SPEC CPU®2017 Integer Rate Result

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Hewlett Packard Enterprise

(Test Sponsor: HPE)
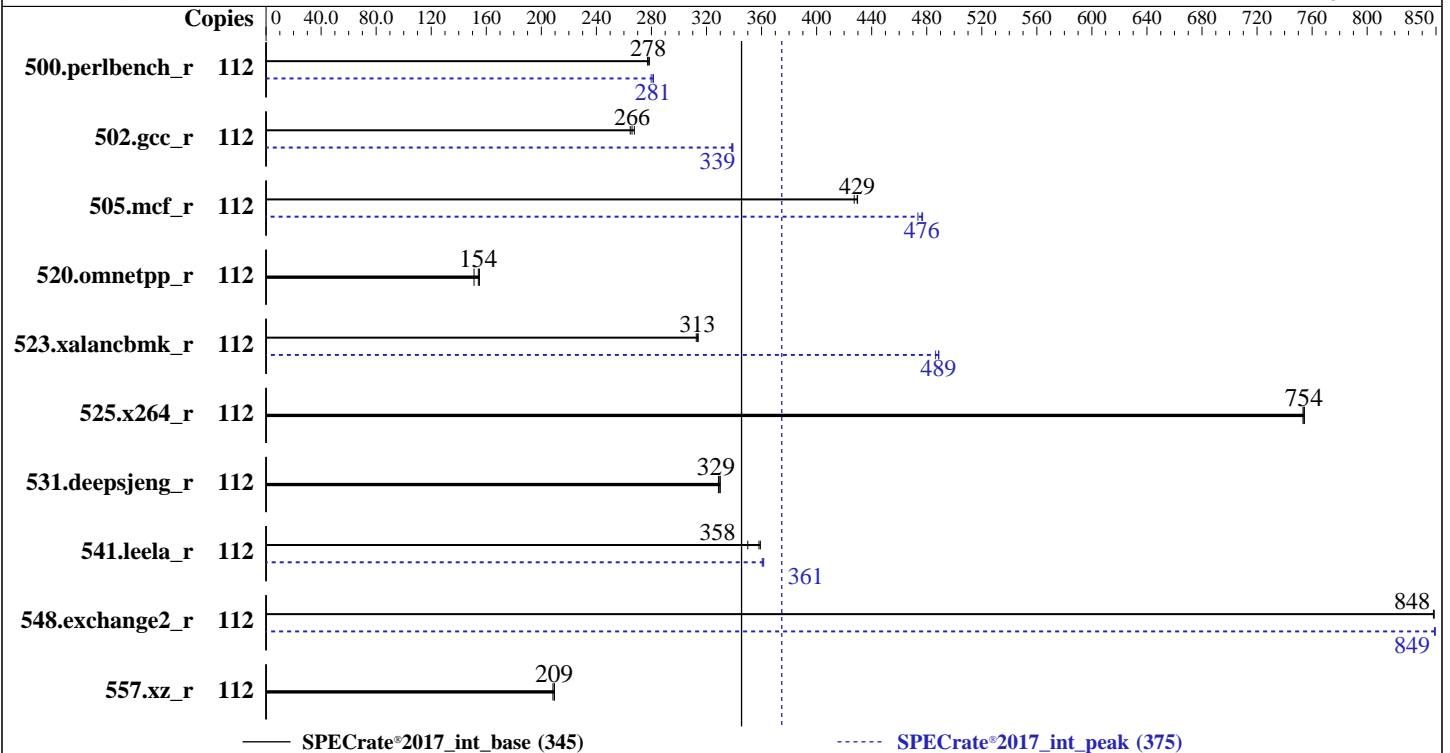
ProLiant DL345 Gen10 Plus
(2.00 GHz, AMD EPYC 7663P)

$SPECrate^{®}2017\_int\_base = 345$

$SPECrate^{®}2017\_int\_peak = 375$

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

Test Date: Dec-2023
Hardware Availability: Nov-2023
Software Availability: May-2022

