## SPEC CPU®2017 Floating Point Speed Result

### ASUSTeK Computer Inc.

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

<table>
<thead>
<tr>
<th>SPECspeed®2017_fp_base</th>
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<tr>
<td>SPECspeed®2017_fp_peak</td>
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**CPU2017 License:** 9016  
**Test Sponsor:** ASUSTeK Computer Inc.  
**Test Date:** Jun-2020  
**Hardware Availability:** Feb-2020  
**Tested by:** ASUSTeK Computer Inc.  
**Software Availability:** Sep-2019

### Hardware

- **CPU Name:** Intel Xeon Gold 6226R  
  - **Max MHz:** 3900  
  - **Nominal:** 2900  
  - **Enabled:** 32 cores, 2 chips  
  - **Orderable:** 1, 2 chip(s)  
  - **Cache L1:** 32 KB I + 32 KB D on chip per core  
  - **L1:** 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 19.0.5.281 of Intel C/C++ Compiler Build 20190815 for Linux; Fortran: Version 19.0.5.281 of Intel Fortran Compiler Build 20190815 for Linux  
  - **Parallel:** 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:** None  
  - **Power Management:** BIOS and OS set to prefer performance at the cost of additional power usage
### Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Base</th>
<th></th>
<th></th>
<th></th>
<th>Peak</th>
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<td>603.bwaves_s</td>
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<td>169</td>
<td>93.4</td>
<td>168</td>
<td>93.3</td>
<td>169</td>
</tr>
</tbody>
</table>

### 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,compact"
- LD_LIBRARY_PATH = "/190u5/lib/intel64"
- OMP_STACKSIZE = "192M"

### 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:
```
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.
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**Test Date:** Jun-2020  
**Test Sponsor:** ASUSTeK Computer Inc.  
**Tested by:** ASUSTeK Computer Inc.  
**Hardware Availability:** Feb-2020  
**Software Availability:** Sep-2019  

### 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)  
Enforce POR = Disable  
Memory Frequency = 2933  
LLC dead line allc = Disabled  
SR-IOV Support = Disabled

Sysinfo program /190u5/bin/sysinfo  
Rev: r6365 of 2019-08-21 295195f888a3d7edbble6e46a485a0011  
running on linux-628j Tue Jun 16 10:28:50 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 6226R CPU @ 2.90GHz
- 2 "physical id"s (chips)
- 32 "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 : 16
  - 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): 32
- On-line CPU(s) list: 0-31
- Thread(s) per core: 1
- Core(s) per socket: 16
- Socket(s): 2
- NUMA node(s): 2
- Vendor ID: GenuineIntel
- CPU family: 6
- Model: 85
- Model name: Intel(R) Xeon(R) Gold 6226R CPU @ 2.90GHz
- Stepping: 7

(Continued on next page)
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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): 0-15
NUMA node1 CPU(s): 16-31
Flags: fpu vme de pse tsc msr pae 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 xtrunc pdcmt pclid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c rdrand lahf_lm ablp 3nowprefetch cpuid_fault epb cat_l3 cdp_l3 invpcid_single intel_pimp ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vnmi flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid rtm cmx mpbx rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd avx512bw avx512vl xsaveopt xsavec 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_l1d arch_capabilities

/platform/cpupinfo cache data
cache size: 22528 KB

From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a physical chip.
available: 2 nodes (0-1)
node 0 cpus: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
node 0 size: 385615 MB
node 0 free: 384223 MB
node 1 cpus: 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
node 1 size: 387038 MB
node 1 free: 386649 MB
node distances:
node 0 1
0: 10 21
1: 21 10

From /proc/meminfo
MemTotal: 791197948 KB
HugePages_Total: 0
Hugepagesize: 2048 KB

From /etc/*release* /etc/*version*

(Continued on next page)
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Platform Notes (Continued)

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 Jun 15 18:05

SPEC is set to: /190u5

Filesystem Type Size Used Avail Use% Mounted on
/dev/sda4 xfs 932G 29G 904G 4% /

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)
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Compiler Version Notes  

==============================================================================  
| C               | 619.lbm_s(base, peak) 638.imagick_s(base, peak) 644.nab_s(base, 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++, C, Fortran | 607.cactuBSSN_s(base, 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.  
| 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.  
| 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.  
|-----------------|------------------------  
| Fortran          | 603.bwaves_s(base, peak) 649.fotonik3d_s(base, peak) 654.roms_s(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.  
|-----------------|------------------------  
| Fortran, C      | 621.wrf_s(base, peak) 627.cam4_s(base, peak) 628.pop2_s(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.  
| Intel(R) C Intel(R) 64 Compiler for applications running on Intel(R) 64,  
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|-----------------|------------------------  

Page 6  
Standard Performance Evaluation Corporation (info@spec.org)  
https://www.spec.org/
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---

### Base Compiler Invocation

C benchmarks:

