



# SPEC CPU®2017 Floating Point Rate Result

Copyright 2017-2023 Standard Performance Evaluation Corporation

**ASUSTeK Computer Inc.**  
ASUS RS720-E10-RS12(Z12PP-D32) Server System  
(2.30 GHz, Intel Xeon Gold 5320T)

**SPECrate®2017\_fp\_base = 378**  
**SPECrate®2017\_fp\_peak = 393**

CPU2017 License: 9016

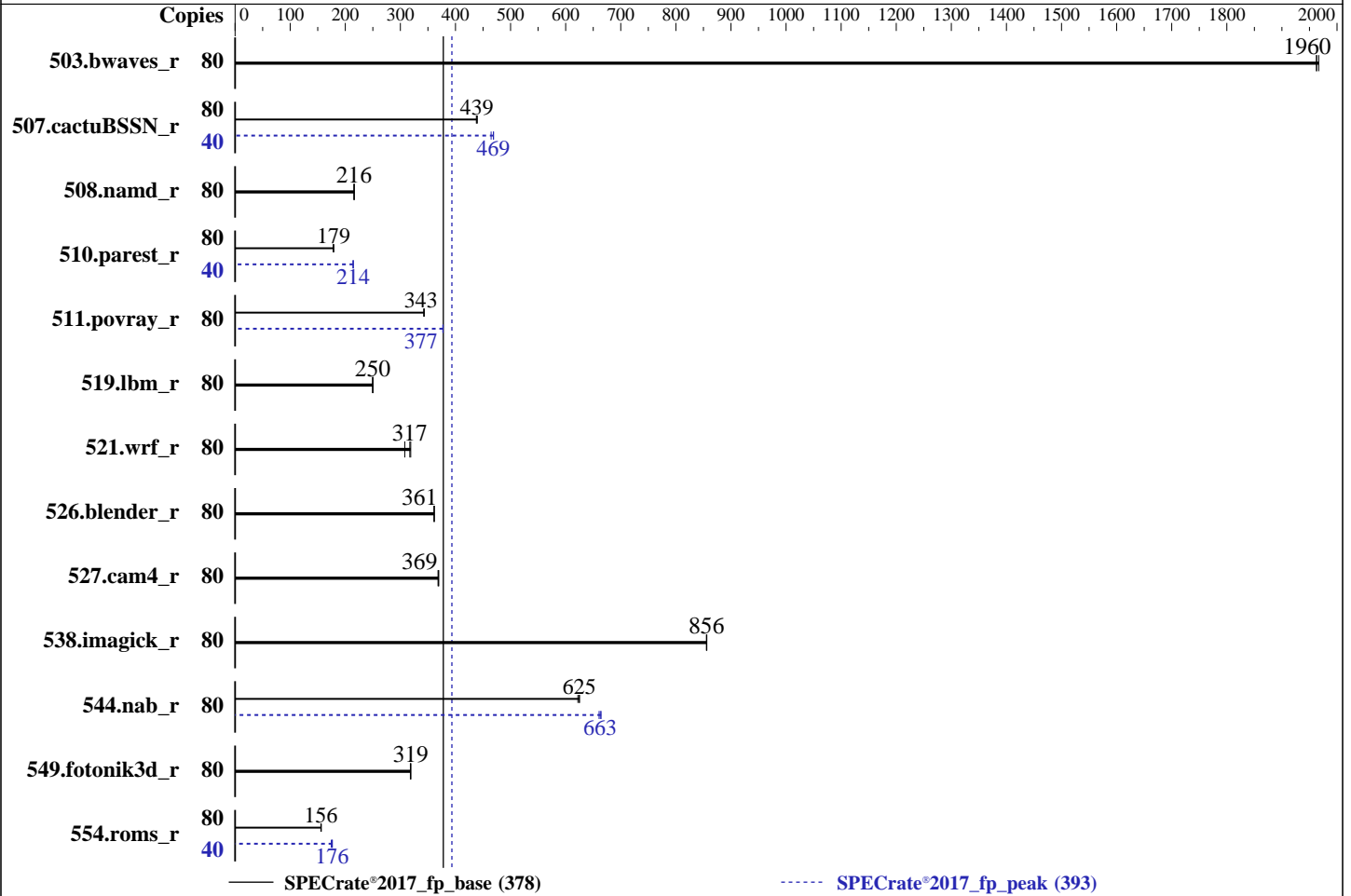
Test Sponsor: ASUSTeK Computer Inc.

