SPEC CPU®2017 Integer Rate Result

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ASUSTeK Computer Inc.

ASUS RS720-E9(Z11PP-D24) Server System
(2.20 GHz, Intel Xeon Gold 6238R)

$SPECrate®2017\_int\_base = 364$

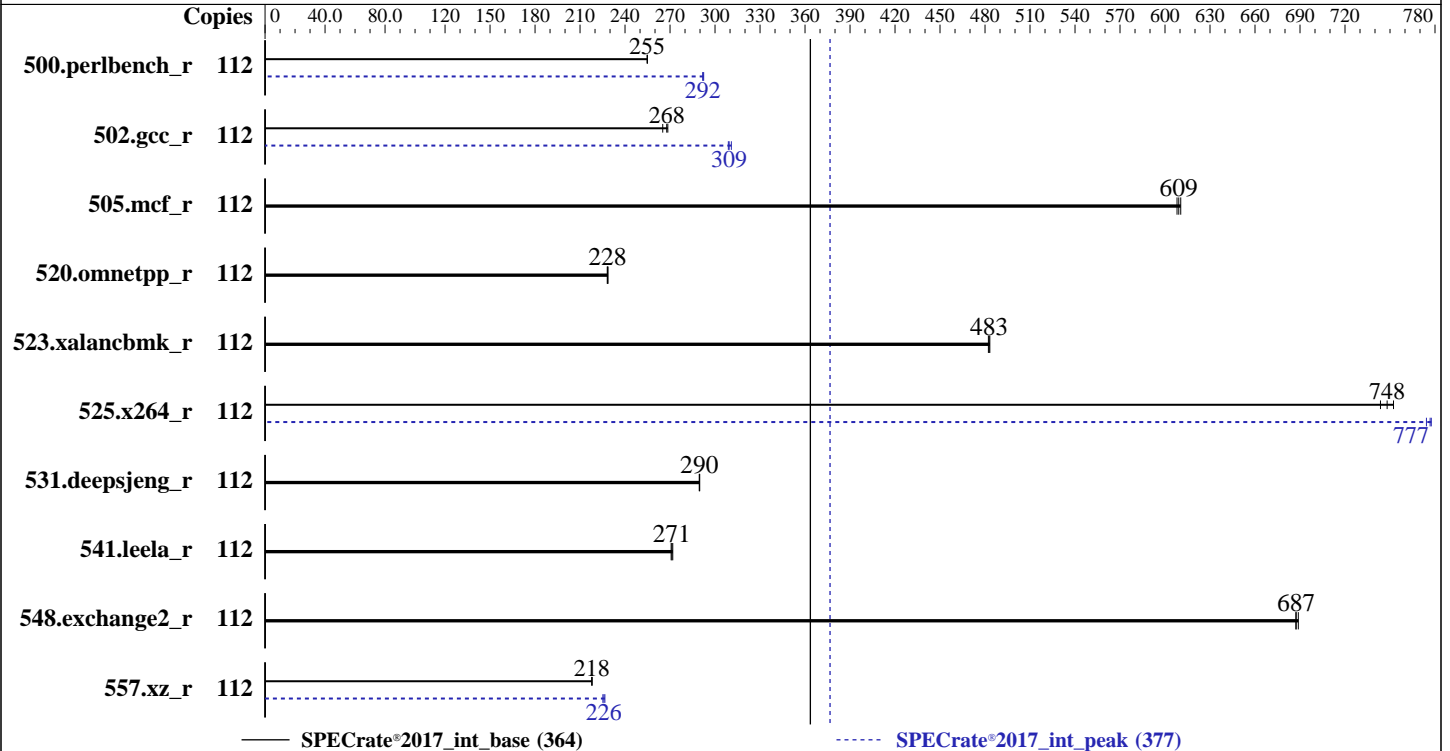$SPECrate®2017\_int\_peak = 377$

CPU2017 License: 9016

Test Sponsor: ASUSTeK Computer Inc.

Tested by: ASUSTeK Computer Inc.