Benchmark	Copies	Base	Peak
500.perlbench_r	112	278	281
502.gcc_r	112	266	339
505.mcf_r	112	429	476
520.omnetpp_r	112	154	
523.xalancbmk_r	112	313	489
525.x264_r	112	754	
531.deepsjeng_r	112	329	
541.leela_r	112	358	361
548.exchange2_r	112	848	849
557.xz_r	112	209	

SPECrate®2017_int_base (345)   SPECrate®2017_int_peak (375)

Hardware

CPU Name: AMD EPYC 7663P
 Max MHz: 3500
 Nominal: 2000
Enabled: 56 cores, 1 chip, 2 threads/core
Orderable: 1 chip
Cache L1: 32 KB I + 32 KB D on chip per core
 L2: 512 KB I+D on chip per core
 L3: 256 MB I+D on chip per chip,
     32 MB shared / 7 cores
 Other: None
Memory: 512 GB (8 x 64 GB 2Rx4 PC4-3200AA-R)
Storage: 1 x 480 GB SAS SSD
Other: None

Software

OS: Red Hat Enterprise Linux 9.0 (Plow)
    Kernel 5.14.0-70.13.1.el9_0.x86_64
Compiler: C/C++/Fortran: Version 3.2.0 of AOCC
Parallel: No
Firmware: HPE BIOS Version A43 v2.90 (10/27/2023) released Oct-2023
File System: xfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: 32/64-bit
Other: jemalloc: jemalloc memory allocator library v5.1.0
Power Management: BIOS set to prefer performance at the cost of additional power usage

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Results Table

	Base						Peak					
Benchmark	**Copies**	**Seconds**	**Ratio**	**Seconds**	**Ratio**	**Seconds**	**Ratio**	**Copies**	**Seconds**	**Ratio**	**Seconds**	**Ratio**	**Seconds**	**Ratio**
500.perlbench_r	112	643	277	640	278	**642**	**278**	112	633	282	637	280	**634**	**281**
502.gcc_r	112	599	265	**596**	**266**	593	268	112	**468**	**339**	468	339	469	338
505.mcf_r	112	421	430	424	427	**421**	**429**	112	**380**	**476**	382	474	379	477
520.omnetpp_r	112	**953**	**154**	972	151	948	155	112	**953**	**154**	972	151	948	155
523.xalancbmk_r	112	378	313	**377**	**313**	377	314	112	**242**	**489**	243	486	242	489
525.x264_r	112	260	754	**260**	**754**	260	753	112	260	754	**260**	**754**	260	753
531.deepsjeng_r	112	**390**	**329**	391	329	389	330	112	**390**	**329**	391	329	389	330
541.leela_r	112	**518**	**358**	516	359	530	350	112	515	360	513	362	**514**	**361**
548.exchange2_r	112	346	848	346	849	**346**	**848**	112	345	849	346	849	**346**	**849**
557.xz_r	112	**578**	**209**	580	208	577	210	112	**578**	**209**	580	208	577	210
SPECrate®2017_int_base =	**345**											
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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) only on request for base runs,
'echo madvise > /sys/kernel/mm/transparent_hugepage/enabled' run as root.
To enable THP for all allocations for peak runs,
'echo always > /sys/kernel/mm/transparent_hugepage/enabled' and
'echo always > /sys/kernel/mm/transparent_hugepage/defrag' run as root.
```

Standard Performance Evaluation Corporation (info@spec.org)   https://www.spec.org/

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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_aocc320_milanx_A_lib/lib;/home/cpu2017/amd_rate_aocc320_milanx_A_lib/lib32:"
MALLOC_CONF = "retain:true"

Environment variables set by runcpu during the 523.xalancbmk_r peak run:
MALLOC_CONF = "thp:never"
```

General Notes

```
Binaries were compiled on a system with 2x AMD EPYC 7742 CPU + 1TiB Memory using OpenSUSE 15.2

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: configured and built with GCC v4.8.2 in RHEL 7.4 (No options specified)
jemalloc 5.1.0 is available here:
https://github.com/jemalloc/jemalloc/releases/download/5.1.0/jemalloc-5.1.0.tar.bz2
```

