# SPEC CPU®2017 Integer Rate Result

## Lenovo Global Technology

ThinkSystem SD650 V2
(2.40 GHz, Intel Xeon Platinum 8360Y)

SPECrate®2017_int_base =       508

SPECrate®2017_int_peak = Not Run

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

**Test Date:** May-2021
**Hardware Availability:** Jul-2021
**Software Availability:** Feb-2021

| Benchmark | Copies | Result |
|---|---|---|
| 500.perlbench_r | 144 | 361 |
| 502.gcc_r | 144 | 378 |
| 505.mcf_r | 144 | 803 |
| 520.omnetpp_r | 144 | 295 |
| 523.xalancbmk_r | 144 | 628 |
| 525.x264_r | 144 | 1080 |
| 531.deepsjeng_r | 144 | 408 |
| 541.leela_r | 144 | 404 |
| 548.exchange2_r | 144 | 1110 |
| 557.xz_r | 144 | 284 |

SPECrate®2017_int_base (508)

## Hardware

CPU Name: Intel Xeon Platinum 8360Y
  Max MHz: 3500
  Nominal: 2400
Enabled: 72 cores, 2 chips, 2 threads/core
Orderable: 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: 54 MB I+D on chip per chip
  Other: None
Memory: 512 GB (16 x 32 GB 2Rx4 PC4-3200AA-R)
Storage: 1 x 480 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

Standard Performance Evaluation Corporation (info@spec.org)                https://www.spec.org/

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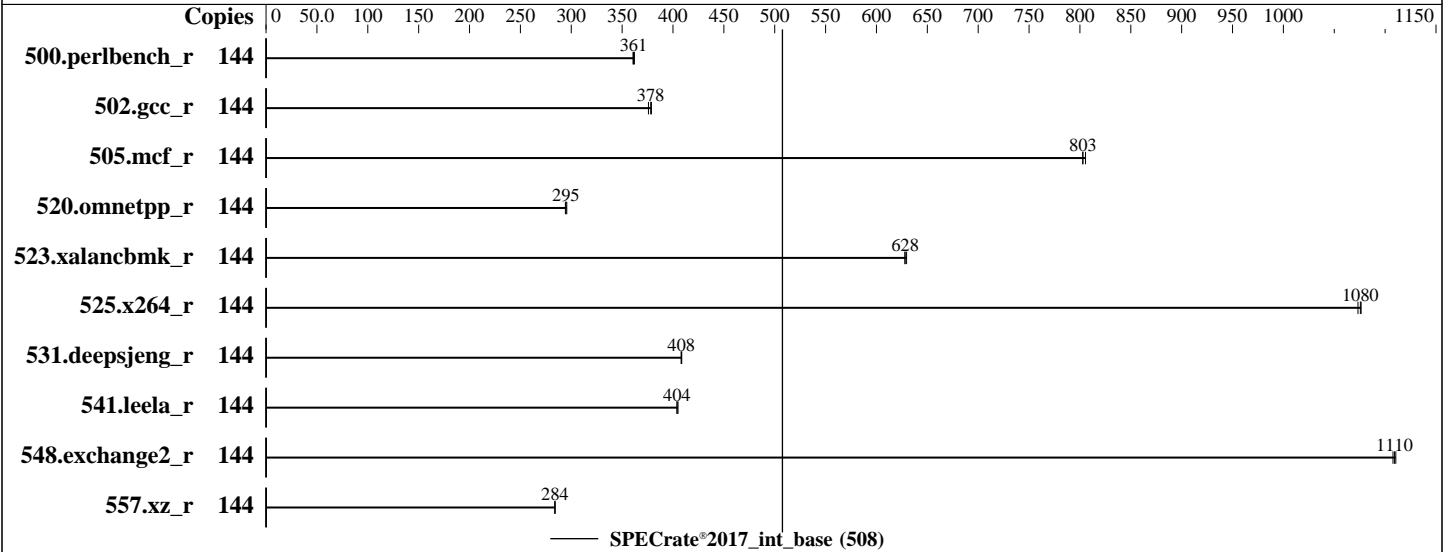
SPECrate®2017_int_peak = Not Run

