ASUSTeK Computer Inc.
ASUS RS720-E9(Z11PP-D24) Server System
(3.40 GHz, Intel Xeon Gold 6246R)

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

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

Threads

| Test   | Threads | 0 | 30.0 | 60.0 | 90.0 | 120 | 150 | 180 | 210 | 240 | 270 | 300 | 330 | 360 | 390 | 420 | 450 | 480 | 510 | 540 | 570 | 600 | 630 | 660 | 690 | 720 | 750 | 780 |
|--------|---------|---|------|------|------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| 621.wrf_s | 32 | 96.3 | 96.3 | 96.3 | 96.3 | 96.3 | 96.3 | 96.3 | 96.3 | 96.3 | 96.3 | 96.3 | 96.3 | 96.3 | 96.3 | 96.3 | 96.3 | 96.3 | 96.3 | 96.3 | 96.3 | 96.3 | 96.3 | 96.3 | 96.3 |
| 627.cam4_s | 32 | 75.0 | 75.0 | 75.0 | 75.0 | 75.0 | 75.0 | 75.0 | 75.0 | 75.0 | 75.0 | 75.0 | 75.0 | 75.0 | 75.0 | 75.0 | 75.0 | 75.0 | 75.0 | 75.0 | 75.0 | 75.0 | 75.0 | 75.0 | 75.0 |
| 628.pop2_s | 32 | 125 | 125 | 125 | 125 | 125 | 125 | 125 | 125 | 125 | 125 | 125 | 125 | 125 | 125 | 125 | 125 | 125 | 125 | 125 | 125 | 125 | 125 | 125 | 125 | 125 | 125 |
| 644.nab_s | 32 | 93.2 | 93.2 | 93.2 | 93.2 | 93.2 | 93.2 | 93.2 | 93.2 | 93.2 | 93.2 | 93.2 | 93.2 | 93.2 | 93.2 | 93.2 | 93.2 | 93.2 | 93.2 | 93.2 | 93.2 | 93.2 | 93.2 | 93.2 | 93.2 |
| 649.fotonik3d_s | 32 | 94.7 | 94.7 | 94.7 | 94.7 | 94.7 | 94.7 | 94.7 | 94.7 | 94.7 | 94.7 | 94.7 | 94.7 | 94.7 | 94.7 | 94.7 | 94.7 | 94.7 | 94.7 | 94.7 | 94.7 | 94.7 | 94.7 | 94.7 | 94.7 |
| 654.roms_s | 32 | 194 | 194 | 194 | 194 | 194 | 194 | 194 | 194 | 194 | 194 | 194 | 194 | 194 | 194 | 194 | 194 | 194 | 194 | 194 | 194 | 194 | 194 | 194 | 194 | 194 | 194 |

Hardware

CPU Name: Intel Xeon Gold 6246R
Max MHz: 4100
Nominal: 3400
Enabled: 32 cores, 2 chips
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 19.0.5.281 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
## SPEC CPU®2017 Floating Point Speed Result

**ASUSTeK Computer Inc.**

ASUS RS720-E9(Z11PP-D24) Server System
(3.40 GHz, Intel Xeon Gold 6246R)

