



SPEC CPU®2017 Integer Rate Result

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Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant DL345 Gen11

(3.15 GHz, AMD EPYC 9455P)

SPECrate®2017_int_base = 618

SPECrate®2017_int_peak = 629

CPU2017 License: 3

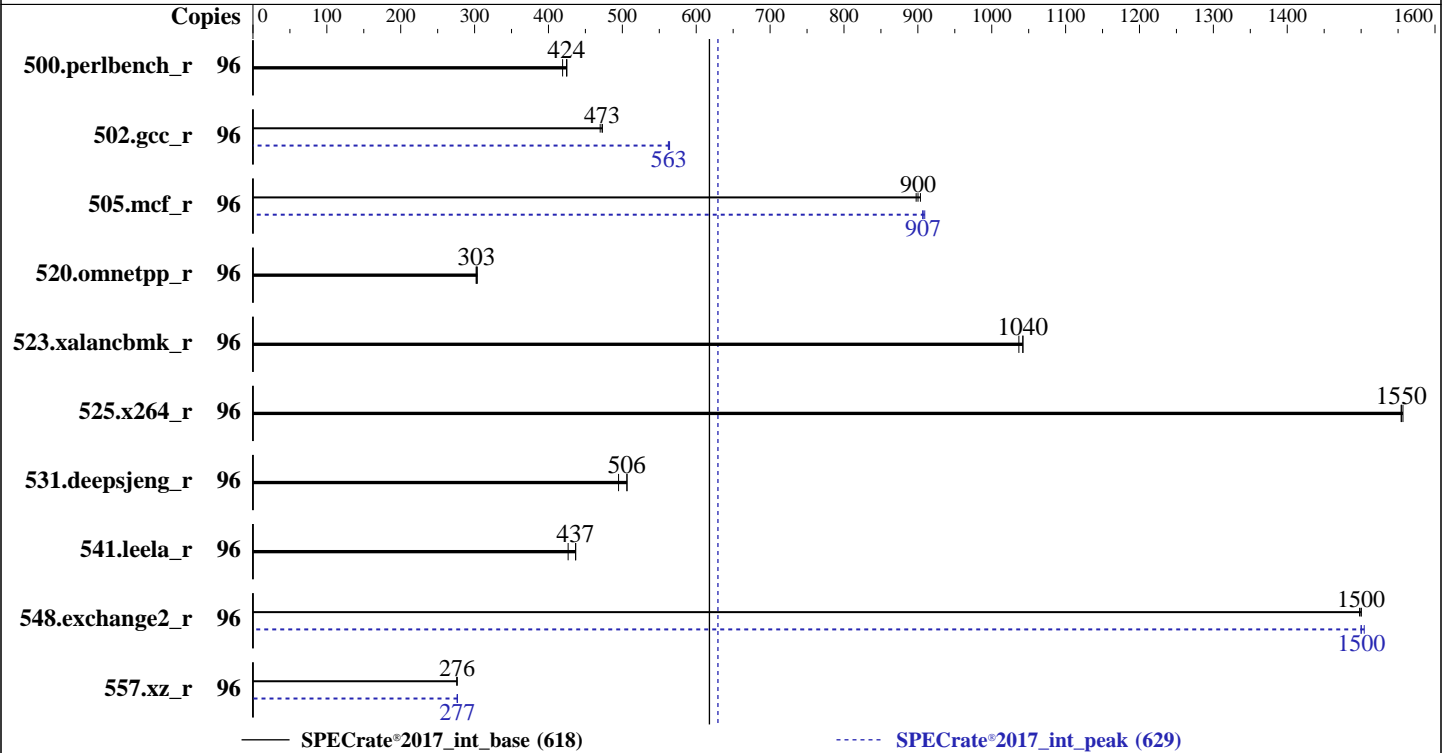
Test Sponsor: HPE

Tested by: HPE

Test Date: Nov-2024

Hardware Availability: Jan-2025

Software Availability: Sep-2024



Hardware

CPU Name: AMD EPYC 9455P
 Max MHz: 4400
 Nominal: 3150
 Enabled: 48 cores, 1 chip, 2 threads/core
 Orderable: 1 chip
 Cache L1: 32 KB I + 48 KB D on chip per core
 L2: 1 MB I+D on chip per core
 L3: 256 MB I+D on chip per chip,
 32 MB shared / 6 cores
 Other: None
 Memory: 384 GB (12 x 32 GB 2Rx8 PC5-6400B-R,
 running at 6000)
 Storage: 1 x 480 GB SATA SSD
 Other: CPU Cooling: Air

