SPEC CPU®2017 Floating Point Rate Result

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Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant DL560 Gen11
(2.20 GHz, Intel Xeon Gold 6416H)

$SPECrate^{®}2017\_fp\_base = 898$

$SPECrate^{®}2017_fp_peak = $ Not Run

CPU2017 License: 3

Test Sponsor: HPE

Tested by: HPE

Test Date: Apr-2023

Hardware Availability: May-2023

Software Availability: Dec-2022

Benchmark	Copies	Result
503.bwaves_r	144	4290
507.cactuBSSN_r	144	1050
508.namd_r	144	468
510.parest_r	144	536
511.povray_r	144	745
519.lbm_r	144	529
521.wrf_r	144	867
526.blender_r	144	723
527.cam4_r	144	839
538.imagick_r	144	2010
544.nab_r	144	1430
549.fotonik3d_r	144	797
554.roms_r	144	463

SPECrate®2017_fp_base (898)

Hardware

CPU Name: Intel Xeon Gold 6416H
 Max MHz: 4200
 Nominal: 2200
Enabled: 72 cores, 4 chips, 2 threads/core
Orderable: 1, 2, 4 chip(s)
Cache L1: 32 KB I + 48 KB D on chip per core
 L2: 2 MB I+D on chip per core
 L3: 45 MB I+D on chip per chip
 Other: None
Memory: 1 TB (32 x 32 GB 2Rx8 PC5-4800B-R)
Storage: 1 x 480 GB SATA SSD
Other: None

Software

OS: SUSE Linux Enterprise Server 15 SP4
 Kernel 5.14.21-150400.22-default
Compiler: C/C++: Version 2023.0 of Intel oneAPI DPC++/C++ Compiler for Linux;
 Fortran: Version 2023.0 of Intel Fortran Compiler for Linux;
Parallel: No
Firmware: HPE BIOS Version v1.30 03/01/2023 released Mar-2023
File System: btrfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: Not Applicable
Other: jemalloc memory allocator V5.0.1
Power Management: BIOS and OS set to prefer performance at the cost of additional power usage

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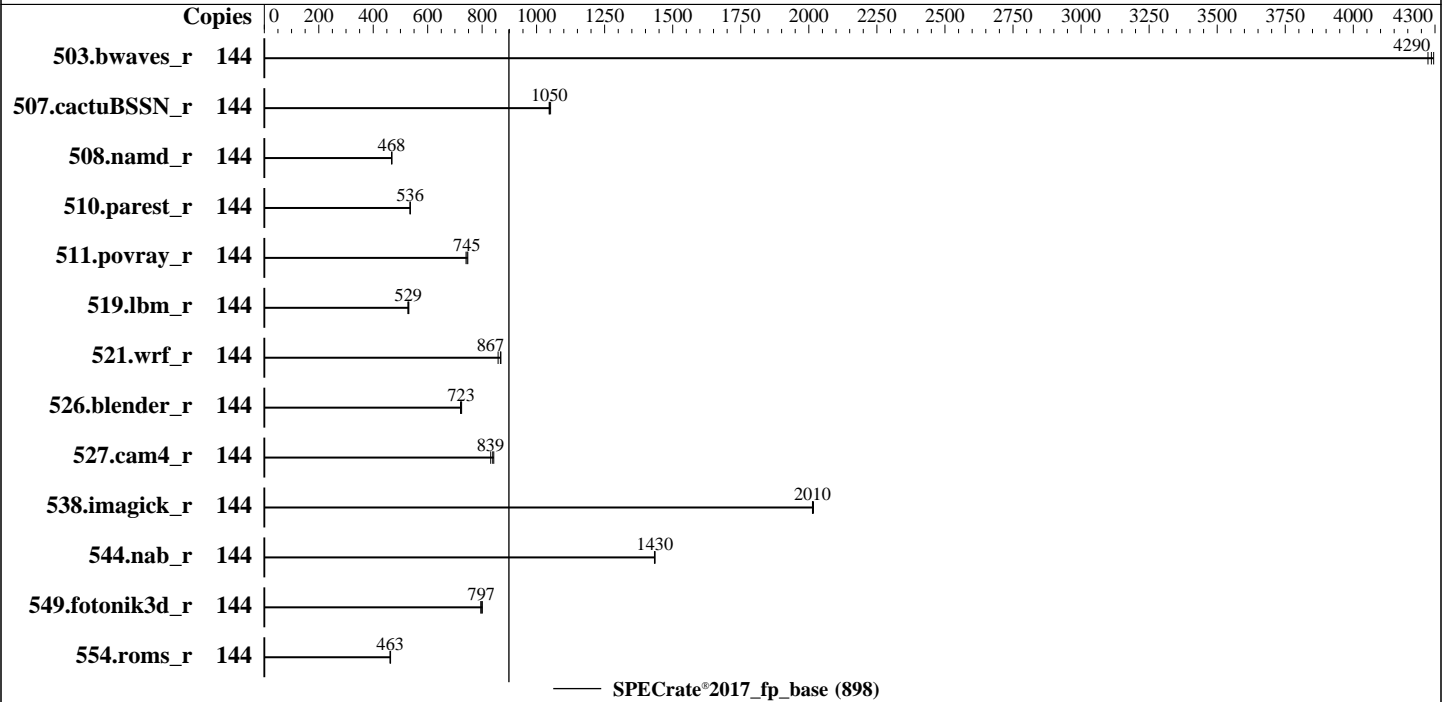|	
CPU2017 License: 3	**Test Date:** Apr-2023
Test Sponsor: HPE	**Hardware Availability:** May-2023
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Results Table

