ASUSTeK Computer Inc.
ASUS ESC8000 G4(Z11PG-D24) Server System
(3.60 GHz, Intel Xeon Gold 6256)

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

- Test Date: Apr-2020
- Hardware Availability: Feb-2020
- Software Availability: Sep-2019

Hardware
CPU Name: Intel Xeon Gold 6256
Max MHz: 4500
Nominal: 3600
Enabled: 24 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: 33 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
Compiler: C/C++: Version 19.0.5.281 of Intel C/C++ Compiler Build 20190815 for Linux;
Fortran: Version 19.0.5.281 of Intel Fortran Compiler Build 20190815 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>
<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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<td>467</td>
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<tr>
<td>531.deepsjeng_r</td>
<td>48</td>
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<td>312</td>
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<td>541.leela_r</td>
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<td>548.exchange2_r</td>
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<td>131</td>
<td>396</td>
<td>131</td>
<td>396</td>
<td>131</td>
</tr>
</tbody>
</table>

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 = 
MALLOCS_CONF = "retain:true"

General Notes

Binaries compiled on a system with 1x Intel Core i9-9900K 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:
General Notes (Continued)

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 /spec2017_19u5/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7edbb6e46a485a0011
running on linux-628j Tue Apr 14 01:27:56 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 6256 CPU @ 3.60GHz
   2  "physical id"s (chips)
   48 "processors"

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

Copyright 2017-2021 Standard Performance Evaluation Corporation

ASUSTeK Computer Inc.
ASUS ESC8000 G4(Z11PG-D24) Server System
(3.60 GHz, Intel Xeon Gold 6256)

SPECrate®2017_int_base = 214
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CPU2017 License: 9016
Test Date: Apr-2020
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Software Availability: Sep-2019

Platform Notes (Continued)

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 : 12
siblings : 24
physical 0: cores 0 3 10 12 13 16 17 21 25 26 27 29
physical 1: cores 2 4 5 9 11 13 16 18 21 24 26 28

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: 2
Core(s) per socket: 12
Socket(s): 2
NUMA node(s): 4
Vendor ID: GenuineIntel
CPU family: 6
Model: 85
Model name: Intel(R) Xeon(R) Gold 6256 CPU @ 3.60GHz
Stepping: 7
CPU MHz: 3600.000
CPU max MHz: 4500.0000
CPU min MHz: 1200.0000
BogoMIPS: 7200.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 33792K
NUMA node0 CPU(s): 0,2,5,6,8,9,24,26,29,30,32,33
NUMA node1 CPU(s): 1,3,4,7,10,11,25,27,28,31,34,35
NUMA node2 CPU(s): 12,15,18,19,21,22,36,39,42,43,45,46
NUMA node3 CPU(s): 13,14,16,17,20,23,37,38,40,41,44,47
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 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 xtrm 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_pentium ssbd mba ibrs ibpb 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 xsaves cqm_llc cqm_occcll cqm_mbb_total cqm_mbb_local dtherm ida arat pln pts hwp hwp_act_window hwp_epp hwp_pkg_req pku

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

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Platform Notes (Continued)

ospke avx512_vnni md_clear flush_l1d arch_capabilities

/proc/cpuinfo cache data
cache size : 33792 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 2 5 6 8 9 24 26 29 30 32 33
node 0 size: 192080 MB
node 0 free: 191450 MB
node 1 cpus: 1 3 4 7 10 11 25 27 28 31 34 35
node 1 size: 193533 MB
node 1 free: 193096 MB
node 2 cpus: 12 15 18 19 21 22 36 39 42 43 45 46
node 2 size: 193533 MB
node 2 free: 193096 MB
node 3 cpus: 13 14 16 17 20 23 37 38 40 41 44 47
node 3 size: 193503 MB
node 3 free: 193055 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:       791194000 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

(Continued on next page)
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Platform Notes (Continued)

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 Apr 13 19:25

SPEC is set to: /spec2017_19u5

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)
The build date 20190815 in sw_compiler is correct for the IC compiler.
The build_date in Compiler Version Notes is incorrect.

