SPEC CPU®2017 Floating Point Rate Result

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Hewlett Packard Enterprise

(Test Sponsor: HPE)
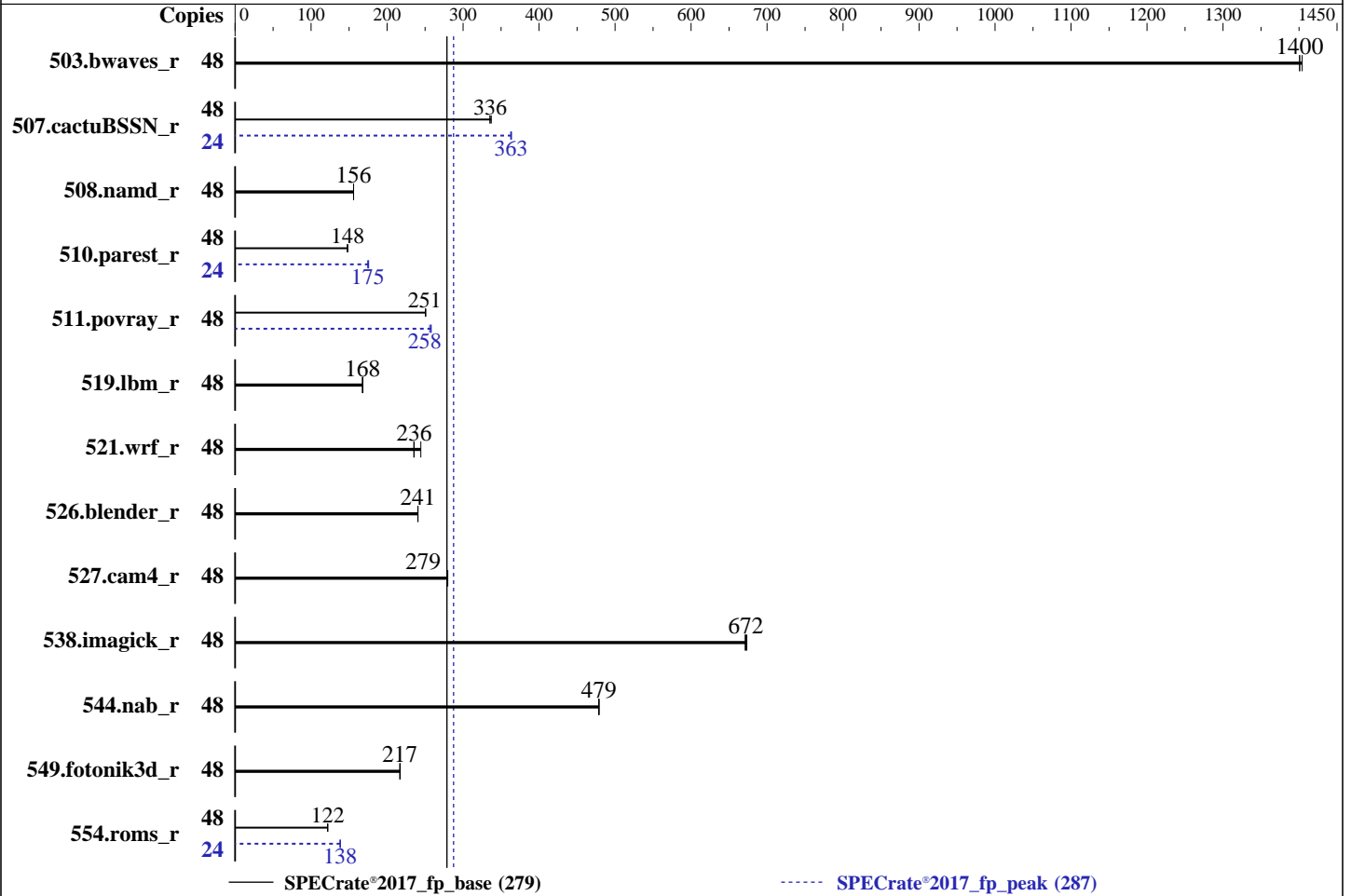
ProLiant DL320 Gen11
(2.10 GHz, Intel Xeon Gold 5412U)