Benchmark	Copies	Base Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Peak Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
503.bwaves_r	144	**337**	**4290**	336	4300	338	4270							
507.cactuBSSN_r	144	173	1050	**174**	**1050**	174	1050							
508.namd_r	144	292	468	292	468	**292**	**468**							
510.parest_r	144	703	536	**703**	**536**	703	536							
511.povray_r	144	454	741	**452**	**745**	450	747							
519.lbm_r	144	288	527	286	531	**287**	**529**							
521.wrf_r	144	376	859	371	869	**372**	**867**							
526.blender_r	144	**303**	**723**	304	721	303	725							
527.cam4_r	144	303	832	299	843	**300**	**839**							
538.imagick_r	144	178	2010	178	2020	**178**	**2010**							
544.nab_r	144	169	1430	169	1430	**169**	**1430**							
549.fotonik3d_r	144	701	801	**704**	**797**	706	795							
554.roms_r	144	**494**	**463**	493	464	495	462							

SPECrate®2017_fp_base = 898

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

Submit Notes

```
The numactl mechanism was used to bind copies to processors. The config file option 'submit'
was used to generate numactl commands to bind each copy to a specific processor.
For details, please see the config file.
```

Operating System Notes

```
Stack size set to unlimited using "ulimit -s unlimited"
Transparent Huge Pages enabled by default
Prior to runcpu invocation
Filesystem page cache synced and cleared with:
sync; echo 3>        /proc/sys/vm/drop_caches
runcpu command invoked through numactl i.e.:
numactl --interleave=all runcpu <etc>
IRQ balance service was stopped using "systemctl stop irqbalance.service"
tuned-adm profile was set to Throughput-Performance using "tuned-adm profile throughput-performance"
perf-bias for all the CPUs is set using "cpupower set -b 0"
```

Environment Variables Notes

```
Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH = "/home/cpu2017/lib/intel64:/home/cpu2017/je5.0.1-64"
MALLOC_CONF = "retain:true"
```

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

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Test Sponsor:	HPE	**Hardware Availability:**	May-2023
Tested by:	HPE	**Software Availability:**	Dec-2022

General Notes

```
Binaries compiled on a system with 2x Intel Xeon Platinum 8280M CPU + 384GB RAM
memory using Red Hat Enterprise Linux 8.4
NA: The test sponsor attests, as of date of publication, that CVE-2017-5754 (Meltdown)
is mitigated in the system as tested and documented.
Yes: The test sponsor attests, as of date of publication, that CVE-2017-5753 (Spectre variant 1)
is mitigated in the system as tested and documented.
Yes: The test sponsor attests, as of date of publication, that CVE-2017-5715 (Spectre variant 2)
is mitigated in the system as tested and documented.
jemalloc, a general purpose malloc implementation
built with the RedHat Enterprise 7.5, and the system compiler gcc 4.8.5
sources available from jemalloc.net or https://github.com/jemalloc/jemalloc/releases
```

Platform Notes

```
The system ROM used for this result contains Intel microcode version 0x2b0001b0 for
the Intel Xeon Gold 6416H Processor
BIOS Configuration
 Workload Profile set to General Throughput Compute
 Memory Patrol Scrubbing set to Disabled
 Last Level Cache (LLC) Dead Line Allocation set to Disabled
 Enhanced Processor Performance Profile set to Aggressive
 Thermal Configuration set to Maximum Cooling
 Workload Profile set to Custom
 Adjacent Sector Prefetch set to Disabled
 DCU Stream Prefetcher set to Disabled
 Minimum Processor Idle Power Package C-State set to Package C6 (non-retention) State

 Sysinfo program /home/cpu2017/bin/sysinfo
 Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
 running on localhost Fri Apr 29 17:33:55 2022

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

 ------------------------------------------------------------
 Table of contents
 ------------------------------------------------------------
  1. uname -a
  2. w
  3. Username
  4. ulimit -a
  5. sysinfo process ancestry
  6. /proc/cpuinfo
  7. lscpu
  8. numactl --hardware
  9. /proc/meminfo
 10. who -r
 11. Systemd service manager version: systemd 249 (249.11+suse.124.g2bc0b2c447)
 12. Services, from systemctl list-unit-files
 13. Linux kernel boot-time arguments, from /proc/cmdline
 14. cpupower frequency-info
 15. 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
```

(Continued on next page)

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Platform Notes (Continued)

```
          ----------------------------------------------------------

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

          ----------------------------------------------------------
          2. w
             17:33:55 up 3 min,  2 users,  load average: 0.42, 1.75, 0.94
            USER      TTY        FROM             LOGIN@   IDLE   JCPU   PCPU WHAT
            root      tty1       -                17:31    2:43   0.00s  0.00s -bash
            root      pts/0      172.16.0.100     17:31   11.00s  1.10s  0.01s -bash

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

          ----------------------------------------------------------
          4. ulimit -a
            core file size          (blocks, -c) unlimited
            data seg size           (kbytes, -d) unlimited
            scheduling priority             (-e) 0
            file size               (blocks, -f) unlimited
            pending signals                 (-i) 4126552
            max locked memory       (kbytes, -l) 64
            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) 4126552
            virtual memory          (kbytes, -v) unlimited
            file locks                      (-x) unlimited

          ----------------------------------------------------------
          5. sysinfo process ancestry
           /usr/lib/systemd/systemd --switched-root --system --deserialize 29
           sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups
           sshd: root@pts/0
           -bash
           -bash
           runcpu --nobuild --action validate --define default-platform-flags --define numcopies=144 -c
             ic2023.0-lin-sapphirerapids-rate-20221201.cfg --define smt-on --define cores=72 --define physicalfirst
             --define invoke_with_interleave --define drop_caches --tune base -o all fprate
           runcpu --nobuild --action validate --define default-platform-flags --define numcopies=144 --configfile
             ic2023.0-lin-sapphirerapids-rate-20221201.cfg --define smt-on --define cores=72 --define physicalfirst
             --define invoke_with_interleave --define drop_caches --tune base --output_format all --nopower --runmode
             rate --tune base --size refrate fprate --nopreenv --note-preenv --logfile
             $SPEC/tmp/CPU2017.010/templogs/preenv.fprate.010.0.log --lognum 010.0 --from_runcpu 2
           specperl $SPEC/bin/sysinfo
           $SPEC = /home/cpu2017

          ----------------------------------------------------------
          6. /proc/cpuinfo
              model name      : Intel(R) Xeon(R) Gold 6416H
              vendor_id       : GenuineIntel
              cpu family      : 6
```