Software

OS: SUSE Linux Enterprise Server 15 SP6
 Kernel 6.4.0-150600.21-default
 Compiler: C/C++/Fortran: Version 5.0.0 of AOCC
 Parallel: No
 Firmware: HPE BIOS Version v2.20 10/31/2024 released
 Oct-2024
 File System: btrfs
 System State: Run level 3 (multi-user)
 Base Pointers: 64-bit
 Peak Pointers: 32/64-bit
 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 | 96 | 365 | 419 | 360 | 424 | 360 | 425 | 96 | 365 | 419 | 360 | 424 | 360 | 425 |
| 502.gcc_r | 96 | 289 | 470 | 287 | 473 | 288 | 473 | 96 | 242 | 562 | 241 | 563 | 241 | 564 |
| 505.mcf_r | 96 | 172 | 900 | 173 | 898 | 172 | 904 | 96 | 171 | 907 | 171 | 906 | 171 | 909 |
| 520.omnetpp_r | 96 | 417 | 302 | 415 | 304 | 416 | 303 | 96 | 417 | 302 | 415 | 304 | 416 | 303 |
| 523.xalancbmk_r | 96 | 97.3 | 1040 | 97.3 | 1040 | 97.8 | 1040 | 96 | 97.3 | 1040 | 97.3 | 1040 | 97.8 | 1040 |
| 525.x264_r | 96 | 108 | 1550 | 108 | 1550 | 108 | 1560 | 96 | 108 | 1550 | 108 | 1550 | 108 | 1560 |
| 531.deepsjeng_r | 96 | 222 | 495 | 217 | 506 | 217 | 506 | 96 | 222 | 495 | 217 | 506 | 217 | 506 |
| 541.leela_r | 96 | 364 | 437 | 364 | 437 | 373 | 427 | 96 | 364 | 437 | 364 | 437 | 373 | 427 |
| 548.exchange2_r | 96 | 168 | 1500 | 168 | 1500 | 168 | 1500 | 96 | 168 | 1500 | 167 | 1500 | 168 | 1500 |
| 557.xz_r | 96 | 375 | 276 | 375 | 276 | 376 | 276 | 96 | 375 | 276 | 374 | 277 | 375 | 277 |

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

Compiler Notes

The AMD64 AOCC Compiler Suite is available at <http://developer.amd.com/amd-aocc/>

Submit Notes

The config file option 'submit' was used.
'numactl' was used to bind copies to the cores.
See the configuration file for details.

Operating System Notes

'ulimit -s unlimited' was used to set environment stack size limit
'ulimit -l 2097152' was used to set environment locked pages in memory limit

runcpu command invoked through numactl i.e.:
numactl --interleave=all runcpu <etc>

To limit dirty cache to 8% of memory, 'sysctl -w vm.dirty_ratio=8' run as root.
To limit swap usage to minimum necessary, 'sysctl -w vm.swappiness=1' run as root.
To free node-local memory and avoid remote memory usage,
'sysctl -w vm.zone_reclaim_mode=1' run as root.
To clear filesystem caches, 'sync; sysctl -w vm.drop_caches=3' run as root.
To disable address space layout randomization (ASLR) to reduce run-to-run
variability, 'sysctl -w kernel.randomize_va_space=0' run as root.

To enable Transparent Hugepages (THP) for all allocations,
'echo always > /sys/kernel/mm/transparent_hugepage/enabled' and
'echo always > /sys/kernel/mm/transparent_hugepage/defrag' run as root.



