Inspur Corporation

Inspur NF5280M6 (Intel Xeon Silver 4316)

SPECratenfspeccpu2017_fp_base = 294
SPECratenfspeccpu2017_fp_peak = 304

CPU2017 License: 3358
Test Sponsor: Inspur Corporation
Tested by: Inspur Corporation
Test Date: Jul-2021
Hardware Availability: May-2021

Tested by: Inspur Corporation
Software Availability: Dec-2020

Hardware

CPU Name: Intel Xeon Silver 4316
Max MHz: 3400
Nominal: 2300
Enabled: 40 cores, 2 chips, 2 threads/core
Orderable: 1, 2 chips
Cache L1: 32 KB I + 48 KB D on chip per core
L2: 1.25 MB I+D on chip per core
L3: 30 MB I+D on chip per core
Other: None
Memory: 1 TB (32 x 32 GB 2Rx4 PC4-3200AA-R, running at 2666)
Storage: 1 x 4 TB NVME SSD
Other: None

Software

OS: Red Hat Enterprise Linux release 8.2 (Ootpa)
Compiler: C/C++: Version 2021.1 of Intel oneAPI DPC++/C++
Compiler Build 20201113 for Linux;
C/C++: Version 2021.1 of Intel C/C++
Compiler Classic Build 20201112 for Linux;
Fortran: Version 2021.1 of Intel Fortran
Compiler Classic Build 20201112 for Linux
Parallel: No
Firmware: Version 05.00.00 released Apr-2021
File System: xfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: 64-bit
Other: jemalloc memory allocator V5.0.1
Power Management: BIOS and OS set to prefer performance at the cost of additional power usage.

503.bwaves_r

507.caactuBSSN_r

508.namd_r

510.parest_r

511.povray_r

519.lbm_r

521.wrf_r

526.blender_r

527.cam4_r

538.imagick_r

544.nab_r

549.fotonik3d_r

554.roms_r

--- SPECratenfspeccpu2017_fp_base (294)
--- SPECratenfspeccpu2017_fp_peak (304)
### Results Table

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</tbody>
</table>

**SPECrate®2017_fp_base = 294**  
**SPECrate®2017_fp_peak = 304**

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"  
SCALING_GOVERNOR set to Performance

### Environment Variables Notes

Environment variables set by runcpu before the start of the run:  
LD_LIBRARY_PATH = "/home/CPU2017/lib/intel64:/home/CPU2017/je5.0.1-64"  
MALLOC_CONF = "retain:true"

### General Notes

Binaries compiled on a system with 1x Intel Core i9-7980XE CPU + 64GB RAM  
memory using Red Hat Enterprise Linux 8.1  
Transparent Huge Pages enabled by default  
Prior to runcpu invocation

(Continued on next page)
General Notes (Continued)

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.

jemalloc, a general purpose malloc implementation
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:
ENERGY_PERF_BIAS_CFG mode set to Performance
Hardware Prefetch set to Disable
VT Support set to Disable
C1E Support set to Disable
Sub NUMA Cluster (SNC) set to Enable
Intel Hyper Threading Technology set to Enable

Sysinfo program /home/CPU2017/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acaafc64d
running on localhost.localdomain Fri Jul 9 15:07:08 2021

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) Silver 4316 CPU @ 2.30GHz
  2 "physical id"s (chips)
  80 "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 : 20
siblings : 40
physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19
physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19

(Continued on next page)
Platform Notes (Continued)

From lscpu from util-linux 2.32.1:

- Architecture: x86_64
- CPU op-mode(s): 32-bit, 64-bit
- Byte Order: Little Endian
- CPU(s): 80
- On-line CPU(s) list: 0-79
- Thread(s) per core: 2
- Core(s) per socket: 20
- Socket(s): 2
- NUMA node(s): 4
- Vendor ID: GenuineIntel
- CPU family: 6
- Model: 106
- Model name: Intel(R) Xeon(R) Silver 4316 CPU @ 2.30GHz
- Stepping: 6
- CPU MHz: 2800.000
- CPU max MHz: 3400.0000
- CPU min MHz: 800.0000
- BogoMIPS: 4600.00
- Virtualization: VT-x
- L1d cache: 48K
- L1i cache: 32K
- L2 cache: 128K
- L3 cache: 30720K
- NUMA node0 CPU(s): 0-9,40-49
- NUMA node1 CPU(s): 10-19,50-59
- NUMA node2 CPU(s): 20-29,60-69
- NUMA node3 CPU(s): 30-39,70-79
- Flags: fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov
- pat pse36 clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtsscp
- lm constant_tsc arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid
- aperfmerf pni pclmulqdq dtes64 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 invpcid_single ssbd mba ibrs
- ibpb stibp ibrs_enhanced tpr_shadow vnmi flexpriority ept vpid fsgsbase tsc_adjust
- bmi1 hle axv2 smep bmi2 erms invpcid rtm cqm rdt_a avx512f avx512dq rdseed adx smap
- avx512ifma clflushopt clwb intel_pt avx512cd sha ni avx512bw avx512vl xsaveopt
- xsaves xgetbv1 xsavec xsaveopt cqm_llc cqm_occup_llc cqm_mbb_total cqm_mbb_local
- wbnoinvd dti dtherm ida arat pln pts avx512vmbi umpk pku ospke avx512_vmbi qfn1 vaes
- vpc1mulqdq avx512_vnni avx512_bitalg tme avx512_vpopcntdq la57 rdrid md_clear pconfig
- flush_lld arch_capabilities