Compiler Version Notes

C       | 502.gcc_r(peak)

Intel(R) C Compiler for applications running on IA-32, Version 19.0.5 NextGen Technology Build 20190729
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

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

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 19.0.5
NextGen Technology Build 20190729
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
----------------------------------------------------------------------------------

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

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

Intel(R) C Compiler for applications running on Intel(R) 64, Version 19.0.5.281 Build 20190815
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
----------------------------------------------------------------------------------

C      | 502.gcc_r(peak)

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

Intel(R) C Compiler for applications running on IA-32, Version 19.0.5 NextGen
Technology Build 20190729
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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 19.0.5
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----------------------------------------------------------------------------------

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

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

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C      | 502.gcc_r(peak)

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

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Compiler Version Notes (Continued)

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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 19.0.5  
NextGen Technology Build 20190729  
Copyright (C) 1985-2019 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 19.0.5.281 Build 20190815  
Copyright (C) 1985-2019 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 19.0.5  
NextGen Technology Build 20190729  
Copyright (C) 1985-2019 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 19.0.5.281 Build 20190815  
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.

Base Compiler Invocation

C benchmarks:  
icc

C++ benchmarks:  
icpc

Fortran benchmarks:  
ifort
## SPEC CPU®2017 Integer Rate Result

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### Base Portability Flags

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<td>500.perlbench_r</td>
<td>-DSPEC_LP64 -DSPEC_LINUX_X64</td>
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<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>557.xz_r</td>
<td>-DSPEC_LP64</td>
</tr>
</tbody>
</table>

### Base Optimization Flags

#### C benchmarks:

```bash
-m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -flto  
-mfpmath=sse -funroll-loops -qnextgen -fuse-ld=gold  
-qopt-mem-layout-trans=4  
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.5.281/linux/compiler/lib/intel64_lin  
-lqkmalloc
```

#### C++ benchmarks:

```bash
-m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -flto -mfpmath=sse  
-funroll-loops -qnextgen -fuse-ld=gold -qopt-mem-layout-trans=4  
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.5.281/linux/compiler/lib/intel64_lin  
-lqkmalloc
```

#### Fortran benchmarks:

```bash
-m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ipo -no-prec-div  
-qopt-mem-layout-trans=4 -nostandard-realloc-lhs  
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.5.281/linux/compiler/lib/intel64_lin  
-lqkmalloc
```

### Peak Compiler Invocation

#### C benchmarks:

- icc

#### C++ benchmarks:

- icpc

#### Fortran benchmarks:

- ifort
### SPEC CPU®2017 Integer Rate Result

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**Software Availability:** Sep-2019

---

#### 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  
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.5.281/linux/compiler/lib/intel64_lin  
-lqkmalloc

502.gcc_r: -m32  
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.5.281/linux/compiler/lib/ia32_lin  
-std=gnu89 -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/je5.0.1-32/lib  
-ljemalloc

505.mcf_r: basepeak = yes

525.x264_r: -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -flto -O3  
-ffast-math -qnextgen -fuse-ld=gold  
-qopt-mem-layout-trans=4 -fno-alias  
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.5.281/linux/compiler/lib/intel64_lin  
-lqkmalloc

557.xz_r: -Wl,-z,muldefs -xCORE-AVX512 -ipo -O3 -no-prec-div  
-qopt-mem-layout-trans=4  
-L/usr/local/IntelCompiler19/compilers_and_libraries_2019.5.281/linux/compiler/lib/intel64_lin  
-lqkmalloc

**C++ benchmarks:**

(Continued on next page)
ASUSTeK Computer Inc.
ASUS ESC8000 G4(Z11PG-D24) Server System
(3.60 GHz, Intel Xeon Gold 6256)

SPECrate®2017_int_base = 214
SPECrate®2017_int_peak = 222

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

Test Date: Apr-2020
Hardware Availability: Feb-2020
Software Availability: Sep-2019

Peak Optimization Flags (Continued)

520.omnetpp_r: basepeak = yes

523.xalancbmk_r: basepeak = yes

531.deepsjeng_r: -m64 -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
-lqkmalloc

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: