SPEC CPU®2017 Integer Speed Result

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Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant DL345 Gen10 Plus
(2.40 GHz, AMD EPYC 7303P)

$SPECspeed®2017\_int\_base = 10.9$
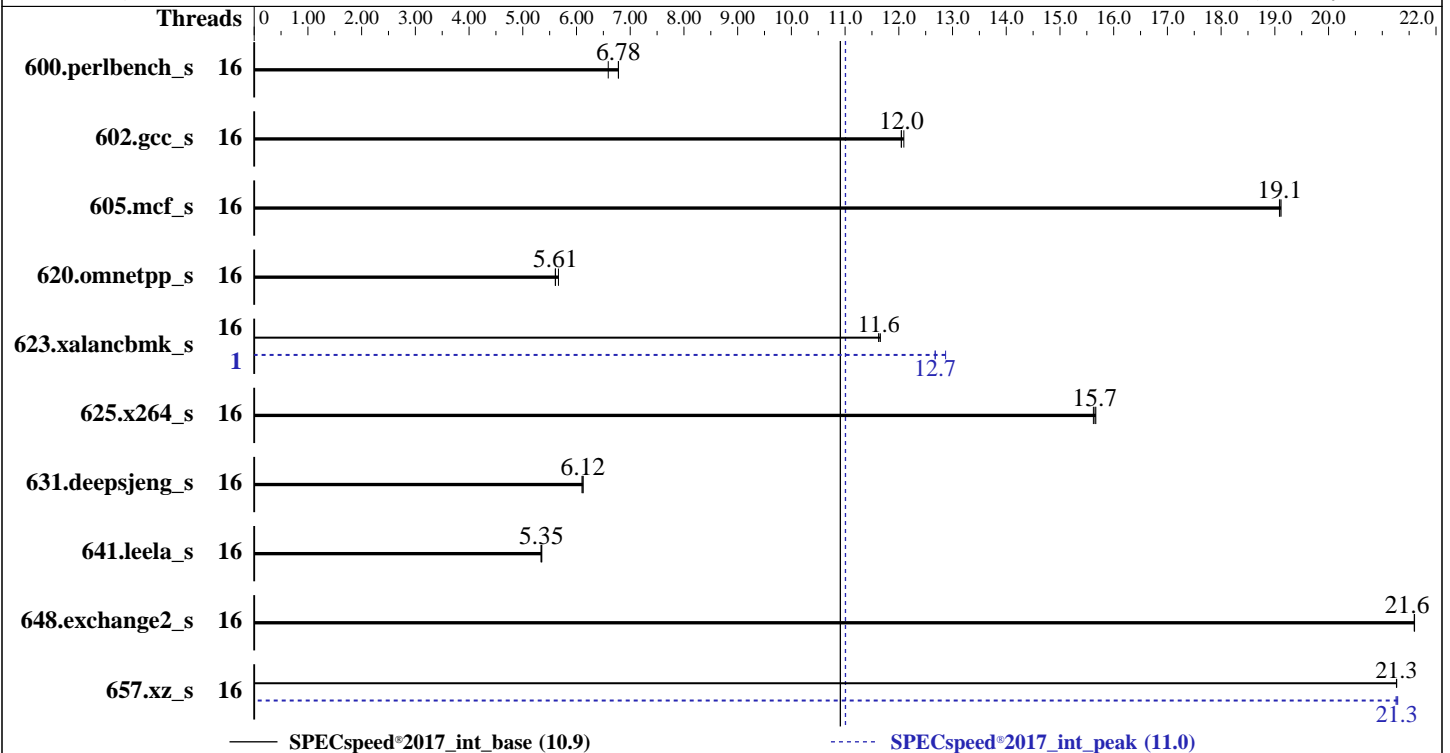
$SPECspeed®2017\_int\_peak = 11.0$

CPU2017 License: 3

Test Sponsor: HPE

Tested by: HPE

Test Date: Nov-2023

Hardware Availability: Nov-2023

Software Availability: May-2022

Threads — scale 0 to 22.0

- 600.perlbench_s 16 — 6.78
- 602.gcc_s 16 — 12.0
- 605.mcf_s 16 — 19.1
- 620.omnetpp_s 16 — 5.61
- 623.xalancbmk_s 16 — 11.6 ; 1 — 12.7
- 625.x264_s 16 — 15.7
- 631.deepsjeng_s 16 — 6.12
- 641.leela_s 16 — 5.35
- 648.exchange2_s 16 — 21.6
- 657.xz_s 16 — 21.3 ; 21.3

——— SPECspeed®2017_int_base (10.9)

- - - - SPECspeed®2017_int_peak (11.0)

