# SPEC CPU®2017 Floating Point Speed Result

## ASUSTeK Computer Inc.

ASUS RS720-E10-RS12(Z12PP-D32) Server System (2.30 GHz, Intel Xeon Silver 4310T)

![SPEC Logo](spec.png)  
![SPEC Logo](spec.png)

<table>
<thead>
<tr>
<th>Threads</th>
<th>SPECspeed®2017_fp_base = 140</th>
<th>SPECspeed®2017_fp_peak = 140</th>
</tr>
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<tbody>
<tr>
<td>603.bwaves_s</td>
<td>40</td>
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</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td>40</td>
<td></td>
</tr>
<tr>
<td>619.lbm_s</td>
<td>40</td>
<td>130</td>
</tr>
<tr>
<td>621.wrf_s</td>
<td>40</td>
<td>123</td>
</tr>
<tr>
<td>627.cam4_s</td>
<td>40</td>
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</tr>
<tr>
<td>628.pop2_s</td>
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<tr>
<td>638.imagick_s</td>
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<tr>
<td>644.nab_s</td>
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<tr>
<td>649.fotonik3d_s</td>
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<td>198</td>
</tr>
<tr>
<td>654.roms_s</td>
<td>40</td>
<td>108</td>
</tr>
</tbody>
</table>

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## Hardware

- **CPU Name:** Intel Xeon Silver 4310T  
- **Max MHz:** 3400  
- **Nominal:** 2300  
- **Enabled:** 20 cores, 2 chips, 2 threads/core  
- **Orderable:** 1, 2 chip(s)  
- **Cache L1:** 32 KB I + 48 KB D on chip per core  
- **L2:** 1.25 MB I+D on chip per core  
- **L3:** 15 MB I+D on chip per chip  
- **Other:** None  
- **Memory:** 1 TB (16 x 64 GB 2Rx4 PC4-3200AA-R, running at 2666)  
- **Storage:** 1 x 1 TB SATA SSD  
- **Other:** None

## Software

- **OS:** Red Hat Enterprise Linux release 8.4 (Ootpa) 4.18.0-305.25.1.el8_4.x86_64  
- **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:** Yes  
- **Firmware:** Version 0802 released Apr-2022  
- **File System:** xfs  
- **System State:** Run level 3 (multi-user)  
- **Base Pointers:** 64-bit  
- **Peak Pointers:** 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.
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CPU2017 License: 9016
Test Sponsor: ASUSTeK Computer Inc.
Tested by: ASUSTeK Computer Inc.

Specspeed®2017_fp_base = 140
Specspeed®2017_fp_peak = 140

Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
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<th>Seconds</th>
<th>Ratio</th>
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</table>

Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

Operating System Notes

Stack size set to unlimited using "ulimit -s unlimited"
OS set to performance mode via cpupower frequency-set -g performance

Environment Variables Notes

Environment variables set by runcpu before the start of the run:
KMP_AFFINITY = "granularity=fine,compact"
LD_LIBRARY_PATH = "/home/ic23/lib/intel64:/home/ic23/je5.0.1-64"
MALLOC_CONF = "retain:true"
OMP_STACKSIZE = "192M"

General Notes

Binaries compiled on a system with 2x Intel Xeon Platinum 8280M CPU + 384GB RAM memory using Redhat Enterprise Linux 8.0
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
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

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General Notes (Continued)
built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5

Platform Notes

BIOS Configuration:
VT-d = Disabled
Patrol Scrub = Disabled
Engine Boost = Aggressive
SR-IOV Support = Disabled

BMC Configuration:
Fan mode = Full speed mode

Sysinfo program /home/ic23/bin/sysinfo
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
running on localhost.localdomain Wed Feb 22 14:31:05 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 239 (239-45.el8_4.3)
12. Services, from systemctl list-unit-files
13. Linux kernel boot-time arguments, from /proc/cmdline
14. cpupower frequency-info
15. tuned-adm active
16. sysctl
17. /sys/kernel/mm/transparent_hugepage
18. /sys/kernel/mm/transparent_hugepage/khugepaged
19. OS release
20. Kernel self-reported vulnerability status, from /sys/devices/system/cpu/vulnerabilities
21. Disk information
22. /sys/devices/virtual/dmi/id
23. dmidecode
24. BIOS

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Hardware Availability: Apr-2022
Software Availability: Dec-2022