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Platform Notes (Continued)

```
       model           : 143
       stepping        : 7
       microcode       : 0x2b0001b0
       bugs            : spectre_v1 spectre_v2 spec_store_bypass swapgs
       cpu cores       : 18
       siblings        : 36
       4 physical ids (chips)
       144 processors (hardware threads)
       physical id 0: core ids 0-17
       physical id 1: core ids 0-17
       physical id 2: core ids 0-17
       physical id 3: core ids 0-17
       physical id 0: apicids 0-35
       physical id 1: apicids 128-163
       physical id 2: apicids 256-291
       physical id 3: apicids 384-419
   Caution: /proc/cpuinfo data regarding chips, cores, and threads is not necessarily reliable, especially for
   virtualized systems.  Use the above data carefully.


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

   From lscpu from util-linux 2.37.2:
     Architecture:              x86_64
     CPU op-mode(s):            32-bit, 64-bit
     Address sizes:             46 bits physical, 57 bits virtual
     Byte Order:                Little Endian
     CPU(s):                    144
     On-line CPU(s) list:       0-143
     Vendor ID:                 GenuineIntel
     Model name:                Intel(R) Xeon(R) Gold 6416H
     CPU family:                6
     Model:                     143
     Thread(s) per core:        2
     Core(s) per socket:        18
     Socket(s):                 4
     Stepping:                  7
     BogoMIPS:                  4400.00
     Flags:                     fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36
                                clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtscp
                                lm constant_tsc art arch_perfmon pebs bts rep_good nopl xtopology
                                nonstop_tsc cpuid aperfmperf tsc_known_freq pni pclmulqdq dtes64 monitor
                                ds_cpl vmx smx est tm2 ssse3 sdbg fma cx16 xtpr pdcm pcid dca sse4_1
                                sse4_2 x2apic movbe popcnt tsc_deadline_timer aes xsave avx f16c rdrand
                                lahf_lm abm 3dnowprefetch cpuid_fault epb cat_l3 cat_l2 cdp_l3
                                invpcid_single cdp_l2 ssbd mba ibrs ibpb stibp ibrs_enhanced tpr_shadow
                                vnmi flexpriority ept vpid ept_ad fsgsbase tsc_adjust bmi1 hle avx2 smep
                                bmi2 erms invpcid rtm cqm rdt_a avx512f avx512dq rdseed adx smap
                                avx512ifma clflushopt clwb intel_pt avx512cd sha_ni avx512bw avx512vl
                                xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbm_total
                                cqm_mbm_local split_lock_detect avx_vnni avx512_bf16 wbnoinvd dtherm ida
                                arat pln pts avx512vbmi umip pku ospke waitpkg avx512_vbmi2 gfni vaes
                                vpclmulqdq avx512_vnni avx512_bitalg tme avx512_vpopcntdq la57 rdpid
                                bus_lock_detect cldemote movdiri movdir64b enqcmd fsrm md_clear serialize
                                tsxldtrk pconfig arch_lbr avx512_fp16 amx_tile flush_l1d arch_capabilities
     Virtualization:            VT-x
     L1d cache:                 3.4 MiB (72 instances)
     L1i cache:                 2.3 MiB (72 instances)
     L2 cache:                  144 MiB (72 instances)
     L3 cache:                  180 MiB (4 instances)
```

(Continued on next page)

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Platform Notes (Continued)

```
  NUMA node(s):               8
  NUMA node0 CPU(s):          0-8,72-80
  NUMA node1 CPU(s):          9-17,81-89
  NUMA node2 CPU(s):          18-26,90-98
  NUMA node3 CPU(s):          27-35,99-107
  NUMA node4 CPU(s):          36-44,108-116
  NUMA node5 CPU(s):          45-53,117-125
  NUMA node6 CPU(s):          54-62,126-134
  NUMA node7 CPU(s):          63-71,135-143
  Vulnerability Itlb multihit:    Not affected
  Vulnerability L1tf:             Not affected
  Vulnerability Mds:              Not affected
  Vulnerability Meltdown:         Not affected
  Vulnerability Spec store bypass: Mitigation; Speculative Store Bypass disabled via prctl and seccomp
  Vulnerability Spectre v1:       Mitigation; usercopy/swapgs barriers and __user pointer sanitization
  Vulnerability Spectre v2:       Mitigation; Enhanced IBRS, IBPB conditional, RSB filling
  Vulnerability Srbds:            Not affected
  Vulnerability Tsx async abort:  Not affected


  From lscpu --cache:
      NAME ONE-SIZE ALL-SIZE WAYS TYPE        LEVEL  SETS PHY-LINE COHERENCY-SIZE
      L1d      48K     3.4M   12 Data          1     64      1          64
      L1i      32K     2.3M    8 Instruction   1     64      1          64
      L2        2M     144M   16 Unified       2   2048      1          64
      L3       45M     180M   15 Unified       3  49152      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: 0-8,72-80
    node 0 size: 128606 MB
    node 0 free: 127841 MB
    node 1 cpus: 9-17,81-89
    node 1 size: 129019 MB
    node 1 free: 128806 MB
    node 2 cpus: 18-26,90-98
    node 2 size: 129019 MB
    node 2 free: 128514 MB
    node 3 cpus: 27-35,99-107
    node 3 size: 129019 MB
    node 3 free: 128457 MB
    node 4 cpus: 36-44,108-116
    node 4 size: 129019 MB
    node 4 free: 128782 MB
    node 5 cpus: 45-53,117-125
    node 5 size: 129019 MB
    node 5 free: 128805 MB
    node 6 cpus: 54-62,126-134
    node 6 size: 128984 MB
    node 6 free: 128596 MB
    node 7 cpus: 63-71,135-143
    node 7 size: 128972 MB
    node 7 free: 128674 MB
    node distances:
    node   0   1   2   3   4   5   6   7
      0:  10  20  30  30  30  30  30  30
      1:  20  10  30  30  30  30  30  30
      2:  30  30  10  20  30  30  30  30
      3:  30  30  20  10  30  30  30  30
```

