.zone_reclaim_mode</td>
<td>0</td>
</tr>
</tbody>
</table>

---

16. /sys/kernel/mm/transparent_hugepage

<table>
<thead>
<tr>
<th>Function</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>defrag [always]</td>
<td></td>
</tr>
<tr>
<td>enabled [always]</td>
<td>madvise never</td>
</tr>
<tr>
<td>hpage_pmd_size 2097152</td>
<td></td>
</tr>
<tr>
<td>shmem_enabled always within_size</td>
<td>advise [never] deny force</td>
</tr>
</tbody>
</table>

---

17. /sys/kernel/mm/transparent_hugepage/khugepaged

<table>
<thead>
<tr>
<th>Function</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>alloc_sleep_millisecs 60000</td>
<td></td>
</tr>
<tr>
<td>defrag 1</td>
<td></td>
</tr>
<tr>
<td>max_ptes_none 511</td>
<td></td>
</tr>
<tr>
<td>max_ptes_shared 256</td>
<td></td>
</tr>
<tr>
<td>max_ptes_swap 64</td>
<td></td>
</tr>
<tr>
<td>pages_to_scan 4096</td>
<td></td>
</tr>
</tbody>
</table>

(Continued on next page)
### 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
   /dev/sdb2 btrfs 892G 13G 879G 2% /home

20. /sys/devices/virtual/dmi/id
   Vendor: Cisco Systems Inc
   Product: UCSC-C220-M7S
   Serial: WZP2702091L

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 M321R8GA0BB0-CQKDG 64 GB 2 rank 4800

22. BIOS
   (This section combines info from /sys/devices and dmidecode.)
   BIOS Vendor: Cisco Systems, Inc.
   BIOS Version: C220M7.4.3.1b.0.0308232129
   BIOS Date: 03/08/2023
   BIOS Revision: 5.29

### Compiler Version Notes

<table>
<thead>
<tr>
<th>C</th>
<th>s19.lbm_r(base, peak) s18.imagick_r(base, peak) s14.nab_r(base, peak)</th>
</tr>
</thead>
</table>
| 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.

<table>
<thead>
<tr>
<th>C++</th>
<th>s10.parest_r(base, peak)</th>
</tr>
</thead>
</table>
| 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.

<table>
<thead>
<tr>
<th>C++, C</th>
<th>s11.povray_r(base, peak) s26.blender_r(base, peak)</th>
</tr>
</thead>
</table>
| Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201 Copyright (C) 1998-2022 Intel Corporation. All rights reserved.

(Continued on next page)
Cisco Systems
Cisco UCS C220 M7 (Intel Xeon Gold 6416H, 2.20GHz)

SPECrater®2017_fp_base = 438
SPECrater®2017_fp_peak = 441

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

Test Date: Oct-2023
Hardware Availability: Feb-2023
Software Availability: Dec-2022

Compiler Version Notes (Continued)

C++, C, Fortran | 507.cactuBSSN_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.

Fortran | 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak) 554.roms_r(base, peak)

Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.

Fortran, C | 521.wrf_r(base, peak) 527.cam4_r(base, peak)

Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.

Base Compiler Invocation

C benchmarks:
icx

C++ benchmarks:
icpx

Fortran benchmarks:
ifx

Benchmarks using both Fortran and C:
ifx icx

Benchmarks using both C and C++:
icpx icx

Benchmarks using Fortran, C, and C++:
icpx icx ifx
Cisco Systems
Cisco UCS C220 M7 (Intel Xeon Gold 6416H, 2.20GHz)

SPECratre®2017_fp_base = 438
SPECratre®2017_fp_peak = 441

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

Base Portability Flags

503.bwaves_r: -DSPEC_LP64
507.cactuBSSN_r: -DSPEC_LP64
508.namd_r: -DSPEC_LP64
510.parest_r: -DSPEC_LP64
511.povray_r: -DSPEC_LP64
519.lbm_r: -DSPEC_LP64
521.wrf_r: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
526.blender_r: -DSPEC_LP64 -DSPEC_LINUX -funsigned-char
527.cam4_r: -DSPEC_LP64 -DSPEC_CASE_FLAG
538.imagick_r: -DSPEC_LP64
544.nab_r: -DSPEC_LP64
549.fotonik3d_r: -DSPEC_LP64
554.roms_r: -DSPEC_LP64

Base Optimization Flags

C benchmarks:
-w -std=c11 -m64 -Wl,-z,muldefs -xsapphirerapids -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-Wno-implicit-int -mprefer-vector-width=512 -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib

C++ benchmarks:
-w -std=c++14 -m64 -Wl,-z,muldefs -xsapphirerapids -Ofast
-ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -mprefer-vector-width=512 -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib

Fortran benchmarks:
-w -m64 -Wl,-z,muldefs -xsapphirerapids -Ofast -ffast-math -flto
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-nostandard-realloc-lhs -align array32byte -auto -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib

Benchmarks using both Fortran and C:
-w -m64 -std=c11 -Wl,-z,muldefs -xsapphirerapids -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-Wno-implicit-int -mprefer-vector-width=512 -nostandard-realloc-lhs
-align array32byte -auto -ljemalloc -L/usr/local/jemalloc64-5.0.1/lib

Benchmarks using both C and C++:
-w -std=c++14 -m64 -std=c11 -Wl,-z,muldefs -xsapphirerapids -Ofast
-ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -Wno-implicit-int -mprefer-vector-width=512

(Continued on next page)
## Base Optimization Flags (Continued)

Benchmarks using both C and C++ (continued):
- `ljemalloc -L/usr/local/jemalloc64-5.0.1/lib`

Benchmarks using Fortran, C, and C++:
- `-w -m64 -std=c++14 -std=c11 -Wl,-z,muldefs -xsapphirerapids -Ofast
  -ffast-math -flto -mfpmath=sse -funroll-loops
  -qopt-mem-layout-trans=4 -Wno-implicit-int -mprefer-vector-width=512
  -nostandard-realloc-lhs -align array32byte -auto -ljemalloc
  -L/usr/local/jemalloc64-5.0.1/lib`

## Peak Compiler Invocation

**C benchmarks:**

- `icx`

**C++ benchmarks:**

- `icpx`

**Fortran benchmarks:**

- `ifx`

Benchmarks using both Fortran and C:

- `ifx icx`

Benchmarks using both C and C++:

- `icpx icx`

Benchmarks using Fortran, C, and C++:

- `icpx icx ifx`

## Peak Portability Flags

Same as Base Portability Flags

## Peak Optimization Flags

**C benchmarks:**

- `519.lbm_r: basepeak = yes`

*(Continued on next page)*
Cisco Systems
Cisco UCS C220 M7 (Intel Xeon Gold 6416H, 2.20GHz)

<table>
<thead>
<tr>
<th>CPU2017 License:</th>
<th>9019</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Sponsor:</td>
<td>Cisco Systems</td>
</tr>
<tr>
<td>Tested by:</td>
<td>Cisco Systems</td>
</tr>
</tbody>
</table>

SPECrate®2017_fp_base = 438
SPECrate®2017_fp_peak = 441

Peak Optimization Flags (Continued)

538.imagick_r.basepeak = yes

544.nab_r.basepeak = yes

C++ benchmarks:

508.namd_r.basepeak = yes


Fortran benchmarks:

503.bwaves_r.basepeak = yes

549.fotonik3d_r.basepeak = yes

554.roms_r -w -m64 -Wl,-z,muldefs -xsaphhirerapids -Ofast -ffast-math -flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -nostandard-realloc-lhs -align array32byte -auto -ljemalloc -L/usr/local/jemalloc64-5.0.1/lib

Benchmarks using both Fortran and C:


Benchmarks using both C and C++:

511.povray_r -w -std=c++14 -m64 -std=c11 -Wl,-z,muldefs -fprofile-generate(pass 1) -fprofile-use=default.profd data(pass 2) -xCORE-AVX2(pass 1) -flto -Ofast -xCORE-AVX512 -ffast-math -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -Wno-implicit-int -mprefer-vector-width=512 -ljemalloc -L/usr/local/jemalloc64-5.0.1/lib

526.blender_r.basepeak = yes

Benchmarks using Fortran, C, and C++:

-w -m64 -std=c++14 -std=c11 -Wl,-z,muldefs -xsaphhirerapids -Ofast -ffast-math -flto -mfpmath=sse -funroll-loops

(Continued on next page)
## Cisco Systems

Cisco UCS C220 M7 (Intel Xeon Gold 6416H, 2.20GHz)

<table>
<thead>
<tr>
<th>SPECrate®2017_fp_base = 438</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECrate®2017_fp_peak = 441</td>
</tr>
</tbody>
</table>

### CPU2017 License: 9019

<table>
<thead>
<tr>
<th>Test Sponsor: Cisco Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tested by: Cisco Systems</td>
</tr>
</tbody>
</table>

### Test Date: Oct-2023

<table>
<thead>
<tr>
<th>Hardware Availability: Feb-2023</th>
</tr>
</thead>
<tbody>
<tr>
<td>Software Availability: Dec-2022</td>
</tr>
</tbody>
</table>

### Peak Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++ (continued):
- `-qopt-mem-layout-trans=4`
- `-Wno-implicit-int`
- `-mprefer-vector-width=512`
- `-nostandard-realloc-lhs`
- `-align array32byte`
- `-auto -ljemalloc`
- `-L/usr/local/jemalloc64-5.0.1/lib`

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](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](http://www.spec.org/cpu2017/flags/Intel-ic2023-official-linux64.xml)