### Hardware

- **CPU Name:** Intel Xeon Gold 6226R
- **Max MHz:** 3900
- **Nominal:** 2900
- **Enabled:** 32 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:** 22 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

---

### SPEC CPU®2017 Integer Rate Result

**ASUSTeK Computer Inc.**
ASUS ESC8000 G4(Z11PG-D24) Server System
(2.90 GHz, Intel Xeon Gold 6226R)

**CPU2017 License:** 9016
**Test Date:** Jun-2020
**Test Sponsor:** ASUSTeK Computer Inc.
**Hardware Availability:** Feb-2020

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

**SPECrate®2017_int_base = 252**
**SPECrate®2017_int_peak = 261**

**Tested Hardware System:**

- **ASUS ESC8000 G4(Z11PG-D24) Server System**
- **CPU2017 License:** 9016
- **Test Date:** Jun-2020
- **Test Sponsor:** ASUSTeK Computer Inc.
- **Hardware Availability:** Feb-2020
- **Tested by:** ASUSTeK Computer Inc.
- **Software Availability:** Apr-2020

**Tested Software System:**

- **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;
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- **Firmware:** Version 6102 released Dec-2019
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- **Peak Pointers:** 32/64-bit
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**Copies**

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SPEC CPU®2017 Integer Rate Result

ASUSTeK Computer Inc.

ASUS ESC8000 G4(Z11PG-D24) Server System
(2.90 GHz, Intel Xeon Gold 6226R)

SPECrate®2017_int_base = 252

SPECrate®2017_int_peak = 261

Results Table

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</table>

SPECrate®2017_int_base = 252

SPECrate®2017_int_peak = 261

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"
MALLOCONF_CONF = "retain:true"
ASUSTeK Computer Inc.
ASUS ESC8000 G4(Z11PG-D24) Server System
(2.90 GHz, Intel Xeon Gold 6226R)

SPECrate®2017_int_base = 252
SPECrate®2017_int_peak = 261

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

Test Date: Jun-2020
Hardware Availability: Feb-2020
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;
sources available from jemalloc.net or

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 /191u1/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7ed1be6e46a485a0011
running on linux-628j Thu Jun 18 23:32:38 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)
SPEC CPU®2017 Integer Rate Result

ASUSTeK Computer Inc.
ASUS ESC8000 G4(Z11PG-D24) Server System
(2.90 GHz, Intel Xeon Gold 6226R)

| SPECrate®2017_int_base = 252 |
| SPECrate®2017_int_peak = 261 |

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

**Platform Notes (Continued)**

From /proc/cpuinfo

```
  model name : Intel(R) Xeon(R) Gold 6226R CPU @ 2.90GHz
  2 "physical id"s (chips)
  64 "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 : 16
  siblings  : 32
  physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
  physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
```

