SPEC CPU®2017 Integer Rate Result

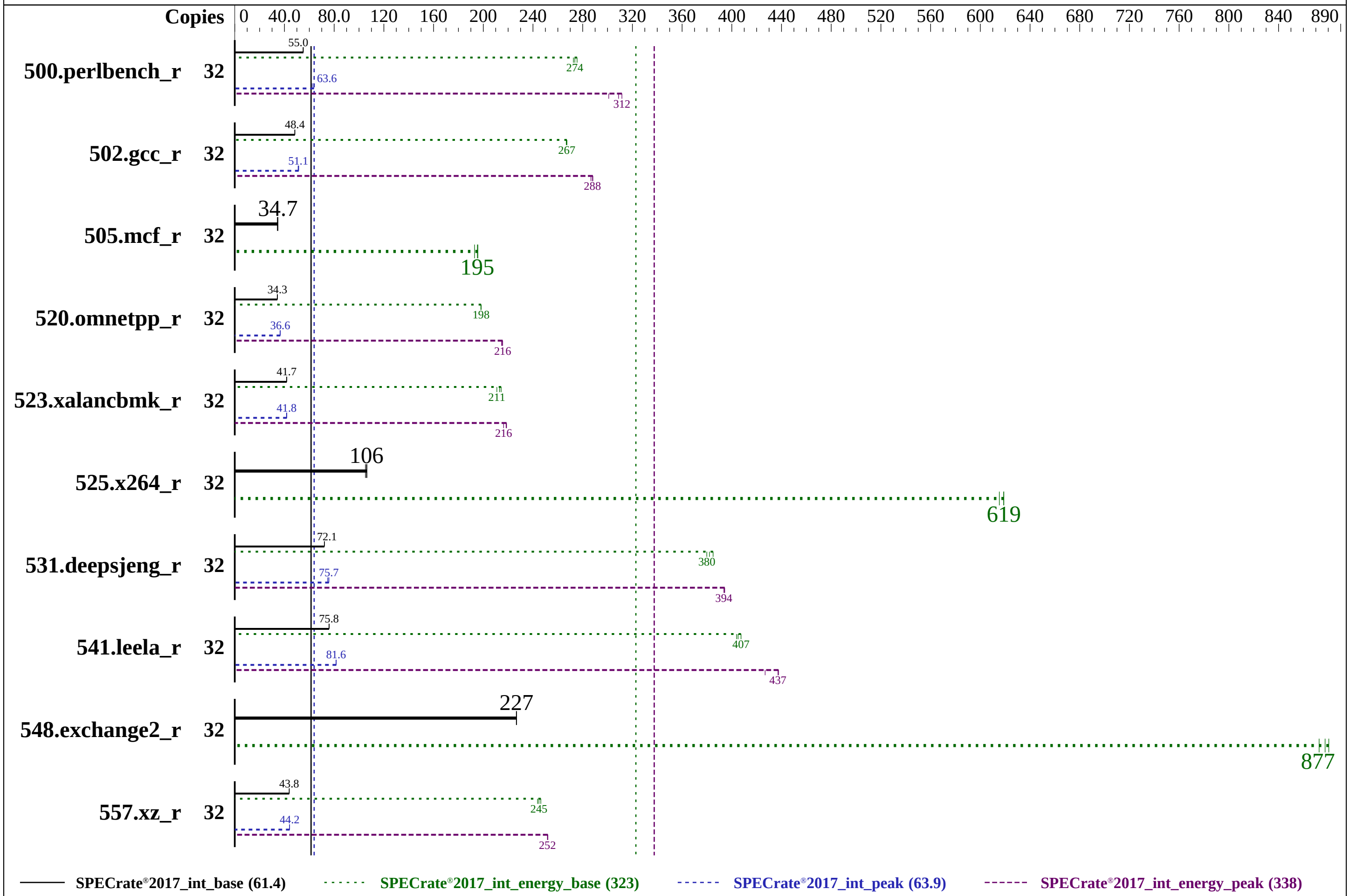
Lenovo Global Technology

(Test Sponsor: Ampere Computing, Inc.)

ThinkSystem HR330A
(3.00 GHz Ampere eMAG 8180)

SPECrate®2017_int_base =	61.4
SPECrate®2017_int_energy_base =	323
SPECrate®2017_int_peak =	63.9
SPECrate®2017_int_energy_peak =	338

CPU2017 License:	6412	**Test Date:**	Feb-2026
Test Sponsor:	Ampere Computing, Inc.	**Hardware Availability:**	Apr-2019
Tested by:	Ampere Computing, Inc.	**Software Availability:**	Aug-2025



Hardware

CPU Name:	Ampere eMAG 8180
Max MHz:	3300
Nominal:	3000
Enabled:	32 cores, 1 chip
Orderable:	1 chips
Cache L1:	32 KB I + 32 KB D on chip per core
L2:	4 MB I+D on chip per chip (256 KiB shared / 2 cores)
L3:	32 MB I+D on chip per chip
Other:	None
Memory:	128 GB (8 x 16 GB 2Rx4 PC4-2666V-R)
Storage:	1 x 480 GB SATA SSD
Other:	CPU Cooling: Air

Software

OS:	Ubuntu 24.04.1 LTS kernel 6.8.0 (64KB pages)
Compiler:	C/C++/Fortran: Version 15.2.0 of GCC
Parallel:	No
Firmware:	Version 1.12 released Nov-2019
File System:	ext4
System State:	Run level 5 (multi-user)
Base Pointers:	64-bit
Peak Pointers:	64-bit
Other:	jemalloc v5.3+, commit hash 1972241
Power Management:	OS CPU governor set to "performance"

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Power

Max. Power (W): 296.14
Idle Power (W): 77.99
Min. Temperature (C): 20.75
Elevation (m): 60
Line Standard: 120 V / 60 Hz / 1 phase / 2 wire
Provisioning: Line powered

Power Settings

Management FW: Version 11.05.111 of Falcon BMC
Memory Mode: Normal

Power-Relevant Hardware

Power Supply: 1 x 550 W (non-redundant)
Details: Lenovo 03LD785 550 Watt High Efficiency Platinum AC Power Supply
Backplane: N/A
Other Storage: N/A
Storage Model #s: 1 x Lenovo 01PE965 (480GB SATA SSD) connected to on-board HBA
NICs Installed: 1 x Lenovo 01PE857 @ 10 GbE (2 ports ethernet)
NICs Enabled (FW/OS): 2 / 1
NICs Connected/Speed: 1 @ 1 Gbps
Other HW Model #s: --

Power Analyzer

Power Analyzer: cpu-reference-ptd:8000
Hardware Vendor: Yokogawa
Model: YokogawaWT310E
Serial Number: T11733385
Input Connection: Serial over USB
Metrology Institute: NIST
Calibration By: Yokogawa USA
Calibration Label: T126622
Calibration Date: 18-Aug-2025
PTDaemon® Version: 1.11.3 (0c074d7d; 2025-10-15)
Setup Description: Directly connected
Current Ranges Used: 5A
Voltage Range Used: 150V

Temperature Meter

Temperature Meter: cpu-reference-ptd:9000
Hardware Vendor: PCSensor
Model: USB9097+DS18B20
Serial Number: --
Input Connection: USB
PTDaemon Version: 1.11.3 (0c074d7d; 2025-10-15)
Setup Description: In front of SUT front panel primary air inlet

Base Results Table

Benchmark	Copies	Seconds	Ratio	Energy (kJ)	Energy Ratio	Average Power	Maximum Power	Seconds	Ratio	Energy (kJ)	Energy Ratio	Average Power	Maximum Power	Seconds	Ratio	Energy (kJ)	Energy Ratio	Average Power	Maximum Power
500.perlbench_r	32	926	55.0	203	273	219	278	**926**	**55.0**	**202**	**274**	**218**	**278**	923	55.2	201	275	217	283
502.gcc_r	32	**937**	**48.4**	**184**	**267**	**197**	**266**	939	48.3	184	267	196	269	937	48.4	184	267	197	270
505.mcf_r	32	**1491**	**34.7**	**290**	**195**	**194**	**271**	1489	34.7	289	196	194	273	1509	34.3	293	193	194	272
520.omnetpp_r	32	**1224**	**34.3**	**229**	**198**	**187**	**195**	1225	34.3	229	198	187	198	1224	34.3	230	198	188	197
523.xalancbmk_r	32	810	41.7	172	213	212	286	**809**	**41.7**	**174**	**211**	**214**	**289**	807	41.9	171	214	212	291
525.x264_r	32	**528**	**106**	**98.1**	**619**	**186**	**205**	527	106	98.2	619	186	205	533	105	98.7	615	185	203
531.deepsjeng_r	32	509	72.1	104	385	204	267	509	72.1	104	382	205	255	**509**	**72.1**	**105**	**380**	**206**	**269**
541.leela_r	32	699	75.8	142	405	203	251	**699**	**75.8**	**141**	**407**	**201**	**243**	698	75.9	142	404	203	264
548.exchange2_r	32	370	227	104	873	281	293	**370**	**227**	**104**	**877**	**280**	**294**	370	227	103	880	279	293
557.xz_r	32	789	43.8	153	246	193	226	**788**	**43.8**	**153**	**245**	**195**	**252**	788	43.9	154	244	196	265

