Lenovo Global Technology  
ThinkSystem ST250 V3  
(3.20 GHz, Intel Xeon E-2488)  

**SPECrate®2017_int_base = 92.8**  
**SPECrate®2017_int_peak = 96.8**

**CPU2017 License:** 9017  
**Test Sponsor:** Lenovo Global Technology  
**Tested by:** Lenovo Global Technology  
**Test Date:** Dec-2023  
**Hardware Availability:** Feb-2024  
**Software Availability:** Dec-2023

---

### Hardware

- **CPU Name:** Intel Xeon E-2488  
- **Max MHz:** 5600  
- **Nominal:** 3200  
- **Enabled:** 8 cores, 1 chip, 2 threads/core  
- **Orderable:** 1 chip  
- **Cache L1:** 32 KB I + 48 KB D on chip per core  
- **L2:** 2 MB I+D on chip per core  
- **L3:** 24 MB I+D on chip per chip  
- **Other:** None  
- **Memory:** 64 GB (2 x 32 GB 2Rx8 PC5-4800B-E, running at 4400)  
- **Storage:** 1 x 1.92 TB SATA SSD  
- **Other:** None

### Software

- **OS:** SUSE Linux Enterprise Server 15 SP5  
- **Kernel:** 5.14.21-150500.53-default  
- **Compiler:** C/C++, Version 2023.2.3 of Intel oneAPI DPC++/C++  
- **Compiler for Linux:** Fortran: Version 2023.2.3 of Intel Fortran  
- **Compiler for Linux:** Compiler for Linux:  
- **Parallel:** No  
- **Firmware:** Lenovo BIOS Version CTE101X 1.10 released Dec-2023  
- **File System:** xfs  
- **System State:** Run level 3 (multi-user)  
- **Base Pointers:** 64-bit  
- **Peak Pointers:** 32/64-bit  
- **Other:** jemalloc memory allocator V5.0.1  
- **Power Management:** BIOS and OS set to prefer performance at the cost of additional power usage
## Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
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<td>541.leela_r</td>
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<td>16</td>
<td>244</td>
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<td>391</td>
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</table>