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): 64
  On-line CPU(s) list: 0-63
  Thread(s) per core: 2
  Core(s) per socket: 16
  Socket(s): 2
  NUMA node(s): 4
  Vendor ID: GenuineIntel
  CPU family: 6
  Model: 85
  Model name: Intel(R) Xeon(R) Gold 6226R CPU @ 2.90GHz
  Stepping: 7
  CPU MHz: 2900.000
  CPU max MHz: 3900.0000
  CPU min MHz: 1200.0000
  BogoMIPS: 5800.00
  Virtualization: VT-x
  L1d cache: 32K
  L1i cache: 32K
  L2 cache: 1024K
  L3 cache: 22528K
  NUMA node0 CPU(s): 0-3,8-11,32-35,40-43
  NUMA node1 CPU(s): 4-7,12-15,36-39,44-47
  NUMA node2 CPU(s): 16-19,24-27,48-51,56-59
  NUMA node3 CPU(s): 20-23,28-31,52-55,60-63
  Flags: fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov
```

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

**ASUS Computer Inc.**

ASUS ESC8000 G4(Z11PG-D24) Server System

(2.90 GHz, Intel Xeon Gold 6226R)

**SPECrate®2017_int_base = 252**

**SPECrate®2017_int_peak = 261**

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<td>Jun-2020</td>
<td>Feb-2020</td>
<td>ASUSTeK Computer Inc.</td>
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<td>Tested by</td>
<td></td>
<td></td>
<td>ASUSTeK Computer Inc.</td>
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</tbody>
</table>

---

### Platform Notes (Continued)

invpcid_single intel_pinn ssbd mba ibrs ibbp 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 xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbb_total
cqm_mbb_local dtherm ida arat pln pts hwp hwp_act_window hwp_epp hwp_pkg_req pku
ospke avx512_vnni md_clear flush_lld arch_capabilities

/proc/cpuinfo cache data
cache size : 22528 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 8 9 10 11 12 13 14 15 32 33 34 35 40 41 42 43
node 0 size: 192079 MB
node 0 free: 191781 MB
node 1 cpus: 4 5 6 7 12 13 14 15 36 37 38 39 44 45 46 47
node 1 size: 193532 MB
node 1 free: 193177 MB
node 2 cpus: 16 17 18 19 24 25 26 27 48 49 50 51 56 57 58 59
node 2 size: 193532 MB
node 2 free: 193294 MB
node 3 cpus: 20 21 22 23 28 29 30 31 52 53 54 55 60 61 62 63
node 3 size: 193502 MB
node 3 free: 193248 MB
node distances:

node 0 1 2 3
0:  10 11 21 21
1:  10 11 21 21
2:  21 21 10 11
3:  21 21 11 10

From /proc/meminfo
MemTotal:       791190944 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"

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

ASUSTeK Computer Inc.
ASUS ESC8000 G4(Z11PG-D24) Server System
(2.90 GHz, Intel Xeon Gold 6226R)

SPECrat®2017_int_base = 252
SPECrat®2017_int_peak = 261

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

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

Platform Notes (Continued)

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 Jun 18 23:31

SPEC is set to: /191u1
Filesystem     Type  Size  Used Avail Use% Mounted on
/dev/sda4      xfs   932G   27G  905G   3% /

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)
==============================================================================

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.

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

<table>
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<td>Intel(R) C Compiler for applications running on Intel(R) 64, Version 2021.1 NextGen Build 20200304</td>
<td>(C) 1985-2020 Intel Corporation. All rights reserved.</td>
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ASUSTeK Computer Inc.  
ASUS ESC8000 G4(Z11PG-D24) Server System  
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SPECrater®2017_int_base = 252
SPECrater®2017_int_peak = 261

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)
==============================================================================

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++     | 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.

==============================================================================
Fortran | 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.

Base Compiler Invocation

C benchmarks:
icc

C++ benchmarks:
icpc

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

ASUSTeK Computer Inc.
ASUS ESC8000 G4(Z11PG-D24) Server System
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SPECrate®2017_int_base = 252
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CPU2017 License: 9016
Test Sponsor: ASUSTeK Computer Inc.
Tested by: ASUSTeK Computer Inc.
Test Date: Jun-2020
Hardware Availability: Feb-2020
Software Availability: Apr-2020

Base Compiler Invocation (Continued)

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 -gnextgen -std=c11
-Wl,-plugin-opt=-x86-bran ches-withi n-32B-boundaries -Wl,-z,muldefs
-xCORE-AVX512 -O3 -ffast-math -ftlo -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 -gnextgen -Wl,-plugin-opt=-x86-bran ches-withi n-32B-boundaries
-Wl,-z,muldefs -xCORE-AVX512 -O3 -ffast-math -ftlo -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-bran ches-withi n-32B-boundaries -Wl,-z,muldefs
-xCORE-AVX512 -O3 -ipo -no-prec-div -qopt-mem-layout-trans=4
-nostandard-realloc-lhs -align array32byte -auto
-mbranches-within-32B-boundaries
-L/usr/local/IntelCompiler19/compilers_and_libraries_2020.1.217/linux/compiler/lib/intel64_lin
-lqkmalloc
### SPEC CPU®2017 Integer Rate Result

**ASUSTeK Computer Inc.**  
ASUS ESC8000 G4(Z11PG-D24) Server System  
(2.90 GHz, Intel Xeon Gold 6226R)  

<table>
<thead>
<tr>
<th>SPECrate®2017_int_base</th>
<th>252</th>
</tr>
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<tbody>
<tr>
<td>SPECrate®2017_int_peak</td>
<td>261</td>
</tr>
</tbody>
</table>

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

**Test Date:** Jun-2020  
**Hardware Availability:** Feb-2020  
**Software Availability:** Apr-2020

---

#### Peak Compiler Invocation

**C benchmarks:**  
`icc`

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

**Fortran benchmarks:**  
`ifort`

---

#### Peak Portability Flags

- **C benchmarks:**
  - `perlbench_r`: `-DSPEC_LP64` `-DSPEC_LINUX_X64`
  - `gcc_r`: `-D_FILE_OFFSET_BITS=64`
  - `mcf_r`: `-DSPEC_LP64`
  - `omnetpp_r`: `-DSPEC_LP64`
  - `xalancbmk_r`: `-DSPEC_LP64` `-DSPEC_LINUX`
  - `x264_r`: `-DSPEC_LP64`
  - `deepsjeng_r`: `-DSPEC_LP64` `-DSPEC_LINUX`
  - `leela_r`: `-DSPEC_LP64` `-DSPEC_LINUX`
  - `exchange2_r`: `-DSPEC_LP64` `-DSPEC_LINUX`
  - `xz_r`: `-DSPEC_LP64` `-DSPEC_LINUX`

---

#### Peak Optimization Flags

- **C benchmarks:**
  - `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`
  
  `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` `-qnextgen` `-fuse-ld=gold`  
  `-qopt-mem-layout-trans=4` `-L/usr/local/jemalloc32-5.0.1/lib` `-ljemalloc`

(Continued on next page)
ASUSTeK Computer Inc.  
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<td>= 261</td>
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</tbody>
</table>

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Peak Optimization Flags (Continued)

505.mcf_r: basepeak = yes

525.x264_r: -m64 -gnextgen -std=c11
-1, -plugin-opt=-x86-branches-within-32B-boundaries
-x1, -z, multefs -xCORE-AVX512 -flto -03 -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: -1, -z, multefs -xCORE-AVX512 -ipo -03 -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.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


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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