ASUSTeK Computer Inc.  
ASUS ESC8000 G4(Z11PG-D24) Server System  
(2.10 GHz, Intel Xeon Gold 6230R)

<table>
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<tr>
<th>SPECrate®2017_int_base = 353</th>
<th>SPECrate®2017_int_peak = 366</th>
</tr>
</thead>
</table>

## Hardware

**CPU Name:** Intel Xeon Gold 6230R  
**Max MHz:** 4000  
**Nominal:** 2100  
**Enabled:** 52 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:** 35.75 MB I+D on chip per chip  
**Other:** None  
**Memory:** 768 GB (24 x 32 GB 2Rx4 PC4-2933Y-R)  
**Storage:** 1 x 1 TB SATA SSD  
**Other:** None

## Software

**OS:** SUSE Linux Enterprise Server 15 SP1  
**Kernel:** 4.12.14-195-default  
**Compiler:** C/C++: Version 19.1.1.217 of Intel C/C++ Compiler Build 20200306 for Linux;  
**Fortran:** Version 19.1.1.217 of Intel Fortran Compiler Build 20200306 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

---

<table>
<thead>
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</tr>
<tr>
<td>Tested by: ASUSTeK Computer Inc.</td>
</tr>
</tbody>
</table>

| Copies | 0 | 40.0 | 80.0 | 120 | 160 | 200 | 240 | 280 | 320 | 360 | 400 | 440 | 480 | 520 | 560 | 600 | 640 | 680 | 720 | 760 |
|--------|---|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 500.perlbench_r | 104 | 241 | 283 |
| 502.gcc_r | 104 | 273 |
| 505.mcf_r | 104 | 318 |
| 520.omnetpp_r | 104 | 229 |
| 523.xalancbmk_r | 104 | 460 |
| 525.x264_r | 104 | 727 |
| 531.deepsjeng_r | 104 | 275 |
| 541.leela_r | 104 | 260 |
| 548.exchange2_r | 104 | 655 |
| 557.xz_r | 104 | 212 |

---

**SPECrate®2017_int_base** (353)  
**SPECrate®2017_int_peak** (366)
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Test Date: May-2020  
Hardware Availability: Feb-2020  
Software Availability: Apr-2020

Results Table

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<td>244</td>
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<tr>
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<td>260</td>
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<tr>
<td>557.xz_r</td>
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<td>212</td>
<td>532</td>
<td>211</td>
<td>104</td>
<td>518</td>
</tr>
</tbody>
</table>

Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

Compiler Notes

The inconsistent Compiler version information under Compiler Version section is due to a discrepancy in Intel Compiler.
The correct version of C/C++ compiler is: Version 19.1.1.217 Build 20200306 Compiler for Linux
The correct version of Fortran compiler is: Version 19.1.1.217 Build 20200306 Compiler for Linux

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 = "/191u1/lib/intel64:/191u1/lib/ia32:/191u1/je5.0.1-32"
MALLOC_CONF = "retain:true"
**SPEC CPU®2017 Integer Rate Result**

**ASUSTeK Computer Inc.**
ASUS ESC8000 G4(Z11PG-D24) Server System
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**Test Date:** May-2020  
**Test Sponsor:** ASUSTeK Computer Inc.  
**Hardware Availability:** Feb-2020  
**Tested by:** ASUSTeK Computer Inc.  
**Software Availability:** Apr-2020

**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  
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;  

**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 alloc = Disabled  
SR-IOV Support = Disabled  
CSM Support = Disabled

Sysinfo program /191u1/bin/sysinfo  
Rev: r6365 of 2019-08-21 295195f888a3d7ed1e6e46a485a0011  
running on linux-628j Wed May 27 19:28:23 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

(Continued on next page)
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Platform Notes (Continued)