Tested by: ASUSTeK Computer Inc.

Test Date: Feb-2023

Hardware Availability: Apr-2022

Software Availability: Dec-2022



## Hardware

CPU Name: Intel Xeon Gold 5320T  
 Max MHz: 3500  
 Nominal: 2300  
 Enabled: 40 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: 30 MB I+D on chip per chip  
 Other: None  
 Memory: 1 TB (16 x 64 GB 2Rx4 PC4-3200AA-R, running at 2933)  
 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: No  
 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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## Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
503.bwaves_r	80	<b>409</b>	<b>1960</b>	409	1960	408	1970	80	<b>409</b>	<b>1960</b>	409	1960	408	1970
507.cactuBSSN_r	80	<b>231</b>	<b>439</b>	230	439	231	438	40	<b>108</b>	<b>469</b>	109	465	108	469
508.namd_r	80	352	216	351	216	<b>352</b>	<b>216</b>	80	352	216	351	216	<b>352</b>	<b>216</b>
510.parest_r	80	1176	178	1169	179	<b>1170</b>	<b>179</b>	40	489	214	488	214	<b>488</b>	<b>214</b>
511.povray_r	80	544	343	<b>545</b>	<b>343</b>	545	343	80	495	377	<b>495</b>	<b>377</b>	495	377
519.lbm_r	80	338	250	<b>338</b>	<b>250</b>	337	250	80	338	250	<b>338</b>	<b>250</b>	337	250
521.wrf_r	80	562	319	<b>565</b>	<b>317</b>	582	308	80	562	319	<b>565</b>	<b>317</b>	582	308
526.blender_r	80	337	361	337	361	<b>337</b>	<b>361</b>	80	337	361	337	361	<b>337</b>	<b>361</b>
527.cam4_r	80	379	369	380	368	<b>379</b>	<b>369</b>	80	379	369	380	368	<b>379</b>	<b>369</b>
538.imagick_r	80	232	856	233	856	<b>233</b>	<b>856</b>	80	232	856	233	856	<b>233</b>	<b>856</b>
544.nab_r	80	<b>215</b>	<b>625</b>	216	622	215	625	80	204	661	<b>203</b>	<b>663</b>	203	664
549.fotonik3d_r	80	<b>978</b>	<b>319</b>	978	319	980	318	80	<b>978</b>	<b>319</b>	978	319	980	318
554.roms_r	80	813	156	<b>814</b>	<b>156</b>	816	156	40	360	176	364	175	<b>361</b>	<b>176</b>

SPECrate®2017\_fp\_base = **378**

SPECrate®2017\_fp\_peak = **393**

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"  
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:  
LD\_LIBRARY\_PATH = "/home/ic23/lib/intel64:/home/ic23/je5.0.1-64"  
MALLOCONF = "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

(Continued on next page)



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## General Notes (Continued)

```
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.  
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 Configuration:  
VT-d = Disabled  
Patrol Scrub = Disabled  
SNC = Enable SNC2 (2-clusters)  
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 Thu Feb 16 15:48:40 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)

(Continued on next page)



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## Platform Notes (Continued)

- 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

```
-----
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
15:48:40 up 6:59, 1 user, load average: 49.90, 72.37, 76.71
USER      TTY      FROM          LOGIN@      IDLE        JCPU        PCPU WHAT
root      tty1     -              08:49       6:58m      1.13s      0.00s /bin/bash ./rate.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) 4126683
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) 4126683
virtual memory          (kbytes, -v) unlimited
```

(Continued on next page)



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## Platform Notes (Continued)

file locks (-x) unlimited

```

-----
5. sysinfo process ancestry
/usr/lib/systemd/systemd --switched-root --system --deserialize 18
login -- root
-bash
/bin/bash ./rate.sh
/bin/bash ./rate.sh
runccpu --nobuild --action validate --define default-platform-flags --define numcopies=80 -c
ic2023.0-lin-core-avx512-rate-20221201.cfg --define smt-on --define cores=40 --define physicalfirst
--define invoke_with_interleave --define drop_caches --tune base,peak -o all fprate
runccpu --nobuild --action validate --define default-platform-flags --define numcopies=80 --configfile
ic2023.0-lin-core-avx512-rate-20221201.cfg --define smt-on --define cores=40 --define physicalfirst
--define invoke_with_interleave --define drop_caches --tune base,peak --output_format all --nopower
--runmode rate --tune base:peak --size refrate fprate --nopreenv --note-preenv --logfile
$SPEC/tmp/CPU2017.008/templogs/preenv.fprate.008.0.log --lognum 008.0 --from_runccpu 2
specperl $SPEC/bin/sysinfo
$SPEC = /home/ic23

```

