## SPEC CPU®2017 Floating Point Speed Result

**Lenovo Global Technology**  
ThinkSystem ST650 V2  
(2.40 GHz, Intel Xeon Gold 6312U)

**SPECspeed®2017_fp_base** = 123  
**SPECspeed®2017_fp_peak** = Not Run

<table>
<thead>
<tr>
<th>Threads</th>
<th>SPECspeed®2017_fp_base (123)</th>
</tr>
</thead>
<tbody>
<tr>
<td>603.bwaves_s</td>
<td>24</td>
</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td>24</td>
</tr>
<tr>
<td>619.lbm_s</td>
<td>24</td>
</tr>
<tr>
<td>621.wrf_s</td>
<td>24</td>
</tr>
<tr>
<td>627.cam4_s</td>
<td>24</td>
</tr>
<tr>
<td>628.pop2_s</td>
<td>24</td>
</tr>
<tr>
<td>638.imagick_s</td>
<td>24</td>
</tr>
<tr>
<td>644.nab_s</td>
<td>24</td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>24</td>
</tr>
<tr>
<td>654.roms_s</td>
<td>24</td>
</tr>
</tbody>
</table>

### Hardware

- **CPU Name:** Intel Xeon Gold 6312U  
- **Max MHz:** 3600  
- **Nominal:** 2400  
- **Enabled:** 24 cores, 1 chip  
- **Orderable:** 1 chip  
- **Cache L1:** 32 KB I + 48 KB D on chip per core  
- **L2:** 1.25 MB I+D on chip per core  
- **L3:** 36 MB I+D on chip per chip  
- **Memory:** 512 GB (16 x 32 GB 2Rx8 PC4-3200AA-R)  
- **Storage:** 1 x 960 GB SATA SSD  
- **Other:** None

### Software

- **OS:** Red Hat Enterprise Linux 8.3  
  (Ootpa)  
  Kernel 4.18.0-240.el8.x86_64
- **Compiler:** Fortran: Version 2021.1 of Intel Fortran Compiler  
  Classic Build 20201112 for Linux;  
  C/C++: Version 2021.1 of Intel C/C++ Compiler  
  Classic Build 20201112 for Linux
- **Parallel:** Yes
- **Firmware:** Lenovo BIOS Version U8E111A 1.02 released May-2021
- **File System:** xfs
- **System State:** Run level 3 (multi-user)
- **Base Pointers:** 64-bit
- **Peak Pointers:** Not Applicable
- **Other:** jemalloc memory allocator V5.0.1
- **Power Management:** BIOS and OS set to prefer performance at the cost of additional power usage
Lenovo Global Technology

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(2.40 GHz, Intel Xeon Gold 6312U)

SPECspeed®2017_fp_base = 123
SPECspeed®2017_fp_peak = Not Run

Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
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<tr>
<td>Base</td>
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<tr>
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<td>81.1</td>
<td>110</td>
<td>80.8</td>
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<tr>
<td>628.pop2_s</td>
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<td>119</td>
<td>122</td>
<td>118</td>
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<td>644.nab_s</td>
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<td>193</td>
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<tr>
<td>649.fotonik3d_s</td>
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<td>127</td>
<td>72.1</td>
<td>127</td>
<td>71.9</td>
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<tr>
<td>654.roms_s</td>
<td>24</td>
<td>154</td>
<td>102</td>
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<td>153</td>
<td>103</td>
</tr>
</tbody>
</table>

SPECspeed®2017_fp_base = 123
SPECspeed®2017_fp_peak = Not Run

Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

Operating System Notes

Stack size set to unlimited using "ulimit -s unlimited"

Environment Variables Notes

Environment variables set by runcpu before the start of the run:
KMP_AFFINITY = "granularity=fine,compact"
LD_LIBRARY_PATH = "/home/cpu2017-1.1.8-ic2021.1-revB/lib/intel64:/home/cpu2017-1.1.8-ic202 1.1-revB/je5.0.1-64"
MALLOC_CONF = "retain:true"
OMP_STACKSIZE = "192M"

General Notes

Binaries compiled on a system with 1x Intel Core i9-7980XE 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.