Platform Notes

```
BIOS Configuration
Workload Profile set to General Throughput Compute
Determinism Control set to Manual
Performance Determinism set to Power Deterministic
Last-Level-Cache(LLC) As Numa Node set to Enabled
NUMA memory domains per socket set to Four memory domains per socket
Memory Patrol Scrubbing set to Disabled
Thermal Configuration set to Maximum Cooling
Memory Interleaving set to Disabled
Workload Profile set to Custom
Power Regulator set to OS Control Mode
L2 HW Prefetcher set to Disabled

 Sysinfo program /home/cpu2017/bin/sysinfo
 Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
 running on localhost.localdomain Sat Dec  2 08:05:26 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
```

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Platform Notes (Continued)

```
  11. Systemd service manager version: systemd 250 (250-6.el9_0)
  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 localhost.localdomain 5.14.0-70.13.1.el9_0.x86_64 #1 SMP PREEMPT Thu Apr 14 12:42:38 EDT 2022 x86_64
    x86_64 x86_64 GNU/Linux

  --------------------------------------------------------------
  2. w
     08:05:26 up 6 min,  1 user,  load average: 0.01, 0.45, 0.35
    USER     TTY       LOGIN@   IDLE   JCPU   PCPU WHAT
    root     pts/0     07Apr22 10.00s  1.17s  0.03s /bin/bash ./amd_rate_aocc320_milanx_A1.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) 2062635
    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) 2062635
    virtual memory              (kbytes, -v) unlimited
    file locks                       (-x) unlimited

  --------------------------------------------------------------
  5. sysinfo process ancestry
   /usr/lib/systemd/systemd --switched-root --system --deserialize 30
   sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups
   sshd: root [priv]
   sshd: root@pts/0
   -bash
   python3 ./run_amd_rate_aocc320_milanx_A1.py
   /bin/bash ./amd_rate_aocc320_milanx_A1.sh
   runcpu --config amd_rate_aocc320_milanx_A1.cfg --tune all --reportable --iterations 3 intrate
   runcpu --configfile amd_rate_aocc320_milanx_A1.cfg --tune all --reportable --iterations 3 --nopower
```

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Platform Notes (Continued)

```
    --runmode rate --tune base:peak --size test:train:refrate intrate --nopreenv --note-preenv --logfile
    $SPEC/tmp/CPU2017.005/templogs/preenv.intrate.005.0.log --lognum 005.0 --from_runcpu 2
  specperl $SPEC/bin/sysinfo
 $SPEC = /home/cpu2017


 ---------------------------------------------------------------
 6. /proc/cpuinfo
     model name        : AMD EPYC 7663P 56-Core Processor
     vendor_id         : AuthenticAMD
     cpu family        : 25
     model             : 1
     stepping          : 1
     microcode         : 0xa0011d1
     bugs              : sysret_ss_attrs spectre_v1 spectre_v2 spec_store_bypass
     TLB size          : 2560 4K pages
     cpu cores         : 56
     siblings          : 112
     1 physical ids (chips)
     112 processors (hardware threads)
     physical id 0: core ids 0-6,8-14,16-22,24-30,32-38,40-46,48-54,56-62
     physical id 0: apicids 0-13,16-29,32-45,48-61,64-77,80-93,96-109,112-125
  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:                48 bits physical, 48 bits virtual
  Byte Order:                   Little Endian
  CPU(s):                       112
  On-line CPU(s) list:          0-111
  Vendor ID:                    AuthenticAMD
  BIOS Vendor ID:               Advanced Micro Devices, Inc.
  Model name:                   AMD EPYC 7663P 56-Core Processor
  BIOS Model name:              AMD EPYC 7663P 56-Core Processor
  CPU family:                   25
  Model:                        1
  Thread(s) per core:           2
  Core(s) per socket:           56
  Socket(s):                    1
  Stepping:                     1
  Frequency boost:              enabled
  CPU max MHz:                  2000.0000
  CPU min MHz:                  1500.0000
  BogoMIPS:                     3992.45
  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 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 invpcid_single
                                hw_pstate ssbd mba ibrs ibpb stibp vmmcall fsgsbase bmi1 avx2 smep bmi2
                                erms invpcid cqm rdt_a rdseed adx smap clflushopt clwb sha_ni xsaveopt
                                xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local
                                clzero irperf xsaveerptr rdpru wbnoinvd amd_ppin arat npt lbrv svm_lock
                                nrip_save tsc_scale vmcb_clean flushbyasid decodeassists pausefilter
```

(Continued on next page)

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Platform Notes (Continued)

```
                              pfthreshold v_vmsave_vmload vgif v_spec_ctrl umip pku ospke vaes
                              vpclmulqdq rdpid overflow_recov succor smca fsrm
     Virtualization:          AMD-V
     L1d cache:               1.8 MiB (56 instances)
     L1i cache:               1.8 MiB (56 instances)
     L2 cache:                28 MiB (56 instances)
     L3 cache:                256 MiB (8 instances)
     NUMA node(s):            8
     NUMA node0 CPU(s):       0-6,56-62
     NUMA node1 CPU(s):       7-13,63-69
     NUMA node2 CPU(s):       14-20,70-76
     NUMA node3 CPU(s):       21-27,77-83
     NUMA node4 CPU(s):       28-34,84-90
     NUMA node5 CPU(s):       35-41,91-97
     NUMA node6 CPU(s):       42-48,98-104
     NUMA node7 CPU(s):       49-55,105-111
     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
     Vulnerability Spectre v1:       Mitigation; usercopy/swapgs barriers and __user pointer sanitization
     Vulnerability Spectre v2:       Mitigation; Retpolines, IBPB conditional, IBRS_FW, STIBP always-on, 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      32K     1.8M   8 Data           1    64      1            64
      L1i      32K     1.8M   8 Instruction    1    64      1            64
      L2      512K      28M   8 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: 8 nodes (0-7)
    node 0 cpus: 0-6,56-62
    node 0 size: 64262 MB
    node 0 free: 63629 MB
    node 1 cpus: 7-13,63-69
    node 1 size: 64506 MB
    node 1 free: 64244 MB
    node 2 cpus: 14-20,70-76
    node 2 size: 64508 MB
    node 2 free: 64264 MB
    node 3 cpus: 21-27,77-83
    node 3 size: 64507 MB
    node 3 free: 64257 MB
    node 4 cpus: 28-34,84-90
    node 4 size: 64508 MB
    node 4 free: 64276 MB
    node 5 cpus: 35-41,91-97
    node 5 size: 64471 MB
    node 5 free: 64228 MB
    node 6 cpus: 42-48,98-104
    node 6 size: 64508 MB
    node 6 free: 64264 MB
    node 7 cpus: 49-55,105-111
```

(Continued on next page)

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Platform Notes (Continued)

```
   node 7 size: 64487 MB
   node 7 free: 64279 MB
   node distances:
   node    0    1    2    3    4    5    6    7
     0:   10   11   12   12   12   12   12   12
     1:   11   10   12   12   12   12   12   12
     2:   12   12   10   11   12   12   12   12
     3:   12   12   11   10   12   12   12   12
     4:   12   12   12   12   10   11   12   12
     5:   12   12   12   12   11   10   12   12
     6:   12   12   12   12   12   12   10   11
     7:   12   12   12   12   12   12   11   10

  ------------------------------------------------------------
9. /proc/meminfo
   MemTotal:       528141768 kB

  ------------------------------------------------------------
10. who -r
   run-level 3 Apr 7 05:30

  ------------------------------------------------------------
11. Systemd service manager version: systemd 250 (250-6.el9_0)
   Default Target  Status
   multi-user      running

  ------------------------------------------------------------
12. Services, from systemctl list-unit-files
   STATE            UNIT FILES
   enabled          NetworkManager NetworkManager-dispatcher NetworkManager-wait-online auditd crond
                    dbus-broker firewalld getty@ irqbalance kdump lvm2-monitor mdmonitor microcode
                    nis-domainname rhsmcertd rsyslog selinux-autorelabel-mark sshd sssd
                    systemd-network-generator udisks2
   enabled-runtime  systemd-remount-fs
   disabled         blk-availability chrony-wait chronyd console-getty cpupower debug-shell kvm_stat
                    man-db-restart-cache-update nftables rdisc rhsm rhsm-facts rpmdb-rebuild serial-getty@
                    sshd-keygen@ systemd-boot-check-no-failures systemd-pstore systemd-sysext
   indirect         sssd-autofs sssd-kcm sssd-nss sssd-pac sssd-pam sssd-ssh sssd-sudo

  ------------------------------------------------------------
13. Linux kernel boot-time arguments, from /proc/cmdline
   BOOT_IMAGE=(hd0,gpt2)/vmlinuz-5.14.0-70.13.1.el9_0.x86_64
   root=/dev/mapper/rhel-root
   ro
   resume=/dev/mapper/rhel-swap
   rd.lvm.lv=rhel/root
   rd.lvm.lv=rhel/swap

  ------------------------------------------------------------
14. cpupower frequency-info
   analyzing CPU 0:
     current policy: frequency should be within 1.50 GHz and 2.00 GHz.
                     The governor "performance" may decide which speed to use
                     within this range.
     boost state support:
       Supported: yes
       Active: yes
       Boost States: 0
       Total States: 3
       Pstate-P0:  2000MHz
```

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Platform Notes (Continued)

```
    ----------------------------------------------------------
    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
    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     Red Hat Enterprise Linux 9.0 (Plow)
    redhat-release Red Hat Enterprise Linux release 9.0 (Plow)
    system-release Red Hat Enterprise Linux release 9.0 (Plow)


    ----------------------------------------------------------
    19. Disk information
    SPEC is set to: /home/cpu2017
    Filesystem            Type  Size  Used Avail Use% Mounted on
    /dev/mapper/rhel-home xfs   372G   18G  354G   5% /home


    ----------------------------------------------------------
    20. /sys/devices/virtual/dmi/id
    Vendor:         HPE
    Product:        ProLiant DL345 Gen10 Plus
    Product Family: ProLiant
    Serial:         CN70460YWF
```

(Continued on next page)

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Platform Notes (Continued)

```
---------------------------------------------------------------
21. 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:
    8x Micron 36ASF8G72PZ-3G2B2 64 GB 2 rank 3200


---------------------------------------------------------------
22. BIOS
(This section combines info from /sys/devices and dmidecode.)
  BIOS Vendor:      HPE
  BIOS Version:     A43
  BIOS Date:        10/27/2023
  BIOS Revision:    2.90
  Firmware Revision: 2.96
```

Compiler Version Notes

```
==============================================================================
C      | 502.gcc_r(peak)
------------------------------------------------------------------------------
AMD clang version 13.0.0 (CLANG: AOCC_3.2.0-Build#128 2021_11_12) (based on LLVM Mirror.Version.13.0.0)
Target: i386-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.2.0/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 13.0.0 (CLANG: AOCC_3.2.0-Build#128 2021_11_12) (based on LLVM Mirror.Version.13.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.2.0/bin
------------------------------------------------------------------------------


==============================================================================
C      | 502.gcc_r(peak)
------------------------------------------------------------------------------
AMD clang version 13.0.0 (CLANG: AOCC_3.2.0-Build#128 2021_11_12) (based on LLVM Mirror.Version.13.0.0)
Target: i386-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.2.0/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 13.0.0 (CLANG: AOCC_3.2.0-Build#128 2021_11_12) (based on LLVM Mirror.Version.13.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.2.0/bin
------------------------------------------------------------------------------
```

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Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant DL345 Gen10 Plus
(2.00 GHz, AMD EPYC 7663P)

SPECrate®2017_int_base = 345

SPECrate®2017_int_peak = 375

CPU2017 License: 3　　　　　　　　　　　　　　　　　**Test Date:**　　　　　Dec-2023
Test Sponsor:　　HPE　　　　　　　　　　　　　　　**Hardware Availability:** Nov-2023
Tested by:　　　　HPE　　　　　　　　　　　　　　　**Software Availability:**　May-2022

