



# SPEC CPU®2017 Integer Rate Result

Copyright 2017-2021 Standard Performance Evaluation Corporation

## Lenovo Global Technology

SPECrate®2017\_int\_base = 412

ThinkSystem ST650 V2  
(2.20 GHz, Intel Xeon Gold 6338N)

SPECrate®2017\_int\_peak = Not Run

CPU2017 License: 9017

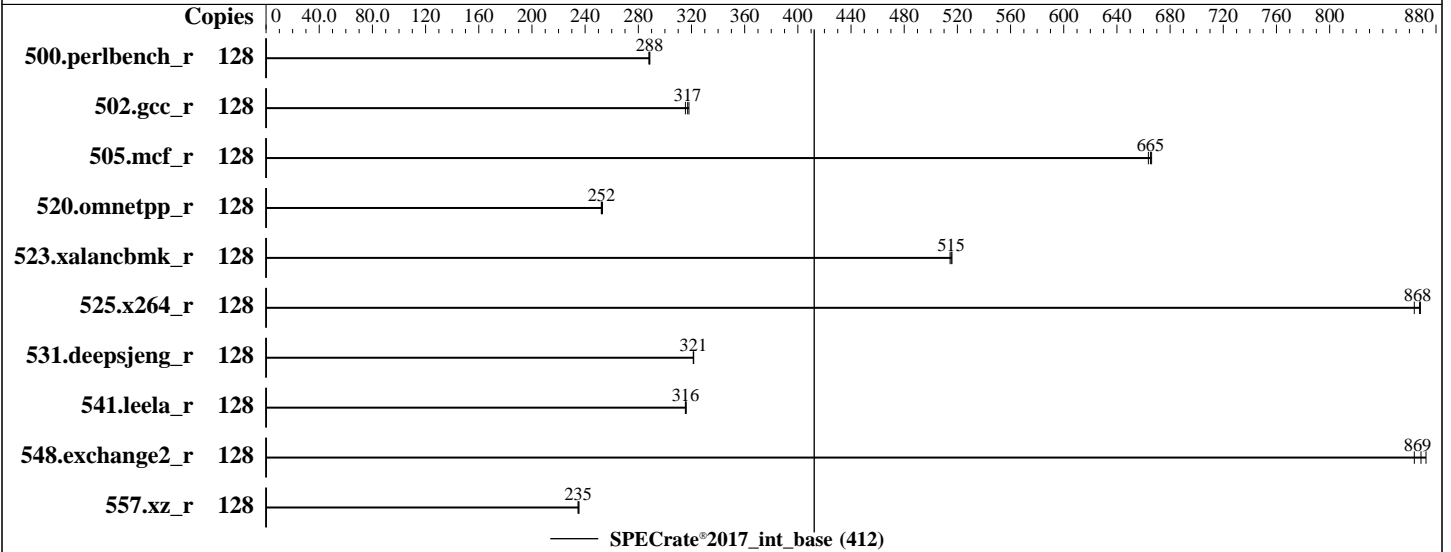
Test Date: May-2021

Test Sponsor: Lenovo Global Technology

Hardware Availability: Jul-2021

Tested by: Lenovo Global Technology

Software Availability: Feb-2021



### Hardware

CPU Name: Intel Xeon Gold 6338N  
 Max MHz: 3500  
 Nominal: 2200  
 Enabled: 64 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: 48 MB I+D on chip per chip  
 Other: None  
 Memory: 1 TB (32 x 32 GB 2Rx8 PC4-3200AA-R, running at 2666)  
 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: C/C++: Version 2021.1 of Intel oneAPI DPC++/C++ Compiler Build 20201113 for Linux;  
 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: No  
 Firmware: Lenovo BIOS Version U8E109PT1 1.01 released Apr-2021  
 File System: xfs  
 System State: Run level 3 (multi-user)  
 Base Pointers: 64-bit  
 Peak Pointers: Not Applicable  
 Other: None  
 Power Management: BIOS and OS set to prefer performance at the cost of additional power usage



