### Lenovo Global Technology

**ThinkSystem SR650 V2**  
(2.90 GHz, Intel Xeon Gold 6326)

---

#### Hardware

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU Name</td>
<td>Intel Xeon Gold 6326</td>
</tr>
<tr>
<td>Max MHz</td>
<td>3500</td>
</tr>
<tr>
<td>Nominal</td>
<td>2900</td>
</tr>
<tr>
<td>Enabled</td>
<td>32 cores, 2 chips, 2 threads/core</td>
</tr>
<tr>
<td>Orderable</td>
<td>1.2 chips</td>
</tr>
<tr>
<td>Cache L1</td>
<td>32 KB I + 48 KB D on chip per core</td>
</tr>
<tr>
<td>L2</td>
<td>1.25 MB I+D on chip per core</td>
</tr>
<tr>
<td>L3</td>
<td>24 MB I+D on chip per chip</td>
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<tr>
<td>Memory</td>
<td>1 TB (32 x 32 GB 2Rx8 PC4-3200AA-R)</td>
</tr>
<tr>
<td>Storage</td>
<td>1 x 960 GB SATA SSD</td>
</tr>
<tr>
<td>Other</td>
<td>None</td>
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</table>

#### Software

<table>
<thead>
<tr>
<th>Feature</th>
<th>Specification</th>
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</thead>
<tbody>
<tr>
<td>OS</td>
<td>Red Hat Enterprise Linux 8.3 (Ootpa)</td>
</tr>
<tr>
<td>Kernel</td>
<td>4.18.0-240.el8.x86_64</td>
</tr>
<tr>
<td>Compiler</td>
<td>C/C++, Version 2021.1 of Intel oneAPI DPC++/C++</td>
</tr>
<tr>
<td></td>
<td>Compiler Build 20201113 for Linux;</td>
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<tr>
<td></td>
<td>Fortran: Version 2021.1 of Intel Fortran Compiler</td>
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<td>Classic Build 20201112 for Linux</td>
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<tr>
<td>Parallel</td>
<td>Yes</td>
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<tr>
<td>Firmware</td>
<td>Lenovo BIOS Version AFE111A 1.02 released May-2021</td>
</tr>
<tr>
<td>File System</td>
<td>xfs</td>
</tr>
<tr>
<td>System State</td>
<td>Run level 3 (multi-user)</td>
</tr>
<tr>
<td>Base Pointers</td>
<td>64-bit</td>
</tr>
<tr>
<td>Peak Pointers</td>
<td>Not Applicable</td>
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<tr>
<td>Other</td>
<td>jemalloc memory allocator V5.0.1</td>
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<tr>
<td>Power Management</td>
<td>BIOS and OS set to prefer performance at the cost</td>
</tr>
<tr>
<td></td>
<td>of additional power usage</td>
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---

SPECSpeed\textsuperscript{2017\_int\_base} = 11.5  
SPECSpeed\textsuperscript{2017\_int\_peak} = Not Run
Lenovo Global Technology

ThinkSystem SR650 V2
(2.90 GHz, Intel Xeon Gold 6326)

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

SPECspeak®2017_int_base = 11.5
SPECspeak®2017_int_peak = Not Run

Results Table

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<thead>
<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
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<tr>
<td>600.perlbench_s</td>
<td>64</td>
<td>249</td>
<td>7.14</td>
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<td>7.08</td>
<td>250</td>
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<td>10.5</td>
<td>384</td>
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<td>605.mcf_s</td>
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<td>620.omnetpp_s</td>
<td>64</td>
<td>167</td>
<td>9.74</td>
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<td>625.x264_s</td>
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<td>648.exchange2_s</td>
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<tr>
<td>657.xz_s</td>
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<td>23.0</td>
<td>269</td>
<td>23.0</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

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,scatter"
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"
MALLOCONF = "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)
# Lenovo Global Technology

## ThinkSystem SR650 V2

(2.90 GHz, Intel Xeon Gold 6326)

<table>
<thead>
<tr>
<th>CPU2017 License</th>
<th>Lenovo Global Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Sponsor:</td>
<td>Lenovo Global Technology</td>
</tr>
<tr>
<td>Tested by:</td>
<td>Lenovo Global Technology</td>
</tr>
</tbody>
</table>

---

## SPECspeed®2017 Int Base = 11.5

## SPECspeed®2017 Int Peak = Not Run

---

### 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

Sysinfo program /home/cpu2017-1.1.8-ic2021.1-revB/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16aca6c64d
running on localhost.localdomain Sun Jul 18 03:11:20 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 6326 CPU @ 2.90GHz
  2 "physical id"s (chips)  
  64 "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 : 32
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 from util-linux 2.32.1:

Architecture: x86_64
CPU op-mode(s): 32-bit, 64-bit
Byte Order: Little Endian
CPU(s): 64
On-line CPU(s) list: 0-63
Thread(s) per core: 2
Core(s) per socket: 16
Socket(s): 2
NUMA node(s): 2
Vendor ID: GenuineIntel
CPU family: 6
Model: 106
Model name: Intel(R) Xeon(R) Gold 6326 CPU @ 2.90GHz
Stepping: 6
CPU MHz: 1933.129
BogoMIPS: 5800.00