Compiler Version Notes (Continued)

```
==============================================================================
C++     | 523.xalancbmk_r(peak)
------------------------------------------------------------------------------
AMD clang version 13.0.0 (CLANG: AOCC_3.2.0-Build#128 2021_11_12) (based on LLVM Mirror.Version.13.0.0)
Target: i386-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.2.0/bin
------------------------------------------------------------------------------


==============================================================================
C++     | 520.omnetpp_r(base, peak) 523.xalancbmk_r(base) 531.deepsjeng_r(base, peak) 541.leela_r(base,
        | peak)
------------------------------------------------------------------------------
AMD clang version 13.0.0 (CLANG: AOCC_3.2.0-Build#128 2021_11_12) (based on LLVM Mirror.Version.13.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.2.0/bin
------------------------------------------------------------------------------


==============================================================================
C++     | 523.xalancbmk_r(peak)
------------------------------------------------------------------------------
AMD clang version 13.0.0 (CLANG: AOCC_3.2.0-Build#128 2021_11_12) (based on LLVM Mirror.Version.13.0.0)
Target: i386-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.2.0/bin
------------------------------------------------------------------------------


==============================================================================
C++     | 520.omnetpp_r(base, peak) 523.xalancbmk_r(base) 531.deepsjeng_r(base, peak) 541.leela_r(base,
        | peak)
------------------------------------------------------------------------------
AMD clang version 13.0.0 (CLANG: AOCC_3.2.0-Build#128 2021_11_12) (based on LLVM Mirror.Version.13.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.2.0/bin
------------------------------------------------------------------------------


==============================================================================
Fortran | 548.exchange2_r(base, peak)
------------------------------------------------------------------------------
AMD clang version 13.0.0 (CLANG: AOCC_3.2.0-Build#128 2021_11_12) (based on LLVM Mirror.Version.13.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.2.0/bin
------------------------------------------------------------------------------
```

Base Compiler Invocation

C benchmarks:
```
clang
```

C++ benchmarks:
```
clang++
```

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SPEC CPU®2017 Integer Rate Result

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Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL345 Gen10 Plus
(2.00 GHz, AMD EPYC 7663P)

SPECrate®2017_int_base = 345

SPECrate®2017_int_peak = 375

CPU2017 License: 3		**Test Date:**	Dec-2023
Test Sponsor:	HPE	**Hardware Availability:**	Nov-2023
Tested by:	HPE	**Software Availability:**	May-2022

Base Compiler Invocation (Continued)

