ASUStek Computer Inc.
ASUS RS700-E10(Z12PP-D32) Server System
(2.10 GHz, Intel Xeon Gold 5318S)

SPECrates® 2017 fp_base = 339
SPECrates® 2017 fp_peak = 351

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**Hardware**

- **CPU Name:** Intel Xeon Gold 5318S
  - Max MHz: 3400
  - Nominal: 2100
  - Enabled: 48 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: 36 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 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;
  - C/C++: Version 2021.1 of Intel C/C++ Compiler Classic Build 20201112 for Linux
- **Parallel:** No
- **Firmware:** Version 0504 released May-2021
- **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.
## Results Table

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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"
MALLOCONF = "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
Copyright 2017-2021 Standard Performance Evaluation Corporation

ASUSTeK Computer Inc.
ASUS RS700-E10(Z12PP-D32) Server System
(2.10 GHz, Intel Xeon Gold 5318S)

SPECrate®2017_fp_base = 339
SPECrate®2017_fp_peak = 351

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

Test Date: Sep-2021
Hardware Availability: May-2021
Software Availability: Mar-2021

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
SNC = Enable SNC2 (2-clusters)
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 982a616c0915b55891ef0e16aaca664d
running on localhost.localdomain Wed Sep 15 11:10:39 2021

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) Gold 5318S CPU @ 2.10GHz
  2 "physical id"s (chips)
  96 "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 : 24
siblings : 48
  physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
  physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23

From lscpu from util-linux 2.32.1:

(Continued on next page)
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Test Date: Sep-2021
Hardware Availability: May-2021
Software Availability: Mar-2021

Platform Notes (Continued)

Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 96
On-line CPU(s) list: 0-95
Thread(s) per core: 2
Core(s) per socket: 24
Socket(s): 2
NUMA node(s): 4
Vendor ID: GenuineIntel
CPU family: 6
Model: 106
Model name: Intel(R) Xeon(R) Gold 5318S CPU @ 2.10GHz
Stepping: 6
CPU MHz: 1582.966
CPU max MHz: 3400.0000
CPU min MHz: 800.0000
BogoMIPS: 4200.00
Virtualization: VT-x
L1d cache: 48K
L1i cache: 32K
L2 cache: 1280K
L3 cache: 36864K
NUMA node0 CPU(s): 0-11, 48-59
NUMA node1 CPU(s): 12-23, 60-71
NUMA node2 CPU(s): 24-35, 72-83
NUMA node3 CPU(s): 36-47, 84-95
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 cpl pcpu
apeperf qni pclmulqdq dtes64 monitor ds_cpl vmx smx est tm sse3 sdbg fma cx16
xtpre pdcm pcd 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 ibrs_enhanced tpr_shadow vni flexpriority ept
vpid ept_ad fsqmbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid cqm rdrt_a
avx512f avx512dq rdrseed adx smap avx512ifma clflushopt clwb intel_pt avx512cd sha_ni
avx512bw avx512vl xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm_occupa llc cqm_mbb_total
cqm_mb_mlocal split_lock_detect wbinvd dtherm ida arat pln pts hwp hwp_act_window
hwp_epp hwp_pkg_req avx512vbmi umip pku ospke avx512 vbmi gnf vaes vpcm1ulq5dq
avx512_vfni avx512_vitalg tme avx512_v popcntdqa 1a57 rdrpid md_clear pconfig flush_lld
arch_capabilities

/platform/cpuinto cache data
    cache size : 36864 KB

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

(Continued on next page)
Platform Notes (Continued)

available: 4 nodes (0-3)
node 0 cpus: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59
node 0 size: 251937 MB
node 0 free: 256647 MB
node 1 cpus: 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59
node 1 size: 252480 MB
node 1 free: 257160 MB
node 2 cpus: 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83
node 2 size: 252672 MB
node 2 free: 257145 MB
node 3 cpus: 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100 101 102 103 104 105 106 107 108 109 110 111 112 113 114 115 116 117 118 119 120 121 122 123
node 3 size: 253003 MB
node 3 free: 257239 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

From /proc/meminfo
MemTotal: 1056468992 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 14:36:0
SPEC CPU®2017 Floating Point Rate Result

ASUSTeK Computer Inc.
ASUS RS700-E10(Z12PP-D32) Server System
(2.10 GHz, Intel Xeon Gold 5318S)

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

SPECrate®2017_fp_base = 339
SPECrate®2017_fp_peak = 351

Test Date: Sep-2021
Hardware Availability: May-2021
Software Availability: Mar-2021

Platform Notes (Continued)

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
  Mitigation: usercopy/swapgs barriers and __user pointer sanitation
CVE-2017-5753 (Spectre variant 1):
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 Sep 14 07:46

SPEC is set to: /home/cpu118

Filesystem            Type  Size  Used  Avail  Use%  Mounted on
/dev/mapper/rhel-home xfs   3.6T   30G   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 2933