From numactl --hardware

(Continued on next page)
Inspur Corporation

Inspur NF5280M6 (Intel Xeon Silver 4316)

SPECrater®2017_fp_base = 294
SPECrater®2017_fp_peak = 304

CPU2017 License: 3358
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Platform Notes (Continued)

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 4 5 6 7 8 9 40 41 42 43 44 45 46 47 48 49
  node 0 size: 257638 MB
  node 0 free: 246747 MB
  node 1 cpus: 10 11 12 13 14 15 16 17 18 19 50 51 52 53 54 55 56 57 58 59
  node 1 size: 258043 MB
  node 1 free: 249603 MB
  node 2 cpus: 20 21 22 23 24 25 26 27 28 29 60 61 62 63 64 65 66 67 68 69
  node 2 size: 258043 MB
  node 2 free: 249637 MB
  node 3 cpus: 30 31 32 33 34 35 36 37 38 39 70 71 72 73 74 75 76 77 78 79
  node 3 size: 258013 MB
  node 3 free: 249613 MB
  node distances:
  node   0   1   2   3
  0: 10 11 20 20
  1: 11 10 20 20
  2: 20 20 10 11
  3: 20 20 11 10

From /proc/meminfo
  MemTotal: 1056500108 kB
  HugePages_Total: 0
  Hugepagesize: 2048 kB

/sbin/tuned-adm active
  It seems that tuned daemon is not running, preset profile is not activated.
  Preset profile: throughput-performance

/sys/devices/system/cpu/cpu*/cpufreq/scaling_governor has
  performance

From /etc/*release* /etc/*version*
  os-release:
    NAME="Red Hat Enterprise Linux"
    VERSION="8.2 (Ootpa)"
    ID="rhel"
    ID_LIKE="fedora"
    VERSION_ID="8.2"
    PLATFORM_ID="platform:el8"
    PRETTY_NAME="Red Hat Enterprise Linux 8.2 (Ootpa)"
    ANSI_COLOR="0;31"
  redhat-release: Red Hat Enterprise Linux release 8.2 (Ootpa)
  system-release: Red Hat Enterprise Linux release 8.2 (Ootpa)
  system-release-cpe: cpe:/o:redhat:enterprise_linux:8.2:ga

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

Inspur Corporation
Inspur NF5280M6 (Intel Xeon Silver 4316)

PSPECrate®2017_fp_base = 294
PSPECrate®2017_fp_peak = 304

CPU2017 License: 3358
Test Sponsor: Inspur Corporation
Tested by: Inspur Corporation

Test Date: Jul-2021
Hardware Availability: May-2021
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Platform Notes (Continued)

uname -a:
    Linux localhost.localdomain 4.18.0-193.el8.x86_64 #1 SMP Fri Mar 27 14:35:58 UTC 2020
    x86_64 x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:

CVE-2018-12207 (iTLB Multihit): Not affected
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): Not affected
    Mitigation: usercopy/swapgs barriers and __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Enhanced IBRS, IBPB:
    conditional, RSB filling
CVE-2020-0543 (Special Register Buffer Data Sampling): No status reported
CVE-2019-11135 (TSX Asynchronous Abort): Not affected

run-level 3 Jul 9 07:25

SPEC is set to: /home/CPU2017
    Filesystem Type Size Used Avail Use% Mounted on
    /dev/mapper/rhel-home xfs 3.6T 98G 3.5T 3% /home

From /sys/devices/virtual/dmi/id
    Vendor: Inspur
    Product: NF5280M6
    Product Family: Family
    Serial: 380251214

Additional information from dmidecode 3.2 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:
    32x Micron 36ASF4G72PZ-3G2R1 32 GB 2 rank 3200, configured at 2666

