



SPEC CPU®2017 Integer Rate Result

Copyright 2017-2024 Standard Performance Evaluation Corporation

Lenovo Global Technology

ThinkSystem SR850 V3
(2.10 GHz, Intel Xeon Gold 6418H)

SPECrate®2017_int_base = 875

SPECrate®2017_int_peak = Not Run

CPU2017 License: 9017

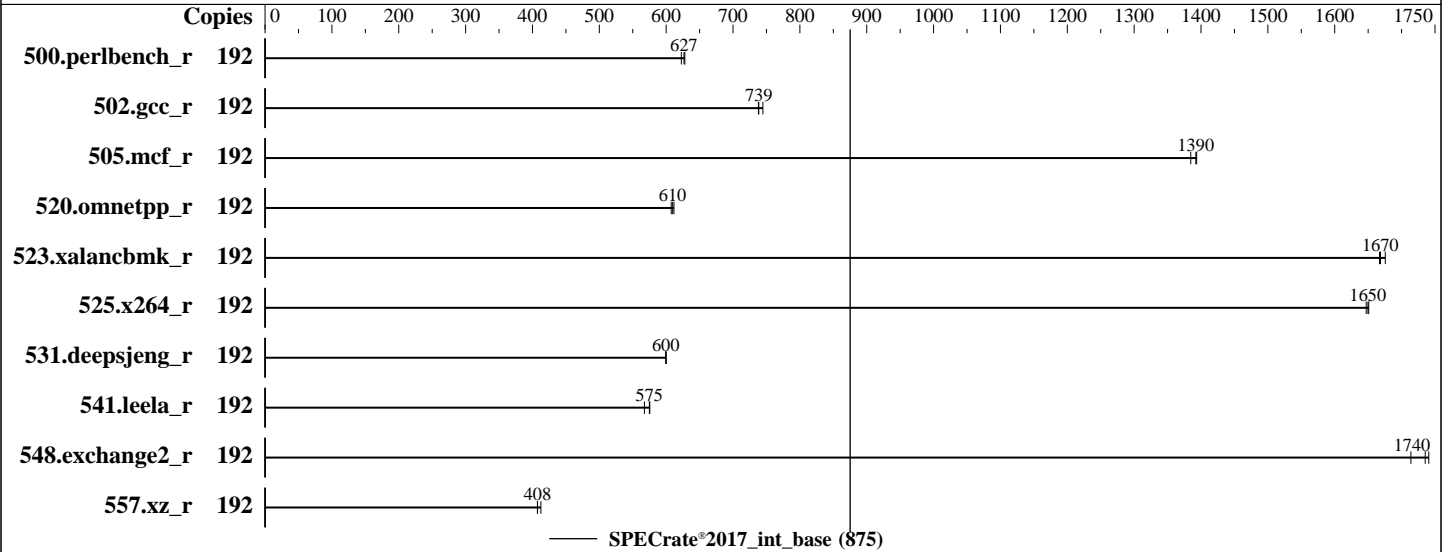
Test Sponsor: Lenovo Global Technology

Tested by: Lenovo Global Technology

Test Date: Oct-2023

Hardware Availability: Jun-2023

Software Availability: Dec-2022



Hardware

CPU Name: Intel Xeon Gold 6418H
 Max MHz: 4000
 Nominal: 2100
 Enabled: 96 cores, 4 chips, 2 threads/core
 Orderable: 2,4 chips
 Cache L1: 32 KB I + 48 KB D on chip per core
 L2: 2 MB I+D on chip per core
 L3: 60 MB I+D on chip per chip
 Other: None
 Memory: 2 TB (32 x 64 GB 2Rx4 PC5-4800B-R)
 Storage: 1 x 960 GB M.2 NVME SSD
 Other: None

Software

OS: Red Hat Enterprise Linux 9.1 (Plow) (x86_64)
 Kernel 5.14.0-162.6.1.el9_1.x86_64
 Compiler: C/C++: Version 2023.0 of Intel oneAPI DPC++/C++ Compiler for Linux;
 Fortran: Version 2023.0 of Intel Fortran Compiler for Linux;
 Parallel: No
 Firmware: Lenovo BIOS Version RSE109C 3.10 released Sep-2023
 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	192	491	623	487	628	488	627									
502.gcc_r	192	368	738	365	745	368	739									
505.mcf_r	192	223	1390	224	1380	223	1390									
520.omnetpp_r	192	412	612	413	610	415	608									
523.xalancbmk_r	192	122	1670	122	1670	121	1680									
525.x264_r	192	204	1650	204	1650	204	1650									
531.deepsjeng_r	192	367	600	367	600	367	600									
541.leela_r	192	552	576	553	575	560	567									
548.exchange2_r	192	289	1740	290	1740	294	1710									
557.xz_r	192	503	413	509	407	509	408									

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

Compiler Notes

SPEC has ruled that the compiler used for this result was performing a compilation that specifically improves the performance of the 523.xalancbmk_r / 623.xalancbmk_s benchmarks using a priori knowledge of the SPEC code and dataset to perform a transformation that has narrow applicability.

In order to encourage optimizations that have wide applicability (see rule 1.4 https://www.spec.org/cpu2017/Docs/runrules.html#rule_1.4), SPEC will no longer publish results using this optimization.

This result is left in the SPEC results database for historical reference.

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/cpu2017-1.1.9-ic2023.0-2/lib/intel64:/home/cpu2017-1.1.9-ic2023.0-2/lib/ia32:/home/cpu2017-1.1.9-ic2023.0-2/je5.0.1-32"
MALLOC_CONF = "retain:true"
```



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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
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 Legacy

CPU P-state Control set to Legacy

DCU Streamer Prefetcher set to Disabled

SNC set to SNC2

UPI Link Disable set to Minimum Number of Links Enabled

LLC Prefetch set to Disabled

Sysinfo program /home/cpu2017-1.1.9-ic2023.0-2/bin/sysinfo
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
running on localhost.localdomain Wed Oct 18 17:23:31 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. numactl --hardware
9. /proc/meminfo
10. who -r
11. Systemd service manager version: systemd 250 (250-12.el9_1)
12. Failed units, from systemctl list-units --state=failed
13. Services, from systemctl list-unit-files
14. Linux kernel boot-time arguments, from /proc/cmdline
15. cpupower frequency-info
16. tuned-adm active
17. sysctl
18. /sys/kernel/mm/transparent_hugepage
19. /sys/kernel/mm/transparent_hugepage/khugepaged
20. OS release
21. Disk information
22. /sys/devices/virtual/dmi/id
23. dmidecode
24. BIOS

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Platform Notes (Continued)

1. `uname -a`
Linux localhost.localdomain 5.14.0-162.6.1.el9_1.x86_64 #1 SMP PREEMPT_DYNAMIC Fri Sep 30 07:36:03 EDT 2022
x86_64 x86_64 x86_64 GNU/Linux

2. `w`
17:23:31 up 5:39, 1 user, load average: 50.03, 146.18, 175.06
USER TTY LOGIN@ IDLE JCPU PCPU WHAT
root tty1 11:54 3:07m 0.86s 0.01s /bin/bash ./run_SR850V3.sh

3. Username
From environment variable \$USER: root

4. `ulimit -a`
real-time non-blocking time (microseconds, -R) unlimited
core file size (blocks, -c) 0
data seg size (kbytes, -d) unlimited
scheduling priority (-e) 0
file size (blocks, -f) unlimited
pending signals (-i) 8255611
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) 8255611
virtual memory (kbytes, -v) unlimited
file locks (-x) unlimited

5. `sysinfo process ancestry`
/usr/lib/systemd/systemd --switched-root --system --deserialize 30
login -- root
-bash
/bin/bash ./run_SR850V3.sh
/bin/bash ./run_SR850V3.sh
runcpu --nobuild --action validate --define default-platform-flags --define numcopies=192 -c
ic2023.0-lin-sapphirerapids-rate-20221201.cfg --define smt-on --define cores=96 --define physicalfirst
--define invoke_with_interleave --define drop_caches --tune base -o all intrate
runcpu --nobuild --action validate --define default-platform-flags --define numcopies=192 --configfile
ic2023.0-lin-sapphirerapids-rate-20221201.cfg --define smt-on --define cores=96 --define physicalfirst
--define invoke_with_interleave --define drop_caches --tune base --output_format all --nopower --runmode
rate --tune base --size refrate intrate --nopreenv --note-preenv --logfile
\$SPEC/tmp/CPU2017.189/templogs/preenv.intrate.189.0.log --lognum 189.0 --from_runcpu 2
specperl \$SPEC/bin/sysinfo
\$SPEC = /home/cpu2017-1.1.9-ic2023.0-2

6. `/proc/cpuinfo`
model name : Intel(R) Xeon(R) Gold 6418H
vendor_id : GenuineIntel
cpu family : 6

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Platform Notes (Continued)