(Continued on next page)
## General Notes (Continued)

jemalloc, a general purpose malloc implementation
built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5

## Platform Notes

BIOS configuration:
Choose Operating Mode set to Maximum Performance and then set it to Custom Mode
C-States set to Legacy
Adjacent Cache Prefetch set to Disabled
Hyper-Threading set to Disabled

Sysinfo program /home/cpu2017-1.1.8-ic2021.1-revB/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16cafc64d
running on localhost.localdomain Sat Jul  3 08:38:36 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) Gold 6312U CPU @ 2.40GHz
 1 "physical id"s (chips)
 24 "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 : 24
siblings : 24
physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
```

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): 24
On-line CPU(s) list: 0-23
Thread(s) per core: 1
Core(s) per socket: 24
Socket(s): 1
NUMA node(s): 1
Vendor ID: GenuineIntel
CPU family: 6
Model: 106
Model name: Intel(R) Xeon(R) Gold 6312U CPU @ 2.40GHz
Stepping: 6
CPU MHz: 3204.403
```
Lenovo Global Technology

ThinkSystem ST650 V2
(2.40 GHz, Intel Xeon Gold 6312U)

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

SPECspeed®2017_fp_base = 123
SPECspeed®2017_fp_peak = Not Run

Platform Notes (Continued)

BogoMIPS: 4800.00
Virtualization: VT-x
L1d cache: 48K
L1i cache: 32K
L2 cache: 1280K
L3 cache: 36864K
NUMA node0 CPU(s): 0-23
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 rdtscp
lm constant_tsc art arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid
aperfmprefp 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 rdram lahf_lm abm 3dnowprefetch cpuid_fault epb cat_l3 invpcid_single
intel_pinn ssbd mba ibpb ibsp ibrs Enhanced tpr_shadow vmm x86Mask x86Pfem x86Zoom
vqdb vcpufreq vcpuid vcpu meme vcpu_thread vcpu_guest vcpu_idle vcpu_time
tmc vcpu鹖cpu vcpu_image vcpu_memory vcpu_memory

From /proc/cpuinfo cache data
  cache size : 36864 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 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23
  node 0 size: 489067 MB
  node 0 free: 514449 MB
  node distances:
    node 0
      0: 10

From /proc/meminfo
  MemTotal: 528016500 kB
  HugePages_Total: 0
  Hugepagesize: 2048 kB

From /sbin/tuned-adm active
  Current active profile: balanced

From /etc/*release* /etc/*version*
  os-release:
    NAME="Red Hat Enterprise Linux"
    VERSION="8.3 (Ootpa)"
    ID="rhel"

(Continued on next page)
Platform Notes (Continued)

```
ID_LIKE="fedora"
VERSION_ID="8.3"
PLATFORM_ID="platform:el8"
PRETTY_NAME="Red Hat Enterprise Linux 8.3 (Ootpa)"
ANSI_COLOR="0;31"
redhat-release: Red Hat Enterprise Linux release 8.3 (Ootpa)
system-release: Red Hat Enterprise Linux release 8.3 (Ootpa)
system-release-cpe: cpe:/o:redhat:enterprise_linux:8.3:ga
uname -a:
  Linux localhost.localdomain 4.18.0-240.el8.x86_64 #1 SMP Wed Sep 23 05:13:10 EDT 2020
  x86_64 x86_64 x86_64 GNU/Linux
```

Kernel self-reported vulnerability status:

<table>
<thead>
<tr>
<th>CVE-2018-12207 (iTLB Multihit)</th>
<th>Not affected</th>
</tr>
</thead>
<tbody>
<tr>
<td>CVE-2018-3620 (L1 Terminal Fault)</td>
<td>Not affected</td>
</tr>
<tr>
<td>Microarchitectural Data Sampling</td>
<td>Not affected</td>
</tr>
<tr>
<td>CVE-2017-5754 (Meltdown)</td>
<td>Not affected</td>
</tr>
<tr>
<td>CVE-2018-3639 (Speculative Store Bypass)</td>
<td>Mitigation: Speculative Store Bypass disabled via prctl and seccomp</td>
</tr>
<tr>
<td>CVE-2017-5753 (Spectre variant 1)</td>
<td>Mitigation: usercopy/swaps barriers and __user pointer sanitization</td>
</tr>
<tr>
<td>CVE-2017-5715 (Spectre variant 2)</td>
<td>Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling</td>
</tr>
<tr>
<td>CVE-2020-0543 (Special Register Buffer Data Sampling)</td>
<td>Not affected</td>
</tr>
<tr>
<td>CVE-2019-11135 (TSX Asynchronous Abort)</td>
<td>Not affected</td>
</tr>
</tbody>
</table>

run-level 3 Jul 3 08:38

SPEC is set to: /home/cpu2017-1.1.8-ic2021.1-revB
Filesystem Type Size Used Avail Use% Mounted on
/dev/sda4 xfs 818G 108G 710G 14% /home