Platform Notes (Continued)

1. uname -a

Linux localhost.localdomain 4.18.0-305.25.1.el8_4.x86_64 #1 SMP Mon Oct 18 14:34:11 EDT 2021 x86_64 x86_64
x86_64 GNU/Linux

2. w

14:31:05 up 10:01,  1 user,  load average: 5.28, 6.13, 3.68
USER     TTY      FROM             LOGIN@   IDLE   JCPU   PCPU WHAT
root     tty1     -                04:29   10:01m  1.18s  0.00s /bin/bash ./speed.sh

3. Username

From environment variable $USER: root

4. ulimit -a

core file size          (blocks, -c) 0
data seg size           (kbytes, -d) unlimited
           scheduling priority             (-e) 0
file size               (blocks, -f) unlimited
           pending signals                 (-i) 4126718
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) 4126718
virtual memory          (kbytes, -v) unlimited
file locks                      (-x) unlimited

5. sysinfo process ancestry

/usr/lib/systemd/systemd --switched-root --system --deserialize 18
login -- root
-bash
/bin/bash ./speed.sh
/bin/bash ./speed.sh
runcpu --nobuild --action validate --define default-platform-flags -c
   ic2023.0-lin-core-avx512-speed-20221201.cfg --define cores=40 --tune base,peak -o all --define drop_caches
fpspeed
runcpu --nobuild --action validate --define default-platform-flags --configfile

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

```
ic2023.0-lin-core-avx512-speed-20221201.cfg --define cores=40 --tune base,peak --output_format all
--define drop_caches --nopower --runmode speed --tune base:peak --size refspeed fpspeed --nopreenv
--note-preenv --logfile $SPEC/tmp/CPU2017.022/templogs/preenv.fpspeed.022.0.log --lognum 022.0
--from_runcpu 2
specperl $SPEC/bin/sysinfo
$SPEC = /home/ic23
```

6. `/proc/cpuinfo`

- **model name**: Intel(R) Xeon(R) Silver 4310T CPU @ 2.30GHz
- **vendor_id**: GenuineIntel
- **cpu family**: 6
- **model**: 106
- **stepping**: 6
- **microcode**: 0xd000331
- **bugs**: spectre_v1 spectre_v2 spec_store_bypass swapgs
- **cpu cores**: 10
- **siblings**: 20

2 physical ids (chips)
40 processors (hardware threads)
physical id 0: core ids 0-9
physical id 1: core ids 0-9
physical id 0: apicids 0-19
physical id 1: apicids 64-83

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 2.32.1`:

- **Architecture**: x86_64
- **CPU op-mode(s)**: 32-bit, 64-bit
- **Byte Order**: Little Endian
- **CPU(s)**: 40
- **On-line CPU(s) list**: 0-39
- **Thread(s) per core**: 2
- **Core(s) per socket**: 10
- **Socket(s)**: 2
- **NUMA node(s)**: 2
- **Vendor ID**: GenuineIntel
- **BIOS Vendor ID**: Intel
- **CPU family**: 6
- **Model**: 106
- **Model name**: Intel(R) Xeon(R) Silver 4310T CPU @ 2.30GHz
- **BIOS Model name**: Intel(R) Xeon(R) Silver 4310T CPU @ 2.30GHz
- **Stepping**: 6
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Hardware Availability: Apr-2022
Software Availability: Dec-2022

Platform Notes (Continued)

CPU MHz: 800.794
CPU max MHz: 3400.0000
CPU min MHz: 800.0000
BogoMIPS: 4600.00
Virtualization: VT-x
L1d cache: 48K
L1i cache: 32K
L2 cache: 1280K
L3 cache: 15360K
NUMA node0 CPU(s): 0-9, 20-29
NUMA node1 CPU(s): 10-19, 30-39

Flags: fpu vme de 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
arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid aperfmperf
pni pclmulqdq dtes64 monitor ds_cpl tsc entrances ensure_segmentation
ctime is the latest setting
numactl --hardware

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

8. numactl --hardware

9. /proc/meminfo

MemTotal: 1056480752 kB

10. who -r

run-level 3 Feb 22 04:29

(Continued on next page)
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SPECspeed®2017_fp_base = 140
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Platform Notes (Continued)

