ASUSTeK Computer Inc.  
ASUS RS720-E10-RS12(Z12PP-D32) Server System  
(2.30 GHz, Intel Xeon Silver 4316)

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

SPECrate\textsuperscript{®}2017\_int\_base = 303  
SPECrate\textsuperscript{®}2017\_int\_peak = 314

Test Date: Mar-2023  
Hardware Availability: Apr-2022  
Software Availability: Dec-2022

| Copies | 0 | 30 | 60 | 90 | 120 | 150 | 180 | 210 | 240 | 270 | 300 | 330 | 360 | 390 | 420 | 450 | 480 | 510 | 540 | 570 | 600 | 630 |
|--------|---|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 500.perlbench\_r | 80 | | | | | 202 | | | | | | | | | | | | | | | | |
| 502.gcc\_r | 80 | | | | | | | | | | | 242 | | | | | | | | | | |
| 505.mcf\_r | 80 | | | | | | | | | | | 247 | | | | | | | | | | |
| 520.omnetpp\_r | 80 | | | | | | | | | | | | | | | | | | | | |
| 523.xalancbmk\_r | 80 | | | | | | | | | | | 488 | | | | | | | | | | |
| 525.x264\_r | 80 | | | | | | | | | | | | | | | | | | | | |
| 531.deepsjeng\_r | 80 | | | | | | | | | | | 509 | | | | | | | | | | |
| 541.leela\_r | 80 | | | | | | | | | | | | | | 509 | | | | | | | |
| 548.exchange2\_r | 80 | | | | | | | | | | | | | | | | | | | | |
| 557.xz\_r | 80 | | | | | | | | | | | | | | | | | | | | |

**Hardware**

CPU Name: Intel Xeon Silver 4316  
Max MHz: 3400  
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 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: No  
Firmware: Version 0802 released Apr-2022  
File System: xfs  
System State: Run level 3 (multi-user)  
Base Pointers: 64-bit  
Peak Pointers: 32/64-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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SPEC CPU®2017 Integer Rate Result
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Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
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<td>500.perlbench_r</td>
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<td>202</td>
<td>80</td>
<td>555</td>
<td>229</td>
</tr>
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<td>502.gcc_r</td>
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<td>468</td>
<td>242</td>
<td>80</td>
<td>395</td>
<td>287</td>
</tr>
<tr>
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<td>80</td>
<td>254</td>
<td>509</td>
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<td>490</td>
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</tr>
<tr>
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<td>80</td>
<td>238</td>
<td>588</td>
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<td>228</td>
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<td>215</td>
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<td>341</td>
<td>616</td>
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<tr>
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<td>80</td>
<td>532</td>
<td>162</td>
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<td>162</td>
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</tbody>
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Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

Compiler Notes

SPEC has ruled that the compiler used for this result was performing a compilation that specifically improves the performance of the 523.xalancbmk_r / 623.xalanchmk_s benchmarks using a priori knowledge of the SPEC code and dataset to perform a transformation that has narrow applicability.

In order to encourage optimizations that have wide applicability (see rule 1.4 https://www.spec.org/cpu2017/Docs/runrules.html#rule_1.4), SPEC will no longer publish results using this optimization.

This result is left in the SPEC results database for historical reference.

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/lib/ia32:/home/ic23/je5.0.1-32"
MALLOC_CONF = "retain:true"
SPEC CPU®2017 Integer Rate Result

ASUSTeK Computer Inc.
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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.
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/ic23/bin/sysinfo
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
running on localhost.localdomain Thu Mar 2 22:35:15 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. sysct1
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

(Continued on next page)
Platform Notes (Continued)

21. Disk information
22. /sys/devices/virtual/dmi/id
23. dmidecode
24. BIOS

--------------------------------------------------------------------------------------

1. uname
   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
   22:35:15 up 17:31,  1 user,  load average: 17.45, 42.90, 60.26

   USER     TTY      FROM             LOGIN@   IDLE   JCPU   PCPU WHAT
   root     tty1     -                05:04   17:30m  1.14s  0.01s /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         (-l)  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
   file locks              (-x) unlimited

--------------------------------------------------------------------------------------