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Platform Notes (Continued)

```
    4:  30  30  30  30  10  20  30  30
    5:  30  30  30  30  20  10  30  30
    6:  30  30  30  30  30  30  10  20
    7:  30  30  30  30  30  30  20  10


   --------------------------------------------------------------
   9. /proc/meminfo
     MemTotal:       1056420024 kB


   --------------------------------------------------------------
   10. who -r
     run-level 3 Apr 29 17:30


   --------------------------------------------------------------
   11. Systemd service manager version: systemd 249 (249.11+suse.124.g2bc0b2c447)
     Default Target  Status
     multi-user      running


   --------------------------------------------------------------
   12. Services, from systemctl list-unit-files
     STATE             UNIT FILES
     enabled           apparmor auditd cron firewalld getty@ haveged irqbalance issue-generator kbdsettings
                       postfix purge-kernels rollback sshd wicked wickedd-auto4 wickedd-dhcp4 wickedd-dhcp6
                       wickedd-nanny
     enabled-runtime   systemd-remount-fs
     disabled          boot-sysctl ca-certificates chrony-wait chronyd console-getty debug-shell ebtables
                       grub2-once haveged-switch-root issue-add-ssh-keys kexec-load lunmask rpmconfigcheck
                       serial-getty@ systemd-boot-check-no-failures systemd-network-generator systemd-sysext
                       systemd-time-wait-sync systemd-timesyncd tuned
     indirect          wickedd


   --------------------------------------------------------------
   13. Linux kernel boot-time arguments, from /proc/cmdline
     BOOT_IMAGE=/boot/vmlinuz-5.14.21-150400.22-default
     root=UUID=1cd4f3cb-461d-45d3-9458-dbcb1beaaea7
     splash=silent
     mitigations=auto
     quiet
     security=apparmor


   --------------------------------------------------------------
   14. cpupower frequency-info
     analyzing CPU 0:
       Unable to determine current policy
       boost state support:
         Supported: yes
         Active: yes


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


   --------------------------------------------------------------
   16. sysctl
     kernel.numa_balancing              1
     kernel.randomize_va_space          2
     vm.compaction_proactiveness        20
     vm.dirty_background_bytes          0
     vm.dirty_background_ratio          10
     vm.dirty_bytes                     0
```

(Continued on next page)

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Platform Notes (Continued)

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


   ----------------------------------------------------------
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 SUSE Linux Enterprise Server 15 SP4


   ----------------------------------------------------------
20. Disk information
SPEC is set to: /home/cpu2017
   Filesystem     Type   Size  Used Avail Use% Mounted on
   /dev/sdb3      btrfs  444G  168G  276G  38% /home


   ----------------------------------------------------------
21. /sys/devices/virtual/dmi/id
   Vendor:         HPE
   Product:        ProLiant DL560 Gen11
   Product Family: ProLiant
   Serial:         CNX2250G5V


   ----------------------------------------------------------
22. dmidecode
   Additional information from dmidecode 3.2 follows.  WARNING: Use caution when you interpret this section.
   The 'dmidecode' program reads system data which is "intended to allow hardware to be accurately
   determined", but the intent may not be met, as there are frequent changes to hardware, firmware, and the
   "DMTF SMBIOS" standard.
   Memory:
     3x Samsung M321R4GA3BB0-CQKDG 32 GB 2 rank 4800
     29x Samsung M321R4GA3BB6-CQKDG 32 GB 2 rank 4800
```

(Continued on next page)

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Platform Notes (Continued)

```
   --------------------------------------------------------------
   23. BIOS
   (This section combines info from /sys/devices and dmidecode.)
     BIOS Vendor:       HPE
     BIOS Version:      1.30
     BIOS Date:         03/01/2023
     BIOS Revision:     1.30
     Firmware Revision: 1.30
```

Compiler Version Notes

```
==============================================================================
C               | 519.lbm_r(base) 538.imagick_r(base) 544.nab_r(base)
------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------


==============================================================================
C++             | 508.namd_r(base) 510.parest_r(base)
------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------


==============================================================================
C++, C          | 511.povray_r(base) 526.blender_r(base)
------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
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Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
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------------------------------------------------------------------------------