Hardware

CPU Name: AMD EPYC 7303P
 Max MHz: 3400
 Nominal: 2400
Enabled: 16 cores, 1 chip
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: 64 MB I+D on chip per chip,
 16 MB shared / 4 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: Yes
Firmware: HPE BIOS Version A43 v2.84 08/17/2023 released Aug-2023
File System: xfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: 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

Benchmark	Base							Peak						
	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
600.perlbench_s	16	269	6.59	262	6.78	**262**	**6.78**	16	269	6.59	262	6.78	**262**	**6.78**
602.gcc_s	16	**330**	**12.0**	331	12.0	329	12.1	16	**330**	**12.0**	331	12.0	329	12.1
605.mcf_s	16	**247**	**19.1**	247	19.1	247	19.1	16	**247**	**19.1**	247	19.1	247	19.1
620.omnetpp_s	16	**291**	**5.61**	288	5.66	291	5.61	16	**291**	**5.61**	288	5.66	291	5.61
623.xalancbmk_s	16	**122**	**11.6**	122	11.7	122	11.6	1	**112**	**12.7**	110	12.9	112	12.7
625.x264_s	16	113	15.7	113	15.6	**113**	**15.7**	16	113	15.7	113	15.6	**113**	**15.7**
631.deepsjeng_s	16	235	6.10	**234**	**6.12**	234	6.12	16	235	6.10	**234**	**6.12**	234	6.12
641.leela_s	16	**319**	**5.35**	319	5.35	320	5.34	16	**319**	**5.35**	319	5.35	320	5.34
648.exchange2_s	16	**136**	**21.6**	136	21.6	136	21.6	16	**136**	**21.6**	136	21.6	136	21.6
657.xz_s	16	**291**	**21.3**	291	21.3	291	21.3	16	**291**	**21.3**	290	21.3	291	21.3
SPECspeed®2017_int_base =		**10.9**												
SPECspeed®2017_int_peak =		**11.0**												

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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Tested by:	HPE	**Software Availability:**	May-2022

Environment Variables Notes

```
Environment variables set by runcpu before the start of the run:
GOMP_CPU_AFFINITY = "0-15"
LD_LIBRARY_PATH =
      "/home/cpu2017/amd_speed_aocc320_milanx_A_lib/lib;/home/cpu2017/amd_speed_aocc320_milanx_A_lib/lib32:"
LIBOMP_NUM_HIDDEN_HELPER_THREADS = "0"
MALLOC_CONF = "retain:true"
OMP_DYNAMIC = "false"
OMP_SCHEDULE = "static"
OMP_STACKSIZE = "128M"
OMP_THREAD_LIMIT = "16"

Environment variables set by runcpu during the 623.xalancbmk_s peak run:
GOMP_CPU_AFFINITY = "0"

Environment variables set by runcpu during the 657.xz_s peak run:
GOMP_CPU_AFFINITY = "0-15"
LIBOMP_NUM_HIDDEN_HELPER_THREADS = "0"
```

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 Peak Frequency Compute
AMD SMT Option set to Disabled
Determinism Control set to Manual
Performance Determinism set to Power Deterministic
Memory Patrol Scrubbing set to disabled
Memory PStates set to Disabled
Last-Level Cache (LLC) as NUMA Node set to Enabled
NUMA memory domains per socket set to Four memory domains per socket
Thermal Configuration set to Maximum Cooling
Workload Profile set to Custom
Power Regulator set to OS Control Mode

 Sysinfo program /home/cpu2017/bin/sysinfo
 Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
 running on localhost.localdomain Thu Nov  2 14:36:38 2023

 SUT (System Under Test) info as seen by some common utilities.

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

Platform Notes (Continued)

```
             ----------------------------------------------------------
              1. uname -a
              2. w
              3. Username
              4. ulimit -a
              5. sysinfo process ancestry
              6. /proc/cpuinfo
              7. lscpu
              8. numactl --hardware
              9. /proc/meminfo
             10. who -r
             11. Systemd service manager version: systemd 250 (250-6.el9_0)
             12. Services, from systemctl list-unit-files
             13. Linux kernel boot-time arguments, from /proc/cmdline
             14. cpupower frequency-info
             15. tuned-adm active
             16. sysctl
             17. /sys/kernel/mm/transparent_hugepage
             18. /sys/kernel/mm/transparent_hugepage/khugepaged
             19. OS release
             20. Disk information
             21. /sys/devices/virtual/dmi/id
             22. dmidecode
             23. 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
               14:36:38 up 23 min,  1 user,  load average: 0.07, 0.02, 0.00
               USER     TTY        LOGIN@   IDLE   JCPU   PCPU WHAT
               root     pts/0      14:21   14.00s  1.15s  0.02s /bin/bash ./amd_speed_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) 2062725
               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) 2062725
               virtual memory              (kbytes, -v) unlimited
               file locks                          (-x) unlimited
```

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Platform Notes (Continued)

```
-----------------------------------------------------------
5. sysinfo process ancestry
 /usr/lib/systemd/systemd --switched-root --system --deserialize 27
 sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups
 sshd: root [priv]
 sshd: root@pts/0
 -bash
 python3 ./run_amd_speed_aocc320_milanx_A1.py
 /bin/bash ./amd_speed_aocc320_milanx_A1.sh
 runcpu --config amd_speed_aocc320_milanx_A1.cfg --tune all --reportable --iterations 3 intspeed
 runcpu --configfile amd_speed_aocc320_milanx_A1.cfg --tune all --reportable --iterations 3 --nopower
   --runmode speed --tune base:peak --size test:train:refspeed intspeed --nopreenv --note-preenv --logfile
   $SPEC/tmp/CPU2017.015/templogs/preenv.intspeed.015.0.log --lognum 015.0 --from_runcpu 2
 specperl $SPEC/bin/sysinfo
$SPEC = /home/cpu2017


-----------------------------------------------------------
6. /proc/cpuinfo
   model name      : AMD EPYC 7303P 16-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       : 16
   siblings        : 16
   1 physical ids (chips)
   16 processors (hardware threads)
   physical id 0: core ids 0-15
   physical id 0: apicids 0-15
 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):                  16
 On-line CPU(s) list:     0-15
 Vendor ID:               AuthenticAMD
 BIOS Vendor ID:          Advanced Micro Devices, Inc.
 Model name:              AMD EPYC 7303P 16-Core Processor
 BIOS Model name:         AMD EPYC 7303P 16-Core Processor
 CPU family:              25
 Model:                   1
 Thread(s) per core:      1
 Core(s) per socket:      16
 Socket(s):               1
 Stepping:                1
 Frequency boost:         enabled
 CPU max MHz:             2400.0000
 CPU min MHz:             1500.0000
 BogoMIPS:                4791.04
```

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Platform Notes (Continued)

```
  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
                               pfthreshold v_vmsave_vmload vgif v_spec_ctrl umip pku ospke vaes
                               vpclmulqdq rdpid overflow_recov succor smca fsrm
  Virtualization:              AMD-V
  L1d cache:                   512 KiB (16 instances)
  L1i cache:                   512 KiB (16 instances)
  L2 cache:                    8 MiB (16 instances)
  L3 cache:                    64 MiB (4 instances)
  NUMA node(s):                4
  NUMA node0 CPU(s):           0-3
  NUMA node1 CPU(s):           4-7
  NUMA node2 CPU(s):           8-11
  NUMA node3 CPU(s):           12-15
  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 disabled, 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     512K    8 Data              1    64        1             64
      L1i       32K     512K    8 Instruction       1    64        1             64
      L2       512K       8M    8 Unified           2  1024        1             64
      L3        16M      64M   16 Unified           3 16384        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: 0-3
    node 0 size: 128775 MB
    node 0 free: 128545 MB
    node 1 cpus: 4-7
    node 1 size: 129022 MB
    node 1 free: 128843 MB
    node 2 cpus: 8-11
    node 2 size: 128986 MB
    node 2 free: 128518 MB
    node 3 cpus: 12-15
    node 3 size: 129002 MB
    node 3 free: 128745 MB
    node distances:
    node   0   1   2   3
```

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Platform Notes (Continued)

```
    0:  10  12  12  12
    1:  12  10  12  12
    2:  12  12  10  12
    3:  12  12  12  10


  ----------------------------------------------------------
  9. /proc/meminfo
    MemTotal:       528164896 kB


  ----------------------------------------------------------
  10. who -r
    run-level 3 Nov 2 14:13


  ----------------------------------------------------------
  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 tuned 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 powertop 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 2.40 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:  2400MHz


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


  ----------------------------------------------------------
  16. sysctl
    kernel.numa_balancing             1
```

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Platform Notes (Continued)

```
   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


   ----------------------------------------------------------
17. /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


   ----------------------------------------------------------
18. /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


   ----------------------------------------------------------
19. 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)


   ----------------------------------------------------------
20. 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


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


   ----------------------------------------------------------
22. 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
```

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Platform Notes (Continued)

```
   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


   --------------------------------------------------------------
   23. BIOS
  (This section combines info from /sys/devices and dmidecode.)
    BIOS Vendor:       HPE
    BIOS Version:      A43
    BIOS Date:         08/17/2023
    BIOS Revision:     2.84
    Firmware Revision: 2.96
```