11. Systemd service manager version: systemd 239 (239-45.el8_4.3)
   Default Target Status
   multi-user running

12. Services, from systemctl list-unit-files
   STATE UNIT FILES
   enabled NetworkManager NetworkManager-dispatcher NetworkManager-wait-online atd auditd autotune cron
   crond firewalld getty@ online-state insights-client-boot irqbalance iscsi iscsi-onboot kdump
   ldconfig lmsensors loadmodules lvm2-monitor mcedit mdmonitor microcode multipathd
   nvmefc-boot-connections pmcd pmie pmlogger rhsmcertd rsyslog selinux-autorelabel-mark smartd sshd
   sssd syslog systemd-timedatex tuned udisks2 vdo
   disabled arp-ethers blk-availability chrony-wait console-getty cpupower debug-shell ebtables fancontrol
   grafana-server iprdump iprint iprupdate ispes iscsid iscsiuiio kpatch kvm_stat ledmon nftables
   nis-domainname nvmf-autoconnect oddjobd pmfind pmie_check pmlogger_check pmlogger_daily_report
   pmlogger_daily_report-poll pmproxy podman-auto-update postfix powertop psacct ras-mc-ctl
   rasdaemon rdisc rhcd rhsm rhsm-facts rrdcached saslauthd serial-getty@ sshd_keygen
   systemd-resolved tcsd
   indirect sssd-autofs sssd-kcm sssd-nss sssd-pac sssd-pam sssd-ssh sssd-sudo
   masked systemd-timedated

13. Linux kernel boot-time arguments, from /proc/cmdline
   BOOT_IMAGE=(hd0,gpt2)/vmlinuz-4.18.0-305.25.1.el8_4.x86_64
   root=/dev/mapper/rhel-root
   ro
   resume=/dev/mapper/rhel-swap
   rd.lvm.lv=rhel/root
   rd.lvm.lv=rhel/swap
   rhgb
   quiet

14. cpupower frequency-info
   analyzing CPU 0:
   current policy: frequency should be within 800 MHz and 3.40 GHz.
   The governor "performance" may decide which speed to use
   within this range.
   boost state support:
   Supported: yes
   Active: yes

15. tuned-adm active
   Current active profile: throughput-performance

(Continued on next page)
Platform Notes (Continued)

16. sysctl
   kernel.numa_balancing               1
   kernel.randomize_va_space           2
   vm.compaction_proactiveness         0
   vm.dirty_background_bytes           0
   vm.dirty_background_ratio          10
   vm.dirty_bytes                     0
   vm.dirty_expire_centisecs          3000
   vm.dirty_ratio                     40
   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                      10
   vm.watermark_boost_factor          15000
   vm.watermark_scale_factor          10
   vm.zone_reclaim_mode               0

17. /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

18. /sys/kernel/mm/transparent_hugepage/khugepaged
   alloc_sleep_millisecs   60000
   defrag                  1
   max_ptes_none           511
   max_ptes_swap           64
   pages_to_scan           4096
   scan_sleep_millisecs    10000

19. OS release
   From /etc/*-release /etc/*-version
   os-release     Red Hat Enterprise Linux 8.4 (Ootpa)
   redhat-release Red Hat Enterprise Linux release 8.4 (Ootpa)
   system-release Red Hat Enterprise Linux release 8.4 (Ootpa)

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Platform Notes (Continued)

20. Kernel self-reported vulnerability status, from /sys/devices/system/cpu/vulnerabilities
   itlb_multihit  Not affected
   l1tf          Not affected
   mds           Not affected
   meltdown      Not affected
   spec_store_bypass Mitigation: Speculative Store Bypass disabled via prctl and seccomp
   spectre_v1    Mitigation: usercopy/swappgs barriers and __user pointer sanitization
   spectre_v2    Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling
   srbds         Not affected
   tsx_async_abort Not affected
For more information, see the Linux documentation on hardware vulnerabilities, for example

21. Disk information
   SPEC is set to: /home/ic23
   Filesystem      Type  Size  Used Avail Use% Mounted on
   /dev/mapper/rhel-home xfs   878G  130G  749G  15% /home

22. /sys/devices/virtual/dmi/id
   Vendor:         ASUSTeK COMPUTER INC.
   Product:        RS720-E10-RS12
   Product Family: Server
   Serial:         012345678901

23. 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 Samsung M393A8G40AB2-CWE 64 GB 2 rank 3200, configured at 2666