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Environment Variables Notes

Environment variables set by runcpu before the start of the run:

```
LD_LIBRARY_PATH =  
"/home/cpu2017/amd_rate_aocc500_znver5_A_lib/lib:/home/cpu2017/amd_rate_aocc500_znver5_A_lib/lib32:"  
MALLOC_CONF = "retain:true"
```

General Notes

Binaries were compiled on a system with 2x AMD EPYC 9174F CPU + 1.5TiB Memory using RHEL 8.6

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
Workload Profile set to General Throughput Compute
Determinism Control set to Manual
Performance Determinism set to Power Deterministic
Memory Patrol Scrubbing set to Disabled
NUMA memory domains per socket set to Four memory domains per socket
ACPI CST C2 Latency set to 18 microseconds
Thermal Configuration set to Maximum Cooling
AMD Periodic Directory Rinse set to Periodic
Workload Profile set to Custom
Power Regulator set to OS Control Mode
The reference code/AGESA version used in this ROM is version Turin-PI 1.0.0.2

Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
running on localhost Fri Nov 15 10:49:01 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 254 (254.10+suse.84.ge8d77af424)
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

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Platform Notes (Continued)

```

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 localhost 6.4.0-150600.21-default #1 SMP PREEMPT_DYNAMIC Thu May 16 11:09:22 UTC 2024 (36c1e09)
x86_64 x86_64 x86_64 GNU/Linux

```

```

-----
2. w
 10:49:01 up 38 min,  1 user,  load average: 0.09, 0.27, 0.20
USER      TTY      FROM          LOGIN@   IDLE   JCPU   PCPU WHAT
root      pts/0    172.17.1.114  22Apr24 13.00s  0.74s  0.04s /bin/bash ./amd_rate_aocc500_znver5_A1.sh

```

```

-----
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) 1546383
max locked memory       (kbytes, -l) 2097152
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) 1546383
virtual memory          (kbytes, -v) unlimited
file locks              (-x) unlimited

```

```

-----
5. sysinfo process ancestry
/usr/lib/systemd/systemd --switched-root --system --deserialize=31
sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups
sshd: root [priv]
sshd: root@pts/0
-bash
-bash
python3 ./run_intrate.py
/bin/bash ./amd_rate_aocc500_znver5_A1.sh
runcpu --config amd_rate_aocc500_znver5_A1.cfg --tune all --reportable --iterations 3 intrate
runcpu --configfile amd_rate_aocc500_znver5_A1.cfg --tune all --reportable --iterations 3 --nopower
--runmode rate --tune base:peak --size test:train:refrate intrate --nopreenv --note-preenv --logfile
$SPEC/tmp/CPU2017.001/templogs/preenv.intrate.001.0.log --lognum 001.0 --from_runcpu 2
specperl $SPEC/bin/sysinfo
$SPEC = /home/cpu2017

```

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Platform Notes (Continued)

```

6. /proc/cpuinfo
model name      : AMD EPYC 9455P 48-Core Processor
vendor_id      : AuthenticAMD
cpu family     : 26
model          : 2
stepping       : 1
microcode      : 0xb00211a
bugs           : sysret_ss_attrs spectre_v1 spectre_v2 spec_store_bypass
TLB size       : 192 4K pages
cpu cores      : 48
siblings       : 96
1 physical ids (chips)
96 processors (hardware threads)
physical id 0: core ids 0-5,8-13,16-21,24-29,32-37,40-45,48-53,56-61
physical id 0: apicids 0-11,16-27,32-43,48-59,64-75,80-91,96-107,112-123
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 2.39.3:

```

Architecture:          x86_64
CPU op-mode(s):        32-bit, 64-bit
Address sizes:         52 bits physical, 57 bits virtual
Byte Order:            Little Endian
CPU(s):                96
On-line CPU(s) list:  0-95
Vendor ID:             AuthenticAMD
BIOS Vendor ID:       Advanced Micro Devices, Inc.
Model name:            AMD EPYC 9455P 48-Core Processor
BIOS Model name:       AMD EPYC 9455P 48-Core Processor           CPU @ 3.1GHz
BIOS CPU family:      107
CPU family:            26
Model:                 2
Thread(s) per core:   2
Core(s) per socket:   48
Socket(s):             1
Stepping:              1
Frequency boost:       enabled
CPU(s) scaling MHz:   101%
CPU max MHz:           3150.0000
CPU min MHz:           1500.0000
BogoMIPS:              6289.90
Flags:                 fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat
pse36 clflush mmx fxsr sse sse2 ht syscall nx mmxext fxsr_opt pdpe1gb
rdtscp lm constant_tsc rep_good amd_lbr_v2 nopl nonstop_tsc cpuid
extd_apicid aperfmperf rapl pni pclmulqdq monitor ssse3 fma cx16 pcid
sse4_1 sse4_2 movbe popcnt aes xsave avx f16c rdrand lahf_lm
cmp_legacy svm extapic cr8_legacy abm sse4a misalignsse 3dnowprefetch
osvw ibs skinit wdt tce topoext perfctr_core perfctr_nb bpext
perfctr_llc mwaitx cpb cat_l3 cdp_l3 hw_pstate ssbd mba perfmon_v2
ibrs ibpb stibp ibrs_enhanced vmmcall fsgsbase tsc_adjust bmi1 avx2
smep bmi2 erms invpcid cqm rdt_a avx512f avx512dq rdseed adx smap
avx512ifma clflushopt clwb avx512cd sha_ni avx512bw avx512vl xsaveopt
xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbm_total
cqm_mbm_local user_shstk avx_vnni avx512_bf16 clzero irperf
xsaveerptr rdpru wbnoinvd amd_ppin cppc arat npt lbrv svm_lock
nrip_save tsc_scale vmcb_clean flushbyasid decodeassists pausefilter
pfthreshold avic v_vmsave_vmload vgif x2avic v_spec_ctrl vnmi

```

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Platform Notes (Continued)

```

Virtualization:
Lld cache:
L1i cache:
L2 cache:
L3 cache:
NUMA node(s):
NUMA node0 CPU(s):
NUMA node1 CPU(s):
NUMA node2 CPU(s):
NUMA node3 CPU(s):
Vulnerability Gather data sampling:
Vulnerability Itlb multihit:
Vulnerability L1tf:
Vulnerability Mds:
Vulnerability Meltdown:
Vulnerability Mmio stale data:
Vulnerability Reg file data sampling:
Vulnerability Retbleed:
Vulnerability Spec rstack overflow:
Vulnerability Spec store bypass:
Vulnerability Spectre v1:
Vulnerability Spectre v2:
Vulnerability Srbds:
Vulnerability Tsx async abort:

```

avx512vbmi umip pku ospke avx512_vbmi2 gfni vaes vpclmulqdq
avx512_vnni avx512_bitalg avx512_vpopcntdq la57 rdpid bus_lock_detect
movdiri movdir64b overflow_recov succor smca fsrm avx512_vp2intersect
flush_llid debug_swap
AMD-V
2.3 MiB (48 instances)
1.5 MiB (48 instances)
48 MiB (48 instances)
256 MiB (8 instances)
4
0-11,48-59
12-23,60-71
24-35,72-83
36-47,84-95
Not affected
Not affected
Not affected
Not affected
Not affected
Not affected
Not affected
Not affected
Not affected
Mitigation; Speculative Store Bypass disabled via prctl
Mitigation; usercopy/swaps barriers and __user pointer sanitization
Mitigation; Enhanced / Automatic IBRS; IBPB conditional; STIBP
always-on; RSB filling; PBRSE-eIBRS Not affected; BHI Not affected
Not affected
Not affected