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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 | 144 | 633 | 362 | 636 | 361 | **635** | **361** | | | | | | | |
| 502.gcc_r | 144 | 542 | 376 | **539** | **378** | 538 | 379 | | | | | | | |
| 505.mcf_r | 144 | 290 | 803 | 289 | 805 | **290** | **803** | | | | | | | |
| 520.omnetpp_r | 144 | **641** | **295** | 642 | 294 | 639 | 296 | | | | | | | |
| 523.xalancbmk_r | 144 | **242** | **628** | 242 | 630 | 242 | 628 | | | | | | | |
| 525.x264_r | 144 | 235 | 1070 | 234 | 1080 | **234** | **1080** | | | | | | | |
| 531.deepsjeng_r | 144 | **404** | **408** | 404 | 409 | 404 | 408 | | | | | | | |
| 541.leela_r | 144 | **590** | **404** | 590 | 404 | 589 | 405 | | | | | | | |
| 548.exchange2_r | 144 | **340** | **1110** | 340 | 1110 | 341 | 1110 | | | | | | | |
| 557.xz_r | 144 | 547 | 284 | 548 | 284 | **548** | **284** | | | | | | | |
| **SPECrate®2017_int_base =** | **508** | | | | | | | | | | | | | |
| **SPECrate®2017_int_peak =** | **Not Run** | | | | | | | | | | | | | |

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-ic202
      1.1-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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Standard Performance Evaluation Corporation (info@spec.org)
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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
C-States set to Autonomous
DCU Streamer Prefetcher set to Disabled
Adjacent Cache Prefetch set to Disabled
UPI Link Disable set to Disabled 1 Link
CPU Frequency Limits set to Restrict maximum frequency
SNC set to Enabled

 Sysinfo program /home/cpu2017-1.1.5-ic2021.1-revB/bin/sysinfo
 Rev: r6538 of 2020-09-24 e8664e66d2d7080afeaa89d4b38e2f1c
 running on ip10-245-59-38.labs.lenovo.com Fri May 14 13:16:36 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) Platinum 8360Y CPU @ 2.40GHz
       2  "physical id"s (chips)
       144 "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 : 36
       siblings  : 72
       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 32 33 34 35
       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 32 33 34 35

 From lscpu:
      Architecture:        x86_64
      CPU op-mode(s):      32-bit, 64-bit
      Byte Order:          Little Endian
      CPU(s):              144
```

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## Platform Notes (Continued)

```
         On-line CPU(s) list: 0-143
         Thread(s) per core:  2
         Core(s) per socket:  36
         Socket(s):           2
         NUMA node(s):        4
         Vendor ID:           GenuineIntel
         CPU family:          6
         Model:               106
         Model name:          Intel(R) Xeon(R) Platinum 8360Y CPU @ 2.40GHz
         Stepping:            6
         CPU MHz:             3100.000
         BogoMIPS:            4800.00
         Virtualization:      VT-x
         L1d cache:           48K
         L1i cache:           32K
         L2 cache:            1280K
         L3 cache:            55296K
         NUMA node0 CPU(s):   0-17,72-89
         NUMA node1 CPU(s):   18-35,90-107
         NUMA node2 CPU(s):   36-53,108-125
         NUMA node3 CPU(s):   54-71,126-143
         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
    aperfmperf 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
    avx512vl 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 : 55296 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 16 17 72 73 74 75 76 77 78 79 80 81
    82 83 84 85 86 87 88 89
    node 0 size: 124978 MB
    node 0 free: 128188 MB
    node 1 cpus: 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 90 91 92 93 94 95 96
    97 98 99 100 101 102 103 104 105 106 107
```

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## Platform Notes (Continued)

```
   node 1 size: 125365 MB
   node 1 free: 128020 MB
   node 2 cpus: 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 108 109 110 111 112
   113 114 115 116 117 118 119 120 121 122 123 124 125
   node 2 size: 125824 MB
   node 2 free: 128615 MB
   node 3 cpus: 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 126 127 128 129 130
   131 132 133 134 135 136 137 138 139 140 141 142 143
   node 3 size: 125579 MB
   node 3 free: 128654 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:       527986552 kB
    HugePages_Total:        0
    Hugepagesize:        2048 kB

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

 /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 ip10-245-59-38.labs.lenovo.com 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:
```

**(Continued on next page)**

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## Platform Notes (Continued)

```
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):               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 14 13:14

SPEC is set to: /home/cpu2017-1.1.5-ic2021.1-revB
   Filesystem      Type  Size  Used Avail Use% Mounted on
   /dev/sda4       xfs   372G   21G  351G   6% /home

From /sys/devices/virtual/dmi/id
    Vendor:          Lenovo
    Product:         ThinkSystem SD650 V2
    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:
    16x Samsung M393A4K40DB3-CWE 32 GB 2 rank 3200

BIOS:
   BIOS Vendor:      Lenovo
   BIOS Version:     U8E109PT1-1.01
   BIOS Date:        04/28/2021
   BIOS Revision:    1.1
   Firmware Revision: 1.40

(End of data from sysinfo program)
```

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## 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
Copyright (C) 1985-2020 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------


==============================================================================
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
Copyright (C) 1985-2020 Intel Corporation.  All rights reserved.
------------------------------------------------------------------------------
```

## 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`

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# Base Portability Flags (Continued)

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`

# 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

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
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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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