From /proc/cpuinfo
model name : Intel(R) Xeon(R) Gold 6230R CPU @ 2.10GHz
  2 "physical id"s (chips)
  104 "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 : 26
siblings : 52
physical 0: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 16 17 18 19 20 21 22 24 25 26 27 28 29
physical 1: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 16 17 18 19 20 21 22 24 25 26 27 28 29

From lscpu:
Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
Address sizes: 46 bits physical, 48 bits virtual
CPU(s): 104
On-line CPU(s) list: 0-103
Thread(s) per core: 2
Core(s) per socket: 26
Socket(s): 2
NUMA node(s): 4
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Gold 6230R CPU @ 2.10GHz
Stepping: 7
CPU MHz: 2100.000
CPU max MHz: 4000.0000
CPU min MHz: 1000.0000
BogoMIPS: 4200.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 36608K
NUMA node0 CPU(s): 0-3,7-9,13-15,20-22,52-55,59-61,65-67,72-74
NUMA node1 CPU(s): 4-6,10-12,16-19,23-25,56-58,62-64,68-71,75-77
NUMA node2 CPU(s): 26-29,33-35,39-41,46-48,78-81,85-87,91-93,98-100
NUMA node3 CPU(s): 30-32,36-38,42-45,49-51,82-84,88-90,94-97,101-103
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 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

(Continued on next page)
Platform Notes (Continued)

xtpr pdcmd 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_puin ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vmni
flexpriority ept vpid fsqsbse tsc_adjust bni1 hle avx2 smep bmi2 erms invpcid rtm
cqm mpx rdt_a avx512f avx512dq rdseed adx clflushopt clwb intei_pt avx512cd
avx512bw avx512vl xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm_occu_p_llc cqm_mbm_total
cqm_mbm_local dtherm ida arat pln pts hwp hwp_act_window hwp_epb hwp_pkg_req pku
ospke avx512_vnni md_clear flush_lld arch_capabilities

/proc/cpuinfo cache data
cache size: 36608 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 13 14 15 20 21 22 52 53 54 55 59 60 61 65 66 67 72 73 74
node 0 size: 192077 MB
node 0 free: 191131 MB
node 1 cpus: 4 5 6 10 11 12 16 17 18 19 23 24 25 56 57 58 62 63 64 68 69 70 71 75 76 77
node 1 size: 193530 MB
node 1 free: 192742 MB
node 2 cpus: 26 27 28 29 33 34 35 39 40 41 46 47 48 78 79 80 81 85 86 87 91 92 93 98 99
100
node 2 size: 193530 MB
node 2 free: 192695 MB
node 3 cpus: 30 31 32 36 37 38 42 43 44 45 49 50 51 82 83 84 88 89 90 94 95 96 97 101
102 103
node 3 size: 193500 MB
node 3 free: 192774 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: 791182724 KB
HugePages_Total: 0
Hugepagesize: 2048 KB

From /etc/*release* /etc/*version*
  os-release:
    NAME="SLES"
    VERSION="15-SP1"
    VERSION_ID="15.1"
    PRETTY_NAME="SUSE Linux Enterprise Server 15 SP1"

(Continued on next page)
SPEC CPU®2017 Integer Rate Result
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Test Date: May-2020
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Software Availability: Apr-2020

---

Platform Notes (Continued)

ID="sles"
ID_LIKE="suse"
ANSI_COLOR="0;32"
CPE_NAME="cpe:/o:suse:sles:15:sp1"

uname -a:
Linux linux-628j 4.12.14-195-default #1 SMP Tue May 7 10:55:11 UTC 2019 (8fba516)
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: __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling

run-level 3 May 26 17:51

SPEC is set to: /191u1
Filesystem Type Size Used Avail Use% Mounted on
/dev/sda4 xfs 932G 19G 914G 2% /

From /sys/devices/virtual/dmi/id
BIOS: American Megatrends Inc. 6102 12/19/2019
Vendor: ASUSTeK COMPUTER INC.
Product: Z11PG-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)

(Continued on next page)
Compiler Version Notes (Continued)