Test Date: Dec-2020

Hardware Availability: Feb-2020

Software Availability: Aug-2020

Benchmark	Copies	Base	Peak
500.perlbench_r	112	255	292
502.gcc_r	112	268	309
505.mcf_r	112	609	
520.omnetpp_r	112	228	
523.xalancbmk_r	112	483	
525.x264_r	112	748	777
531.deepsjeng_r	112	290	
541.leela_r	112	271	
548.exchange2_r	112	687	
557.xz_r	112	218	226

SPECrate®2017_int_base (364)   SPECrate®2017_int_peak (377)

Hardware

CPU Name: Intel Xeon Gold 6238R
Max MHz: 4000
Nominal: 2200
Enabled: 56 cores, 2 chips, 2 threads/core
Orderable: 1, 2 chip(s)
Cache L1: 32 KB I + 32 KB D on chip per core
 L2: 1 MB I+D on chip per core
 L3: 38.5 MB I+D on chip per chip
 Other: None
Memory: 768 GB (24 x 32 GB 2Rx4 PC4-2933Y-R)
Storage: 1 x 960 GB SATA SSD
Other: None

Software

OS: Red Hat Enterprise Linux release 8.1 (Ootpa)
Kernel 4.18.0-147.el8.x86_64
Compiler: C/C++: Version 19.1.2.275 of Intel C/C++
Compiler Build 20200604 for Linux;
Fortran: Version 19.1.2.275 of Intel Fortran
Compiler Build 20200623 for Linux
Parallel: No
Firmware: Version 6102 released Dec-2019
File System: xfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: 32/64-bit
Other: jemalloc: jemalloc memory allocator library 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
500.perlbench_r	112	**700**	**255**	700	255	700	255	112	611	292	**611**	**292**	610	292
502.gcc_r	112	591	269	**592**	**268**	598	265	112	510	311	513	309	**513**	**309**
505.mcf_r	112	296	610	**297**	**609**	298	608	112	296	610	**297**	**609**	298	608
520.omnetpp_r	112	643	229	644	228	**643**	**228**	112	643	229	644	228	**643**	**228**
523.xalancbmk_r	112	**245**	**483**	245	482	245	483	112	**245**	**483**	245	482	245	483
525.x264_r	112	**262**	**748**	264	744	261	752	112	**252**	**777**	252	778	253	774
531.deepsjeng_r	112	443	290	443	290	**443**	**290**	112	443	290	443	290	**443**	**290**
541.leela_r	112	685	271	682	272	**684**	**271**	112	685	271	682	272	**684**	**271**
548.exchange2_r	112	**427**	**687**	426	689	427	687	112	**427**	**687**	426	689	427	687
557.xz_r	112	555	218	555	218	**555**	**218**	112	537	225	**535**	**226**	534	227
SPECrate®2017_int_base =	**364**													
SPECrate®2017_int_peak =	**377**													

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/191u2/lib/intel64:/home/191u2/lib/ia32:/home/191u2/je5.0.1-32"
MALLOC_CONF = "retain:true"
```

General Notes

```
Binaries compiled on a system with 1x Intel Core i9-7980XE CPU + 64GB 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
```

(Continued on next page)

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General Notes (Continued)

```
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.

The jemalloc library was
configured and built at default for
32bit (i686) and 64bit (x86_64) targets;
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
ENERGY_PERF_BIAS_CFG mode = performance
SNC = Enabled
IMC interleaving = 1-way
Engine Boost = Level3(Max)
Enforce POR = Disable
Memory Frequency = 2933
LLC dead line allc = Disabled
SR-IOV Support = Disabled
CSM Support = Disabled

 Sysinfo program /home/191u2/bin/sysinfo
 Rev: r6365 of 2019-08-21 295195f888a3d7edb1e6e46a485a0011
 running on localhost.localdomain Wed Dec  2 10:57:41 2020

 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 6238R CPU @ 2.20GHz
       2  "physical id"s (chips)
       112 "processors"
    cores, siblings (Caution: counting these is hw and system dependent. The following
```

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Platform Notes (Continued)