SPECrate®2017_int_base = 61.4

SPECrate®2017_int_energy_base = 323

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

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Peak Results Table

Benchmark	Copies	Seconds	Ratio	Energy (kJ)	Energy Ratio	Average Power	Maximum Power	Seconds	Ratio	Energy (kJ)	Energy Ratio	Average Power	Maximum Power	Seconds	Ratio	Energy (kJ)	Energy Ratio	Average Power	Maximum Power
500.perlbench_r	32	817	62.4	184	301	225	283	**801**	**63.6**	**177**	**312**	**222**	**285**	800	63.7	179	309	224	284
502.gcc_r	32	889	51.0	172	287	193	250	880	51.5	171	288	194	248	**886**	**51.1**	**171**	**288**	**193**	**239**
505.mcf_r	32	**1491**	**34.7**	**290**	**195**	**194**	**271**	1489	34.7	289	196	194	273	1509	34.3	293	193	194	272
520.omnetpp_r	32	1152	36.4	212	215	184	195	1146	36.6	211	215	185	193	**1146**	**36.6**	**211**	**216**	**184**	**192**
523.xalancbmk_r	32	812	41.6	168	218	206	296	**809**	**41.8**	**169**	**216**	**209**	**296**	807	41.9	167	219	207	294
525.x264_r	32	**528**	**106**	**98.1**	**619**	**186**	**205**	527	106	98.2	619	186	205	533	105	98.7	615	185	203
531.deepsjeng_r	32	484	75.7	101	394	209	269	**484**	**75.7**	**101**	**394**	**209**	**275**	491	74.7	101	394	206	260
541.leela_r	32	**650**	**81.6**	**131**	**437**	**202**	**237**	650	81.5	131	438	202	245	649	81.7	134	427	207	255
548.exchange2_r	32	370	227	104	873	281	293	**370**	**227**	**104**	**877**	**280**	**294**	370	227	103	880	279	293
557.xz_r	32	782	44.2	149	252	191	248	**783**	**44.2**	**149**	**252**	**191**	**243**	783	44.2	149	252	191	239

SPECrate®2017_int_peak = 63.9

SPECrate®2017_int_energy_peak = 338

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

Submit Notes

```
The config file option 'submit' was used.
```

Environment Variables Notes

```
Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH = "/usr/lib64/:/usr/lib/:/lib64:/home/mjm/jemalloc/lib"
```

General Notes

```
jemalloc is a general purpose malloc(3) implementation that emphasizes
fragmentation avoidance and scalable concurrency support.
sources available from https://github.com/facebook/jemalloc/tree/1972241
and built via "./configure --with-lg-quantum=3" which used system gcc-14 -O3

This benchmark result is intended to provide perspective on
past power and/or performance using the historical hardware
and/or software described on this result page.

The system as described on this result page was formerly
generally available. At the time of this publication, it may
not be shipping, and/or may not be supported, and/or may fail
to meet other tests of General Availability described in the
SPEC OSG Policy document, http://www.spec.org/osg/policy.html

This measured result may not be representative of the result
that would be measured were this benchmark run with hardware
and software available as of the publication date.
```

Platform Notes

```
Sysinfo program /home/mjm/cpu2017/bin/sysinfo
```

(Continued on next page)