5. sysinfo process ancestry
   /usr/lib/systemd/systemd --switched-root --system --deserialize 18
   login -- root
   -bash
   /bin/bash ./.rate.sh
   runcpu --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 intrate
   runcpu --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 intrate --nopreenv --note-preenv --logfile
   $SPEC/tmp/CPU2017.039/templogs/preenv.intrate.039.0.log --lognum 039.0 --from_runcpu 2
   specperl $SPEC/bin/sysinfo
   $SPEC = /home/ic23

--------------------------------------------------------------------------------------

6. /proc/cpuinfo

(Continued on next page)
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Platform Notes (Continued)

model name : Intel(R) Xeon(R) Silver 4316 CPU @ 2.30GHz  
vendor_id : GenuineIntel  
cpu family : 6  
model : 106  
stepping : 6  
microcode : 0x0d000331  
bugs : spectre_v1 spectre_v2 spec_store_bypass swaps  
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 64-103  
physical id 1: apicids 0-39

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):              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) Silver 4316 CPU @ 2.30GHz  
BIOS Model name:     Intel(R) Xeon(R) Silver 4316 CPU @ 2.30GHz  
Stepping:            6  
CPU MHz:             800.143  
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:            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 smx 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 vmx smx est tm2 ssse3 sdbg fma cx16 xtpr pdcm pcid dca sse4_1_2 x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault ept vpid adx smep bmi1 hle avx2 smep bmi2 ertl invpcid_single intel_pinn ssbd h人家 ibs ibpb stibp ibrs_interest ts_pr_shadow vni flexpriority ept vpid ept_ad fsgsbase tsc_adjust bmi1 h人家 avx2 smep bmi2 ertl invpd cqm rdr a axv512f axv512g rdseed adx smap axv512ifma clflushopt clwb intel_pt axv512cd sha ni axv512bw axv512vl xsaveopt xsaves

(Continued on next page)
Platform Notes (Continued)

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: 257582 MB
  node 0 free: 256386 MB
  node 1 cpus: 10-19,50-59
  node 1 size: 258043 MB
  node 1 free: 257222 MB
  node 2 cpus: 20-29,60-69
  node 2 size: 258043 MB
  node 2 free: 257219 MB
  node 3 cpus: 30-39,70-79
  node 3 size: 258041 MB
  node 3 free: 257301 MB

9. /proc/meminfo
MemTotal: 1056471760 kB

10. who -r
run-level 3 Mar 2 05:04

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@ chrony
crond firewalld getty@ import-state insights-client-boot irqbalance iscsi iscsi-onboot kdump
libstoragemgmt lm_sensors loadmodules lvm2-monitor mcelog mdmonitor microcode multipathd
nvme-boot-connections pmd pnie pmlogger rhsmcrtd rsyslog selinux-autorelabel-mark smartd sshd
sssd syslogd systemd systemd-timedatectl" tuned udisks2 vdo

disabled arp-etherblk availability chrony-wait console-getty cpupower debug-shell ebtables fancontrol
grafana-server iprump iprupdate iprupdate ipsec iscsi iscsiulo kpatch kvm_stat ledmonitor nftables
nls-domainname nvmf-autoconnect oddjobd pmfind pmie_check pmlogger_check pmlogger_daily_report
pmlogger_daily_report-poll pmproxy podman-auto-update postfix powertools ras-mc-ctl
radademon rdisc rhc rhsm-rhsm-facts rrdcached saslauthd systemd-getty@ sshd-keygen@
systemd-resolved tcds
indirect systemd-timedated

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

(Continued on next page)
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Platform Notes (Continued)

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

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+advise [advise] 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_sleepMillisecs 600000
   defrag 1
   max_ptes_none 511
   max_ptes_swap 64
   pages_to_scan 4096
   scan_sleepMillisecs 10000

(Continued on next page)
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Platform Notes (Continued)

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
   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/swapgs barriers and __user pointer sanitization
   spectre_v2           Mitigation: Enhanced IBRS, IBPB: conditional, RSF filling
   srbd                 Not affected
   txs_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  124G  755G  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

Compiler Version Notes

C       | 502.gcc_r(peak)
-----------------------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on IA-32, Version 2023.0.0 Build 20221201
(Continued on next page)
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<td>Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201</td>
<td></td>
</tr>
<tr>
<td>Copyright (C) 1985-2022 Intel Corporation. All rights reserved.</td>
<td></td>
</tr>
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</table>

### Base Compiler Invocation

**C benchmarks:**
- icx

**C++ benchmarks:**
- icpx

**Fortran benchmarks:**
- ifx
### ASUSTeK Computer Inc.
ASUS RS720-E10-RS12(Z12PP-D32) Server System (2.30 GHz, Intel Xeon Silver 4316)

<table>
<thead>
<tr>
<th>SPECrate®2017_int_base</th>
<th>SPECrate®2017_int_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>303</td>
<td>314</td>
</tr>
</tbody>
</table>

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

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

#### Base Portability Flags

- 500.perlbench_r: -DSPEC_LP64 -DSPEC_LINUX_X64
- 502.gcc_r: -DSPEC_LP64
- 505.mcf_r: -DSPEC_LP64
- 520.omnetpp_r: -DSPEC_LP64
- 523.xalancbmk_r: -DSPEC_LP64 -DSPEC_LINUX
- 525.x264_r: -DSPEC_LP64
- 531.deepsjeng_r: -DSPEC_LP64
- 541.leela_r: -DSPEC_LP64
- 548.exchange2_r: -DSPEC_LP64
- 557.xz_r: -DSPEC_LP64

#### Base Optimization Flags

**C benchmarks:**
- -w -std=c11 -m64 -Wl,-z,muldefs -xcORE-AVX512 -O3 -ffast-math
- -flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
- -L/usr/local/intel/compiler/2023.0.0/linux/compiler/lib/intel64_lin
- -lqkmalloc

**C++ benchmarks:**
- -w -std=c++14 -m64 -Wl,-z,muldefs -xcORE-AVX512 -O3 -ffast-math
- -flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
- -L/usr/local/intel/compiler/2023.0.0/linux/compiler/lib/intel64_lin
- -lqkmalloc

**Fortran benchmarks:**
- -w -m64 -Wl,-z,muldefs -xcORE-AVX512 -O3 -ffast-math -flto
- -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
- -nostandard-realloc-lhs -align array32byte -auto
- -L/usr/local/intel/compiler/2023.0.0/linux/compiler/lib/intel64_lin
- -lqkmalloc

#### Peak Compiler Invocation

**C benchmarks:**
- icx

**C++ benchmarks:**
- icpx

**Fortran benchmarks:**
- ifx
Peak Portability Flags

500.perlbench_r: -DSPEC_LP64 -DSPEC_LINUX_X64
502.gcc_r: -D_FILE_OFFSET_BITS=64
505.mcf_r: -DSPEC_LP64
520.omnetpp_r: -DSPEC_LP64
523.xalancbmk_r: -DSPEC_LP64 -DSPEC_LINUX
525.x264_r: -DSPEC_LP64
531.deepsjeng_r: -DSPEC_LP64
541.leela_r: -DSPEC_LP64
548.exchange2_r: -DSPEC_LP64
557.xz_r: -DSPEC_LP64

Peak Optimization Flags

C benchmarks:

500.perlbench_r: -w -std=c11 -m64 -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
   -fno-strict-overflow
   -L/usr/local/intel/compiler/2023.0.0/linux/compiler/lib/intel64_lin
   -lqkmalloc

502.gcc_r: -m32
   -L/usr/local/intel/compiler/2023.0.0/linux/compiler/lib/ia32_lin
   -std=gnu89 -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
   -L/usr/local/jemalloc32-5.0.1/lib -ljemalloc

505.mcf_r: basepeak = yes

525.x264_r: -w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast
   -ffast-math -flto -mfpmath=sse -funroll-loops
   -qopt-mem-layout-trans=4 -fno-alias
   -L/usr/local/intel/compiler/2023.0.0/linux/compiler/lib/intel64_lin
   -lqkmalloc

557.xz_r: basepeak = yes

C++ benchmarks:

(Continued on next page)
**SPEC CPU®2017 Integer Rate Result**

ASUSTeK Computer Inc.

ASUS RS720-E10-RS12(Z12PP-D32) Server System (2.30 GHz, Intel Xeon Silver 4316)

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<tr>
<th>SPECrate®2017_int_base</th>
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</tr>
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</table>

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

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**Peak Optimization Flags (Continued)**

- 520.omnetpp_r: \texttt{basepeak} = yes
- 523.xalancbmk_r: \texttt{basepeak} = yes
- 531.deepsjeng_r: \texttt{basepeak} = yes
- 541.leela_r: \texttt{basepeak} = yes

Fortran benchmarks:

- 548.exchange2_r: \texttt{basepeak} = yes

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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)

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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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