Intel(R) C Compiler for applications running on IA-32, Version 2021.1 NextGen
Build 20200304
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 2021.1
NextGen Build 20200304
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

--------------------------------------------------------
| C       | 500.perlbench_r(peak) 557.xz_r(peak) |

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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) |

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| C       | 500.perlbench_r(peak) 557.xz_r(peak) |

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## Compiler Version Notes (Continued)

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

==============================================================================
|      | 500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base, peak) 525.x264_r(base, peak) 557.xz_r(base) |
-----------------------------------------------------------------------------
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NextGen Build 20200304
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-----------------------------------------------------------------------------

==============================================================================
|      | 500.perlbench_r(peak) 557.xz_r(peak) |
-----------------------------------------------------------------------------
Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.1.1.217 Build 20200306
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
-----------------------------------------------------------------------------

==============================================================================
|      | 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 2021.1
NextGen Build 20200304
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
-----------------------------------------------------------------------------

==============================================================================
|      | 548.exchange2_r(base, peak) |
-----------------------------------------------------------------------------
Intel(R) Fortran Intel(R) 64 Compiler for applications running on Intel(R) 64,
Version 19.1.1.217 Build 20200306
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

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Base Compiler Invocation

C benchmarks:
icc
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, multidefs
-xCORE-AVX512 -O3 -ffast-math -fto -mfpmath=sse -funroll-loops
-fuse-ld=gold -qopt-mem-layout-trans=4
-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.1.217/linux/compiler/lib/intel64_lin
-lqkmalloc

C++ benchmarks:
-m64 -qnextgen -Wl, -plugin-opt=-x86-branches-within-32B-boundaries
-Wl, -z, multidefs -xCORE-AVX512 -O3 -ffast-math -fto -mfpmath=sse
-funroll-loops -fuse-ld=gold -qopt-mem-layout-trans=4
-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.1.217/linux/compiler/lib/intel64_lin
-lqkmalloc

Fortran benchmarks:
-m64 -Wl, -plugin-opt=-x86-branches-within-32B-boundaries -Wl, -z, multidefs
-xCORE-AVX512 -O3 -ipo -no-prec-div -qopt-mem-layout-trans=4

(Continued on next page)
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Base Optimization Flags (Continued)

Fortran benchmarks (continued):
- nostandard-realloc-lhs -align array32byte -auto
- mbranches-within-32B-boundaries
- /usr/local/IntelCompiler19/compilers_and_libraries_2020.1.217/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_2020.1.217/linux/compiler/lib/intel64_lin
- lqkmalloc

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

### ASUSTeK Computer Inc. ASUS ESC8000 G4(Z11PG-D24) Server System
(2.10 GHz, Intel Xeon Gold 6230R)

<table>
<thead>
<tr>
<th>SPECrate®2017_int_base</th>
<th>SPECrate®2017_int_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>353</td>
<td>366</td>
</tr>
</tbody>
</table>

| CPU2017 License: | 9016 | Test Date: | May-2020 |
| Test Sponsor:    | ASUSTeK Computer Inc. | Hardware Availability: | Feb-2020 |
| Tested by:       | ASUSTeK Computer Inc. | Software Availability: | Apr-2020 |

### Peak Optimization Flags (Continued)

```plaintext
502.gcc_r: -m32
-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.1.217/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 -m64 -flto
-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
-fuse-ld=gold -qopt-mem-layout-trans=4 -fno-alias
-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.1.217/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_2020.1.217/linux/compiler/lib/intel64_lin
-lqkmalloc

C++ benchmarks:

520.omnetpp_r: basepeak = yes

523.xalancbmk_r: basepeak = yes

531.deepsjeng_r: basepeak = yes

541.leelar_r: basepeak = yes

Fortran benchmarks:

548.exchange2_r: basepeak = yes
```

**The flags files that were used to format this result can be browsed at**

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You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/Intel-ic19.1u1-official-linux64_revA.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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