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

(End of data from sysinfo program)
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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
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------
==============================================================================
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 2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------
==============================================================================
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
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
Intel(R) C Intel(R) 64 Compiler Classic for applications running on Intel(R)
64, Version 2021.1 Build 20201112_000000
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------
==============================================================================
C++, C                  | 511.povray_r(base) 526.blender_r(base, peak)
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Compiler Version Notes (Continued)

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C++, C  |  511.povray_r(base) 526.blender_r(base, peak)

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2021.1 Build 20201113
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

C++, C, Fortran  |  507.cactuBSSN_r(base, peak)

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Fortran, C  |  521.wrf_r(peak)

Intel(R) Fortran Intel(R) 64 Compiler Classic for applications running on Intel(R) 64, Version 2021.1 Build 20201112_000000
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**Hardware Availability:** May-2021  
**Test Date:** Sep-2021  
**Software Availability:** Mar-2021  

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**Compiler Version Notes (Continued)**  

| Fortran, C | 521.wrf_r(base) 527.cam4_r(base, peak) |
|-----------------------------|
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| Copyright (C) 1985-2020 Intel Corporation. All rights reserved. |

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| Fortran, C | 521.wrf_r(peak) |
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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 |
| Copyright (C) 1985-2020 Intel Corporation. All rights reserved. |

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| Fortran, C | 521.wrf_r(base) 527.cam4_r(base, peak) |
|-----------------------------|
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**Base Compiler Invocation**  

C benchmarks:  
icx  

C++ benchmarks:  
icpx  

Fortran benchmarks:  
ifort  

(Continued on next page)
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<td>ASUSTeK Computer Inc.</td>
<td>Software Availability:</td>
<td>Mar-2021</td>
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</tbody>
</table>

**Base Compiler Invocation (Continued)**

Benchmarks using both Fortran and C:

ifort icx

Benchmarks using both C and C++:

icpx icx

Benchmarks using Fortran, C, and C++:

icpx icx ifort

**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  
-mbranches-within-32B-boundaries -ljemalloc  
-L/usr/local/jemalloc64-5.0.1/lib

C++ benchmarks:

-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math -flto  
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4  
-mbranches-within-bounds -ljemalloc  
-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

(Continued on next page)
ASUSTeK Computer Inc.  
ASUS RS700-E10(Z12PP-D32) Server System  
(2.10 GHz, Intel Xeon Gold 5318S)  

**SPEC CPU®2017 Floating Point Rate Result**

**SPECrate®2017_fp_base = 339**

**SPECrate®2017_fp_peak = 351**

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

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**Base Optimization Flags (Continued)**

Fortran benchmarks (continued):
- -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:
- -w -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math  
- -flto -mfpmathsse -funroll-loops -qopt-mem-layout-trans=4 -O3 -ipo  
- -no-prec-div -qopt-prefetch -ffinite-math-only  
- -qopt-multiple-gather-scatter-by-shuffles  
- -mbranches-within-32B-boundaries -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 -mfpmathsse -funroll-loops -qopt-mem-layout-trans=4  
- -mbranches-within-32B-boundaries -ljemalloc  
- -L/usr/local/jemalloc64-5.0.1/lib

Benchmarks using Fortran, C, and C++:
- -w -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math  
- -flto -mfpmathsse -funroll-loops -qopt-mem-layout-trans=4 -O3  
- -no-prec-div -qopt-prefetch -ffinite-math-only  
- -qopt-multiple-gather-scatter-by-shuffles  
- -mbranches-within-32B-boundaries -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

Benchmarks using both Fortran and C:
- 521.wrf_r:ifort icc

(Continued on next page)
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**Peak Compiler Invocation (Continued)**

527.cam4_r: 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


C++ benchmarks:

508.namd_r: basepeak = yes


Fortran benchmarks:

503.bwaves_r: -w -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ipo -no-prec-div -qopt-prefetch -ffinite-math-only

(Continued on next page)
SPEC CPU®2017 Floating Point Rate Result
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ASUSTeK Computer Inc.
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Peak Optimization Flags (Continued)

503.bwaves_r (continued):
-qopt-multiple-gather-scatter-by-shuffles
-ipo -qopt-mem-layout-trans=4 -nostandard-realloc-lhs
-align array32byte -auto -mbranches-within-32B-boundaries
-1jemalloc -L/usr/local/jemalloc64-5.0.1/lib

549.fotonik3d_r: basepeak = yes

554.roms_r: Same as 503.bwaves_r

Benchmarks using both Fortran and C:

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

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
-ipo -qopt-multiple-gather-scatter-by-shuffles
-ipo -qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries
-1jemalloc -L/usr/local/jemalloc64-5.0.1/lib

526.blender_r: basepeak = yes

Benchmarks using Fortran, C, and C++:

507.cactuBSSN_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-V1.0.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/ASUSTekPlatform-Settings-z12-V1.0.xml
http://www.spec.org/cpu2017/flags/Intel-ic2021-official-linux64_revA.xml
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