**SPECrate®2017_int_base = 92.8**

**SPECrate®2017_int_peak = 96.8**

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

## Submit Notes

The taskset mechanism was used to bind copies to processors. The config file option 'submit' was used to generate taskset 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/cpu2017-1.1.9-ic2023.2.3/lib/intel64:/home/cpu2017-1.1.9-ic2023.2.3/lib/ia32:/home/cpu2017-1.1.9-ic2023.2.3/lib64:/home/cpu2017-1.1.9-ic2023.2.3/lib64:/home/cpu2017-1.1.9-ic2023.2.3/lib64:/home/cpu2017-1.1.9-ic2023.2.3/lib64:
"
MALLOC_CONF = "retain:true"
```

## General Notes

Binaries compiled on a system with 2x Intel Xeon Platinum 8280M CPU + 384GB RAM memory using Red Hat Enterprise Linux 8.4.

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.

jemalloc, a general purpose malloc implementation
Lenovo Global Technology  
ThinkSystem ST250 V3  
(3.20 GHz, Intel Xeon E-2488)

SPEC CPU®2017 Integer Rate Result  

Copyright 2017-2024 Standard Performance Evaluation Corporation

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CPU2017 License: 9017  
Test Sponsor: Lenovo Global Technology  
Tested by: Lenovo Global Technology  
Test Date: Dec-2023  
Hardware Availability: Feb-2024  
Software Availability: Dec-2023

General Notes (Continued)

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

Sysinfo program /home/cpu2017-1.1.9-ic2023.2.3/bin/sysinfo
Rev: r6732 of 2022-11-07 fe91c89b7ed5c6ae2c92cc097bec197
running on localhost Sat Dec 23 00:20:21 2023

SUT (System Under Test) info as seen by some common utilities.

Table of contents

1. uname -a  
2. w  
3. Username  
4. ulimit -a  
5. sysinfo process ancestry  
6. /proc/cpuinfo  
7. lscpu  
8. numacl --hardware  
9. /proc/meminfo  
10. who -r  
11. Systemd service manager version: systemd 249 (249.16+suse.171.gdad0071f15)  
12. Services, from systemctl list-unit-files  
13. Linux kernel boot-time arguments, from /proc/cmdline  
14. cpupower frequency-info  
15. sysctl  
16. /sys/kernel/mm/transparent_hugepage  
17. /sys/kernel/mm/transparent_hugepage/kruegerned  
18. OS release  
19. Disk information  
20. /sys/devices/virtual/dmi/id  
21. dmidecode  
22. BIOS

1. uname -a  
Linux localhost 5.14.21-150500.53-default #1 SMP PREEMPT_DYNAMIC Wed May 10 07:56:26 UTC 2023 (b630043)  
x86_64 x86_64 x86_64 GNU/Linux

2. w  
00:20:21 up 9 min, 2 users, load average: 0.00, 0.00, 0.00  
USER TTY FROM LOGIN@ IDLE JCPU PCPU WHAT  
root tty1 - 00:11 13.00s 0.58s 0.00s sh 1.sh  
root pts/0 172.30.81.13 00:11 3:56 0.01s 0.01s -bash

3. Username  
From environment variable $USER: root

4. ulimit -a

(Continued on next page)
### Lenovo Global Technology

**ThinkSystem ST250 V3 (3.20 GHz, Intel Xeon E-2488)**

**SPECrate**
- **SPECrate\textsubscript{2017\_int\_base} = 92.8**
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**CPU2017 License:** 9017

**Test Date:** Dec-2023

**Test Sponsor:** Lenovo Global Technology

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**Hardware Availability:** Feb-2024

**Software Availability:** Dec-2023

---

**Platform Notes (Continued)**

- core file size: (blocks, -c) unlimited
- data seg size: (kbytes, -d) unlimited
- scheduling priority: (e) 0
- file size: (blocks, -f) unlimited
- pending signals: (-l) 256767
- max locked memory: (kbytes, -l) 64
- max memory size: (kbytes, -m) unlimited
- open files: (-n) 1024
- pipe size: (512 bytes, -p) 8
- POSIX message queues: (bytes, -q) 819200
- real-time priority: (-r) 0
- stack size: (kbytes, -s) unlimited
- cpu time: (seconds, -t) unlimited
- max user processes: (-u) 256767
- virtual memory: (kbytes, -v) unlimited
- file locks: (-x) unlimited

---

6. **/proc/cpuinfo**

- model name: Intel(R) Xeon(R) E E-2488
- vendor_id: GenuineIntel
- cpu family: 6
- model: 183
- stepping: 1
- microcode: 0x11f
- bugs: spectre_v1 spectre_v2 spec_store_bypass swapgs eibrs_pbrsb
- cpu cores: 8
- siblings: 16
- 1 physical id (chips)
- 16 processors (hardware threads)
- physical id 0: core ids 0-7
- physical id 0: apicids 0-15

Caution: /proc/cpuinfo data regarding chips, cores, and threads is not necessarily reliable, especially for virtualized systems. Use the above data carefully.

---

7. **Isccpu**

From lsccpu from util-linux 2.37.4:

- Architecture: x86_64
- CPU op-mode(s): 32-bit, 64-bit
- Address sizes: 42 bits physical, 48 bits virtual

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

Test Date: Dec-2023
Hardware Availability: Feb-2024
Software Availability: Dec-2023

SPECrate®2017_int_base = 92.8
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Platform Notes (Continued)