```

-----
6. /proc/cpuinfo
model name      : Intel(R) Xeon(R) Gold 5320T 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      : 20
siblings       : 40
2 physical ids (chips)
80 processors (hardware threads)
physical id 0: core ids 0-19
physical id 1: core ids 0-19
physical id 0: apicids 0-39
physical id 1: apicids 64-103

```

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

```

(Continued on next page)



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## Platform Notes (Continued)

```

CPU(s): 80
On-line CPU(s) list: 0-79
Thread(s) per core: 2
Core(s) per socket: 20
Socket(s): 2
NUMA node(s): 4
Vendor ID: GenuineIntel
BIOS Vendor ID: Intel
CPU family: 6
Model: 106
Model name: Intel(R) Xeon(R) Gold 5320T CPU @ 2.30GHz
BIOS Model name: Intel(R) Xeon(R) Gold 5320T CPU @ 2.30GHz
Stepping: 6
CPU MHz: 2467.872
CPU max MHz: 3500.0000
CPU min MHz: 800.0000
BogoMIPS: 4600.00
Virtualization: VT-x
L1d cache: 48K
L1i cache: 32K
L2 cache: 1280K
L3 cache: 30720K
NUMA node0 CPU(s): 0-9,40-49
NUMA node1 CPU(s): 10-19,50-59
NUMA node2 CPU(s): 20-29,60-69
NUMA node3 CPU(s): 30-39,70-79
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 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 invpcid_single intel_ppin 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 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 split_lock_detect
wbnoinvd dtherm ida arat pln pts hwp hwp_act_window hwp_epp hwp_pkg_req avx512vbmi
umip pku ospke avx512_vbmi2 gfni vaes vpclmulqdq avx512_vnni avx512_bitalg tme
avx512_vpopcntdq la57 rdpid fsrm md_clear pconfig flush_l1d arch_capabilities

```

-----  
8. numactl --hardware

NOTE: a numactl 'node' might or might not correspond to a physical chip.  
available: 4 nodes (0-3)  
node 0 cpus: 0-9,40-49  
node 0 size: 257619 MB  
node 0 free: 245169 MB

(Continued on next page)



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## Platform Notes (Continued)

```
node 1 cpus: 10-19,50-59
node 1 size: 258043 MB
node 1 free: 249841 MB
node 2 cpus: 20-29,60-69
node 2 size: 258043 MB
node 2 free: 249650 MB
node 3 cpus: 30-39,70-79
node 3 size: 258003 MB
node 3 free: 249962 MB
node distances:
node  0  1  2  3
  0:  10 11 20 20
  1:  11 10 20 20
  2:  20 20 10 11
  3:  20 20 11 10
```

---

```
9. /proc/meminfo
   MemTotal:      1056471760 kB
```

---

```
10. who -r
    run-level 3 Feb 16 08:49
```

---

```
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 autovt@ chronyd
           crond firewalld getty@ import-state insights-client-boot irqbalance iscsi iscsi-onboot kdump
           libstoragemgmt lm_sensors loadmodules lvm2-monitor mcelog mdmonitor microcode multipathd
           nvme-fc-boot-connections pmcd pmie pmlogger rhsmcertd rsyslog selinux-autorelabel-mark smartd sshd
           sssd syslog sysstat timedatex tuned udisks2 vdo
disabled   arp-ethers blk-availability chrony-wait console-getty cpupower debug-shell ebttables fancontrol
           grafana-server iprdump iprinit ipupdate ipsec iscsid iscsiui kpatch kvm_stat ledmon nftables
           nis-domainname nvme-fc-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 tcspd
indirect   sssd-autofs sssd-kcm sssd-nss sssd-pac sssd-pam sssd-ssh sssd-sudo
masked     systemd-timedated
```

(Continued on next page)



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## Platform Notes (Continued)

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 3.50 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

-----  
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

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## Platform Notes (Continued)

17. /sys/kernel/mm/transparent\_hugepage  
defrag always defer defer+madvice [madvice] never  
enabled [always] madvice 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)

20. Kernel self-reported vulnerability status, from /sys/devices/system/cpu/vulnerabilities  
itlb\_multihit Not affected  
lltf Not affected  
mds Not affected  
meltdown Not affected  
spec\_store\_bypass Mitigation: Speculative Store Bypass disabled via prctl and seccomp  
spectre\_v1 Mitigation: usercopy/swaps 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  
<https://www.kernel.org/doc/html/latest/admin-guide/hw-vuln/index.html>