```

From lscpu --cache:
NAME ONE-SIZE ALL-SIZE WAYS TYPE LEVEL SETS PHY-LINE COHERENCY-SIZE
Lld 48K 2.3M 12 Data 1 64 1 64
L1i 32K 1.5M 8 Instruction 1 64 1 64
L2 1M 48M 16 Unified 2 1024 1 64
L3 32M 256M 16 Unified 3 32768 1 64

```

```

-----
8. numactl --hardware
NOTE: a numactl 'node' might or might not correspond to a physical chip.
available: 4 nodes (0-3)
node 0 cpus: 0-11,48-59
node 0 size: 96407 MB
node 0 free: 95881 MB
node 1 cpus: 12-23,60-71
node 1 size: 96761 MB
node 1 free: 96432 MB
node 2 cpus: 24-35,72-83
node 2 size: 96761 MB
node 2 free: 96468 MB
node 3 cpus: 36-47,84-95
node 3 size: 96689 MB
node 3 free: 96344 MB
node distances:
node 0 1 2 3
0: 10 12 12 12
1: 12 10 12 12
2: 12 12 10 12
3: 12 12 12 10

```

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Platform Notes (Continued)

9. /proc/meminfo

MemTotal: 395899624 kB

10. who -r

run-level 3 Apr 22 17:30

11. Systemd service manager version: systemd 254 (254.10+suse.84.ge8d77af424)

| Default Target | Status |
|----------------|---------|
| multi-user | running |

12. Services, from systemctl list-unit-files

| STATE | UNIT FILES |
|-----------------|--|
| enabled | apparmor auditd cron getty@ irqbalance issue-generator kbdsettings lvm2-monitor postfix purge-kernels rollback sshd systemd-pstore wicked wicked-auto4 wicked-dhcp4 wicked-dhcp6 wicked-nanny |
| enabled-runtime | systemd-remount-fs |
| disabled | blk-availability boot-sysctl ca-certificates chrony-wait chronyd console-getty debug-shell grub2-once haveged hwloc-dump-hwdata issue-add-ssh-keys kexec-load lunmask rpmconfigcheck serial-getty@ systemd-boot-check-no-failures systemd-confext systemd-network-generator systemd-sysext systemd-time-wait-sync systemd-timesyncd |
| indirect | pcsd systemd-userdbd wickedd |

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

BOOT_IMAGE=/boot/vmlinuz-6.4.0-150600.21-default
root=UUID=04efbdca-1d19-4013-beec-bea4f709b7ae
splash=silent
mitigations=auto
quiet
security=apparmor

14. cpupower frequency-info

analyzing CPU 42:
current policy: frequency should be within 1.50 GHz and 3.15 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 | 0 |
| 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 | 8 |
| vm.dirty_writeback_centisecs | 500 |
| vm.dirtytime_expire_seconds | 43200 |
| vm.extfrag_threshold | 500 |
| vm.min_unmapped_ratio | 1 |
| vm.nr_hugepages | 0 |

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Platform Notes (Continued)

```
vm.nr_hugepages_mempolicy      0
vm.nr_overcommit_hugepages     0
vm.swappiness                   1
vm.watermark_boost_factor      15000
vm.watermark_scale_factor      10
vm.zone_reclaim_mode           1
```

```
-----
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 SP6
-----
```

```
-----
19. Disk information
SPEC is set to: /home/cpu2017
Filesystem      Type  Size  Used Avail Use% Mounted on
/dev/sda2       btrfs 445G  27G  417G   6% /home
-----
```

```
-----
20. /sys/devices/virtual/dmi/id
Vendor:      HPE
Product:     ProLiant DL345 Gen11
Product Family: ProLiant
Serial:      DL345G11-002
-----
```

```
-----
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:
  11x Hynix HMC88AHBRA471N 32 GB 2 rank 6400, configured at 6000
  1x Hynix HMC88AHBRA472N 32 GB 2 rank 6400, configured at 6000
-----
```

