ASUSTeK Computer Inc.
ASUS RS700-E10(Z12PP-D32) Server System
(2.30 GHz, Intel Xeon Silver 4310T)

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

**Test Date:** Jan-2022
**Hardware Availability:** May-2021
**Software Availability:** Mar-2021

<table>
<thead>
<tr>
<th>SPECrate®2017_fp_base</th>
<th>186</th>
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<tbody>
<tr>
<td>SPECrate®2017_fp_peak</td>
<td>191</td>
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<table>
<thead>
<tr>
<th>Test Date</th>
<th>Jan-2022</th>
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</thead>
<tbody>
<tr>
<td>Hardware</td>
<td></td>
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</table>

**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
**Memory:** 1 TB (16 x 64 GB 2Rx4 PC4-3200AA-R, running at 2666)
**Storage:** 1 x 4 TB PCIe NVME SSD
**Other:** None

**Software**

**OS:** Red Hat Enterprise Linux release 8.3 (Ootpa) 4.18.0-240.22.1.el8_3.x86_64
**Compiler:** C/C++: Version 2021.1 of Intel oneAPI DPC++/C++ Compiler Build 20201113 for Linux; Fortran: Version 2021.1 of Intel Fortran Compiler Classic Build 20201112 for Linux

**Firmware:** No
**System State:** Run level 3 (multi-user)
**Base Pointers:** 64-bit
**Peak Pointers:** 64-bit
**Power Management:** BIOS and OS set to prefer performance at the cost of additional power usage.

---

**503.bwaves_r**
**507.cacluBSSN_r**
**508.namd_r**
**510.parest_r**
**511.povray_r**
**519.lbm_r**
**521.wrf_r**
**526.blender_r**
**527.cam4_r**
**538.imagick_r**
**544.nab_r**
**549.fotonik3d_r**
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Results Table

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<td>309</td>
<td>103</td>
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</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"
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/cpu118/lib/intel64:/home/cpu118/je5.0.1-64"
MALLOC_CONF = "retain:true"

General Notes

Binaries compiled on a system with 1x Intel Core i9-7980XE CPU + 64GB RAM memory using Red Hat Enterprise Linux 8.1
Transparent Huge Pages enabled by default
Prior to runcpu invocation

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

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</tbody>
</table>

### 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.


### 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/cpu118/bin/sysinfo

Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16aaca64d running on localhost.localdomain Sat Jan 8 02:23:07 2022

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

For more information on this section, see https://www.spec.org/cpu2017/Docs/config.html#sysinfo

From /proc/cpuinfo

```
model name : Intel(R) Xeon(R) Silver 4310T CPU @ 2.30GHz
  2 "physical id"s (chips)
  40 "processors"
cores, siblings (Caution: counting these is hw and system dependent. The following excerpts from /proc/cpuinfo might not be reliable. Use with caution.)
cpu cores : 10
  siblings : 20
  physical 0: cores 0 1 2 3 4 5 6 7 8 9
  physical 1: cores 0 1 2 3 4 5 6 7 8 9
```

From lscpu from util-linux 2.32.1:

```
Architecture: x86_64
```

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

ASUSTeK Computer Inc.

ASUS RS700-E10(Z12PP-D32) Server System (2.30 GHz, Intel Xeon Silver 4310T)

| SPECrate®2017_fp_base = 186 | SPECrate®2017_fp_peak = 191 |

**CPU2017 License:** 9016

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**Test Date:** Jan-2022

**Hardware Availability:** May-2021

**Software Availability:** Mar-2021

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Platform Notes (Continued)

- **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
- **CPU family:** 6
- **Model:** 106
- **Model name:** Intel(R) Xeon(R) Silver 4310T CPU @ 2.30GHz
- **Stepping:** 6
- **CPU MHz:** 2836.333
- **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 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 pbe bts rep_good nopl xtopology nonstop_tsc cpuid
aperfmpref pni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16
xtrnr pdcm 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_pinn ssbd mba ibrs ibpb stibp ibrs_enhanced trp_shadow vnmi fpxprec ept
vpid ept_ad fsgsbase tsc_adjust bmsm hle avx2 smep bmi2 erms invpcid cqm rd_t
avx512f avx512dq rdseed adx smap avx512ifma clflushopt clwb intel_pt avx512cd sha ni
avx512bw avx512vl xsaveopt xsaves xgetbv1 xsavevs cqm_llc cqm_occupa llc cqm_mmamb
total cqm_mmm_local split_lock_detect wbnoinvd dtherm ida arat pln pts hwp hwp_act_window
hwp_epp hwp_pkgreq avx512vmbi umip pku ospke avx512_vmbi2 gfnv vaes vpcmuleq
avx512_vnni avx512_bitalg tme avx512_vpopcntd64 la57 rdpid md_clear pconfig flush_l1d
arch_capabilities

/proc/cpuinfo cache data

cache size : 15360 KB

From numactl --hardware

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

available: 2 nodes (0-1)

node 0 cpus: 0 1 2 3 4 5 6 7 8 9 20 21 22 23 24 25 26 27 28 29
node 0 size: 504700 MB

(Continued on next page)
ASUSTeK Computer Inc.

