Lenovo Global Technology
ThinkSystem SR655
3.20 GHz, AMD EPYC 7262

SPECspeed®2017_fp_base = 46.9
SPECspeed®2017_fp_peak = 47.0

CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Tested by: Lenovo Global Technology

Threads

<table>
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<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>SPECspeed®2017_fp_base</th>
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<tr>
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<tr>
<td>607.cactuBSSN_s</td>
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<td>23.7</td>
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<td>619.lbm_s</td>
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<tr>
<td>621.wrf_s</td>
<td>8</td>
<td>32.5</td>
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<tr>
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<tr>
<td>628.pop2_s</td>
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<tr>
<td>638.imagick_s</td>
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<td>644.nab_s</td>
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<tr>
<td>649.fotonik3d_s</td>
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</tr>
<tr>
<td>654.roms_s</td>
<td>8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Hardware
CPU Name: AMD EPYC 7262
Max MHz: 3400
Nominal: 3200
Enabled: 8 cores, 1 chip
Orderable: 1 chip
Cache L1: 32 KB I + 32 KB D on chip per core
L2: 512 KB I+D on chip per core
L3: 128 MB I+D on chip per chip, 16 MB per core
Other: None
Memory: 256 GB (8 x 32 GB 2Rx4 PC4-3200AA-R)
Storage: 1 x 960 GB SATA SSD
Other: None

Software
OS: SUSE Linux Enterprise Server 15 SP1 (x86_64)
Kernel 4.12.14-195-default
Compiler: C/C++: Version 1.3.0 of AOCC
Fortran: Version 4.8.2 for GCC
Parallel: Yes
Firmware: Lenovo BIOS Version CFE103L released Aug-2019
File System: xfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: 64-bit
Other: jemalloc: jemalloc memory allocator library version 5.1.0
Power Management: --
Lenovo Global Technology
ThinkSystem SR655
3.20 GHz, AMD EPYC 7262

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Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
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<tr>
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</tbody>
</table>

SPECspeed®2017_fp_base = 46.9
SPECspeed®2017_fp_peak = 47.0

Compiler Notes

The AMD64 AOCC Compiler Suite is available at
http://developer.amd.com/amd-aocc/

The AOCC Fortran Plugin version 1.3.0 was used to leverage AOCC optimizers with gfortran. It is available here:
http://developer.amd.com/amd-aocc/

Submit Notes

The config file option 'submit' was used.
'numactl' was used to bind copies to the cores.
See the configuration file for details.

Operating System Notes

'ulimit -s unlimited' was used to set environment stack size
'ulimit -l 2097152' was used to set environment locked pages in memory limit

runspec command invoked through numactl i.e.:
numactl --interleave=all runspec <etc>

Set dirty_ratio=8 to limit dirty cache to 8% of memory
Set swappiness=1 to swap only if necessary
Set zone_reclaim_mode=1 to free local node memory and avoid remote memory sync then drop_caches=3 to reset caches before invoking runcpu

(Continued on next page)
Lenovo Global Technology
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Operating System Notes (Continued)

dirty_ratio, swappiness, zone_reclaim_mode and drop_caches were
all set using privileged echo (e.g. echo 1 > /proc/sys/vm/swappiness).

Transparent huge pages set to 'always' for this run (OS default)

General Notes

Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH = "/home/cpu2017-1.0.5-amd-na/amd_speed_aocc130_naples_A_lib/64"
LD_LIBRARY_PATH = "$LD_LIBRARY_PATH:/home/cpu2017-1.0.5-amd-na/amd_speed_aocc130_naples_A_lib/32"
OMP_DYNAMIC = "false"
OMP_PLACES = "cores"
OMP_PROC_BIND = "close"
OMP_SCHEDULE = "static"
OMP_STACKSIZE = "192M"
OMP_WAIT_POLICY = "active"

Binaries were compiled on a system with 2p AMD EPYC 7601 CPU + 512GB Memory using RHEL 7.6

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.
Yes: The test sponsor attests, as of date of publication, that CVE-2018-3640 (Spectre variant 3a) is mitigated in the system as tested and documented.
Yes: The test sponsor attests, as of date of publication, that CVE-2018-3639 (Spectre variant 4) is mitigated in the system as tested and documented.

jemalloc: configured and built with GCC v4.8.5 in RHEL v7.2 under default conditions.
https://github.com/jemalloc/jemalloc/releases/download/5.1.0/jemalloc-5.1.0.tar.bz2

Platform Notes

BIOS settings:
Operating Mode set to Maximum Performance
SMT Mode set to Disabled
EfficiencyModeEn set to Auto