```
    excerpts from /proc/cpuinfo might not be reliable.  Use with caution.)
      cpu cores : 28
      siblings  : 56
      physical 0: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27
      28 29 30
      physical 1: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24 25 26 27
      28 29 30

  From lscpu:
      Architecture:        x86_64
      CPU op-mode(s):      32-bit, 64-bit
      Byte Order:          Little Endian
      CPU(s):              112
      On-line CPU(s) list: 0-111
      Thread(s) per core:  2
      Core(s) per socket:  28
      Socket(s):           2
      NUMA node(s):        4
      Vendor ID:           GenuineIntel
      CPU family:          6
      Model:               85
      Model name:          Intel(R) Xeon(R) Gold 6238R CPU @ 2.20GHz
      Stepping:            7
      CPU MHz:             3245.345
      CPU max MHz:         4000.0000
      CPU min MHz:         1000.0000
      BogoMIPS:            4400.00
      Virtualization:      VT-x
      L1d cache:           32K
      L1i cache:           32K
      L2 cache:            1024K
      L3 cache:            39424K
      NUMA node0 CPU(s):   0-3,7-9,14-17,21-23,56-59,63-65,70-73,77-79
      NUMA node1 CPU(s):   4-6,10-13,18-20,24-27,60-62,66-69,74-76,80-83
      NUMA node2 CPU(s):   28-31,35-37,42-45,49-51,84-87,91-93,98-101,105-107
      NUMA node3 CPU(s):   32-34,38-41,46-48,52-55,88-90,94-97,102-104,108-111
      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 cdp_l3
      invpcid_single intel_ppin ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vnmi
      flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm
      cqm mpx rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd
      avx512bw avx512vl xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbm_total
      cqm_mbm_local dtherm ida arat pln pts hwp hwp_act_window hwp_epp hwp_pkg_req pku
```

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CPU2017 License: 9016		**Test Date:**	Dec-2020
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Platform Notes (Continued)

```
      ospke avx512_vnni md_clear flush_l1d arch_capabilities

 /proc/cpuinfo cache data
    cache size : 39424 KB

 From numactl --hardware  WARNING: a numactl 'node' might or might not correspond to a
 physical chip.
   available: 4 nodes (0-3)
   node 0 cpus: 0 1 2 3 7 8 9 14 15 16 17 21 22 23 56 57 58 59 63 64 65 70 71 72 73 77 78
   79
   node 0 size: 192078 MB
   node 0 free: 191079 MB
   node 1 cpus: 4 5 6 10 11 12 13 18 19 20 24 25 26 27 60 61 62 66 67 68 69 74 75 76 80 81
   82 83
   node 1 size: 193530 MB
   node 1 free: 192874 MB
   node 2 cpus: 28 29 30 31 35 36 37 42 43 44 45 49 50 51 84 85 86 87 91 92 93 98 99 100
   101 105 106 107
   node 2 size: 193530 MB
   node 2 free: 192675 MB
   node 3 cpus: 32 33 34 38 39 40 41 46 47 48 52 53 54 55 88 89 90 94 95 96 97 102 103 104
   108 109 110 111
   node 3 size: 193504 MB
   node 3 free: 192932 MB
   node distances:
   node   0   1   2   3
     0:  10  11  21  21
     1:  11  10  21  21
     2:  21  21  10  11
     3:  21  21  11  10

 From /proc/meminfo
    MemTotal:       791187620 kB
    HugePages_Total:        0
    Hugepagesize:        2048 kB

 From /etc/*release* /etc/*version*
    os-release:
      NAME="Red Hat Enterprise Linux"
      VERSION="8.1 (Ootpa)"
      ID="rhel"
      ID_LIKE="fedora"
      VERSION_ID="8.1"
      PLATFORM_ID="platform:el8"
      PRETTY_NAME="Red Hat Enterprise Linux 8.1 (Ootpa)"
      ANSI_COLOR="0;31"
    redhat-release: Red Hat Enterprise Linux release 8.1 (Ootpa)
```

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Tested by:	ASUSTeK Computer Inc.	**Software Availability:**	Aug-2020

Platform Notes (Continued)