Platform Notes (Continued)

```
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
running on emag Fri Feb 27 18:49:45 2026

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 255 (255.4-1ubuntu8.8)
12. Services, from systemctl list-unit-files
13. Linux kernel boot-time arguments, from /proc/cmdline
14. sysctl
15. /sys/kernel/mm/transparent_hugepage
16. /sys/kernel/mm/transparent_hugepage/khugepaged
17. OS release
18. Disk information
19. /sys/devices/virtual/dmi/id
20. dmidecode
21. BIOS
------------------------------------------------------------

------------------------------------------------------------
1. uname -a
  Linux emag 6.8.0 #1 SMP PREEMPT_DYNAMIC Fri Feb 28 00:25:30 UTC 2025 aarch64 aarch64 aarch64 GNU/Linux

------------------------------------------------------------
2. w
   18:49:45 up 70 days, 19:14,  2 users,  load average: 2.03, 9.95, 13.63
  USER     TTY      FROM             LOGIN@   IDLE   JCPU   PCPU WHAT
  mjm               10.13.114.186    28Jan26 36:39m  0.00s  0.02s sshd: mjm [priv]

------------------------------------------------------------
3. Username
  From environment variable $USER:  mjm

------------------------------------------------------------
4. ulimit -a
  time(seconds)        unlimited
  file(blocks)         unlimited
  data(kbytes)         unlimited
  stack(kbytes)        unlimited
  coredump(blocks)     0
  memory(kbytes)       unlimited
  locked memory(kbytes) 16691648
  process              128681
  nofiles              1024
  vmemory(kbytes)      unlimited
```

(Continued on next page)

Platform Notes (Continued)

```
  locks                 unlimited
  rtprio                0

------------------------------------------------------------
5. sysinfo process ancestry
 /usr/lib/systemd/systemd --system --deserialize=66
 SCREEN
 -bin/tcsh
 runcpu --flagsurl=$SPEC/gcc.2024-08-14.xml --reportable -c emag-Ofast-gcc15 --tune=base,peak -n 3 -C 32
   intrate
 runcpu --flagsurl $SPEC/gcc.2024-08-14.xml --reportable --configfile emag-Ofast-gcc15 --tune base,peak
   --iterations 3 --copies 32 --runmode rate --tune base:peak --size refrate intrate --nopreenv --note-preenv
   --logfile $SPEC/tmp/CPU2017.093/templogs/preenv.intrate.093.0.log --lognum 093.0 --from_runcpu 2
 specperl $SPEC/bin/sysinfo -f
$SPEC = /home/mjm/cpu2017

------------------------------------------------------------
6. /proc/cpuinfo
    CPU implementer : 0x50
    CPU architecture: 8
    CPU variant     : 0x3
    CPU part        : 0x000
    CPU revision    : 2
    Features        : fp asimd evtstrm aes pmull sha1 sha2 crc32 cpuid

------------------------------------------------------------
7. lscpu

From lscpu from util-linux 2.39.3:
  Architecture:                    aarch64
  CPU op-mode(s):                  32-bit, 64-bit
  Byte Order:                      Little Endian
  CPU(s):                          32
  On-line CPU(s) list:             0-31
  Vendor ID:                       APM
  Model name:                      -
  Model:                           2
  Thread(s) per core:              1
  Core(s) per socket:              32
  Socket(s):                       1
  Stepping:                        0x3
  Frequency boost:                 disabled
  CPU(s) scaling MHz:              100%
  CPU max MHz:                     2911.7639
  CPU min MHz:                     363.9700
  BogoMIPS:                        80.00
  Flags:                           fp asimd evtstrm aes pmull sha1 sha2 crc32 cpuid
  L1d cache:                       1 MiB (32 instances)
  L1i cache:                       1 MiB (32 instances)
  L2 cache:                        4 MiB (16 instances)
  NUMA node(s):                    1
  NUMA node0 CPU(s):               0-31
  Vulnerability Gather data sampling: Not affected
  Vulnerability Itlb multihit:     Not affected
  Vulnerability L1tf:              Not affected
  Vulnerability Mds:               Not affected
  Vulnerability Meltdown:          Mitigation; PTI
```

(Continued on next page)