Sysinfo program /home/cpu2017-1.0.5-amd-na/bin/sysinfo
Rev: r5974 of 2018-05-19 9bcede8f2999c33d61f64985e45859ea9
running on linux-01om Fri Sep 20 18:27:40 2019

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)
## Lenovo Global Technology

### ThinkSystem SR655

### 3.20 GHz, AMD EPYC 7262

<table>
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<td>Hardware Availability</td>
<td>Aug-2019</td>
</tr>
<tr>
<td>Software Availability</td>
<td>Jun-2019</td>
</tr>
</tbody>
</table>

### Platform Notes (Continued)

From `/proc/cpuinfo`

```plaintext
model name : AMD EPYC 7262 8-Core Processor
  1 "physical id"s (chips)
  8 "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 : 8
siblings : 8
physical 0: cores 0 4 8 12 16 20 24 28
```

From `lscpu`:

```plaintext
Architecture:        x86_64
CPU op-mode(s):      32-bit, 64-bit
Byte Order:          Little Endian
Address sizes:       43 bits physical, 48 bits virtual
CPU(s):              8
On-line CPU(s) list: 0-7
Thread(s) per core:  1
Core(s) per socket:  8
Socket(s):           1
NUMA node(s):        1
Vendor ID:           AuthenticAMD
CPU family:          23
Model:               49
Model name:          AMD EPYC 7262 8-Core Processor
Stepping:            0
CPU MHz:             3200.000
CPU max MHz:         3200.0000
CPU min MHz:         1500.0000
BogoMIPS:            6387.77
Virtualization:      AMD-V
L1d cache:           32K
L1i cache:           32K
L2 cache:            512K
L3 cache:            16384K
NUMA node0 CPU(s):   0-7
Flags:               fpu vme de pse tsc msr pae mce cmov pat pse36 clflush mmx fxsr sse sse2 ht syscall nx mmxext fxsr_opt pdpe1gb rdtscp lm constant_tsc rep_good nopl xtopology nonstop_tsc cpuid extd_apicid aperfmperf pni pclmulqdq monitor ssse3 fma cx16 sse4_1 sse4_2 movbe popcnt aes avx avx2 f16c rdrand lahf_lm cmp_legacy svm extapic cr8_legacy abm sse4a misalignsse 3dnowprefetch osvw ibs skinit wdt tce topoext perfctr_core perfctr_nb bpxe perfctr_l2 mwaitx cpb cat_l3 cdp_l3 hw_pstate sme ssbd sev ibrs ibpb stibp vmmcall fsgsbase bmi1 avx2 smep bmi2 cmq rdt_a rdsseed adx smap clflushopt clwb sha_ni xsaveopt xsavec xgetbv1 xsave xsaveopt arat npt lbv svm_lock nrip_save tsc_scale vmcb_clean flushbyasid decodeassists pausefilter pfthreshold avic v_msave_vmload vgf umip rdpid overflow_recov succor smca
```

(Continued on next page)
Lenovo Global Technology
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**SPECspeed®2017_fp_base = 46.9**
**SPECspeed®2017_fp_peak = 47.0**

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</tr>
<tr>
<td>Software Availability</td>
<td>Jun-2019</td>
</tr>
</tbody>
</table>

**Platform Notes (Continued)**

/proc/cpuinfo cache data
  cache size : 512 KB

From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a physical chip.
  available: 1 nodes (0)
  node 0 cpus: 0 1 2 3 4 5 6 7
  node 0 size: 257760 MB
  node 0 free: 257042 MB
  node distances:
    node 0
    0: 10

From /proc/meminfo
  MemTotal: 263946396 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-01om 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-2017-5754 (Meltdown): Not affected
CVE-2017-5753 (Spectre variant 1): Mitigation: __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Full AMD retpoline, IBPB: conditional, IBRS_FW, STIBP: disabled, RSB filling

run-level 3 Sep 20 18:19

SPEC is set to: /home/cpu2017-1.0.5-amd-na

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<tr>
<th>Filesystem</th>
<th>Type</th>
<th>Size</th>
<th>Used</th>
<th>Avail</th>
<th>Use%</th>
<th>Mounted on</th>
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</thead>
<tbody>
<tr>
<td>/dev/sda2</td>
<td>xfs</td>
<td>893G</td>
<td>98G</td>
<td>795G</td>
<td>11%</td>
<td>/</td>
</tr>
</tbody>
</table>

(Continued on next page)
Platform Notes (Continued)

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.