**SPECspeed®2017_fp_base = 151**

**SPECspeed®2017_fp_peak = 152**

---

### Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>603.bwaves_s</td>
<td>32</td>
<td>102</td>
<td>576</td>
<td>105</td>
<td>564</td>
<td>103</td>
</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td>32</td>
<td>104</td>
<td>160</td>
<td>104</td>
<td>160</td>
<td>103</td>
</tr>
<tr>
<td>619.lbm_s</td>
<td>32</td>
<td>48.2</td>
<td>109</td>
<td>48.1</td>
<td>109</td>
<td>48.2</td>
</tr>
<tr>
<td>621.wrf_s</td>
<td>32</td>
<td>86.4</td>
<td>153</td>
<td>85.8</td>
<td>154</td>
<td>85.5</td>
</tr>
<tr>
<td>627.cam4_s</td>
<td>32</td>
<td>92.1</td>
<td>96.2</td>
<td>92.1</td>
<td>96.3</td>
<td>91.6</td>
</tr>
<tr>
<td>628.pop2_s</td>
<td>32</td>
<td>159</td>
<td>74.6</td>
<td>158</td>
<td>75.0</td>
<td>158</td>
</tr>
<tr>
<td>638.imagick_s</td>
<td>32</td>
<td>116</td>
<td>125</td>
<td>119</td>
<td>121</td>
<td>114</td>
</tr>
<tr>
<td>644.nab_s</td>
<td>32</td>
<td>69.8</td>
<td>250</td>
<td>69.8</td>
<td>250</td>
<td>69.8</td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>32</td>
<td>97.8</td>
<td>93.2</td>
<td>97.7</td>
<td>93.3</td>
<td>98.0</td>
</tr>
<tr>
<td>654.roms_s</td>
<td>32</td>
<td>81.2</td>
<td>194</td>
<td>81.1</td>
<td>194</td>
<td>81.3</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
- Transparent Huge Pages enabled by default
- Prior to runcpu invocation
- Filesystem page cache synced and cleared with:
  ```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.
### 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 295195f888a3d7edbe6e46a485a0011
running on linux-628j Fri Oct 16 05:22:36 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 6246R CPU @ 3.40GHz
- 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 5 6 9 11 12 16 18 20 21 26 28 29
- physical 1: cores 0 1 2 3 4 5 6 12 13 16 17 18 19 21 24 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): 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 6246R CPU @ 3.40GHz
- Stepping: 7

(Continued on next page)
SPEC CPU®2017 Floating Point Speed Result
Copyright 2017-2020 Standard Performance Evaluation Corporation

ASUSTeK Computer Inc.
ASUS RS720-E9(Z11PP-D24) Server System (3.40 GHz, Intel Xeon Gold 6246R)

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

SPECspeed®2017_fp_base = 151
SPECspeed®2017_fp_peak = 152

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

Platform Notes (Continued)

CPU MHz: 3400.000
CPU max MHz: 4100.0000
CPU min MHz: 1200.0000
BogoMIPS: 6800.00
Virtualization: VT-x
L1d cache: 32K
L1i cache: 32K
L2 cache: 1024K
L3 cache: 36608K
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 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_pSpin ssbd mba ibrs ibpb ibrs_enhanced tpr_shadow vnmi flexpriority ept vpid fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erts invpcid rtm cqm mpx rdt_a avx512f avx512dq rdseed adx smap clflushopt clwb intel_pt avx512cd avx512bw avx512vl xsaveopt xsaves xsavec xgetbv1 xsaves cqm_llc cqm_occmap_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

/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)
node 0 cpus: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
node 0 size: 385616 MB
node 0 free: 384577 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: 386300 MB
node distances:
node 0 1
0: 10 21
1: 21 10

From /proc/meminfo
MemTotal: 791198756 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

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

(Continued on next page)
ASUSTeK Computer Inc.
ASUS RS720-E9(Z11PP-D24) Server System
(3.40 GHz, Intel Xeon Gold 6246R)

SPEC CPU®2017 Floating Point Speed Result
Copyright 2017-2020 Standard Performance Evaluation Corporation

SPECspeed®2017_fp_base = 151
SPECspeed®2017_fp_peak = 152

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 Oct 15 17:46

SPEC is set to: /190u5
 implicated

From /sys/devices/virtual/dmi/id
BIOS: American Megatrends Inc. 6102 12/05/2019
Vendor: ASUSTeK COMPUTER INC.
Product: Z11PP-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 SMI BIOS" standard.

Memory:
24x Samsung M393A4K40CB2-CVF 32 GB 2 rank 2933

(End of data from sysinfo program)
ASUSTeK Computer Inc.
ASUS RS720-E9(Z11PP-D24) Server System (3.40 GHz, Intel Xeon Gold 6246R)

SPECspeed®2017_fp_base = 151
SPECspeed®2017_fp_peak = 152

CPU2017 License: 9016
Test Sponsor: ASUSTeK Computer Inc.
Test Date: Oct-2020
Tested by: ASUSTeK Computer Inc.
Hardware Availability: Feb-2020
Software Availability: Sep-2019

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,
   Version 19.0.5.281 Build 20190815
Copyright (C) 1985-2019 Intel Corporation. All rights reserved.
SPEC CPU®2017 Floating Point Speed Result

ASUSTeK Computer Inc.
ASUS RS720-E9(Z1IPP-D24) Server System
(3.40 GHz, Intel Xeon Gold 6246R)

SPECspeed®2017_fp_base = 151
SPECspeed®2017_fp_peak = 152

CPU2017 License: 9016
Test Sponsor: ASUSTeK Computer Inc.
Test Date: Oct-2020
Tested by: ASUSTeK Computer Inc.
Hardware Availability: Feb-2020
Software Availability: Sep-2019

Base 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

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:
-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:
-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:
-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

(Continued on next page)
## SPEC CPU®2017 Floating Point Speed Result

### ASUSTeK Computer Inc.

ASUS RS720-E9(Z11PP-D24) Server System  
(3.40 GHz, Intel Xeon Gold 6246R)

<table>
<thead>
<tr>
<th>SPECspeed®2017_fp_base</th>
<th>SPECspeed®2017_fp_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>151</td>
<td>152</td>
</tr>
</tbody>
</table>

**CPU2017 License:** 9016  
**Test Sponsor:** ASUSTeK Computer Inc.  
**Tested by:** ASUSTeK Computer Inc.  
**Test Date:** Oct-2020  
**Hardware Availability:** Feb-2020  
**Software Availability:** Sep-2019

### Base Optimization Flags (Continued)

<table>
<thead>
<tr>
<th>Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>-m64 -std=c11 -xCORE-AVX512 -ipo -O3 -no-prec-div -qopt-prefetch</td>
</tr>
<tr>
<td>-ffinite-math-only -qopt-mem-layout-trans=4 -qopenmp -DSPEC_OPENMP</td>
</tr>
<tr>
<td>-nostandard-realloc-lhs</td>
</tr>
</tbody>
</table>

### 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

- **Fortran benchmarks:**

  - 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

(Continued on next page)
## 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: