



# SPEC CPU®2017 Integer Speed Result

Copyright 2017-2024 Standard Performance Evaluation Corporation

## Lenovo Global Technology

ThinkSystem SR630 V3  
(2.10 GHz, Intel Xeon Gold 6538N)

SPECspeed®2017\_int\_base = 14.9

SPECspeed®2017\_int\_peak = Not Run

CPU2017 License: 9017

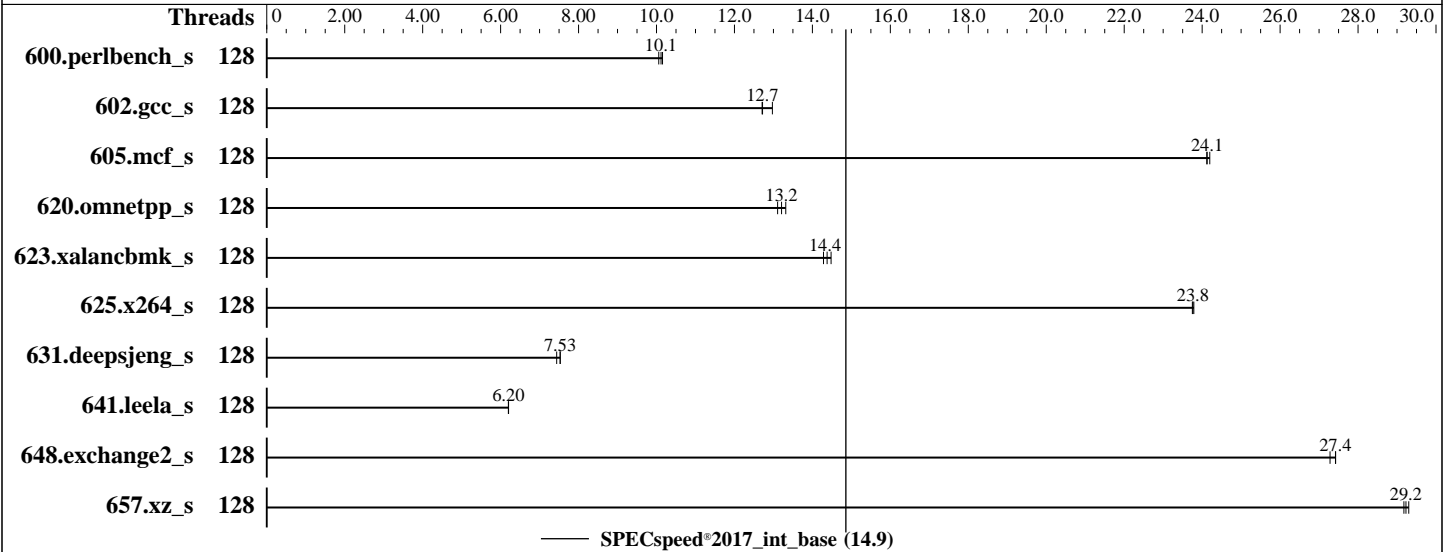
Test Sponsor: Lenovo Global Technology

Tested by: Lenovo Global Technology

Test Date: Mar-2024

Hardware Availability: Feb-2024

Software Availability: Mar-2024



### Hardware

CPU Name: Intel Xeon Gold 6538N  
 Max MHz: 4100  
 Nominal: 2100  
 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: 2 MB I+D on chip per core  
 L3: 60 MB I+D on chip per chip  
 Other: None  
 Memory: 1 TB (16 x 64 GB 2Rx4 PC5-5600B-R, running at 5200)  
 Storage: 1 x 960 GB SATA SSD  
 Other: Cooling: Air