Compiler Version Notes

```
==============================================================================================================
C        | 600.perlbench_s(base, peak) 602.gcc_s(base, peak) 605.mcf_s(base, peak) 625.x264_s(base, peak)
         | 657.xz_s(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++      | 620.omnetpp_s(base, peak) 623.xalancbmk_s(base, peak) 631.deepsjeng_s(base, peak)
         | 641.leela_s(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 | 648.exchange2_s(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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Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL345 Gen10 Plus
(2.40 GHz, AMD EPYC 7303P)

SPECspeed®2017_int_base = 10.9

SPECspeed®2017_int_peak = 11.0

CPU2017 License: 3	**Test Date:**	Nov-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

600.perlbench_s: `-DSPEC_LINUX_X64 -DSPEC_LP64`
602.gcc_s: `-DSPEC_LP64`
605.mcf_s: `-DSPEC_LP64`
620.omnetpp_s: `-DSPEC_LP64`
623.xalancbmk_s: `-DSPEC_LINUX -DSPEC_LP64`
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:
```
-m64 -Wl,-allow-multiple-definition -Wl,-mllvm -Wl,-enable-licm-vrp
-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 -O3 -march=znver3
-fveclib=AMDLIBM -ffast-math -fopenmp -flto -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 -z muldefs
-DSPEC_OPENMP -fopenmp=libomp -lomp -lamdlibm -ljemalloc -lflang
```

C++ benchmarks:
```
-m64 -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 -O3 -march=znver3
-fveclib=AMDLIBM -ffast-math -fopenmp -flto
-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 -mllvm -extra-vectorizer-passes
-mllvm -reduce-array-computations=3 -mllvm -global-vectorize-slp=true
-mllvm -convert-pow-exp-to-int=false -z muldefs
```

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Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL345 Gen10 Plus
(2.40 GHz, AMD EPYC 7303P)

SPECspeed®2017_int_base = 10.9

SPECspeed®2017_int_peak = 11.0

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

Base Optimization Flags (Continued)

C++ benchmarks (continued):
```
-fvirtual-function-elimination -fvisibility=hidden -DSPEC_OPENMP
-fopenmp=libomp -lomp -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
-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 -O3 -march=znver3
-fveclib=AMDLIBM -ffast-math -fopenmp -flto -z muldefs
-mllvm -unroll-aggressive -mllvm -unroll-threshold=150 -DSPEC_OPENMP
-fopenmp=libomp -lomp -lamdlibm -ljemalloc -lflang
```

Base Other Flags

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

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

Fortran benchmarks:
```
-Wno-return-type
```

Peak Compiler Invocation

C benchmarks:
```
clang
```

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

Fortran benchmarks:
```
flang
```

Peak Portability Flags

```
Same as Base Portability Flags
```

Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL345 Gen10 Plus
(2.40 GHz, AMD EPYC 7303P)

SPECspeed®2017_int_base = 10.9

SPECspeed®2017_int_peak = 11.0

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

Peak Optimization Flags

C benchmarks:

600.perlbench_s: basepeak = yes

602.gcc_s: basepeak = yes

605.mcf_s: basepeak = yes

625.x264_s: basepeak = yes

657.xz_s: -m64 -Wl,-allow-multiple-definition
-Wl,-mllvm -Wl,-enable-licm-vrp
-Wl,-mllvm -Wl,-do-block-reorder=aggressive
-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 -Ofast
-march=znver3 -fveclib=AMDLIBM -ffast-math -fopenmp
-flto -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 -do-block-reorder=aggressive -DSPEC_OPENMP
-fopenmp=libomp -lomp -lamdlibm -ljemalloc -lflang

C++ benchmarks:

620.omnetpp_s: basepeak = yes

623.xalancbmk_s: -m64 -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-do-block-reorder=aggressive -Ofast
-march=znver3 -fveclib=AMDLIBM -ffast-math -fopenmp
-flto -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
-DSPEC_OPENMP -fopenmp=libomp -lomp -lamdlibm -ljemalloc
-lflang

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Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL345 Gen10 Plus
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SPECspeed®2017_int_base = 10.9

SPECspeed®2017_int_peak = 11.0

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

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

Peak Optimization Flags (Continued)

631.deepsjeng_s: `basepeak = yes`

641.leela_s: `basepeak = yes`

Fortran benchmarks:

648.exchange2_s: `basepeak = yes`

Peak Other Flags

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

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

Fortran benchmarks:
`-Wno-return-type`

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`

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