(Continued on next page)
Lenovo Global Technology
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SPECspeed®2017_int_base = 11.5
SPECspeed®2017_int_peak = Not Run

Platform Notes (Continued)

Virtualization: VT-x
L1d cache: 48K
L1i cache: 32K
L2 cache: 1280K
L3 cache: 24576K
NUMA node0 CPU(s): 0-15,32-47
NUMA node1 CPU(s): 16-31,48-63
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
xtrr pdcm pcid dca sse4_1 sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave
avxf16c rdrand lahf_lm abm 3dnowprefetch cpuid_fault epb cat_l3 invpcid_single
intel_pinn ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vnumi flexpriority ept
vpid ept_ad fsgsbase tsc_adjust bmi1 hle avx2 smep bmi2 erms invpcid cqm rdt_a
avx512f avx512dq rdseed adx smap avx512ifma clflushopt clwb intel_pt avx512cd sha_ni
avx512bw avx512vl xsaveopt xsaves xsavec xgetbv1 xsaveas cqm_llc cqm_occ_bitllc cqm_mbb_total
cqm_mbb_local split_lock_detect wboinvd dtbherm ida arat pln pts avx512vmbm umip pkp
ospke avx512_vbmi2 gfnl vaes vpcmuldqav axv512_vnni avx512_vbitlg tme
avx512_vpopcntdq la57 rdpid md_clear pconfig flush_l1d arch_capabilities

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 32 33 34 35 36 37 38 39 40 41 42 43
  44 45 46 47
node 0 size: 491335 MB
node 0 free: 515023 MB
node 1 cpus: 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 48 49 50 51 52 53 54 55 56
  57 58 59 60 61 62 63
node 1 size: 492985 MB
node 1 free: 515337 MB
node distances:
  node   0   1
  0:  10  20
  1:  20  10

From /proc/meminfo
MemTotal: 1056488900 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

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

(Continued on next page)
SPEC CPU®2017 Integer Speed Result

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

SPECspeed®2017_int_base = 11.5
SPECspeed®2017_int_peak = Not Run

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

Platform Notes (Continued)

/usr/bin/lsb_release -d
  Red Hat Enterprise Linux release 8.3 (Ootpa)

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

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

run-level 3 Jul 18 03:07

SPEC is set to: /home/cpu2017-1.1.8-ic2021.1-revB

Filesystem Type Size Used Avail Use% Mounted on
/dev/sda4 xfs 818G 160G 658G 20% /home

From /sys/devices/virtual/dmi/id
  Vendor: Lenovo

(Continued on next page)
SPEC CPU®2017 Integer Speed Result
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Platform Notes (Continued)

Product: ThinkSystem SR650 V2 MB
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:
32x Samsung M393A4G43AB3-CWE 32 GB 2 rank 3200

BIOS:
BIOS Vendor: Lenovo
BIOS Version: AFE111A-1.02
BIOS Date: 05/07/2021
BIOS Revision: 1.2
Firmware Revision: 1.10

(End of data from sysinfo program)

Compiler Version Notes
==============================================================================
C | 600.perlbench_s(base) 602.gcc_s(base) 605.mcf_s(base) 625.x264_s(base)
   | 657.xz_s(base)
==============================================================================
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++ | 620.omnetpp_s(base) 623.xalancbmk_s(base) 631.deepsjeng_s(base)
    | 641.leela_s(base)
==============================================================================
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.
==============================================================================
Fortran | 648.exchange2_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.

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Compiler Version Notes (Continued)

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Base Compiler Invocation

C benchmarks:
icx

C++ benchmarks:
icpx

Fortran benchmarks:
ifort

Base Portability Flags

600.perlbench_s: -DSPEC_LP64 -DSPEC_LINUX_X64
602.gcc_s: -DSPEC_LP64
605.mcf_s: -DSPEC_LP64
620.omnetpp_s: -DSPEC_LP64
623.xalancbmk_s: -DSPEC_LP64 -DSPEC_LINUX
625.x264_s: -DSPEC_LP64
631.deepsjeng_s: -DSPEC_LP64
641.leela_s: -DSPEC_LP64
648.exchange2_s: -DSPEC_LP64
657.xz_s: -DSPEC_LP64

Base Optimization Flags

C benchmarks:
-DSPEC_OPENMP -std=c11 -m64 -fiopenmp -Wl,-z,muldefs -xCORE-AVX2
-O3 -ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -mbranches-within-32B-boundaries
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

C++ benchmarks:
-DSPEC_OPENMP -m64 -Wl,-z,muldefs -xCORE-AVX2 -O3 -ffast-math -flto
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-mbranches-within-32B-boundaries
-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin/
-lqkmalloc

(Continued on next page)
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**Test Date:** Jul-2021  
**Hardware Availability:** Jul-2021  
**Software Availability:** Dec-2020

### Base Optimization Flags (Continued)

Fortran benchmarks:
- `-m64`  
- `-xCORE-AVX2`  
- `-O3`  
- `-ipo`  
- `-no-prec-div`  
- `-qopt-mem-layout-trans=4`  
- `-nostandard-realloc-lhs`  
- `-align array32byte`  
- `-auto`  
- `-mbranches-within-32B-boundaries`

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

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### End of Document

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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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