Byte Order: Little Endian
CPU(s): 16
On-line CPU(s) list: 0-15
Vendor ID: GenuineIntel
Model name: Intel(R) Xeon(R) E-2488
CPU family: 6
Model: 183
Thread(s) per core: 2
Core(s) per socket: 8
Socket(s): 1
Stepping: 1
BogoMIPS: 6374.40
Flags:

Virtualization: VT-x
L1d cache: 384 KiB (8 instances)
L1i cache: 256 KiB (8 instances)
L2 cache: 16 MiB (8 instances)
L3 cache: 24 MiB (1 instance)
NUMA node(s): 1
NUMA node0 CPU(s): 0-15

Vulnerability Itlb multihit: Not affected
Vulnerability L1tf: Not affected
Vulnerability Mds: Not affected
Vulnerability Meltdown: Not affected
Vulnerability Mmio stale data: Not affected
Vulnerability Retbleed: Not affected
Vulnerability Spec store bypass: Mitigation; Speculative Store Bypass disabled via prctl and seccomp
Vulnerability Spectre v1: Mitigation; usercopy/swapsgs barriers and __user pointer sanitization
Vulnerability Spectre v2: Mitigation; Enhanced IBRS, IBPB conditional, RSB filling, PBRSB-eIBRS SW sequence
Vulnerability Srbds: Not affected
Vulnerability Txs async abort: Not affected

From lscpu --cache:

<table>
<thead>
<tr>
<th>NAME</th>
<th>ONE-SIZE</th>
<th>ALL-SIZE</th>
<th>WAYS</th>
<th>TYPE</th>
<th>LEVEL</th>
<th>SETS</th>
<th>PHY-LINE</th>
<th>COHERENCY-SIZE</th>
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</thead>
<tbody>
<tr>
<td>L1d</td>
<td>48K</td>
<td>384K</td>
<td>12</td>
<td>Data</td>
<td>1</td>
<td>64</td>
<td>1</td>
<td>64</td>
</tr>
<tr>
<td>L1i</td>
<td>32K</td>
<td>256K</td>
<td>8</td>
<td>Instruction</td>
<td>1</td>
<td>64</td>
<td>1</td>
<td>64</td>
</tr>
<tr>
<td>L2</td>
<td>2M</td>
<td>16M</td>
<td>16</td>
<td>Unified</td>
<td>2</td>
<td>2048</td>
<td>1</td>
<td>64</td>
</tr>
<tr>
<td>L3</td>
<td>24M</td>
<td>24M</td>
<td>12</td>
<td>Unified</td>
<td>3</td>
<td>32768</td>
<td>1</td>
<td>64</td>
</tr>
</tbody>
</table>

8. numactl --hardware
NOTE: a numactl 'node' might or might not correspond to a physical chip.

available: 1 nodes (0)
node 0 cpus: 0-15
node 0 size: 64221 MB
node 0 free: 63676 MB
node distances:

(Continued on next page)
Spec CPU®2017 Integer Rate Result

Lenovo Global Technology
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Platform Notes (Continued)

node 0
0: 10

9. /proc/meminfo
MemTotal: 65763240 kB

10. who -r
run-level 3 Dec 23 00:11

11. Systemd service manager version: systemd 249 (249.16+suse.171.gdad0071f15)
Default Target Status
multi-user running

12. Services, from systemctl list-unit-files
STATE UNIT FILES
enabled YaST2-Firstboot YaST2-Second-Stage apparmor auditd cron getty@ irqbalance issue-generator kbdsettings klog lvm2-monitor nscd postfix purge-kernels rollback rayslog smartd sshd systemd-pstore wicked wickedd-auto4 wickedd-dhcp4 wickedd-dhcp6 wickedd-nanny
enabled-runtime systemctl-remount-fs
indirect wickeddd

13. Linux kernel boot-time arguments, from /proc/cmdline
BOOT_IMAGE=/boot/vmlinuz-5.14.21-150500.53-default
root=UUID=1a7e87cc-1541-4a67-83ce-e77f091f769b
splash=silent
mitigations=auto
quiet
security=apparmor

14. cpupower frequency-info
analyzing CPU 0:
 Unable to determine current policy
 boost state support:
 Supported: yes
 Active: yes

15. sysctl
kernel.numa_balancing 0
kernel.randomize_va_space 2
vm.compaction_proactiveness 20
vm.dirty_background_bytes 0
vm.dirty_background_ratio 10
vm.dirty_bytes 0
vm.dirty_expire_centisecs 3000
vm.dirty_ratio 20
vm.dirty_writeback_centisecs 500
vm.dirtytime_expire_seconds 43200

(Continued on next page)
**Platform Notes (Continued)**

16. `/sys/kernel/mm/transparent_hugepage`
   
   defrag: always defer defer+madvise [madvise] never
   enabled: [always] madvise never
   hpage_pmd_size: 2097152
   shmem_enabled: always within_size advise [never] deny force

17. `/sys/kernel/mm/transparent_hugepage/khugepaged`
   
   alloc_sleep_millisecs: 60000
   defrag: 1
   max_ptes_none: 511
   max_ptes_shared: 256
   max_ptes_swap: 64
   pages_to_scan: 4096
   scan_sleep_millisecs: 10000

18. OS release
   
   From `/etc/*-release /etc/*-version`
   os-release SUSE Linux Enterprise Server 15 SP5

19. Disk information
   
   SPEC is set to: `/home/cpu2017-1.1.9-ic2023.2.3`

   Filesystem | Type | Size | Used | Avail | Use% | Mounted on
   ---------- | ---- | ---- | ---- | ------ | ---- | ---------
   /dev/sdc2  | xfs  | 1.8T | 30G  | 1.8T   | 2%   | /

20. `/sys/devices/virtual/dmi/id`
   
   Vendor: Lenovo
   Product: ThinkSystem ST250 V3
   Product Family: ThinkSystem
   Serial: 1234567890

21. dmidecode
   
   Additional information from dmidecode 3.4 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:
   2x Samsung M324R4GA3BB0-CQKOL 32 GB 2 rank 4800, configured at 4400

22. BIOS
   