$SPECrate^{®}2017\_fp\_base = 279$

$SPECrate^{®}2017\_fp\_peak = 287$

CPU2017 License: 3

Test Sponsor: HPE

Tested by: HPE

Test Date: May-2023

Hardware Availability: Apr-2023

Software Availability: Dec-2022

Benchmark	Copies	Base	Peak
503.bwaves_r	48	1400	
507.cactuBSSN_r	48 / 24	336	363
508.namd_r	48	156	
510.parest_r	48 / 24	148	175
511.povray_r	48 / 24	251	258
519.lbm_r	48	168	
521.wrf_r	48	236	
526.blender_r	48	241	
527.cam4_r	48	279	
538.imagick_r	48	672	
544.nab_r	48	479	
549.fotonik3d_r	48	217	
554.roms_r	48 / 24	122	138

SPECrate®2017_fp_base (279)

SPECrate®2017_fp_peak (287)

Hardware

CPU Name: Intel Xeon Gold 5412U

 Max MHz: 3900

 Nominal: 2100

Enabled: 24 cores, 1 chip, 2 threads/core

Orderable: 1 Chip

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: 256 GB (8 x 32 GB 2Rx8 PC5-4800B-R, running at 4400)

Storage: 1 x 480 GB SATA 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++: 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: xfs

System State: Run level 3 (multi-user)

Base Pointers: 64-bit

Peak Pointers: 64-bit

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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Results Table

Benchmark	Base						Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
503.bwaves_r	48	343	1400	**344**	**1400**	344	1400	48	343	1400	**344**	**1400**	344	1400
507.cactuBSSN_r	48	180	337	**181**	**336**	181	335	24	83.8	363	83.5	364	**83.7**	**363**
508.namd_r	48	**292**	**156**	293	156	292	156	48	**292**	**156**	293	156	292	156
510.parest_r	48	848	148	**848**	**148**	850	148	24	**359**	**175**	357	176	359	175
511.povray_r	48	**447**	**251**	447	251	448	250	48	438	256	434	258	**435**	**258**
519.lbm_r	48	301	168	**302**	**168**	302	168	48	301	168	**302**	**168**	302	168
521.wrf_r	48	457	235	**456**	**236**	440	244	48	457	235	**456**	**236**	440	244
526.blender_r	48	304	240	**304**	**241**	304	241	48	304	240	**304**	**241**	304	241
527.cam4_r	48	300	280	301	279	**301**	**279**	48	300	280	301	279	**301**	**279**
538.imagick_r	48	177	673	178	671	**178**	**672**	48	177	673	178	671	**178**	**672**
544.nab_r	48	169	479	169	478	**169**	**479**	48	169	479	169	478	**169**	**479**
549.fotonik3d_r	48	861	217	863	217	**863**	**217**	48	861	217	863	217	**863**	**217**
554.roms_r	48	625	122	**626**	**122**	627	122	24	276	138	**276**	**138**	275	138
SPECrate®2017_fp_base =	**279**												
SPECrate®2017_fp_peak =	**287**												

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"
```

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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 5412U processor.
BIOS Configuration:
 Workload Profile set to General Throughput Compute
 Thermal Configuration set to Maximum Cooling
 Enhanced Processor Performance Profile set to Aggressive
 Last Level Cache (LLC) Dead Line Allocation set to Disabled
 Memory Patrol Scrubbing set to Disabled
 Workload Profile set to Custom
  DCU Stream Prefetcher set to Disabled
  Adjacent Sector Prefetch 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.localdomain Sat May 13 21:25:11 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
 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
```

