# SPEC CPU®2017 Integer Speed Result

## ASUSTeK Computer Inc.

ASUS ESC8000 G4(Z11PG-D24) Server System (2.20 GHz, Intel Xeon Gold 5220R)

<table>
<thead>
<tr>
<th>SPECspeed®2017_int_base = 11.9</th>
<th>SPECspeed®2017_int_peak = 12.2</th>
</tr>
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<tbody>
<tr>
<td>CPU2017 License: 9016</td>
<td>Test Date: May-2020</td>
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<td>Test Sponsor: ASUSTeK Computer Inc.</td>
<td>Hardware Availability: Feb-2020</td>
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### Threads

<table>
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<tr>
<th>Benchmark</th>
<th>Threads</th>
</tr>
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<tbody>
<tr>
<td>600.perlbench_s</td>
<td>48</td>
</tr>
<tr>
<td>602.gcc_s</td>
<td>48</td>
</tr>
<tr>
<td>605.mcf_s</td>
<td>48</td>
</tr>
<tr>
<td>620.omnetpp_s</td>
<td>48</td>
</tr>
<tr>
<td>623.xalancbmk_s</td>
<td>48</td>
</tr>
<tr>
<td>625.x264_s</td>
<td>48</td>
</tr>
<tr>
<td>631.deepsjeng_s</td>
<td>48</td>
</tr>
<tr>
<td>641.leela_s</td>
<td>48</td>
</tr>
<tr>
<td>648.exchange2_s</td>
<td>48</td>
</tr>
<tr>
<td>657.xz_s</td>
<td>48</td>
</tr>
</tbody>
</table>

### SPECspeed®2017_int_base (11.9)

### SPECspeed®2017_int_peak (12.2)

### Hardware

- **CPU Name:** Intel Xeon Gold 5220R
- **Max MHz:** 4000
- **Nominal:** 2200
- **Enabled:** 48 cores, 2 chips
- **Orderable:** 1, 2 chip(s)
- **Cache L1:** 32 KB I + 32 KB D on chip per core
- **Cache L2:** 1 MB I+D on chip per core
- **Cache L3:** 35.75 MB I+D on chip per chip
- **Other:** None
- **Memory:** 768 GB (24 x 32 GB 2Rx4 PC4-2933Y-R, running at 2666)
- **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:** Yes
- **Firmware:** Version 6102 released Dec-2019
- **File System:** xfs
- **System State:** Run level 3 (multi-user)
- **Base Pointers:** 64-bit
- **Peak Pointers:** 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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SPECSpeed®2017_int_base = 11.9
SPECSpeed®2017_int_peak = 12.2

Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>600.perlbench_s</td>
<td>48</td>
<td>251</td>
<td>7.06</td>
<td>253</td>
<td>7.02</td>
<td>251</td>
<td>7.07</td>
<td>48</td>
<td>218</td>
<td>8.14</td>
<td>217</td>
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<tr>
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<td>356</td>
<td>11.2</td>
<td>357</td>
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<td>347</td>
<td>11.5</td>
<td>341</td>
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<tr>
<td>620.omnetpp_s</td>
<td>48</td>
<td>143</td>
<td>11.4</td>
<td>145</td>
<td>11.2</td>
<td>144</td>
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<td>143</td>
<td>11.4</td>
<td>144</td>
<td>11.3</td>
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<tr>
<td>625.x264_s</td>
<td>48</td>
<td>104</td>
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<td>631.deepsjeng_s</td>
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<td>236</td>
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<td>641.leela_s</td>
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<td>338</td>
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<td>339</td>
<td>5.03</td>
<td>339</td>
<td>5.03</td>
<td>338</td>
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<tr>
<td>648.exchange2_s</td>
<td>48</td>
<td>169</td>
<td>17.3</td>
<td>169</td>
<td>17.4</td>
<td>169</td>
<td>17.4</td>
<td>48</td>
<td>169</td>
<td>17.3</td>
<td>169</td>
<td>17.4</td>
<td>169</td>
</tr>
<tr>
<td>657.xz_s</td>
<td>48</td>
<td>248</td>
<td>24.9</td>
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<td>25.0</td>
<td>48</td>
<td>248</td>
<td>24.9</td>
<td>248</td>
<td>25.0</td>
<td>248</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