### Software

OS: SUSE Linux Enterprise Server 15 SP4  
 Kernel 5.14.21-150400.22-default  
 Compiler: C/C++: Version 2024.0.2 of Intel oneAPI DPC++/C++ Compiler for Linux;  
 Fortran: Version 2024.0.2 of Intel Fortran Compiler for Linux;  
 Parallel: Yes  
 Firmware: Lenovo BIOS Version ESE123C 3.12 released Feb-2024  
 File System: xfs  
 System State: Run level 3 (multi-user)  
 Base Pointers: 64-bit  
 Peak Pointers: Not Applicable  
 Other: jemalloc memory allocator V5.0.1  
 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						
	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
600.perlbench_s	128	176	10.1	<u>175</u>	<u>10.1</u>	175	10.2							
602.gcc_s	128	<b>313</b>	<u>12.7</u>	313	12.7	307	13.0							
605.mcf_s	128	<b>196</b>	<u>24.1</u>	195	24.2	196	24.1							
620.omnetpp_s	128	122	13.3	<u>123</u>	<u>13.2</u>	124	13.1							
623.xalancbmk_s	128	99.2	14.3	<b>98.6</b>	<b>14.4</b>	97.9	14.5							
625.x264_s	128	<b>74.2</b>	<u>23.8</u>	74.2	23.8	74.3	23.7							
631.deepsjeng_s	128	<b>190</b>	<u>7.53</u>	193	7.44	190	7.53							
641.leela_s	128	<b>275</b>	<u>6.20</u>	275	6.20	275	6.20							
648.exchange2_s	128	108	27.3	107	27.4	<b>107</b>	<b>27.4</b>							
657.xz_s	128	212	29.2	<u>212</u>	<u>29.2</u>	211	29.3							

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

### 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/cpu2017-1.1.9-ic2024.0.2/lib/intel64:/home/cpu2017-1.1.9-ic2024.0.2/je5.0.1-64"  
MALLOC\_CONF = "retain:true"  
OMP\_STACKSIZE = "192M"

### General Notes

Binaries compiled on a system with 2x Intel Xeon Platinum 8280M CPU + 384GB 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.  
jemalloc, a general purpose malloc implementation  
built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5  
sources available from jemalloc.net or <https://github.com/jemalloc/jemalloc/releases>



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## Platform Notes

BIOS configuration:

Choose Operating Mode set to Custom Mode  
CPU P-State Control set to Cooperative with Legacy

Sysinfo program /home/cpu2017-1.1.9-ic2024.0.2/bin/sysinfo  
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197  
running on test1 Tue Mar 12 22:58:34 2024

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 249 (249.11+suse.124.g2bc0b2c447)
- 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/khugepaged
- 18. OS release
- 19. Disk information
- 20. /sys/devices/virtual/dmi/id
- 21. dmidecode
- 22. BIOS

```
1. uname -a
Linux test1 5.14.21-150400.22-default #1 SMP PREEMPT_DYNAMIC Wed May 11 06:57:18 UTC 2022 (49db222) x86_64
x86_64 x86_64 GNU/Linux
```

```
2. w
 22:58:34 up 2 min,  1 user,  load average: 0.40, 0.31, 0.12
USER      TTY      FROM          LOGIN@      IDLE        JCPU      PCPU      WHAT
root     tty1      -             22:58       6.00s      0.86s     0.00s     -bash
```

```
3. Username
From environment variable $USER:  root
```

```
4. ulimit -a
core file size          (blocks, -c) unlimited
data seg size           (kbytes, -d) unlimited
scheduling priority     (-e) 0
file size                (blocks, -f) unlimited
pending signals         (-i) 4126873
max locked memory       (kbytes, -l) 64
```

(Continued on next page)



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### Platform Notes (Continued)

```

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) 4126873
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
-bash
runcpu --nobuild --action validate --define default-platform-flags -c
  ic2024.0.2-lin-sapphirerapids-speed-20231213.cfg --define cores=64 --tune base -o all --define
  intspeedaffinity --define smt-on --define drop_caches intspeed
runcpu --nobuild --action validate --define default-platform-flags --configfile
  ic2024.0.2-lin-sapphirerapids-speed-20231213.cfg --define cores=64 --tune base --output_format all
  --define intspeedaffinity --define smt-on --define drop_caches --nopower --runmode speed --tune base
  --size refspeed intspeed --nopreenv --note-preenv --logfile
  $SPEC/tmp/CPU2017.035/temlogs/preenv.intspeed.035.0.log --lognum 035.0 --from_runcpu 2
specperl $SPEC/bin/sysinfo
$SPEC = /home/cpu2017-1.1.9-ic2024.0.2

```

#### 6. /proc/cpuinfo

```

model name      : INTEL(R) XEON(R) GOLD 6538N
vendor_id       : GenuineIntel
cpu family      : 6
model           : 207
stepping        : 2
microcode       : 0x21000200
bugs            : spectre_v1 spectre_v2 spec_store_bypass swapgs
cpu cores       : 32
siblings        : 64
2 physical ids (chips)
128 processors (hardware threads)
physical id 0:  core ids 0-31
physical id 1:  core ids 0-31
physical id 0:  apicids 0-63
physical id 1:  apicids 128-191

```

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 2.37.2:

```

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):            128
On-line CPU(s) list: 0-127
Vendor ID:         GenuineIntel
Model name:        INTEL(R) XEON(R) GOLD 6538N

```

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### Platform Notes (Continued)

```

CPU family:           6
Model:               207
Thread(s) per core:  2
Core(s) per socket: 32
Socket(s):           2
Stepping:            2
CPU max MHz:         4100.0000
CPU min MHz:         800.0000
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 cdp_l2 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 rtm 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 avx_vnni avx512_bf16 wbnoinvd dtherm ida arat pln pts hwp
                    hwp_act_window hwp_epp hwp_pkg_req 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 avx512_fp16
                    amx_tile flush_lld arch_capabilities
Virtualization:      VT-x
L1d cache:           3 MiB (64 instances)
L1i cache:           2 MiB (64 instances)
L2 cache:            128 MiB (64 instances)
L3 cache:            120 MiB (2 instances)
NUMA node(s):        2
NUMA node0 CPU(s):  0-31,64-95
NUMA node1 CPU(s):  32-63,96-127
Vulnerability Itlb multihit: Not affected
Vulnerability L1tf:  Not affected
Vulnerability Mds:   Not affected
Vulnerability Meltdown: Not affected
Vulnerability Spec store bypass: Mitigation; Speculative Store Bypass disabled via prctl and seccomp
Vulnerability Spectre v1: Mitigation; usercopy/swapgs barriers and __user pointer sanitization
Vulnerability Spectre v2: Mitigation; Enhanced IBRS, IBPB conditional, RSB filling
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	3M	12	Data	1	64	1	64
L1i	32K	2M	8	Instruction	1	64	1	64
L2	2M	128M	16	Unified	2	2048	1	64
L3	60M	120M	15	Unified	3	65536	1	64

8. numactl --hardware

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

```

available: 2 nodes (0-1)
node 0 cpus: 0-31,64-95
node 0 size: 515743 MB
node 0 free: 514537 MB
node 1 cpus: 32-63,96-127

```

(Continued on next page)



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### Platform Notes (Continued)

```
node 1 size: 515998 MB
node 1 free: 514786 MB
node distances:
node  0  1
  0: 10 21
  1: 21 10
```