BIOS Lenovo CFE103L 08/19/2019
Memory:
8x Samsung M393A4K40DB2-CWE 32 kB 2 rank 3200
8x Unknown Unknown

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
 C               | 619.lbm_s(base, peak) 638.imagick_s(base, peak) 644.nab_s(base, peak)
==============================================================================
AOCC.LLVM.1.3.0.B34.2018_10_22 clang version 7.0.0 (CLANG: Jenkins
AOCC_1_3_0_Release-Build#34) (based on LLVM AOCC.LLVM.1.3.0.B34.2018_10_22)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /root/work/compilers/aocc1.3.0/AOCC-1.3.0-Compiler/bin

==============================================================================
C++, C, Fortran | 607.cactuBSSN_s(base, peak)
==============================================================================
AOCC.LLVM.1.3.0.B34.2018_10_22 clang version 7.0.0 (CLANG: Jenkins
AOCC_1_3_0_Release-Build#34) (based on LLVM AOCC.LLVM.1.3.0.B34.2018_10_22)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /root/work/compilers/aocc1.3.0/AOCC-1.3.0-Compiler/bin
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AOCC_1_3_0_Release-Build#34) (based on LLVM AOCC.LLVM.1.3.0.B34.2018_10_22)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /root/work/compilers/aocc1.3.0/AOCC-1.3.0-Compiler/bin
GNU Fortran (GCC) 4.8.2
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CPU2017 License: 9017
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SPECspeed®2017_fp_base = 46.9
SPECspeed®2017_fp_peak = 47.0

Test Date: Sep-2019
Hardware Availability: Aug-2019
Software Availability: Jun-2019

Compiler Version Notes (Continued)

Fortran

| 603.bwaves_s(base, peak) 649.fotonik3d_s(base, peak) 654.roms_s(base, peak) |

GNU Fortran (GCC) 4.8.2
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==============================================================================
Fortran, C

| 621.wrf_s(base, peak) 627.cam4_s(base, peak) 628.pop2_s(base, peak) |

GNU Fortran (GCC) 4.8.2
Copyright (C) 2013 Free Software Foundation, Inc.
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Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /root/work/compilers/aocc1.3.0/AOCC-1.3.0-Compiler/bin

Base Compiler Invocation

C benchmarks:
clang

Fortran benchmarks:
clang gfortran

Benchmarks using both Fortran and C:
clang gfortran

Benchmarks using Fortran, C, and C++:
clang++ clang gfortran
Lenovo Global Technology
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3.20 GHz, AMD EPYC 7262

SPECspeed®2017_fp_base = 46.9
SPECspeed®2017_fp_peak = 47.0

Base Portability Flags

603.bwaves_s: -DSPEC_LP64
607.cactuBSSN_s: -DSPEC_LP64
619.lbm_s: -DSPEC_LP64
621.wrf_s: -DSPEC_CASE_FLAG -fconverg=big-endian -DSPEC_LP64
627.cam4_s: -DSPEC_CASE_FLAG -DSPEC_LP64
628.pop2_s: -DSPEC_CASE_FLAG -fconverg=big-endian -DSPEC_LP64
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:
- flto -Wl,-plugin-opt=-merge-constant
- Wl,-plugin-opt=-lsr-in-nested-loop
- Wl,-plugin-opt=-enable-vectorize-compare=false -O3 -ffast-math
- march=znver1 -mno-avx2 -fstruct-layout=3 -mllv -unroll-threshold=50
- fremap-arrays -mllv -inline-threshold=1000
- flv-function-specialization -mllv -enable-gvn-hoist
- mllvm -function-specialize -z muldefs -DSPEC_OPENMP -fopenmp
- DUSE_OPENMP -fopenmp=libomp -lomp -lpthread -ldl -ljemalloc
- lamdlibm

Fortran benchmarks:
- flto -Wl,-plugin-opt=-merge-constant
- Wl,-plugin-opt=-lsr-in-nested-loop
- Wl,-plugin-opt=-enable-vectorize-compare=false -O3 -mavx -madx
- funroll-loops -ffast-math -z muldefs -fplugin=dragonegg.so
- fplugin-arg=dragonegg-llvm-option=-merge-constant
- fplugin-arg=dragonegg-llvm-option=-enable-vectorize-compare=false
- DSPEC_OPENMP -DUSE_OPENMP -fopenmp -fopenmp=libomp -lomp -lpthread
- ld1 -ljemalloc -lamdlibm -lgfortran

Benchmarks using both Fortran and C:
- flto -Wl,-plugin-opt=-merge-constant
- Wl,-plugin-opt=-lsr-in-nested-loop
- Wl,-plugin-opt=-enable-vectorize-compare=false -O3 -ffast-math
- march=znver1 -mno-avx2 -fstruct-layout=3 -mllv -unroll-threshold=50
- fremap-arrays -mllv -inline-threshold=1000
- flv-function-specialization -mllv -enable-gvn-hoist
- mllvm -function-specialize -mavx -madx -funroll-loops -z muldefs
- fplugin=dragonegg.so -fplugin-arg=dragonegg-llvm-option=-merge-constant
- fplugin-arg=dragonegg-llvm-option=-enable-vectorize-compare=false

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Lenovo Global Technology

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SPECspeed®2017_fp_base = 46.9
SPECspeed®2017_fp_peak = 47.0

CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Tested by: Lenovo Global Technology
Test Date: Sep-2019
Hardware Availability: Aug-2019
Software Availability: Jun-2019

Base Optimization Flags (Continued)

Benchmarks using both Fortran and C (continued):
-DSPEC_OPENMP -DUSE_OPENMP -fopenmp -fopenmp=libomp -lomp -lpthread
-ldl -ljemalloc -lamlidlibm -lgfortran

Benchmarks using Fortran, C, and C++:
-std=c++98 -flto -Wl,-plugin-opt=-merge-constant
-Wl,-plugin-opt=-lsr-in-nested-loop
-Wl,-plugin-opt=-enable-vectorize-compares=false -O3 -ffast-math
-march=znver1 -mno-avx2 -fstruct-layout=3 -mllvm -unroll-threshold=50
-fremap-arrays -mllvm -inline-threshold=1000
-fly-function-specialization -mllvm -enable-gvn-hoist
-mllvm -function-specialize -mllvm -unroll-threshold=100
-finline-aggressive -mllvm -enable-vectorize-compares=false -mavx
-madx -funroll-loops -z muldefs -fplugin=dragonegg.so
-fplugin-arg-dragonegg-llvm-option=-merge-constant
-fplugin-arg-dragonegg-llvm-option=-enable-vectorize-compares=false
-DSPEC_OPENMP -fopenmp -DUSE_OPENMP -fopenmp=libomp -lomp -lpthread
-ldl -ljemalloc -lamlidlibm

Base Other Flags

C benchmarks:
-Wno-return-type

Fortran benchmarks:
-Wno-return-type

Benchmarks using both Fortran and C:
-Wno-return-type

Benchmarks using Fortran, C, and C++:
-Wno-return-type

Peak Compiler Invocation

C benchmarks:
clang

Fortran benchmarks:
clang gfortran

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

Benchmarks using both Fortran and C:
clang gfortran

Benchmarks using Fortran, C, and C++:
clang++ clang gfortran

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: basepeak = yes

Fortran benchmarks:
603.bwaves_s: basepeak = yes
649.fotonik3d_s: basepeak = yes
654.roms_s: basepeak = yes

Benchmarks using both Fortran and C:
621.wrf_s: basepeak = yes
627.cam4_s: basepeak = yes
628.pop2_s: basepeak = yes

Benchmarks using Fortran, C, and C++:
-std=c++98 -flto -Wl,-plugin-opt=-merge-constant
-Wl,-plugin-opt=-lsr-in-nested-loop -Ofast -march=znver1
-fstruct-layout=3 -mlvm -vectorize-memory-aggressively -mno-avx2
-mlvm -unroll-threshold=100 -fremap-arrays
-mlvm -inline-threshold=1000 -finline-aggressive -O3 -mavx2 -madx

(Continued on next page)
## Lenovo Global Technology

**ThinkSystem SR655**  
3.20 GHz, AMD EPYC 7262

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</tr>
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</table>

### SPEC/cpu2017 Floating Point Speed Result

**SPECspeed®2017_fp_base = 46.9**  
**SPECspeed®2017_fp_peak = 47.0**

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## Peak Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++ (continued):
- `–funroll-loops`  
- `–ffast-math`  
- `–fplugin=dragonegg.so`  
- `–fplugin-arg-dragonegg-llvm-option=–merge-constant`  
- `–fplugin-arg-dragonegg-llvm-option=–inline-threshold:1000`  
- `–DSPEC_OPENMP`  
- `–fopenmp`  
- `–DUSE_OPENMP`  
- `–fopenmp=libomp`  
- `–lomp`  
- `–lpthread`  
- `–ldl`  
- `–ljemalloc`  
- `–lamdlibm`

---

## Peak Other Flags

### C benchmarks:
- `–Wno-return-type`

### Fortran benchmarks:
- `–Wno-return-type`

### Benchmarks using both Fortran and C:
- `–Wno-return-type`

### Benchmarks using Fortran, C, and C++:
- `–Wno-return-type`

---

The flags files that were used to format this result can be browsed at:

- [http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-Rome-C.html](http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-Rome-C.html)

You can also download the XML flags sources by saving the following links:

- [http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-Rome-C.xml](http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-Rome-C.xml)

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For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

Tested with SPEC CPU®2017 v1.0.5 on 2019-09-20 06:27:39-0400.  