From /sys/devices/virtual/dmi/id
Vendor: Lenovo
Product: ThinkSystem ST650V2
Product Family: ThinkSystem
Serial: 1234567890

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:
Platform Notes (Continued)

16x NO DIMM NO DIMM
16x Samsung M393A4G43AB3-CWE 32 GB 2 rank 3200

BIOS:
BIOS Vendor: Lenovo
BIOS Version: U8E111A-1.02
BIOS Date: 05/07/2021
BIOS Revision: 1.2
Firmware Revision: 1.40
(End of data from sysinfo program)

Compiler Version Notes

C               | 619.lbm_s(base) 638.imagick_s(base) 644.nab_s(base)
------------------
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, Fortran | 607.cactuBSSN_s(base)
------------------
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.
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.
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.

Fortran         | 603.bwaves_s(base) 649.fotonik3d_s(base) 654.roms_s(base)
------------------
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.

Fortran, C      | 621.wrf_s(base) 627.cam4_s(base) 628.pop2_s(base)
(Continued on next page)
Lenovo Global Technology
ThinkSystem ST650 V2
(2.40 GHz, Intel Xeon Gold 6312U)

SPECspeed®2017_fp_base = 123
SPECspeed®2017_fp_peak = Not Run

Compiler Version Notes (Continued)

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-AVX2 -ipo -03 -no-prec-div -qopt-prefetch

(Continued on next page)
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CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Tested by: Lenovo Global Technology

<table>
<thead>
<tr>
<th>Test Date:</th>
<th>Jul-2021</th>
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<tbody>
<tr>
<td>Hardware Availability:</td>
<td>Jul-2021</td>
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<tr>
<td>Software Availability:</td>
<td>Dec-2020</td>
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**Base Optimization Flags (Continued)**

C benchmarks (continued):
- `-ffinite-math-only` `-qopt-mem-layout-trans=4` `-qopenmp` `-DSPEC_OPENMP`
- `-mbranches-within-32B-boundaries`

Fortran benchmarks:
- `-m64` `-Wl,-z,muldefs` `-DSPEC_OPENMP` `-xCORE-AVX2` `-ipo` `-O3` `-no-prec-div`
- `-qopt-prefetch` `-ffinite-math-only` `-qopt-mem-layout-trans=4` `-qopenmp`
- `-nostandard-realloc-lhs` `-mbranches-within-32B-boundaries`
- `-L/usr/local/jemalloc64-5.0.1/lib` `-ljemalloc`

Benchmarks using both Fortran and C:
- `-m64` `-std=c11` `-Wl,-z,muldefs` `-xCORE-AVX2` `-ipo` `-O3` `-no-prec-div`
- `-qopt-prefetch` `-ffinite-math-only` `-qopt-mem-layout-trans=4` `-qopenmp`
- `-DSPEC_OPENMP` `-mbranches-within-32B-boundaries` `-nostandard-realloc-lhs`
- `-L/usr/local/jemalloc64-5.0.1/lib` `-ljemalloc`

Benchmarks using Fortran, C, and C++:
- `-m64` `-std=c11` `-Wl,-z,muldefs` `-xCORE-AVX2` `-ipo` `-O3` `-no-prec-div`
- `-qopt-prefetch` `-ffinite-math-only` `-qopt-mem-layout-trans=4` `-qopenmp`
- `-DSPEC_OPENMP` `-mbranches-within-32B-boundaries` `-nostandard-realloc-lhs`
- `-L/usr/local/jemalloc64-5.0.1/lib` `-ljemalloc`

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-ICElake-E.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-ICElake-E.xml
http://www.spec.org/cpu2017/flags/Intel-ic2021-official-linux64_revA.xml

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