BIOS:
    BIOS Vendor: American Megatrends Inc.
    BIOS Version: 05.00.00
    BIOS Date: 04/25/2021
    BIOS Revision: 5.22

(End of data from sysinfo program)
Inspur Corporation
Inspur NF5280M6 (Intel Xeon Silver 4316)

SPEC CPU®2017 Floating Point Rate Result
Copyright 2017-2021 Standard Performance Evaluation Corporation

SPECrate®2017_fp_base = 294
SPECrate®2017_fp_peak = 304

Compiler Version Notes

==============================================================================
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|                 | Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
|                 |   Version 2021.1 Build 20201113                                       |
|                 | Copyright (C) 1985-2020 Intel Corporation. All rights reserved.        |
|                 |------------------------------------------------------------------------------|
|                 | C++                        | 508.namd_r(base, peak) 510.parest_r(base, peak)                         |
|                 |------------------------------------------------------------------------------|
|                 | Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
|                 |   Version 2021.1 Build 20201113                                       |
|                 | Copyright (C) 1985-2020 Intel Corporation. All rights reserved.        |
|                 |------------------------------------------------------------------------------|
|                 | C++, C                     | 511.povray_r(peak)                                                     |
|                 |------------------------------------------------------------------------------|
|                 | Intel(R) C++ Intel(R) 64 Compiler Classic for applications running on    |
|                 |   Intel(R) 64, Version 2021.1 Build 20201112_000000                   |
|                 | Copyright (C) 1985-2020 Intel Corporation. All rights reserved.        |
|                 |------------------------------------------------------------------------------|
|                 | C++, C                     | 511.povray_r(base) 526.blender_r(base, peak)                           |
|                 |------------------------------------------------------------------------------|
|                 | Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
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|                 | C++, C                     | 511.povray_r(peak)                                                     |
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## Inspur Corporation

**Inspur NF5280M6 (Intel Xeon Silver 4316)**

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**CPU2017 License:** 3358  
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### Compiler Version Notes (Continued)

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Intel(R) Fortran Intel(R) 64 Compiler Classic for applications running on Intel(R) 64, Version 2021.1 Build 20201112_000000  
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

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Copyright (C) 1985-2020 Intel Corporation. All rights reserved.  
Intel(R) C Intel(R) 64 Compiler Classic for applications running on Intel(R) 64, Version 2021.1 Build 20201112_000000  
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(Continued on next page)
### SPEC CPU®2017 Floating Point Rate Result

**Inspur Corporation**

**Inspur NF5280M6 (Intel Xeon Silver 4316)**

- **CPU2017 License:** 3358
- **Test Sponsor:** Inspur Corporation
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**Test Date:** Jul-2021  
**Hardware Availability:** May-2021  
**Software Availability:** Dec-2020

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### Compiler Version Notes (Continued)

```plaintext
Fortran, C      | 521.wrf_r(base) 527.cam4_r(base, peak)
```

Intel(R) Fortran Intel(R) 64 Compiler Classic for applications running on Intel(R) 64, Version 2021.1 Build 20201112_000000
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.

### Base Compiler Invocation

- **C benchmarks:** icx
- **C++ benchmarks:** icpx
- **Fortran benchmarks:** ifort

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(Continued on next page)
## Base Compiler Invocation (Continued)

Benchmarks using both Fortran and C:
```shell
ifort icx
```

Benchmarks using both C and C++:
```shell
icpx icx
```

Benchmarks using Fortran, C, and C++:
```shell
icpx icx ifort
```

## Base Portability Flags

- 503.bwaves_r: -DSPEC_LP64
- 507.cactuBSSN_r: -DSPEC_LP64
- 508.namd_r: -DSPEC_LP64
- 510.parest_r: -DSPEC_LP64
- 511.povray_r: -DSPEC_LP64
- 519.lbm_r: -DSPEC_LP64
- 521.wrf_r: -DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian
- 526.blender_r: -DSPEC_LP64 -DSPEC_LINUX -funsigned-char
- 527.cam4_r: -DSPEC_LP64 -DSPEC_CASE_FLAG
- 538.imagick_r: -DSPEC_LP64
- 544.nab_r: -DSPEC_LP64
- 549.fotonik3d_r: -DSPEC_LP64
- 554.roms_r: -DSPEC_LP64

## Base Optimization Flags

### C benchmarks:
```shell
-w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math -flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries -ljemalloc -L/usr/local/jemalloc64-5.0.1/lib
```

### C++ benchmarks:
```shell
-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math -flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries -ljemalloc -L/usr/local/jemalloc64-5.0.1/lib
```