```
    system-release: Red Hat Enterprise Linux release 8.1 (Ootpa)
    system-release-cpe: cpe:/o:redhat:enterprise_linux:8.1:ga

 uname -a:
    Linux localhost.localdomain 4.18.0-147.el8.x86_64 #1 SMP Thu Sep 26 15:52:44 UTC 2019
    x86_64 x86_64 x86_64 GNU/Linux

 Kernel self-reported vulnerability status:

 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
 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


 run-level 3 Dec 1 18:27

 SPEC is set to: /home/191u2
    Filesystem              Type  Size  Used Avail Use% Mounted on
    /dev/mapper/rhel-home xfs   839G   24G  815G   3% /home

 From /sys/devices/virtual/dmi/id
    BIOS:    American Megatrends Inc. 6102 12/05/2019
    Vendor:  ASUSTeK COMPUTER INC.
    Product: Z11PP-D24 Series
    Product Family: Server
    Serial:  System Serial Number

 Additional information from dmidecode 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:
    24x Samsung M393A4K40CB2-CVF 32 GB 2 rank 2933

 (End of data from sysinfo program)
```

Compiler Version Notes

```
==============================================================================
 C     | 502.gcc_r(peak)
------------------------------------------------------------------------------
```

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Compiler Version Notes (Continued)

```
Intel(R) C Compiler for applications running on IA-32, Version 19.1.2.275
  Build 20200604
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------


==============================================================================
C        | 500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base, peak)
         | 525.x264_r(base, peak) 557.xz_r(base)
------------------------------------------------------------------------------
Intel(R) C Compiler for applications running on Intel(R) 64, Version
  19.1.2.275 Build 20200604
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------


==============================================================================
C        | 500.perlbench_r(peak) 557.xz_r(peak)
------------------------------------------------------------------------------
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.1.2.275 Build 20200623
Copyright (C) 1985-2020 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------


==============================================================================
C        | 502.gcc_r(peak)
------------------------------------------------------------------------------
Intel(R) C Compiler for applications running on IA-32, Version 19.1.2.275
  Build 20200604
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------


==============================================================================
C        | 500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base, peak)
         | 525.x264_r(base, peak) 557.xz_r(base)
------------------------------------------------------------------------------
Intel(R) C Compiler for applications running on Intel(R) 64, Version
  19.1.2.275 Build 20200604
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------


==============================================================================
C        | 500.perlbench_r(peak) 557.xz_r(peak)
------------------------------------------------------------------------------
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.1.2.275 Build 20200623
Copyright (C) 1985-2020 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------
```

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```
==============================================================================
C        | 502.gcc_r(peak)
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  Build 20200604
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------------------------------------------------------------------------------


==============================================================================
C        | 500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base, peak)
         | 525.x264_r(base, peak) 557.xz_r(base)
------------------------------------------------------------------------------
Intel(R) C Compiler for applications running on Intel(R) 64, Version
  19.1.2.275 Build 20200604
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------


==============================================================================
C        | 500.perlbench_r(peak) 557.xz_r(peak)
------------------------------------------------------------------------------
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
  Version 19.1.2.275 Build 20200623
Copyright (C) 1985-2020 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------


==============================================================================
C++      | 520.omnetpp_r(base, peak) 523.xalancbmk_r(base, peak)
         | 531.deepsjeng_r(base, peak) 541.leela_r(base, peak)
------------------------------------------------------------------------------
Intel(R) C++ Compiler for applications running on Intel(R) 64, Version
  19.1.2.275 Build 20200604
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------


==============================================================================
Fortran | 548.exchange2_r(base, peak)
------------------------------------------------------------------------------
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R)
  64, Version 19.1.2.275 Build 20200623
Copyright (C) 1985-2020 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------
```