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:
KMP_AFFINITY = "granularity=fine,scatter"
LD_LIBRARY_PATH = "/191u1/lib/intel64:/191u1/je5.0.1-64"
MALLOC_CONF = "retain:true"
OMP_STACKSIZE = "192M"

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:

(Continued on next page)
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| SPECspeed®2017_int_base = 11.9 |
| SPECspeed®2017_int_peak = 12.2 |

General Notes (Continued)

```bash
sync; echo 3> /proc/sys/vm/drop_caches
```

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
HyperThreading = Disabled
CSM Support = Disabled
Engine Boost = Level3(Max)
SR-IOV Support = Disabled
LLC dead line allc = Disabled

Sysinfo program /191u1/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7ed61e646a485a0011
running on linux-628j Thu May 21 09:37:04 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
```bash
model name : Intel(R) Xeon(R) Gold 5220R CPU @ 2.20GHZ
  2 "physical id"s (chips)
  48 "processors"
core, 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 : 24
  physical 0: cores 0 1 2 3 4 5 6 9 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29
  physical 1: cores 0 1 2 3 4 5 6 9 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29
```

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**SPECspeed®2017_int_base = 11.9**

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### Platform Notes (Continued)

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):** 48
- **On-line CPU(s) list:** 0-47
- **Thread(s) per core:** 1
- **Core(s) per socket:** 24
- **Socket(s):** 2
- **NUMA node(s):** 2
- **Vendor ID:** GenuineIntel
- **CPU family:** 6
- **Model:** 85
- **Model name:** Intel(R) Xeon(R) Gold 5220R CPU @ 2.20GHz
- **Stepping:** 7
- **CPU MHz:** 2200.000
- **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:** 36608K
- **NUMA node0 CPU(s):** 0-23
- **NUMA node1 CPU(s):** 24-47

**Flags:**
- `fpu vme de pse tsc msr pae mce cmov pat pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdelgb rdtscl ml 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_pppin ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vnmi flexpriority ept vpid fsgsbase ts_adjusr bmi1 hle avx2 smep bmi2 erms invpcid rdmsqm mpx rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd avx512bw avx512vl xsaves xsaveopt xsave xgetbv1 xsavec cqm_llc cqm_occup_llc cqm_mbm_total cqm_mmb_local dtherm ida arat pln pts hwp hwp_act_window hwp_epp hwp_pkg_req pku ospke avx512_vnni md_clear flush_l1d 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:** 2 nodes (0-1)

(Continued on next page)
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Platform Notes (Continued)

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
node 0 size: 385584 MB
node 0 free: 378620 MB
node 1 cpus: 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47
node 1 size: 387066 MB
node 1 free: 377883 MB
node distances:
node 0 1
0:  10  21
1:  21  10

From /proc/meminfo
MemTotal:       791194340 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"
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 20 22:24

SPEC is set to: /191u1

Filesystem     Type  Size  Used Avail Use% Mounted on
/dev/sda4      xfs   932G  36G  897G  4% /

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Platform Notes (Continued)

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 | 600.perlbench_s(base) 602.gcc_s(base, peak) 605.mcf_s(base, peak)
  | 625.x264_s(base, peak) 657.xz_s(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.
==============================================================================
C | 600.perlbench_s(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.
==============================================================================
C | 600.perlbench_s(base) 602.gcc_s(base, peak) 605.mcf_s(base, peak)
  | 625.x264_s(base, peak) 657.xz_s(base, peak)
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<th>600.perlbench_s(peak)</th>
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Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,  
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<table>
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<tr>
<th>C++</th>
<th>620.omnetpp_s(base, peak) 623.xalancbmk_s(base, peak) 631.deepsjeng_s(base, peak) 641.leela_s(base, peak)</th>
</tr>
</thead>
</table>

Intel(R) C++ Compiler for applications running on Intel(R) 64, Version 2021.1  
NextGen Build 20200304  
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<table>
<thead>
<tr>
<th>Fortran</th>
<th>648.exchange2_s(base, peak)</th>
</tr>
</thead>
</table>

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.  