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Platform Notes (Continued)

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

          ----------------------------------------------------------
          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
             21:25:11 up 14 min,  2 users,  load average: 0.07, 0.02, 0.00
            USER     TTY        LOGIN@   IDLE   JCPU   PCPU WHAT
            root     tty1       21:21    3:35   0.00s  0.00s -bash
            root     pts/0      21:21    7.00s  0.82s  0.00s -bash

          ----------------------------------------------------------
          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) 1030656
            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) 1030656
            virtual memory              (kbytes, -v) unlimited
            file locks                          (-x) unlimited

          ----------------------------------------------------------
          5. sysinfo process ancestry
           /usr/lib/systemd/systemd --switched-root --system --deserialize 28
           sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups
           sshd: root [priv]
           sshd: root@pts/0
           -bash
           -bash
           runcpu --nobuild --action validate --define default-platform-flags --define numcopies=48 -c
             ic2023.0-lin-sapphirerapids-rate-20221201.cfg --define smt-on --define cores=24 --define physicalfirst
             --define invoke_with_interleave --define drop_caches --tune base,peak -o all fprate
           runcpu --nobuild --action validate --define default-platform-flags --define numcopies=48 --configfile
             ic2023.0-lin-sapphirerapids-rate-20221201.cfg --define smt-on --define cores=24 --define physicalfirst
             --define invoke_with_interleave --define drop_caches --tune base,peak --output_format all --nopower
             --runmode rate --tune base:peak --size refrate fprate --nopreenv --note-preenv --logfile
             $SPEC/tmp/CPU2017.032/templogs/preenv.fprate.032.0.log --lognum 032.0 --from_runcpu 2
           specperl $SPEC/bin/sysinfo
           $SPEC = /home/cpu2017

          ----------------------------------------------------------
          6. /proc/cpuinfo
              model name        : Intel(R) Xeon(R) Gold 5412U
```

(Continued on next page)

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Platform Notes (Continued)

```
    vendor_id       : GenuineIntel
    cpu family      : 6
    model           : 143
    stepping        : 8
    microcode       : 0x2b0001b0
    bugs            : spectre_v1 spectre_v2 spec_store_bypass swapgs
    cpu cores       : 24
    siblings        : 48
    1 physical ids (chips)
    48 processors (hardware threads)
    physical id 0: core ids 0-23
    physical id 0: apicids 0-47
  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:          46 bits physical, 57 bits virtual
  Byte Order:             Little Endian
  CPU(s):                 48
  On-line CPU(s) list:    0-47
  Vendor ID:              GenuineIntel
  BIOS Vendor ID:         Intel(R) Corporation
  Model name:             Intel(R) Xeon(R) Gold 5412U
  BIOS Model name:        Intel(R) Xeon(R) Gold 5412U
  CPU family:             6
  Model:                  143
  Thread(s) per core:     2
  Core(s) per socket:     24
  Socket(s):              1
  Stepping:               8
  BogoMIPS:               4200.00
  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 avx2 smep bmi2
                          erms invpcid 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:              1.1 MiB (24 instances)
  L1i cache:              768 KiB (24 instances)
  L2 cache:               48 MiB (24 instances)
  L3 cache:               45 MiB (1 instance)
  NUMA node(s):           2
  NUMA node0 CPU(s):      0-11,24-35
```

(Continued on next page)

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Platform Notes (Continued)

```
  NUMA node1 CPU(s):           12-23,36-47
  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; 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     1.1M   12 Data           1    64      1          64
      L1i      32K     768K    8 Instruction    1    64      1          64
      L2        2M      48M   16 Unified        2  2048      1          64
      L3       45M      45M   15 Unified        3 49152      1          64