Base Compiler Invocation

C benchmarks:
icc

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Base Compiler Invocation (Continued)

C++ benchmarks:
`icpc`

Fortran benchmarks:
`ifort`

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:
```
-m64 -qnextgen -std=c11
-Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs
-xCORE-AVX512 -O3 -ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4
-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.3.275/linux/compiler/lib/intel64_lin
-lqkmalloc
```

C++ benchmarks:
```
-m64 -qnextgen -Wl,-plugin-opt=-x86-branches-within-32B-boundaries
-Wl,-z,muldefs -xCORE-AVX512 -O3 -ffast-math -flto -mfpmath=sse
-funroll-loops -qopt-mem-layout-trans=4
-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.3.275/linux/compiler/lib/intel64_lin
-lqkmalloc
```

Fortran benchmarks:
```
-m64 -Wl,-plugin-opt=-x86-branches-within-32B-boundaries -Wl,-z,muldefs
-xCORE-AVX512 -O3 -ipo -no-prec-div -qopt-mem-layout-trans=4
-nostandard-realloc-lhs -align array32byte -auto
```

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Base Optimization Flags (Continued)

Fortran benchmarks (continued):
```
-mbranches-within-32B-boundaries
-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.3.275/linux/compiler/lib/intel64_lin
-lqkmalloc
```

Peak Compiler Invocation

C benchmarks:
```
icc
```

C++ benchmarks:
```
icpc
```

Fortran benchmarks:
```
ifort
```

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: -Wl,-z,muldefs -prof-gen(pass 1) -prof-use(pass 2)
-xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4 -fno-strict-overflow
-mbranches-within-32B-boundaries
-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.3.275/linux/compiler/lib/intel64_lin
-lqkmalloc
```

(Continued on next page)

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Peak Optimization Flags (Continued)

502.gcc_r: -m32
-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.3.275/linux/compiler/lib/ia32_lin
-std=gnu89
-Wl,-plugin-opt=-x86-branches-within-32B-boundaries
-Wl,-z,muldefs -fprofile-generate(pass 1)
-fprofile-use=default.profdata(pass 2) -xCORE-AVX512 -flto
-Ofast(pass 1) -O3 -ffast-math -qnextgen
-qopt-mem-layout-trans=4 -L/usr/local/jemalloc32-5.0.1/lib
-ljemalloc

505.mcf_r: basepeak = yes

525.x264_r: -m64 -qnextgen -std=c11
-Wl,-plugin-opt=-x86-branches-within-32B-boundaries
-Wl,-z,muldefs -xCORE-AVX512 -flto -O3 -ffast-math
-qopt-mem-layout-trans=4 -fno-alias
-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.3.275/linux/compiler/lib/intel64_lin
-lqkmalloc

557.xz_r: -Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries
-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.3.275/linux/compiler/lib/intel64_lin
-lqkmalloc

C++ benchmarks:

520.omnetpp_r: basepeak = yes

523.xalancbmk_r: basepeak = yes

531.deepsjeng_r: basepeak = yes

541.leela_r: basepeak = yes

Fortran benchmarks:

548.exchange2_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-z11-V2.0-revH.html
http://www.spec.org/cpu2017/flags/Intel-ic19.1u1-official-linux64_revA.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/ASUSTekPlatform-Settings-z11-V2.0-revH.xml
http://www.spec.org/cpu2017/flags/Intel-ic19.1u1-official-linux64_revA.xml

SPEC CPU®2017 Integer Rate Result

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ASUSTeK Computer Inc.

ASUS RS720-E9(Z11PP-D24) Server System
(2.20 GHz, Intel Xeon Gold 6238R)

SPECrate®2017_int_base = 364

SPECrate®2017_int_peak = 377

CPU2017 License:	9016	**Test Date:**	Dec-2020
Test Sponsor:	ASUSTeK Computer Inc.	**Hardware Availability:**	Feb-2020
Tested by:	ASUSTeK Computer Inc.	**Software Availability:**	Aug-2020

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

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