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## Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
500.perlbench_r	128	708	288	<b>706</b>	<b>288</b>	706	289							
502.gcc_r	128	570	318	575	315	<b>572</b>	<b>317</b>							
505.mcf_r	128	311	666	312	664	<b>311</b>	<b>665</b>							
520.omnetpp_r	128	664	253	<b>666</b>	<b>252</b>	666	252							
523.xalancbmk_r	128	263	515	<b>262</b>	<b>515</b>	262	516							
525.x264_r	128	258	868	260	864	<b>258</b>	<b>868</b>							
531.deepsjeng_r	128	456	322	<b>456</b>	<b>321</b>	456	321							
541.leela_r	128	672	315	<b>672</b>	<b>316</b>	671	316							
548.exchange2_r	128	388	864	<b>386</b>	<b>869</b>	384	872							
557.xz_r	128	587	235	589	235	<b>589</b>	<b>235</b>							

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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"

## Environment Variables Notes

Environment variables set by runcpu before the start of the run:  
LD\_LIBRARY\_PATH =  
"/home/cpu2017-1.1.5-ic2021.1-revB/lib/intel64:/home/cpu2017-1.1.5-ic2021.1-revB/lib/ia32:/home/cpu2017-1.1.5-ic2021.1-revB/je5.0.1-32"  
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  
Filesystem page cache synced and cleared with:  
sync; echo 3> /proc/sys/vm/drop\_caches

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## General Notes (Continued)

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.

## Platform Notes

BIOS configuration:  
Choose Operating Mode set to Maximum Performance and then set it to Custom Mode  
DCU Streamer Prefetcher set to Disabled  
SNC set to Enabled  
UPI Link Disable set to Disabled 1 Link

Sysinfo program /home/cpu2017-1.1.5-ic2021.1-revB/bin/sysinfo  
Rev: r6538 of 2020-09-24 e8664e66d2d7080afeaa89d4b38e2f1c  
running on localhost.localdomain Thu May 20 00:22:27 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 6338N CPU @ 2.20GHz  
2 "physical id"s (chips)  
128 "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 : 32  
siblings : 64  
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 24  
25 26 27 28 29 30 31  
physical 1: 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 24  
25 26 27 28 29 30 31

From lscpu:  
Architecture: x86\_64  
CPU op-mode(s): 32-bit, 64-bit  
Byte Order: Little Endian  
CPU(s): 128  
On-line CPU(s) list: 0-127  
Thread(s) per core: 2  
Core(s) per socket: 32

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### Platform Notes (Continued)

```

Socket(s):                2
NUMA node(s):            4
Vendor ID:               GenuineIntel
CPU family:              6
Model:                   106
Model name:              Intel(R) Xeon(R) Gold 6338N CPU @ 2.20GHz
Stepping:                6
CPU MHz:                  2700.000
BogoMIPS:                 4400.00
Virtualization:          VT-x
L1d cache:                48K
L1i cache:                32K
L2 cache:                 1280K
L3 cache:                 49152K
NUMA node0 CPU(s):       0-15,64-79
NUMA node1 CPU(s):       16-31,80-95
NUMA node2 CPU(s):       32-47,96-111
NUMA node3 CPU(s):       48-63,112-127
Flags:                    fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov
pat pse36 clflush dts acpi mmx fxsr sse2 sse3 ss ht tm pbe syscall nx pdpe1gb rdtscp
lm constant_tsc art arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid
aperfmpperf 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 intel_ppin
ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow vnmi 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
avx512v1 xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbm_total
cqm_mbm_local split_lock_detect wbnoinvd dtherm ida arat pln pts avx512vbmi umip pku
ospke avx512_vbmi2 gfni vaes vpclmulqdq avx512_vnni avx512_bitalg tme
avx512_vpopcntdq la57 rdpid md_clear pconfig flush_l1d arch_capabilities

```

```

/proc/cpuinfo cache data
cache size : 49152 KB

```

```

From numactl --hardware 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 10 11 12 13 14 15 64 65 66 67 68 69 70 71 72 73 74 75
76 77 78 79
node 0 size: 251605 MB
node 0 free: 257112 MB
node 1 cpus: 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 80 81 82 83 84 85 86 87 88
89 90 91 92 93 94 95
node 1 size: 252536 MB
node 1 free: 257768 MB
node 2 cpus: 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 96 97 98 99 100 101 102