Base Compiler Invocation  

C benchmarks:  
icc  
C++ benchmarks:  
icpc  
Fortran benchmarks:  
ifort  

Base Portability Flags  

600.perlbench_s: -DSPEC_LP64 -DSPEC_LINUX_X64  
602.gcc_s: -DSPEC_LP64  
605.mcf_s: -DSPEC_LP64  
620.omnetpp_s: -DSPEC_LP64  
623.xalancbmk_s: -DSPEC_LP64 -DSPEC_LINUX  
625.x264_s: -DSPEC_LP64  

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Base Portability Flags (Continued)

631.deepsjeng_s: -DSPEC_LP64
641.leela_s: -DSPEC_LP64
648.exchange2_s: -DSPEC_LP64
657.xz_s: -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
-fuse-ld=gold -qopt-mem-layout-trans=4 -fopenmp -DSPEC_OPENMP
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

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 -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 -xCORE-AVX512
-O3 -ipo -no-prec-div -qopt-mem-layout-trans=4
-nostandard-realloc-lhs -align array32byte
-mbranches-within-32B-boundaries

Peak Compiler Invocation

C benchmarks:
icc

C++ benchmarks:
icpc

Fortran benchmarks:
ifort
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Software Availability: Apr-2020

Peak Portability Flags

600.perlbench_s: -DSPEC_LP64 -DSPEC_LINUX_X64
602.gcc_s: -DSPEC_LP64(*) -DSPEC_LP64
605.mcf_s: -DSPEC_LP64
620.omnetpp_s: -DSPEC_LP64
623.xalancbmk_s: -DSPEC_LP64 -DSPEC_LINUX
625.x264_s: -DSPEC_LP64
631.deepsjeng_s: -DSPEC_LP64
641.leea_s: -DSPEC_LP64
648.exchange2_s: -DSPEC_LP64
657.xz_s: -DSPEC_LP64

(*) Indicates a portability flag that was found in a non-portability variable.

Peak Optimization Flags

C benchmarks:

600.perlbench_s: -Wl, -z, muldefs -prof-gen(pass 1) -prof-use(pass 2)
-xCORE-AVX512 -ipo -03 -no-prec-div
-qopt-mem-layout-trans=4 -fno-strict-overflow
-mbranches-within-32B-boundaries
-1/usr/local/jemalloc64-5.0.1/lib -ljemalloc

602.gcc_s: -m64 -qnextgen -std=c11 -fuse-ld=gold
-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) -03 -ffast-math -qopt-mem-layout-trans=4
-1/usr/local/jemalloc64-5.0.1/lib -ljemalloc

605.mcf_s: basepeak = yes

620.omnetpp_s: basepeak = yes

(Continued on next page)
ASUSTeK Computer Inc.
ASUS ESC8000 G4(Z11PG-D24) Server System (2.20 GHz, Intel Xeon Gold 5220R)

SPECspeed\textsuperscript{®}2017\textunderscore int\textunderscore peak = 12.2
SPECspeed\textsuperscript{®}2017\textunderscore int\textunderscore base = 11.9

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

Test Date: May-2020
Hardware Availability: Feb-2020
Software Availability: Apr-2020

Peak Optimization Flags (Continued)

623.xalancbmk\_s: basepeak = yes
631.deepsjeng\_s: basepeak = yes
641.leela\_s: basepeak = yes

Fortran benchmarks:
648.exchange2\_s: basepeak = yes

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

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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