```bash
cce
```

Fortran benchmarks:

```bash
ifort
```

Benchmarks using both Fortran and C:

```bash
ifort icc
```

Benchmarks using Fortran, C, and C++:

```bash
icpc icc ifort
```

---

### Base Portability Flags

603.bwaves_s: -DSPEC_LP64  
607.cactuBSSN_s: -DSPEC_LP64  
619.lbm_s: -DSPEC_LP64  
621.wrf_s: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian  
627.cam4_s: -DSPEC_LP64 -DSPEC_CASE_FLAG  
628.pop2_s: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian  
-assume byterecl  
638.imagick_s: -DSPEC_LP64  
644.nab_s: -DSPEC_LP64  
649.fotonik3d_s: -DSPEC_LP64  
654.roms_s: -DSPEC_LP64

---

### Base Optimization Flags

C benchmarks:

```bash
-m64 -std=c11 -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
```

Fortran benchmarks:

```bash
-m64 -DSPEC_OPENMP -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -nostandard-realloc-lhs
```

Benchmarks using both Fortran and C:

```bash
-m64 -std=c11 -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP -nostandard-realloc-lhs
```

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Base Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++:
```
-m64 -std=c11 -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch
-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP
-nostandard-realloc-lhs
```

Peak Compiler Invocation

C benchmarks:
```
icc
```

Fortran benchmarks:
```
ifort
```

Benchmarks using both Fortran and C:
```
ifort icc
```

Benchmarks using Fortran, C, and C++:
```
icpc icc ifort
```

Peak Portability Flags

Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:
```
619.lbm_s: basepeak = yes
638.imagick_s: basepeak = yes
```

```
644.nab_s: -m64 -std=c11 -xCORE-AVX512 -ipo -O3 -no-prec-div
-qopt-prefetch -ffinite-math-only -qopt-mem-layout-trans=4
-qopenmp -DSPEC_OPENMP
```

Fortran benchmarks:
```
603.bwaves_s: -m64 -prof-gen(pass 1) -prof-use(pass 2)
-DSPEC_SUPPRESS_OPENMP -DSPEC_OPENMP -O2 -xCORE-AVX512
-qopt-prefetch -ipo -O3 -ffinite-math-only -no-prec-div
```

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Peak Optimization Flags (Continued)

603.bwaves_s (continued):
- qopt-mem-layout-trans=4 - qopenmp - nostandard-realloc-lhs

649.fotonik3d_s: Same as 603.bwaves_s

654.roms_s: basepeak = yes

Benchmarks using both Fortran and C:

621.wrf_s: -m64 -std=c11 -prof-gen(pass 1) -prof-use(pass 2) -O2
-xCORE-AVX512 - qopt-prefetch -ipo -O3 -ffinite-math-only
-no-prec-div - qopt-mem-layout-trans=4
-DSPEC_SUPPRESS_OPENMP - qopenmp -DSPEC_OPENMP
-nostandard-realloc-lhs

627.cam4_s: -m64 -std=c11 -xCORE-AVX512 -ipo -O3 -no-prec-div
- qopt-prefetch -ffinite-math-only - qopt-mem-layout-trans=4
- qopenmp -DSPEC_OPENMP - nostandard-realloc-lhs

628.pop2_s: Same as 621.wrf_s

Benchmarks using Fortran, C, and C++:

607.cactuBSSN_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:

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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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