Platform Notes (Continued)

```
  Vulnerability Mmio stale data:      Not affected
  Vulnerability Retbleed:             Not affected
  Vulnerability Spec rstack overflow: Not affected
  Vulnerability Spec store bypass:    Vulnerable
  Vulnerability Spectre v1:           Mitigation; __user pointer sanitization
  Vulnerability Spectre v2:           Vulnerable
  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       32K       1M    8 Data            1
     L1i       32K       1M    8 Instruction     1
     L2       256K       4M   32 Unified         2

------------------------------------------------------------
8. numactl --hardware
NOTE: a numactl 'node' might or might not correspond to a physical chip.
  available: 1 nodes (0)
  node 0 cpus: 0-31
  node 0 size: 130403 MB
  node 0 free: 101255 MB
  node distances:
  node   0
    0:  10

------------------------------------------------------------
9. /proc/meminfo
   MemTotal:       133533376 kB

------------------------------------------------------------
10. who -r
  run-level 5 Dec 18 23:35

------------------------------------------------------------
11. Systemd service manager version: systemd 255 (255.4-1ubuntu8.8)
  Default Target  Status
  graphical       running

------------------------------------------------------------
12. Services, from systemctl list-unit-files
  STATE            UNIT FILES
  enabled          ModemManager apparmor apport blk-availability cloud-config cloud-final cloud-init
                   cloud-init-local console-setup cron dmesg e2scrub_reap finalrd getty@ grub-common
                   grub-initrd-fallback keyboard-setup lvm2-monitor multipathd networkd-dispatcher open-iscsi
                   open-vm-tools pollinate power-profiles-daemon rsyslog secureboot-db setvtrgb snapd sysstat
                   systemd-networkd systemd-networkd-wait-online systemd-pstore systemd-resolved
                   systemd-timesyncd ua-reboot-cmds ubuntu-advantage udisks2 ufw unattended-upgrades vgauth
  enabled-runtime  netplan-ovs-cleanup systemd-fsck-root systemd-remount-fs
  disabled         console-getty debug-shell ipmievd iscsid nftables rsync ssh systemd-boot-check-no-failures
                   systemd-confext systemd-network-generator systemd-networkd-wait-online@
                   systemd-pcrlock-file-system systemd-pcrlock-firmware-code systemd-pcrlock-firmware-config
                   systemd-pcrlock-machine-id systemd-pcrlock-make-policy
                   systemd-pcrlock-secureboot-authority systemd-pcrlock-secureboot-policy systemd-sysext
                   systemd-time-wait-sync
  generated        openipmi perlbal
  indirect         serial-getty@ systemd-sysupdate systemd-sysupdate-reboot uuidd
```

(Continued on next page)

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Platform Notes (Continued)

```
  masked           cryptdisks cryptdisks-early hwclock multipath-tools-boot screen-cleanup sudo x11-common

------------------------------------------------------------
13. Linux kernel boot-time arguments, from /proc/cmdline
  BOOT_IMAGE=/boot/vmlinuz-6.8.0
  root=UUID=16268541-06d0-4374-97ca-2d512d4db26f
  ro
  cma=1024M
  iommu.passthrough=1

------------------------------------------------------------
14. 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
  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

------------------------------------------------------------
15. /sys/kernel/mm/transparent_hugepage
  defrag          always defer defer+madvise [madvise] never
  enabled         always [madvise] never
  hpage_pmd_size  536870912
  shmem_enabled   always within_size advise [never] deny force

------------------------------------------------------------
16. /sys/kernel/mm/transparent_hugepage/khugepaged
  alloc_sleep_millisecs   60000
  defrag                      1
  max_ptes_none            8191
  max_ptes_shared          4096
  max_ptes_swap            1024
  pages_to_scan           65536
  scan_sleep_millisecs    10000

------------------------------------------------------------
17. OS release
  From /etc/*-release /etc/*-version
  os-release Ubuntu 24.04.1 LTS

------------------------------------------------------------
18. Disk information
SPEC is set to: /home/mjm/cpu2017
```

(Continued on next page)

Platform Notes (Continued)

```
  Filesystem     Type  Size  Used Avail Use% Mounted on
  /dev/sda2      ext4  439G  292G  124G  71% /

------------------------------------------------------------
19. /sys/devices/virtual/dmi/id
    Vendor:         Lenovo
    Product:        HR330A            7X33CTO1WW
    Product Family: Lenovo ThinkSystem HR330A/HR350A

------------------------------------------------------------
20. dmidecode
  Additional information from dmidecode 3.5 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:
    8x Samsung M393A2K43CB2-CTD 16 GB 2 rank 2667


------------------------------------------------------------
21. BIOS
(This section combines info from /sys/devices and dmidecode.)
   BIOS Vendor:       LENOVO
   BIOS Version:      HVE104N-1.12
   BIOS Date:         11/29/2019
   BIOS Revision:     1.12
   Firmware Revision: 1.7
```

Power Settings Notes

```
OS CPU governor was set using the command:
echo performance | tee /sys/devices/system/cpu/cpu*/cpufreq/scaling_governor
```