```
-----
22. BIOS
(This section combines info from /sys/devices and dmidecode.)
BIOS Vendor:      HPE
BIOS Version:     2.20
BIOS Date:        10/31/2024
BIOS Revision:    2.20
-----
```

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Platform Notes (Continued)

Firmware Revision: 1.63

Compiler Version Notes

=====
C | 502.gcc_r(peak)

AMD clang version 17.0.6 (CLANG: AOCC_5.0.0-Build#1316 2024_09_09)
Target: i386-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-5.0.0-4925-1316/bin

=====
C | 500.perlbench_r(base, peak) 502.gcc_r(base) 505.mcf_r(base, peak) 525.x264_r(base, peak)
| 557.xz_r(base, peak)

AMD clang version 17.0.6 (CLANG: AOCC_5.0.0-Build#1316 2024_09_09)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-5.0.0-4925-1316/bin

=====
C | 502.gcc_r(peak)

AMD clang version 17.0.6 (CLANG: AOCC_5.0.0-Build#1316 2024_09_09)
Target: i386-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-5.0.0-4925-1316/bin

=====
C | 500.perlbench_r(base, peak) 502.gcc_r(base) 505.mcf_r(base, peak) 525.x264_r(base, peak)
| 557.xz_r(base, peak)

AMD clang version 17.0.6 (CLANG: AOCC_5.0.0-Build#1316 2024_09_09)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-5.0.0-4925-1316/bin

=====
C++ | 520.omnetpp_r(base, peak) 523.xalancbmk_r(base, peak) 531.deepsjeng_r(base, peak)
| 541.leela_r(base, peak)

AMD clang version 17.0.6 (CLANG: AOCC_5.0.0-Build#1316 2024_09_09)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-5.0.0-4925-1316/bin

=====
Fortran | 548.exchange2_r(base, peak)

AMD clang version 17.0.6 (CLANG: AOCC_5.0.0-Build#1316 2024_09_09)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc/aocc-compiler-rel-5.0.0-4925-1316/bin

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SPEC CPU®2017 Integer Rate Result

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Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant DL345 Gen11

(3.15 GHz, AMD EPYC 9455P)

SPECrate®2017_int_base = 618

SPECrate®2017_int_peak = 629

CPU2017 License: 3
Test Sponsor: HPE
Tested by: HPE

Test Date: Nov-2024
Hardware Availability: Jan-2025
Software Availability: Sep-2024

Compiler Version Notes (Continued)

Base Compiler Invocation

C benchmarks:

clang

C++ benchmarks:

clang++

Fortran benchmarks:

flang

Base Portability Flags

500.perlbench_r: -DSPEC_LINUX_X64 -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:

-m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-ldist-scalar-expand -fenable-aggressive-gather
-Wl,-mllvm -Wl,-extra-inliner -z muldefs -O3 -march=znver5
-fveclib=AMDLIBM -ffast-math -fno-PIE -no-pie -flto
-fstruct-layout=7 -mllvm -unroll-threshold=50
-mllvm -inline-threshold=1000 -fremap-arrays -fstrip-mining
-mllvm -reduce-array-computations=3 -zopt -lamdlibm -lflang
-lamdalloc-ext -ldl

C++ benchmarks:

-m64 -std=c++14 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3

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Base Optimization Flags (Continued)

C++ benchmarks (continued):

```
-Wl,-mllvm -Wl,-do-block-reorder=advanced -z muldefs -O3 -march=znver5
-fveclib=AMDLIBM -ffast-math -flto -mllvm -unroll-threshold=100
-mllvm -loop-unswitch-threshold=200000
-mllvm -reduce-array-computations=3 -zopt -fno-PIE -no-pie
-fvirtual-function-elimination -fvisibility=hidden
-mllvm -do-block-reorder=advanced -lamdlibm -lflang -lamdalloc-ext
-ldl
```

Fortran benchmarks:

```
-m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-inline-recursion=4 -Wl,-mllvm -Wl,-lsr-in-nested-loop
-Wl,-mllvm -Wl,-enable-iv-split -z muldefs -O3 -march=znver5
-fveclib=AMDLIBM -ffast-math -flto
-fepilog-vectorization-of-inductions -mllvm -optimize-strided-mem-cost
-floop-transform -mllvm -unroll-aggressive -mllvm -unroll-threshold=500
-lamdlibm -lflang -lamdalloc -ldl
```

Base Other Flags

C benchmarks:

```
-Wno-unused-command-line-argument
```

C++ benchmarks:

```
-Wno-unused-command-line-argument
```

Fortran benchmarks:

```
-Wno-unused-command-line-argument
```

Peak Compiler Invocation

C benchmarks:

```
clang
```

C++ benchmarks:

```
clang++
```

Fortran benchmarks:

```
flang
```



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Peak Portability Flags

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

Peak Optimization Flags

C benchmarks:

500.perlbench_r: basepeak = yes

```
502.gcc_r: -m32 -flto -Wl,-mllvm -Wl,-ldist-scalar-expand
-fenable-aggressive-gather -Wl,-mllvm -Wl,-extra-inliner
-z muldefs -Ofast -march=znver5 -fveclib=AMDLIBM
-ffast-math -fstruct-layout=7 -mllvm -unroll-threshold=50
-freemap-arrays -fstrip-mining
-mllvm -inline-threshold=1000
-mllvm -reduce-array-computations=3 -zopt -fgnu89-inline
-lamdalloc
```

```
505.mcf_r: -m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-extra-inliner -Ofast -march=znver5
-fveclib=AMDLIBM -ffast-math -flto -fstruct-layout=7
-mllvm -unroll-threshold=50 -freemap-arrays -fstrip-mining
-mllvm -inline-threshold=1000
-mllvm -reduce-array-computations=3 -zopt -lamdlibm
-lflang -lamdalloc-ext -ldl
```

525.x264_r: basepeak = yes

```
557.xz_r: -m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-ldist-scalar-expand
-fenable-aggressive-gather -Wl,-mllvm -Wl,-extra-inliner
-Ofast -march=znver5 -fveclib=AMDLIBM -ffast-math -flto
-fstruct-layout=7 -mllvm -unroll-threshold=50
-freemap-arrays -fstrip-mining
```

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Peak Optimization Flags (Continued)

557.xz_r (continued):

```
-mllvm -inline-threshold=1000  
-mllvm -reduce-array-computations=3 -zopt -lamdlibm  
-lflang -lamdalloc-ext -ldl
```

C++ benchmarks:

520.omnetpp_r: basepeak = yes

523.xalancbmk_r: basepeak = yes

531.deepsjeng_r: basepeak = yes

541.leela_r: basepeak = yes

Fortran benchmarks:

```
-m64 -Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6  
-Wl,-mllvm -Wl,-reduce-array-computations=3  
-Wl,-mllvm -Wl,-inline-recursion=4 -Wl,-mllvm -Wl,-lsr-in-nested-loop  
-Wl,-mllvm -Wl,-enable-iv-split -O3 -march=znver5 -fveclib=AMDLIBM  
-ffast-math -flto -fepilog-vectorization-of-inductions  
-mllvm -optimize-strided-mem-cost -floop-transform  
-mllvm -unroll-aggressive -mllvm -unroll-threshold=500 -lamdlibm  
-lflang -lamdalloc -ldl
```

Peak Other Flags

C benchmarks (except as noted below):

```
-Wno-unused-command-line-argument
```

502.gcc_r: -L/usr/lib32 -Wno-unused-command-line-argument

```
-L/home/work/cpu2017/v119/aocc5/1316/amd_rate_aocc500_znver5_A_lib/lib32
```

C++ benchmarks:

```
-Wno-unused-command-line-argument
```

Fortran benchmarks:

```
-Wno-unused-command-line-argument
```

The flags files that were used to format this result can be browsed at

<http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-AMD-Turin-rev1.0.html>

<http://www.spec.org/cpu2017/flags/aocc500-flags.html>



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You can also download the XML flags sources by saving the following links:

<http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-AMD-Turin-rev1.0.xml>

<http://www.spec.org/cpu2017/flags/aocc500-flags.xml>

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