```

model          : 143
stepping       : 8
microcode      : 0x2b0004d0
bugs           : spectre_v1 spectre_v2 spec_store_bypass swapgs eibrs_pbrsb
cpu cores      : 24
siblings       : 48
4 physical ids (chips)
192 processors (hardware threads)
physical id 0: core ids 0-23
physical id 1: core ids 0-23
physical id 2: core ids 0-23
physical id 3: core ids 0-23
physical id 0: apicids 0-47
physical id 1: apicids 128-175
physical id 2: apicids 256-303
physical id 3: apicids 384-431

```

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

7. lscpu

From lscpu from util-linux 2.37.4:

```

Architecture:          x86_64
CPU op-mode(s):        32-bit, 64-bit
Address sizes:         46 bits physical, 57 bits virtual
Byte Order:            Little Endian
CPU(s):                192
On-line CPU(s) list:  0-191
Vendor ID:             GenuineIntel
BIOS Vendor ID:       Intel(R) Corporation
Model name:            Intel(R) Xeon(R) Gold 6418H
BIOS Model name:      Intel(R) Xeon(R) Gold 6418H
CPU family:            6
Model:                 143
Thread(s) per core:   2
Core(s) per socket:   24
Socket(s):             4
Stepping:              8
BogoMIPS:              4200.00
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 tsc_known_freq pni pclmulqdq dtes64 monitor
                      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 cat_l2 cdp_l3
                      invpcid_single intel_ppin cdp_l2 ssbd mba ibrs ibpb stibp ibrs_enhanced
                      tpr_shadow vnmi flexpriority ept vpid ept_ad fsgsbase tsc_adjust bmlil 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 avx_vnni avx512_bf16 wbnoinvd dtherm ida
                      arat pln pts hfi avx512vbmi umip pku ospke waitpkg avx512_vbmi2 gfni vaes
                      vpclmulqdq avx512_vnni avx512_bitalg tme avx512_vpoperntdq la57 rdpid
                      bus_lock_detect cldemote movdiri movdir64b enqcmd fsrm md_clear serialize
                      tsxldtrk pconfig arch_lbr amx_bf16 avx512_fpl6 amx_tile amx_int8 flush_l1d
                      arch_capabilities
Virtualization:        VT-x
Lld cache:            4.5 MiB (96 instances)

```

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Platform Notes (Continued)

```

L1i cache:          3 MiB (96 instances)
L2 cache:          192 MiB (96 instances)
L3 cache:          240 MiB (4 instances)
NUMA node(s):      8
NUMA node0 CPU(s): 0-11,96-107
NUMA node1 CPU(s): 12-23,108-119
NUMA node2 CPU(s): 24-35,120-131
NUMA node3 CPU(s): 36-47,132-143
NUMA node4 CPU(s): 48-59,144-155
NUMA node5 CPU(s): 60-71,156-167
NUMA node6 CPU(s): 72-83,168-179
NUMA node7 CPU(s): 84-95,180-191
Vulnerability Itlb multihit: Not affected
Vulnerability Lltf:      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
Vulnerability Spectre v1: Mitigation; usercopy/swaps barriers and __user pointer sanitization
Vulnerability Spectre v2: Mitigation; Enhanced IBRS, IBPB conditional, RSB filling, PBR SB-eIBRS SW
sequence
Vulnerability Srbds:     Not affected
Vulnerability Tsx async abort: Not affected

```

From lscpu --cache:

NAME	ONE-SIZE	ALL-SIZE	WAYS	TYPE	LEVEL	SETS	PHY-LINE	COHERENCY-SIZE
L1d	48K	4.5M	12	Data	1	64	1	64
L1i	32K	3M	8	Instruction	1	64	1	64
L2	2M	192M	16	Unified	2	2048	1	64
L3	60M	240M	15	Unified	3	65536	1	64

8. numactl --hardware

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

```

available: 8 nodes (0-7)
node 0 cpus: 0-11,96-107
node 0 size: 257704 MB
node 0 free: 256455 MB
node 1 cpus: 12-23,108-119
node 1 size: 258004 MB
node 1 free: 256931 MB
node 2 cpus: 24-35,120-131
node 2 size: 258042 MB
node 2 free: 256941 MB
node 3 cpus: 36-47,132-143
node 3 size: 258042 MB
node 3 free: 257000 MB
node 4 cpus: 48-59,144-155
node 4 size: 258042 MB
node 4 free: 256981 MB
node 5 cpus: 60-71,156-167
node 5 size: 258042 MB
node 5 free: 256984 MB
node 6 cpus: 72-83,168-179
node 6 size: 258042 MB
node 6 free: 256997 MB
node 7 cpus: 84-95,180-191
node 7 size: 258020 MB
node 7 free: 256880 MB

```

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Platform Notes (Continued)

node distances:

node	0	1	2	3	4	5	6	7
0:	10	12	21	21	31	31	21	21
1:	12	10	21	21	31	31	21	21
2:	21	21	10	12	21	21	31	31
3:	21	21	12	10	21	21	31	31
4:	31	31	21	21	10	12	21	21
5:	31	31	21	21	12	10	21	21
6:	21	21	31	31	21	21	10	12
7:	21	21	31	31	21	21	12	10

9. /proc/meminfo

MemTotal: 2113476860 kB

10. who -r

run-level 3 Oct 18 11:44

11. Systemd service manager version: systemd 250 (250-12.e19_1)

Default Target	Status
multi-user	degraded

12. Failed units, from systemctl list-units --state=failed

UNIT	LOAD	ACTIVE	SUB	DESCRIPTION
* NetworkManager-wait-online.service	loaded	failed	failed	Network Manager Wait Online
* systemd-sysctl.service	loaded	failed	failed	Apply Kernel Variables

13. Services, from systemctl list-unit-files

STATE	UNIT FILES
enabled	NetworkManager NetworkManager-dispatcher NetworkManager-wait-online auditd chronyd crond dbus-broker getty@ irqbalance kdump low-memory-monitor mdmonitor microcode nis-domainname rhsmcertd rsyslog rtkit-daemon selinux-autorelabel-mark sshd sssd systemd-network-generator tuned udisks2 upower
enabled-runtime	systemd-remount-fs
disabled	canberra-system-bootup canberra-system-shutdown canberra-system-shutdown-reboot chrony-wait console-getty cpupower debug-shell firewallld kvm_stat man-db-restart-cache-update nftables pesign rdisc rhsm rhsm-facts rpmdb-rebuild serial-getty@ sshd-keygen@ systemd-boot-check-no-failures systemd-pstore systemd-sysex ntp_sync
generated	ntp_sync
indirect	sssd-autofs sssd-kcm sssd-nss sssd-pac sssd-pam sssd-ssh sssd-sudo

14. Linux kernel boot-time arguments, from /proc/cmdline

BOOT_IMAGE=(hd3,gpt3)/boot/vmlinuz-5.14.0-162.6.1.e19_1.x86_64
root=UUID=43a7f1b1-66b0-456a-8c3f-451305a00281
ro
resume=UUID=58de1c40-542f-453b-bb6a-6bbd3510660a

15. cpupower frequency-info

analyzing CPU 0:
Unable to determine current policy
boost state support:
Supported: yes
Active: yes

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Platform Notes (Continued)

16. tuned-adm active
Current active profile: throughput-performance

17. sysctl

kernel.numa_balancing	1
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	40
vm.dirty_writeback_centisecs	500
vm.dirtytime_expire_seconds	43200
vm.extfrag_threshold	500
vm.min_unmapped_ratio	1
vm.nr_hugepages	0
vm.nr_hugepages_mempolicy	0
vm.nr_overcommit_hugepages	0
vm.swappiness	10
vm.watermark_boost_factor	15000
vm.watermark_scale_factor	10
vm.zone_reclaim_mode	0

18. /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

19. /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

20. OS release

From /etc/*-release /etc/*-version	
os-release	Red Hat Enterprise Linux 9.1 (Plow)
redhat-release	Red Hat Enterprise Linux release 9.1 (Plow)
system-release	Red Hat Enterprise Linux release 9.1 (Plow)

21. Disk information

SPEC is set to: /home/cpu2017-1.1.9-ic2023.0-2

Filesystem	Type	Size	Used	Avail	Use%	Mounted on
/dev/nvme0n1p4	xfs	819G	28G	791G	4%	/home

22. /sys/devices/virtual/dmi/id

Vendor:	Lenovo
Product:	ThinkSystem SR850 V3

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Platform Notes (Continued)

Product Family: ThinkSystem
Serial: None

23. dmidecode

Additional information from dmidecode 3.3 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:

- 7x Samsung M321R8GA0BB0-CQKDG 64 GB 2 rank 4800
- 3x Samsung M321R8GA0BB0-CQKEG 64 GB 2 rank 4800
- 3x Samsung M321R8GA0BB0-CQKMG 64 GB 2 rank 4800
- 6x Samsung M321R8GA0BB0-CQKVE 64 GB 2 rank 4800
- 13x Samsung M321R8GA0BB0-CQKVG 64 GB 2 rank 4800

24. BIOS

(This section combines info from /sys/devices and dmidecode.)