24. BIOS
   (This section combines info from /sys/devices and dmidecode.)
   BIOS Vendor: American Megatrends Inc.
   BIOS Version: 0802
   BIOS Date: 04/29/2022
   BIOS Revision: 8.2
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## Compiler Version Notes

```plaintext
---

C    619.lbm_s(base, peak) 638.imagick_s(base, peak) 644.nab_s(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++, C, Fortran  607.cactuBSSN_s(base, peak)

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Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version  
2023.0.0 Build 20221201  
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ASUSTeK Computer Inc.
ASUS RS720-E10-RS12(Z12PP-D32) Server System (2.30 GHz, Intel Xeon Silver 4310T)

SPECspeed®2017_fp_base = 140
SPECspeed®2017_fp_peak = 140

CPU2017 License: 9016
Test Sponsor: ASUSTeK Computer Inc.
Tested by: ASUSTeK Computer Inc.

Base Compiler Invocation

C benchmarks: icx

Fortran benchmarks: ifx

Benchmarks using both Fortran and C: ifx icx

Benchmarks using Fortran, C, and C++: icpx icx ifx

Base Portability Flags

603.bwaves_s: -DSPEC_LP64
607.cactuBSSN_s: -DSPEC_LP64
619.lbm_s: -DSPEC_LP64
621.wrf_s: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
627.cam4_s: -DSPEC_LP64 -DSPEC_CASE_FLAG
628.pop2_s: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
-assume byterecl
638.imagick_s: -DSPEC_LP64
644.nab_s: -DSPEC_LP64
649.fotonik3d_s: -DSPEC_LP64
654.roms_s: -DSPEC_LP64

Base Optimization Flags

C benchmarks:
-m64 -std=c11 -Wl,-z,muldefs -xcORE-AVX512 -Ofast -ffast-math -flto
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -flto
-DSPEC_OPENMP -Wno-implicit-int -L/usr/local/jemalloc64-5.0.1/lib
-ljemalloc

Fortran benchmarks:
-m64 -Wl,-z,muldefs -DSPEC_OPENMP -xcORE-AVX512 -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -flto
-nostandard-realloc-lhs -align array32byte -auto
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

Benchmarks using both Fortran and C:
-m64 -std=c11 -Wl,-z,muldefs -xcORE-AVX512 -Ofast -ffast-math -flto

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SPEC CPU®2017 Floating Point Speed Result
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CPU2017 License: 9016
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Test Sponsor: ASUSTeK Computer Inc.
Hardware Availability: Apr-2022
Tested by: ASUSTeK Computer Inc.
Software Availability: Dec-2022

Base Optimization Flags (Continued)

Benchmarks using both Fortran and C (continued):
- `mfpmath=ssse -funroll-loops -qopt-mem-layout-trans=4 -fiopenmp`
- `DSPEC_OPENMP -Wno-implicit-int -nostandard-realloc-lhs`
- `align array32byte -auto -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc`

Benchmarks using Fortran, C, and C++:
- `m64 -std=c++14 -std=c11 -W1,-z,muldefs -xCORE-AVX512 -Ofast`
- `ffast-math -flto -mfpmath=ssse -funroll-loops`
- `qopt-mem-layout-trans=4 -fiopenmp -DSPEC_OPENMP -Wno-implicit-int`
- `nostandard-realloc-lhs -align array32byte -auto -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc`

Peak Compiler Invocation

C benchmarks:
icx

Fortran benchmarks:
ifx

Benchmarks using both Fortran and C:
ifx icx

Benchmarks using Fortran, C, and C++:
icpx icx ifx

Peak Portability Flags

Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:
619.lbm_s: basepeak = yes
638.imagick_s: basepeak = yes
644.nab_s: basepeak = yes

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Peak Optimization Flags (Continued)

Fortran benchmarks:
603.bwaves_s: basepeak = yes
649.fotonik3d_s: basepeak = yes
654.roms_s: basepeak = yes

Benchmarks using both Fortran and C:
621.wrf_s: basepeak = yes
627.cam4_s: basepeak = yes
628.pop2_s: basepeak = yes

Benchmarks using Fortran, C, and C++:
607.cactuBSSN_s: 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
http://www.spec.org/cpu2017/flags/ASUSTekPlatform-Settings-z12-V1.2.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/ASUSTekPlatform-Settings-z12-V1.2.xml

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

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