Compiler Version Notes

```
==============================================================================================================
C       | 500.perlbench_r(base, peak) 502.gcc_r(base, peak) 505.mcf_r(base, peak) 525.x264_r(base, peak)
        | 557.xz_r(base, peak)
--------------------------------------------------------------------------------------------------------------
gcc (GCC) 15.2.0
Copyright (C) 2025 Free Software Foundation, Inc.
This is free software; see the source for copying conditions.  There is NO
warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.
--------------------------------------------------------------------------------------------------------------

==============================================================================================================
C++     | 520.omnetpp_r(base, peak) 523.xalancbmk_r(base, peak) 531.deepsjeng_r(base, peak)
        | 541.leela_r(base, peak)
--------------------------------------------------------------------------------------------------------------
g++ (GCC) 15.2.0
Copyright (C) 2025 Free Software Foundation, Inc.
This is free software; see the source for copying conditions.  There is NO
warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.
--------------------------------------------------------------------------------------------------------------
```

(Continued on next page)

Compiler Version Notes (Continued)

```
==============================================================================================================
Fortran | 548.exchange2_r(base, peak)
--------------------------------------------------------------------------------------------------------------
GNU Fortran (GCC) 15.2.0
Copyright (C) 2025 Free Software Foundation, Inc.
This is free software; see the source for copying conditions.  There is NO
warranty; not even for MERCHANTABILITY or FITNESS FOR A PARTICULAR PURPOSE.
--------------------------------------------------------------------------------------------------------------
```

Base Compiler Invocation

C benchmarks:
gcc

C++ benchmarks:
g++

Fortran benchmarks:
gfortran

Base Portability Flags

500.perlbench_r: -DSPEC_LINUX_AARCH64 -DSPEC_LP64
502.gcc_r: -DSPEC_LP64
505.mcf_r: -DSPEC_LP64
520.omnetpp_r: -DSPEC_LP64
523.xalancbmk_r: -DSPEC_LINUX -DSPEC_LP64
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:
-mabi=lp64 -std=c99 -g -Ofast -mcpu=native -flto=16
-fno-strict-aliasing -fno-unsafe-math-optimizations
-fno-finite-math-only -fgnu89-inline -L/home/mjm/jemalloc/lib
-ljemalloc

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Base Optimization Flags (Continued)

C++ benchmarks:
-mabi=lp64 -std=c++03 -g -Ofast -mcpu=native -flto=16
-L/home/mjm/jemalloc/lib -ljemalloc

Fortran benchmarks:
-mabi=lp64 -g -Ofast -mcpu=native -flto=16 -L/home/mjm/jemalloc/lib
-ljemalloc

Base Other Flags

C benchmarks:
-fcommon

C++ benchmarks:
-Wno-error=template-body

Peak Compiler Invocation

C benchmarks:
gcc

C++ benchmarks:
g++

Fortran benchmarks:
gfortran

Peak Portability Flags

Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:

(Continued on next page)

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Peak Optimization Flags (Continued)

500.perlbench_r: `-mabi=lp64 -std=c99 -fprofile-generate -fprofile-use -g -Ofast -mcpu=native -flto=16 -fno-strict-aliasing -fno-unsafe-math-optimizations -fno-finite-math-only -L/home/mjm/jemalloc/lib -ljemalloc`

502.gcc_r: `-mabi=lp64 -std=c99 -fprofile-generate -fprofile-use -g -Ofast -mcpu=native -flto=16 -fno-strict-aliasing -fgnu89-inline -L/home/mjm/jemalloc/lib -ljemalloc`

505.mcf_r: `basepeak = yes`

525.x264_r: `basepeak = yes`

557.xz_r: `-mabi=lp64 -std=c99 -fprofile-generate -fprofile-use -g -Ofast -mcpu=native -flto=16 -L/home/mjm/jemalloc/lib -ljemalloc`

C++ benchmarks:
`-mabi=lp64 -std=c++03 -fprofile-generate -fprofile-use -g -Ofast -mcpu=native -flto=16 -L/home/mjm/jemalloc/lib -ljemalloc`

Fortran benchmarks:

548.exchange2_r: `basepeak = yes`

Peak Other Flags

C benchmarks:

505.mcf_r: `-fcommon`

525.x264_r: `-fcommon`

C++ benchmarks:

523.xalancbmk_r: `-Wno-error=template-body`

The flags file that was used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/gcc.2026-04-28.00.html

You can also download the XML flags source by saving the following link:
`http://www.spec.org/cpu2017/flags/gcc.2026-04-28.00.xml`

For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

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