   (This section combines info from `/sys/devices` and dmidecode.)
   BIOS Vendor: Lenovo
   BIOS Version: CTE101X-1.10
## Lenovo Global Technology

**ThinkSystem ST250 V3**  
(3.20 GHz, Intel Xeon E-2488)

### SPEC CPU®2017 Integer Rate Result

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</tbody>
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### Platform Notes (Continued)

- BIOS Date: 12/20/2023
- BIOS Revision: 1.10
- Firmware Revision: 1.10

### Compiler Version Notes

<table>
<thead>
<tr>
<th>Compiler Invocation</th>
<th>Base Compiler Invocation</th>
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<tbody>
<tr>
<td>C</td>
<td>icx</td>
</tr>
<tr>
<td>C</td>
<td>502.gcc_r(peak)</td>
</tr>
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<tr>
<td>Fortran</td>
<td>548.exchange2_r(base, peak)</td>
</tr>
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</table>

(Continued on next page)
## Base Compiler Invocation (Continued)

C++ benchmarks:
- icpx

Fortran benchmarks:
- ifx

## Base Portability Flags

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</tr>
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<tr>
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</tr>
</tbody>
</table>

## Base Optimization Flags

### C benchmarks:

- `-w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX2 -O3 -ffast-math -flto`
- `-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4`
- `-L/home/specdev/new_compilers/ic2023.2.3/compiler/lib/intel64_lin`
- `-lqkmalloc`

### C++ benchmarks:

- `-w -std=c++14 -m64 -Wl,-z,muldefs -xCORE-AVX2 -O3 -ffast-math`
- `-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4`
- `-L/home/specdev/new_compilers/ic2023.2.3/compiler/lib/intel64_lin`
- `-lqkmalloc`

### Fortran benchmarks:

- `-w -m64 -Wl,-z,muldefs -xCORE-AVX2 -O3 -ffast-math -flto`
- `-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4`
- `-nostandard-realloc-lhs -align array32byte -auto`
- `-L/home/specdev/new_compilers/ic2023.2.3/compiler/lib/intel64_lin`
- `-lqkmalloc`
Lenovo Global Technology
ThinkSystem ST250 V3
(3.20 GHz, Intel Xeon E-2488)

SPECrate®2017_int_base = 92.8
SPECrate®2017_int_peak = 96.8

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

Test Date: Dec-2023
Hardware Availability: Feb-2024
Software Availability: Dec-2023

Peak Compiler Invocation

C benchmarks:
icx

C++ benchmarks:
icpx

Fortran benchmarks:
ifix

Peak Portability Flags

500.perlbench_r: -DSPEC_LP64 -DSPEC_LINUX_X64
502.gcc_r: -D_FILE_OFFSET_BITS=64
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

Peak Optimization Flags

C benchmarks:
500.perlbench_r: -w -std=c11 -m64 -W1,-z,muldefs
-fprofile-generate(pass 1)
-fprofile-use=default.profdata(pass 2) -xCORE-AVX2 -flto
-Ofast -ffast-math -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -fno-strict-overflow
-L/home/specdev/new_compilers/ic2023.2.3/compiler/lib/intel64_lin
-lqkmalloc

502.gcc_r: -m32
-L/home/specdev/new_compilers/ic2023.2.3/compiler/lib/ia32_lin
-std=gnu89 -W1,-z,muldefs -fprofile-generate(pass 1)
-fprofile-use=default.profdata(pass 2) -xCORE-AVX2 -flto
-Ofast -ffast-math -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -L/usr/local/jemalloc32-5.0.1/lib
-ljemalloc

(Continued on next page)
## Lenovo Global Technology

**ThinkSystem ST250 V3**
(3.20 GHz, Intel Xeon E-2488)

<table>
<thead>
<tr>
<th>SPECrate®2017_int_base</th>
<th>92.8</th>
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<tbody>
<tr>
<td>SPECrate®2017_int_peak</td>
<td>96.8</td>
</tr>
</tbody>
</table>

- **CPU2017 License:** 9017
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- **Tested by:** Lenovo Global Technology
- **Test Date:** Dec-2023
- **Hardware Availability:** Feb-2024
- **Software Availability:** Dec-2023

### Peak Optimization Flags (Continued)

505.mcf_r: basepeak = yes

525.x264_r: -w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX2 -Ofast
-ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -fno-alias
-L/home/specdev/new_compilers/ic2023.2.3/compiler/lib/intel64_lin
-lqkmalloc

557.xz_r: basepeak = yes

C++ benchmarks:

520.omnetpp_r: basepeak = yes
523.xalancbmk_r: basepeak = yes
531.deepsjeng_r: basepeak = yes
541.leela_r: basepeak = yes

Fortran benchmarks:

548.exchange2_r: basepeak = yes

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/Intel-ic2023p2-official-linux64.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/Intel-ic2023p2-official-linux64.xml
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-Catlow-A.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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