### Fortran benchmarks:
```shell
-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ipo -no-prec-div -qopt-prefetch -ffinite-math-only
```
Insper Corporation
Insper NF5280M6 (Intel Xeon Silver 4316)

SPECrate®2017_fp_base = 294
SPECrate®2017_fp_peak = 304

CPU2017 License: 3358
Test Sponsor: Insper Corporation
Tested by: Insper Corporation

Test Date: Jul-2021
Hardware Availability: May-2021
Software Availability: Dec-2020

Base Optimization Flags (Continued)

Fortran benchmarks (continued):
-qopt-multiple-gather-scatter-by-shuffles -qopt-mem-layout-trans=4
-nostandard-realloc-lhs -align array32byte -auto
-mbranches-within-32B-boundaries -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib

Benchmarks using both Fortran and C:
-w -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -O3 -ipo
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-multiple-gather-scatter-by-shuffles
-mbranches-within-32B-boundaries -nostandard-realloc-lhs
-align array32byte -auto -ljemalloc -L/usr/local/jemalloc64-5.0.1/lib

Benchmarks using both C and C++:
-w -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-mbranches-within-32B-boundaries -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib

Benchmarks using Fortran, C, and C++:
-w -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -O3
-no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-multiple-gather-scatter-by-shuffles
-mbranches-within-32B-boundaries -nostandard-realloc-lhs
-align array32byte -auto -ljemalloc -L/usr/local/jemalloc64-5.0.1/lib

Peak Compiler Invocation

C benchmarks:
icx

C++ benchmarks:
icpx

Fortran benchmarks:
ifort

Benchmarks using both Fortran and C:
521.wrf_r: ifort icx

(Continued on next page)
Peak Compiler Invocation (Continued)

527.cam4_r: ifort icx

Benchmarks using both C and C++:

511.povray_r: icpc icc
526.blender_r: icpx icx

Benchmarks using Fortran, C, and C++:
icpx icx ifort

Peak Portability Flags

Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:

519.lbm_r: basepeak = yes
538.imagick_r: basepeak = yes

544.nab_r: -w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX512 -flto
-Ofast -qopt-mem-layout-trans=4
-fimf-accuracy-bits=14:sqrt
-mbranches-within-32B-boundaries -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib

C++ benchmarks:

508.namd_r: basepeak = yes

510.parest_r: -w -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries
-ljemalloc -L/usr/local/jemalloc64-5.0.1/lib

Fortran benchmarks:

503.bwaves_r: -w -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ipo
-no-prec-div -qopt-prefetch -ffinite-math-only

(Continued on next page)
Peak Optimization Flags (Continued)

503.bwaves_r (continued):
-qopt-multiple-gather-scatter-by-shuffles
-qopt-mem-layout-trans=4 -nostandard-realloc-lhs
-align array32byte -auto -mbranches-within-32B-boundaries
-ljemalloc -L/usr/local/jemalloc64-5.0.1/lib

549.fotonik3d_r: basepeak = yes

554.roms_r: Same as 503.bwaves_r

Benchmarks using both Fortran and C:

521.wrf_r: -prof-gen(pass 1) -prof-use(pass 2) -xCORE-AVX512 -O3
-ipo -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-multiple-gather-scatter-by-shuffles
-qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries
-nostandard-realloc-lhs -align array32byte -auto
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

527.cam4_r: basepeak = yes

Benchmarks using both C and C++:

511.povray_r: -prof-gen(pass 1) -prof-use(pass 2) -xCORE-AVX512 -O3
-ipo -no-prec-div -qopt-prefetch -ffinite-math-only
-qopt-multiple-gather-scatter-by-shuffles
-qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

526.blender_r: basepeak = yes

Benchmarks using Fortran, C, and C++:

507.cactuBSSN_r: basepeak = yes

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/Inspur-Platform-Settings-V2.0.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/Intel-ic2021-official-linux64_revA.xml
http://www.spec.org/cpu2017/flags/Inspur-Platform-Settings-V2.0.xml
### SPEC CPU®2017 Floating Point Rate Result

**Inspur Corporation**  
Inspur NF5280M6 (Intel Xeon Silver 4316)

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- **CPU2017 License:** 3358  
- **Test Sponsor:** Inspur Corporation  
- **Tested by:** Inspur Corporation

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<th>Jul-2021</th>
<th><strong>Hardware Availability:</strong></th>
<th>May-2021</th>
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<td><strong>Test Date:</strong></td>
<td>Jul-2021</td>
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</tbody>
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- **Test Date:** Jul-2021  
- **Hardware Availability:** May-2021  
- **Software Availability:** Dec-2020

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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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