21. Disk information  
SPEC is set to: /home/ic23  
Filesystem Type Size Used Avail Use% Mounted on  
/dev/mapper/rhel-home xfs 878G 158G 721G 18% /home

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

(Continued on next page)



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## Platform Notes (Continued)

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 2933

### 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

## Compiler Version Notes

=====  
C | 519.lbm\_r(base, peak) 538.imagick\_r(base, peak)  
| 544.nab\_r(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++ | 508.namd\_r(base, peak) 510.parest\_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.

=====  
C++, C | 511.povray\_r(base, peak) 526.blender\_r(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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Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,

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# SPEC CPU®2017 Floating Point Rate Result

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**ASUSTeK Computer Inc.**  
ASUS RS720-E10-RS12(Z12PP-D32) Server System  
(2.30 GHz, Intel Xeon Gold 5320T)

**SPECrate®2017\_fp\_base = 378**  
**SPECrate®2017\_fp\_peak = 393**

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

**Test Date:** Feb-2023  
**Hardware Availability:** Apr-2022  
**Software Availability:** Dec-2022

## Compiler Version Notes (Continued)

Version 2023.0.0 Build 20221201  
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=====  
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  
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Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,  
Version 2023.0.0 Build 20221201  
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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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=====  
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.  
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,  
Version 2023.0.0 Build 20221201  
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## Base Compiler Invocation

C benchmarks:  
icx

C++ benchmarks:  
icpx

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## Base Compiler Invocation (Continued)

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

## 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 -xCORE-AVX512 -Ofast -ffast-math  
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4  
-Wno-implicit-int -ljemalloc -L/usr/local/jemalloc64-5.0.1/lib

C++ benchmarks:

-w -std=c++14 -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math  
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -ljemalloc  
-L/usr/local/jemalloc64-5.0.1/lib

Fortran benchmarks:

-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math -flto

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## Base Optimization Flags (Continued)

Fortran benchmarks (continued):

```
-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 -xCORE-AVX512 -Ofast -ffast-math  
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4  
-Wno-implicit-int -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 -xCORE-AVX512 -Ofast  
-ffast-math -flto -mfpmath=sse -funroll-loops  
-qopt-mem-layout-trans=4 -Wno-implicit-int -ljemalloc  
-L/usr/local/jemalloc64-5.0.1/lib
```

Benchmarks using Fortran, C, and C++:

```
-w -std=c++14 -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast  
-ffast-math -flto -mfpmath=sse -funroll-loops  
-qopt-mem-layout-trans=4 -Wno-implicit-int -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



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**Test Date:** Feb-2023

**Hardware Availability:** Apr-2022

**Software Availability:** Dec-2022

## Peak Portability Flags

Same as Base Portability Flags

## Peak Optimization Flags

C benchmarks:

519.lbm\_r: basepeak = yes

538.imagick\_r: basepeak = yes

544.nab\_r: -w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast  
-ffast-math -flto -mfpmath=sse -funroll-loops  
-qopt-mem-layout-trans=4 -Wno-implicit-int  
-qopt-zmm-usage=high -ljemalloc  
-L/usr/local/jemalloc64-5.0.1/lib

C++ benchmarks:

508.namd\_r: basepeak = yes

510.parest\_r: -w -std=c++14 -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast  
-ffast-math -flto -mfpmath=sse -funroll-loops  
-qopt-mem-layout-trans=4 -ljemalloc  
-L/usr/local/jemalloc64-5.0.1/lib

Fortran benchmarks:

503.bwaves\_r: basepeak = yes

549.fotonik3d\_r: basepeak = yes

554.roms\_r: -w -m64 -Wl,-z,muldefs -xCORE-AVX512 -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:

521.wrf\_r: basepeak = yes

527.cam4\_r: basepeak = yes

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## Peak Optimization Flags (Continued)

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.profdata(pass 2) -xCORE-AVX2(pass 1)
-flto -Ofast -xCORE-AVX512 -ffast-math -mfpmath=sse
-funroll-loops -qopt-mem-layout-trans=4 -Wno-implicit-int
-ljemalloc -L/usr/local/jemalloc64-5.0.1/lib
```

526.blender\_r: basepeak = yes

Benchmarks using Fortran, C, and C++:

```
-w -std=c++14 -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast
-ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -Wno-implicit-int -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/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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