ASUS RS700-E10(Z12PP-D32) Server System
(2.30 GHz, Intel Xeon Silver 4310T)

SPECRate®2017_fp_peak = 191
SPECRate®2017_fp_base = 186

Platform Notes (Continued)

node 0 free: 514452 MB
node 1 cpus: 10 11 12 13 14 15 16 17 18 19 30 31 32 33 34 35 36 37 38 39
node 1 size: 505104 MB
node 1 free: 514612 MB
node distances:
  node 0 1
  0: 10 20
  1: 20 10

From /proc/meminfo
  MemTotal:       1056482204 kB
  HugePages_Total:       0
  Hugepagesize:       2048 kB

/sbin/tuned-adm active
  Current active profile: throughput-performance

/sys/devices/system/cpu/cpu*/cpufreq/scaling_governor has performance

From /etc/*release* /etc/*version*
  os-release:
    NAME="Red Hat Enterprise Linux"
    VERSION="8.3 (Ootpa)"
    ID="rhel"
    ID_LIKE="fedora"
    VERSION_ID="8.3"
    PLATFORM_ID="platform:el8"
    PRETTY_NAME="Red Hat Enterprise Linux 8.3 (Ootpa)"
    ANSI_COLOR="0;31"
  redhat-release: Red Hat Enterprise Linux release 8.3 (Ootpa)
  system-release: Red Hat Enterprise Linux release 8.3 (Ootpa)
  system-release-cpe: cpe:/o:redhat:enterprise_linux:8.3:ga

uname -a:
  Linux localhost.localdomain 4.18.0-240.22.1.el8_3.x86_64 #1 SMP Thu Mar 25 14:36:04 EDT 2021 x86_64 x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:

CVE-2018-12207 (iTLB Multihit):
  Not affected
CVE-2018-3620 (L1 Terminal Fault):
  Not affected
Microarchitectural Data Sampling:
  Not affected
CVE-2017-5754 (Meltdown):
  Not affected
CVE-2018-3639 (Speculative Store Bypass):
  Mitigation: Speculative Store Bypass disabled via prctl and seccomp

(Continued on next page)
ASUSTeK Computer Inc.  
ASUS RS700-E10(Z12PP-D32) Server System  
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Test Date: Jan-2022

Platform Notes (Continued)

CVE-2017-5753 (Spectre variant 1):  
Mitigation: usercopy/swapgs barriers and \_user pointer sanitization

CVE-2017-5715 (Spectre variant 2):  
Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling

CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected

CVE-2019-11135 (TSX Asynchronous Abort): Not affected

run-level 3 Jan 7 06:32

SPEC is set to: /home/cpu118

Filesystem Type Size Used Avail Use% Mounted on
/dev/mapper/rhel-home xfs 3.6T 31G 3.6T 1% /home

From /sys/devices/virtual/dmi/id
Vendor: ASUSTeK COMPUTER INC.
Product: RS700-E10-RS12U
Product Family: Server

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 NO DIMM NO DIMM
16x Samsung M393A8G40AB2-CWE 64 GB 2 rank 3200, configured at 2666

BIOS:
BIOS Vendor: American Megatrends Inc.
BIOS Version: 0504
BIOS Date: 05/26/2021
BIOS Revision: 5.4

(End of data from sysinfo program)

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 2021.1 Build 20201113  
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(Continued on next page)
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SPECrate®2017_fp_base = 186
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Compiler Version Notes (Continued)

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C++ | 508.namd_r(base, peak) 510.parest_r(base, peak)
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--------------------------------------------------------------------------------
C++, C | 511.povray_r(peak)
--------------------------------------------------------------------------------
Intel(R) C++ Intel(R) 64 Compiler Classic for applications running on
  Intel(R) 64, Version 2021.1 Build 20201112_000000
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Intel(R) C Intel(R) 64 Compiler Classic for applications running on Intel(R)
  64, Version 2021.1 Build 20201112_000000
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--------------------------------------------------------------------------------
C++, C | 511.povray_r(base) 526.blender_r(base, peak)
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Compiler Version Notes (Continued)

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Fortran | 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak)
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Fortran, C | 521.wrf_r(base, peak) 527.cam4_r(base, peak)
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Base Compiler Invocation

C benchmarks:
icx

C++ benchmarks:
icpx

(Continued on next page)
## Base Compiler Invocation (Continued)