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,-allow-multiple-definition -Wl,-mllvm -Wl,-enable-licm-vrp
-flto -Wl,-mllvm -Wl,-region-vectorize
-Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-enable-loop-fusion -O3 -march=znver3 -fveclib=AMDLIBM
-ffast-math -fstruct-layout=5 -mllvm -unroll-threshold=50
-mllvm -inline-threshold=1000 -fremap-arrays
-mllvm -function-specialize -flv-function-specialization
-mllvm -enable-gvn-hoist -mllvm -global-vectorize-slp=true
-mllvm -enable-licm-vrp -mllvm -reduce-array-computations=3
-mllvm -enable-loop-fusion -z muldefs -lamdlibm -ljemalloc -lflang
```

C++ benchmarks:
```
-m64 -std=c++98 -flto -Wl,-mllvm -Wl,-region-vectorize
-Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-enable-loop-fusion -O3 -march=znver3 -fveclib=AMDLIBM
-ffast-math -mllvm -enable-partial-unswitch
-mllvm -unroll-threshold=100 -finline-aggressive
-flv-function-specialization -mllvm -loop-unswitch-threshold=200000
-mllvm -reroll-loops -mllvm -aggressive-loop-unswitch
```

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Standard Performance Evaluation Corporation (info@spec.org)
https://www.spec.org/

Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL345 Gen10 Plus
(2.00 GHz, AMD EPYC 7663P)

SPECrate®2017_int_base = 345

SPECrate®2017_int_peak = 375

CPU2017 License: 3		**Test Date:**	Dec-2023
Test Sponsor:	HPE	**Hardware Availability:**	Nov-2023
Tested by:	HPE	**Software Availability:**	May-2022

Base Optimization Flags (Continued)

C++ benchmarks (continued):
```
-mllvm -extra-vectorizer-passes -mllvm -reduce-array-computations=3
-mllvm -global-vectorize-slp=true -mllvm -convert-pow-exp-to-int=false
-mllvm -enable-loop-fusion -z muldefs -fvirtual-function-elimination
-fvisibility=hidden -lamdlibm -ljemalloc -lflang
```

Fortran benchmarks:
```
-m64 -Wl,-mllvm -Wl,-inline-recursion=4
-Wl,-mllvm -Wl,-lsr-in-nested-loop -Wl,-mllvm -Wl,-enable-iv-split
-flto -Wl,-mllvm -Wl,-region-vectorize
-Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-enable-loop-fusion -O3 -march=znver3 -fveclib=AMDLIBM
-ffast-math -z muldefs -mllvm -unroll-aggressive
-mllvm -unroll-threshold=500 -lamdlibm -ljemalloc -lflang
```

Base Other Flags

C benchmarks:
```
-Wno-unused-command-line-argument
```

C++ benchmarks:
```
-Wno-unused-command-line-argument
```

Peak Compiler Invocation

C benchmarks:
```
clang
```

C++ benchmarks:
```
clang++
```

Fortran benchmarks:
```
flang
```

Peak Portability Flags

500.perlbench_r: `-DSPEC_LINUX_X64 -DSPEC_LP64`

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Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL345 Gen10 Plus
(2.00 GHz, AMD EPYC 7663P)

SPECrate®2017_int_base = 345

SPECrate®2017_int_peak = 375

CPU2017 License: 3		**Test Date:**	Dec-2023
Test Sponsor:	HPE	**Hardware Availability:**	Nov-2023
Tested by:	HPE	**Software Availability:**	May-2022

Peak Portability Flags (Continued)

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: `-m64 -Wl,-allow-multiple-definition`
`-Wl,-mllvm -Wl,-enable-licm-vrp -flto`
`-Wl,-mllvm -Wl,-function-specialize`
`-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6`
`-Wl,-mllvm -Wl,-reduce-array-computations=3`
`-fprofile-instr-generate`(pass 1)
`-fprofile-instr-use`(pass 2) `-Ofast -march=znver3`
`-fveclib=AMDLIBM -ffast-math -fstruct-layout=7`
`-mllvm -unroll-threshold=50 -fremap-arrays`
`-flv-function-specialization -mllvm -inline-threshold=1000`
`-mllvm -enable-gvn-hoist -mllvm -global-vectorize-slp=false`
`-mllvm -function-specialize -mllvm -enable-licm-vrp`
`-mllvm -reduce-array-computations=3 -lamdlibm -ljemalloc`

502.gcc_r: `-m32 -Wl,-allow-multiple-definition`
`-Wl,-mllvm -Wl,-enable-licm-vrp -flto`
`-Wl,-mllvm -Wl,-function-specialize -Ofast -march=znver3`
`-fveclib=AMDLIBM -ffast-math -fstruct-layout=7`
`-mllvm -unroll-threshold=50 -fremap-arrays`