  -------------------------------------------------------------
  8. numactl --hardware
  NOTE: a numactl 'node' might or might not correspond to a physical chip.
    available: 2 nodes (0-1)
    node 0 cpus: 0-11,24-35
    node 0 size: 128695 MB
    node 0 free: 128036 MB
    node 1 cpus: 12-23,36-47
    node 1 size: 129007 MB
    node 1 free: 128337 MB
    node distances:
    node   0   1
      0:  10  20
      1:  20  10

  -------------------------------------------------------------
  9. /proc/meminfo
    MemTotal:      263888728 kB

  -------------------------------------------------------------
  10. who -r
    run-level 3 May 13 21:10

  -------------------------------------------------------------
  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 chronyd 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 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

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

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Platform Notes (Continued)

```
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:
     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
   vm.dirty_expire_centisecs       3000
   vm.dirty_ratio                    40
   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

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

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Platform Notes (Continued)

```
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  128G  244G  35% /home

  --------------------------------------------------------------
21. /sys/devices/virtual/dmi/id
    Vendor:         HPE
    Product:        ProLiant DL320 Gen11
    Product Family: ProLiant
    Serial:         CNX2210H28

  --------------------------------------------------------------
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
  determined", but the intent may not be met, as there are frequent changes to hardware, firmware, and the
  "DMTF SMBIOS" standard.
  Memory:
    4x Hynix HMCG88AEBRA168N 32 GB 2 rank 4800, configured at 4400
    4x Hynix HMCG88MEBRA113N 32 GB 2 rank 4800, configured at 4400


  --------------------------------------------------------------
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: 1.20
```

Compiler Version Notes

```
==============================================================================
C             | 519.lbm_r(base, peak) 538.imagick_r(base, peak) 544.nab_r(base, peak)
------------------------------------------------------------------------------
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, peak) 510.parest_r(base, peak)
------------------------------------------------------------------------------
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, peak) 526.blender_r(base, peak)
------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
```

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```
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
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, Fortran | 507.cactuBSSN_r(base, peak)
------------------------------------------------------------------------------------------------------
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.
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) Fortran Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
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------------------------------------------------------------------------------------------------------


==============================================================================================
Fortran         | 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak) 554.roms_r(base, peak)
------------------------------------------------------------------------------------------------------
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, peak) 527.cam4_r(base, peak)
------------------------------------------------------------------------------------------------------
Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
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```

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`

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

SPEC CPU®2017 Floating Point Rate Result

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Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL320 Gen11
(2.10 GHz, Intel Xeon Gold 5412U)

SPECrate®2017_fp_base = 279

SPECrate®2017_fp_peak = 287

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

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`
`-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`

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SPEC CPU®2017 Floating Point Rate Result

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

Base Optimization Flags (Continued)

Benchmarks using both C and C++ (continued):
```
-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
```

Peak 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
```

Peak Portability Flags

```
Same as Base Portability Flags
```

Peak Optimization Flags

C benchmarks:

519.lbm_r: `basepeak = yes`

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CPU2017 License: 3

Test Sponsor: HPE

Tested by: HPE

Test Date: May-2023

Hardware Availability: Apr-2023

Software Availability: Dec-2022

Peak Optimization Flags (Continued)

538.imagick_r: `basepeak = yes`

544.nab_r: `basepeak = yes`

C++ benchmarks:

508.namd_r: `basepeak = yes`

510.parest_r: `-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:

503.bwaves_r: `basepeak = yes`

549.fotonik3d_r: `basepeak = yes`

554.roms_r: `-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:

521.wrf_r: `basepeak = yes`

527.cam4_r: `basepeak = yes`

Benchmarks using both C and C++:

511.povray_r: `-w -std=c++14 -m64 -std=c11 -Wl,-z,muldefs`
`-fprofile-generate(pass 1)`
`-fprofile-use=default.profdata(pass 2) -xCORE-AVX2(pass 1)`
`-flto -Ofast -xCORE-AVX512 -ffast-math -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`

526.blender_r: `basepeak = yes`

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`

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Peak Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++ (continued):

```
-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

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

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