==============================================================================
C++, C, Fortran | 507.cactuBSSN_r(base)
------------------------------------------------------------------------------
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==============================================================================
Fortran         | 503.bwaves_r(base) 549.fotonik3d_r(base) 554.roms_r(base)
------------------------------------------------------------------------------
Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
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==============================================================================
Fortran, C      | 521.wrf_r(base) 527.cam4_r(base)
------------------------------------------------------------------------------
Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
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```

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Hewlett Packard Enterprise
(Test Sponsor: HPE)

SPECrate®2017_fp_base =   898

ProLiant DL560 Gen11
(2.20 GHz, Intel Xeon Gold 6416H)

SPECrate®2017_fp_peak = Not Run

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

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

Compiler Version Notes (Continued)

Base Compiler Invocation

C benchmarks:
`icx`

C++ benchmarks:
`icpx`

Fortran benchmarks:
`ifx`

Benchmarks using both Fortran and C:
`ifx icx`

Benchmarks using both C and C++:
`icpx icx`

Benchmarks using Fortran, C, and C++:
`icpx icx ifx`

Base Portability Flags

503.bwaves_r: `-DSPEC_LP64`
507.cactuBSSN_r: `-DSPEC_LP64`
508.namd_r: `-DSPEC_LP64`
510.parest_r: `-DSPEC_LP64`
511.povray_r: `-DSPEC_LP64`
519.lbm_r: `-DSPEC_LP64`
521.wrf_r: `-DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian`
526.blender_r: `-DSPEC_LP64 -DSPEC_LINUX -funsigned-char`
527.cam4_r: `-DSPEC_LP64 -DSPEC_CASE_FLAG`
538.imagick_r: `-DSPEC_LP64`
544.nab_r: `-DSPEC_LP64`
549.fotonik3d_r: `-DSPEC_LP64`
554.roms_r: `-DSPEC_LP64`

Base Optimization Flags

C benchmarks:
`-w -std=c11 -m64 -Wl,-z,muldefs -xsapphirerapids -Ofast -ffast-math`

(Continued on next page)

SPEC CPU®2017 Floating Point Rate Result

Copyright 2017-2023 Standard Performance Evaluation Corporation

Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL560 Gen11
(2.20 GHz, Intel Xeon Gold 6416H)

SPECrate®2017_fp_base =   898

SPECrate®2017_fp_peak = Not Run

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

Base Optimization Flags (Continued)

C benchmarks (continued):
```
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-Wno-implicit-int -mprefer-vector-width=512 -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib
```

C++ benchmarks:
```
-w -std=c++14 -m64 -Wl,-z,muldefs -xsapphirerapids -Ofast
-ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -mprefer-vector-width=512 -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib
```

Fortran benchmarks:
```
-w -m64 -Wl,-z,muldefs -xsapphirerapids -Ofast -ffast-math -flto
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-nostandard-realloc-lhs -align array32byte -auto -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib
```

Benchmarks using both Fortran and C:
```
-w -m64 -std=c11 -Wl,-z,muldefs -xsapphirerapids -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4
-Wno-implicit-int -mprefer-vector-width=512 -nostandard-realloc-lhs
-align array32byte -auto -ljemalloc -L/usr/local/jemalloc64-5.0.1/lib
```

Benchmarks using both C and C++:
```
-w -std=c++14 -m64 -std=c11 -Wl,-z,muldefs -xsapphirerapids -Ofast
-ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -Wno-implicit-int -mprefer-vector-width=512
-ljemalloc -L/usr/local/jemalloc64-5.0.1/lib
```

Benchmarks using Fortran, C, and C++:
```
-w -m64 -std=c++14 -std=c11 -Wl,-z,muldefs -xsapphirerapids -Ofast
-ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -Wno-implicit-int -mprefer-vector-width=512
-nostandard-realloc-lhs -align array32byte -auto -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib
```

The flags files that were used to format this result can be browsed at
  http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-SPR-rev1.2.html
  http://www.spec.org/cpu2017/flags/Intel-ic2023-official-linux64.html

You can also download the XML flags sources by saving the following links:
  http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-SPR-rev1.2.xml
  http://www.spec.org/cpu2017/flags/Intel-ic2023-official-linux64.xml

SPEC CPU®2017 Floating Point Rate Result

Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL560 Gen11
(2.20 GHz, Intel Xeon Gold 6416H)

SPECrate®2017_fp_base =   898

SPECrate®2017_fp_peak = Not Run

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

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

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