`-flv-function-specialization -mllvm -inline-threshold=1000`
`-mllvm -enable-gvn-hoist -mllvm -global-vectorize-slp=true`
`-mllvm -function-specialize -mllvm -enable-licm-vrp`
`-mllvm -reduce-array-computations=3 -fgnu89-inline`
`-ljemalloc`

505.mcf_r: `-m64 -Wl,-allow-multiple-definition`
`-Wl,-mllvm -Wl,-enable-licm-vrp -flto`
`-Wl,-mllvm -Wl,-function-specialize`
`-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6`
`-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast`

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Hewlett Packard Enterprise
(Test Sponsor: HPE)

SPECrate®2017_int_base = 345

ProLiant DL345 Gen10 Plus
(2.00 GHz, AMD EPYC 7663P)

SPECrate®2017_int_peak = 375

CPU2017 License:	3	**Test Date:**	Dec-2023
Test Sponsor:	HPE	**Hardware Availability:**	Nov-2023
Tested by:	HPE	**Software Availability:**	May-2022

Peak Optimization Flags (Continued)

505.mcf_r (continued):
```
-march=znver3 -fveclib=AMDLIBM -ffast-math
-fstruct-layout=7 -mllvm -unroll-threshold=50
-fremap-arrays -flv-function-specialization
-mllvm -inline-threshold=1000 -mllvm -enable-gvn-hoist
-mllvm -global-vectorize-slp=true
-mllvm -function-specialize -mllvm -enable-licm-vrp
-mllvm -reduce-array-computations=3 -lamdlibm -ljemalloc
```

525.x264_r: basepeak = yes

557.xz_r: basepeak = yes

C++ benchmarks:

520.omnetpp_r: basepeak = yes

523.xalancbmk_r:
```
-m32 -Wl,-mllvm -Wl,-do-block-reorder=aggressive -flto
-Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast
-march=znver3 -fveclib=AMDLIBM -ffast-math
-finline-aggressive -mllvm -unroll-threshold=100
-flv-function-specialization -mllvm -enable-licm-vrp
-mllvm -reroll-loops -mllvm -aggressive-loop-unswitch
-mllvm -reduce-array-computations=3
-mllvm -global-vectorize-slp=true
-mllvm -do-block-reorder=aggressive
-fvirtual-function-elimination -fvisibility=hidden
-ljemalloc
```

531.deepsjeng_r: basepeak = yes

541.leela_r:
```
-m64 -std=c++98 -flto -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast
-march=znver3 -fveclib=AMDLIBM -ffast-math
-finline-aggressive -mllvm -unroll-threshold=100
-flv-function-specialization -mllvm -enable-licm-vrp
-mllvm -reroll-loops -mllvm -aggressive-loop-unswitch
-mllvm -reduce-array-computations=3
-mllvm -global-vectorize-slp=true
-fvirtual-function-elimination -fvisibility=hidden
-lamdlibm -ljemalloc
```

Hewlett Packard Enterprise
(Test Sponsor: HPE)

SPECrate®2017_int_base = 345

ProLiant DL345 Gen10 Plus
(2.00 GHz, AMD EPYC 7663P)

SPECrate®2017_int_peak = 375

CPU2017 License: 3		**Test Date:**	Dec-2023
Test Sponsor: HPE		**Hardware Availability:**	Nov-2023
Tested by: HPE		**Software Availability:**	May-2022

Peak Optimization Flags (Continued)

Fortran benchmarks:
```
-m64 -Wl,-mllvm -Wl,-inline-recursion=4
-Wl,-mllvm -Wl,-lsr-in-nested-loop -Wl,-mllvm -Wl,-enable-iv-split
-flto -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -O3 -march=znver3
-fveclib=AMDLIBM -ffast-math -mllvm -unroll-aggressive
-mllvm -unroll-threshold=500 -lamdlibm -ljemalloc -lflang
```

Peak Other Flags

C benchmarks (except as noted below):
```
-Wno-unused-command-line-argument
```

502.gcc_r: `-L/usr/lib -Wno-unused-command-line-argument`
`-L/sppo/bin/cpu2017v118-aocc3-milanX/amd_rate_aocc320_milanx_A_lib/lib32`

C++ benchmarks (except as noted below):
```
-Wno-unused-command-line-argument
```

523.xalancbmk_r: `-L/usr/lib -Wno-unused-command-line-argument`
`-L/sppo/bin/cpu2017v118-aocc3-milanX/amd_rate_aocc320_milanx_A_lib/lib32`

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-AMD-V1.3-EPYC-revS.html
http://www.spec.org/cpu2017/flags/aocc320-flags-A1.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-AMD-V1.3-EPYC-revS.xml
http://www.spec.org/cpu2017/flags/aocc320-flags-A1.xml

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

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