```

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### Platform Notes (Continued)

```

103 104 105 106 107 108 109 110 111
node 2 size: 252757 MB
node 2 free: 257586 MB
node 3 cpus: 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 112 113 114 115 116 117
118 119 120 121 122 123 124 125 126 127
node 3 size: 252302 MB
node 3 free: 257614 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:      1056474220 kB
HugePages_Total:      0
Hugepagesize:    2048 kB

```

```

/sbin/tuned-adm active
Current active profile: throughput-performance

```

```

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):               Not affected
CVE-2018-3639 (Speculative Store Bypass): Mitigation: Speculative Store

```

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### Platform Notes (Continued)

CVE-2017-5753 (Spectre variant 1): Bypass disabled via prctl and seccomp  
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): Not affected

CVE-2019-11135 (TSX Asynchronous Abort): Not affected

run-level 3 May 20 00:19

SPEC is set to: /home/cpu2017-1.1.5-ic2021.1-revB

Filesystem	Type	Size	Used	Avail	Use%	Mounted on
/dev/sda4	xfs	818G	50G	768G	7%	/home

From /sys/devices/virtual/dmi/id

Vendor: Lenovo  
Product: ThinkSystem ST650V2  
Product Family: ThinkSystem  
Serial: 1234567890

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.

Memory:  
32x Samsung M393A4G43AB3-CWE 32 GB 2 rank 3200, configured at 2666

BIOS:

BIOS Vendor: Lenovo  
BIOS Version: U8E109PT1-1.01  
BIOS Date: 04/28/2021  
BIOS Revision: 1.1  
Firmware Revision: 1.20

(End of data from sysinfo program)

### Compiler Version Notes

```
=====
C      | 500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base)
      | 525.x264_r(base) 557.xz_r(base)
-----
```

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2021.1 Build 20201113

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## Compiler Version Notes (Continued)

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=====  
C++ | 520.omnetpp\_r(base) 523.xalancbmk\_r(base) 531.deepsjeng\_r(base)  
| 541.leela\_r(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 | 548.exchange2\_r(base)  
=====

Intel(R) Fortran Intel(R) 64 Compiler Classic for applications running on  
Intel(R) 64, Version 2021.1 Build 20201112\_000000

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## Base Compiler Invocation

C benchmarks:

icx

C++ benchmarks:

icpx

Fortran benchmarks:

ifort

## Base Portability Flags

500.perlbench\_r: -DSPEC\_LP64 -DSPEC\_LINUX\_X64

502.gcc\_r: -DSPEC\_LP64

505.mcf\_r: -DSPEC\_LP64

520.omnetpp\_r: -DSPEC\_LP64

523.xalancbmk\_r: -DSPEC\_LP64 -DSPEC\_LINUX

525.x264\_r: -DSPEC\_LP64

531.deepsjeng\_r: -DSPEC\_LP64

541.leela\_r: -DSPEC\_LP64

548.exchange2\_r: -DSPEC\_LP64

557.xz\_r: -DSPEC\_LP64



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## Base Optimization Flags

### C benchmarks:

```
-w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX512 -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
```

### C++ benchmarks:

```
-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -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
```

### Fortran benchmarks:

```
-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -O3 -ipo -no-prec-div  
-qopt-mem-layout-trans=4 -nostandard-realloc-lhs -align array32byte  
-auto -mbranches-within-32B-boundaries  
-L/opt/intel/oneapi/compiler/2021.1.1/linux/compiler/lib/intel64_lin  
-lqkmalloc
```

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-D.html>

[http://www.spec.org/cpu2017/flags/Intel-ic2021-official-linux64\\_revA.html](http://www.spec.org/cpu2017/flags/Intel-ic2021-official-linux64_revA.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-D.xml>

[http://www.spec.org/cpu2017/flags/Intel-ic2021-official-linux64\\_revA.xml](http://www.spec.org/cpu2017/flags/Intel-ic2021-official-linux64_revA.xml)

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For questions about this result, please contact the tester. For other inquiries, please contact [info@spec.org](mailto:info@spec.org).

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