Fortran benchmarks:

```bash
ifort
```

Benchmarks using both Fortran and C:

```bash
ifort icx
```

Benchmarks using both C and C++:

```bash
icpx icx
```

Benchmarks using Fortran, C, and C++:

```bash
icpx icx ifort
```

## Base Portability Flags

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<tr>
<th>Benchmark</th>
<th>Flags</th>
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</thead>
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<td>503.bwaves_r</td>
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<tr>
<td>519.lbm_r</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>521.wrf_r</td>
<td>-DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian</td>
</tr>
<tr>
<td>526.blender_r</td>
<td>-DSPEC_LP64 -DSPEC_LINUX -funsigned-char</td>
</tr>
<tr>
<td>527.cam4_r</td>
<td>-DSPEC_LP64 -DSPEC_CASE_FLAG</td>
</tr>
<tr>
<td>538.imagick_r</td>
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<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>554.roms_r</td>
<td>-DSPEC_LP64</td>
</tr>
</tbody>
</table>

## Base Optimization Flags

### C benchmarks:

```bash
-w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math -flto -mfpmath=sse -funroll-loops -gopt-mem-layout-trans=4 -mbranches-within-32B-boundaries -ljemalloc -L/usr/local/jemalloc64-5.0.1/lib
```

### C++ benchmarks:

```bash
-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math -flto -mfpmath=sse -funroll-loops -gopt-mem-layout-trans=4 -mbranches-within-32B-boundaries -ljemalloc
```

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

ASUSTeK Computer Inc.
ASUS RS700-E10(Z12PP-D32) Server System
(2.30 GHz, Intel Xeon Silver 4310T)

SPECrate®2017_fp_base = 186
SPECrate®2017_fp_peak = 191

CPU2017 License: 9016
Test Sponsor: ASUSTeK Computer Inc.
Tested by: ASUSTeK Computer Inc.
Test Date: Jan-2022
Hardware Availability: May-2021
Tested by: ASUSTeK Computer Inc.
Software Availability: Mar-2021

Base Optimization Flags (Continued)

C++ benchmarks (continued):
-L/usr/local/jemalloc64-5.0.1/lib

Fortran benchmarks:
-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ipo -no-prec-div
-qopt-prefetch -ffinite-math-only
-qopt-multiple-gather-scatter-by-shuffles -qopt-mem-layout-trans=4
-nostandard-realloc-lhs -align array32byte -auto
-branches-within-32B-boundaries -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 -O3 -ipo
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-multiple-gather-scatter-by-shuffles
-nostandard-realloc-lhs -align array32byte -auto -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib

Benchmarks using both C and C++:
-w -m64 -std=c11 -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

Peak Compiler Invocation

C benchmarks:
icx

C++ benchmarks:
icpx

Fortran benchmarks:
ifort

(Continued on next page)
ASUSTeK Computer Inc. 
ASUS RS700-E10(Z12PP-D32) Server System 
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SPEC CPU®2017 Floating Point Rate Result 

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SPECrate®2017_fp_base = 186 
SPECrate®2017_fp_peak = 191 

Peak Compiler Invocation (Continued) 

Benchmarks using both Fortran and C: 
ifort icx 
Benchmarks using both C and C++: 
511.povray_r icpc icc 
526.blender_r icpx icx 
Benchmarks using Fortran, C, and C++: 
icpx icx ifort 

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 -flto 
-Ofast -qopt-mem-layout-trans=4 
-fimf-accuracy-bits=14:sqrt 
-branches-within-32B-boundaries -ljemalloc 
-L/usr/local/jemalloc64-5.0.1/lib 

C++ benchmarks: 
508.namd_r: basepeak = yes 
510.parest_r: -w -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math 
-flto -mfpmath=sse -funroll-loops 
-qopt-mem-layout-trans=4 -branches-within-32B-boundaries 
-ljemalloc -L/usr/local/jemalloc64-5.0.1/lib 

Fortran benchmarks: 

(Continued on next page)
ASUSTeK Computer Inc.
ASUS RS700-E10(Z12PP-D32) Server System
(2.30 GHz, Intel Xeon Silver 4310T)

SPEC CPU®2017 Floating Point Rate Result
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Test Date: Jan-2022
Hardware Availability: May-2021
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Peak Optimization Flags (Continued)

503.bwaves_r: basepeak = yes

549.fotonik3d_r: basepeak = yes

554.roms_r: -w -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ipo
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-multiple-gather-scatter-by-shuffles
-qopt-mem-layout-trans=4 -nostandard-realloc-lhs
-align array32byte -auto -mbranches-within-32B-boundaries
-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

Benchmarks using both C and C++:

511.povray_r: -prof-gen(pass 1) -prof-use(pass 2) -xCORE-AVX512 -O3
-ipo -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-multiple-gather-scatter-by-shuffles
-qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

526.blender_r: basepeak = yes

Benchmarks using Fortran, C, and C++:

507.cactusBSSN_r: basepeak = yes

The flags files that were used to format this result can be browsed at
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/ASUSTekPlatform-Settings-z12-V1.2.xml
http://www.spec.org/cpu2017/flags/Intel-ic2021-official-linux64_revA.xml

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