```

BIOS Vendor:      Lenovo
BIOS Version:     RSE109C-3.10
BIOS Date:        09/26/2023
BIOS Revision:    3.10
Firmware Revision: 3.10

```

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 2023.0.0 Build 20221201
Copyright (C) 1985-2022 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 2023.0.0 Build 20221201
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.

Fortran | 548.exchange2_r(base)

Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.

Base Compiler Invocation

C benchmarks:
icx

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Base Compiler Invocation (Continued)

C++ benchmarks:

icpx

Fortran benchmarks:

ifx

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
```

Base Optimization Flags

C benchmarks:

```
-w -std=c11 -m64 -Wl,-z,muldefs -xsapphirerapids -O3 -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-L/usr/local/intel/compiler/2023.0.0/linux/compiler/lib/intel64_lin
-lqkmalloc
```

C++ benchmarks:

```
-w -std=c++14 -m64 -Wl,-z,muldefs -xsapphirerapids -O3 -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-L/usr/local/intel/compiler/2023.0.0/linux/compiler/lib/intel64_lin
-lqkmalloc
```

Fortran benchmarks:

```
-w -m64 -Wl,-z,muldefs -xsapphirerapids -O3 -ffast-math -flto
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-nostandard-realloc-lhs -align array32byte -auto
-L/usr/local/intel/compiler/2023.0.0/linux/compiler/lib/intel64_lin
-lqkmalloc
```



SPEC CPU®2017 Integer Rate Result

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Lenovo Global Technology

ThinkSystem SR850 V3
(2.10 GHz, Intel Xeon Gold 6418H)

SPECrate®2017_int_base = 875

SPECrate®2017_int_peak = Not Run

CPU2017 License: 9017

Test Sponsor: Lenovo Global Technology

Tested by: Lenovo Global Technology

Test Date: Oct-2023

Hardware Availability: Jun-2023

Software Availability: Dec-2022

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-Eaglestream-AA.html>

http://www.spec.org/cpu2017/flags/Intel-ic2023-official-linux64_revB.2023-10-11.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-Eaglestream-AA.xml>

http://www.spec.org/cpu2017/flags/Intel-ic2023-official-linux64_revB.2023-10-11.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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