```
-----
9. /proc/meminfo
   MemTotal:      1056503924 kB
```

```
-----
10. who -r
    run-level 3 Mar 12 22:57
```

```
-----
11. Systemd service manager version: systemd 249 (249.11+suse.124.g2bc0b2c447)
    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@ haveged irqbalance iscsi
                    issue-generator kbdsettings klog lvm2-monitor nscd postfix purge-kernels rollback rsyslog
                    smartd sshd wicked wickedd-auto4 wickedd-dhcp4 wickedd-dhcp6 wickedd-nanny
    enabled-runtime systemd-remount-fs
    disabled       autofs autoyast-initscripts blk-availability boot-sysctl ca-certificates chrony-wait
                    chronyd console-getty cups cups-browsed debug-shell ebttables exchange-bmc-os-info
                    firewallld gpm grub2-once haveged-switch-root ipmi ipmievdev iscsi-init iscsid iscsiui
                    issue-add-ssh-keys kexec-load lunmask man-db-create multipathd nfs nfs-blkmap nmb rdisc
                    rpcbind rpmconfigcheck rsyncd serial-getty@ smartd_generate_opts smb snmpd snmptrapd
                    systemd-boot-check-no-failures systemd-network-generator systemd-sysext
                    systemd-time-wait-sync systemd-timesyncd
    generated      ntp_sync
    indirect       wickedd
```

```
-----
13. Linux kernel boot-time arguments, from /proc/cmdline
    BOOT_IMAGE=/boot/vmlinuz-5.14.21-150400.22-default
    root=UUID=f976c541-a329-4c54-ba84-4be16556ee18
    splash=silent
    mitigations=auto
    quiet
    security=apparmor
```

```
-----
14. cpupower frequency-info
    analyzing CPU 0:
        current policy: frequency should be within 800 MHz and 4.10 GHz.
                        The governor "performance" may decide which speed to use
                        within this range.
    boost state support:
        Supported: yes
        Active: yes
```

```
-----
15. sysctl
    kernel.numa_balancing          1
    kernel.randomize_va_space     2
```

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### Platform Notes (Continued)

```

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
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                    60
vm.watermark_boost_factor       15000
vm.watermark_scale_factor        10
vm.zone_reclaim_mode            0

```

```

-----
16. /sys/kernel/mm/transparent_hugepage
defrag          always 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 SP4

```

```

-----
19. Disk information
SPEC is set to: /home/cpu2017-1.1.9-ic2024.0.2
Filesystem      Type  Size  Used Avail Use% Mounted on
/dev/sda2       xfs   894G  253G  642G  29% /

```

```

-----
20. /sys/devices/virtual/dmi/id
Vendor:         Lenovo
Product:        ThinkSystem SR630 V3
Product Family: ThinkSystem
Serial:         1234567890

```

```

-----
21. dmidecode
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:

```

(Continued on next page)



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## Platform Notes (Continued)

14x Samsung M321R8GA0PB0-CWMMKH 64 GB 2 rank 5600, configured at 5200  
2x Samsung M321R8GA0PB0-CWMMXH 64 GB 2 rank 5600, configured at 5200

### 22. BIOS

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

BIOS Vendor: Lenovo  
BIOS Version: ESE123C-3.12  
BIOS Date: 02/22/2024  
BIOS Revision: 3.12  
Firmware Revision: 12.6

## 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 2024.0.2 Build 20231213  
Copyright (C) 1985-2023 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 2024.0.2 Build 20231213  
Copyright (C) 1985-2023 Intel Corporation. All rights reserved.  
=====

=====  
Fortran | 648.exchange2\_s(base)  
=====

Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2024.0.2 Build 20231213  
Copyright (C) 1985-2023 Intel Corporation. All rights reserved.  
=====

## Base Compiler Invocation

C benchmarks:

icx

C++ benchmarks:

icpx

Fortran benchmarks:

ifx





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## 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:

```
-w -std=c11 -m64 -Wl,-z,muldefs -xsapphirerapids -O3 -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -fiopenmp
-DSPEC_OPENMP -L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

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/jemalloc64-5.0.1/lib -ljemalloc
```

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
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

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-ic2024-official-linux64.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-ic2024-official-linux64.xml>

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Tested with SPEC CPU®2017 v1.1.9 on 2024-03-12 10:58:34-0400.  
 Report generated on 2024-04-09 15:51:13 by CPU2017 PDF formatter v6716.  
 Originally published on 2024-04-09.