SPEC CPU®2017 Floating Point Rate Result

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Hewlett Packard Enterprise

(Test Sponsor: HPE)

$SPECrate®2017\_fp\_base = 1130$

ProLiant DL560 Gen11
(2.10 GHz, Intel Xeon Gold 6418H)

$SPECrate®2017\_fp\_peak = 1160$

CPU2017 License: 3

Test Sponsor: HPE

Tested by: HPE

Test Date: Apr-2023

Hardware Availability: May-2023

Software Availability: Mar-2023

Benchmark	Copies	base	peak
503.bwaves_r	192	5500	
507.cactuBSSN_r	192	1350	
507.cactuBSSN_r	96		1440
508.namd_r	192	633	
510.parest_r	192	656	
510.parest_r	96		751
511.povray_r	192	988	
511.povray_r	(peak)		1020
519.lbm_r	192	597	
521.wrf_r	192	1030	
526.blender_r	192	955	
527.cam4_r	192	1100	
538.imagick_r	192	2680	
544.nab_r	192	1910	
549.fotonik3d_r	192	916	
554.roms_r	192	547	
554.roms_r	96		581

—— SPECrate®2017_fp_base (1130)   ······· SPECrate®2017_fp_peak (1160)

Hardware

CPU Name: Intel Xeon Gold 6418H

Max MHz: 4000

Nominal: 2100

Enabled: 96 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: 60 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: Ubuntu 22.04.1 LTS
Kernel 5.15.0-69-generic

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: ext4

System State: Run level 5 (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

Standard Performance Evaluation Corporation (info@spec.org)

https://www.spec.org/

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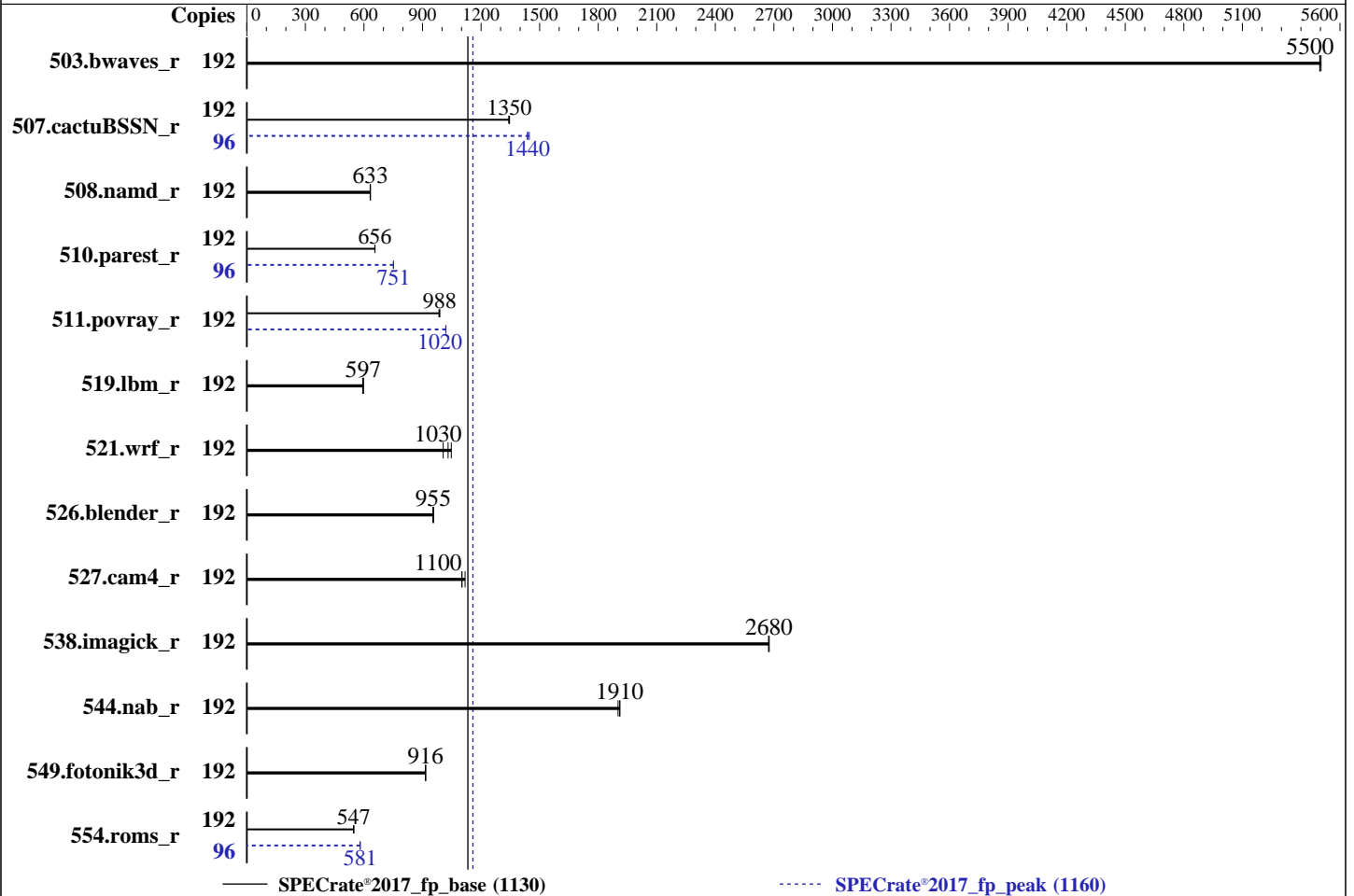## Hewlett Packard Enterprise
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Results Table

Benchmark	Base						Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
503.bwaves_r	192	350	5500	350	5500	**350**	**5500**	192	350	5500	350	5500	**350**	**5500**
507.cactuBSSN_r	192	181	1340	**181**	**1350**	181	1350	96	**84.4**	**1440**	84.0	1450	84.6	1440
508.namd_r	192	**288**	**633**	288	633	289	632	192	**288**	**633**	288	633	289	632
510.parest_r	192	766	656	**765**	**656**	765	657	96	334	751	334	751	**334**	**751**
511.povray_r	192	455	984	454	988	**454**	**988**	192	440	1020	439	1020	**440**	**1020**
519.lbm_r	192	341	593	339	597	**339**	**597**	192	341	593	339	597	**339**	**597**
521.wrf_r	192	**417**	**1030**	428	1010	411	1050	192	**417**	**1030**	428	1010	411	1050
526.blender_r	192	**306**	**955**	307	953	306	956	192	**306**	**955**	307	953	306	956
527.cam4_r	192	300	1120	305	1100	**305**	**1100**	192	300	1120	305	1100	**305**	**1100**
538.imagick_r	192	**179**	**2680**	179	2670	178	2680	192	**179**	**2680**	179	2670	178	2680
544.nab_r	192	169	1910	**169**	**1910**	170	1900	192	169	1910	**169**	**1910**	170	1900
549.fotonik3d_r	192	**817**	**916**	817	915	817	916	192	**817**	**916**	817	915	817	916
554.roms_r	192	556	549	559	546	**558**	**547**	96	263	581	263	580	**263**	**581**

SPECrate®2017_fp_base =	**1130**
SPECrate®2017_fp_peak =	**1160**

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 6418H 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
The reported date by sysinfo is incorrect due to computer clock being not set correctly.
The correct test date is: Apr-2023

 Sysinfo program /home/cpu2017/bin/sysinfo
 Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
 running on admin1 Thu Mar  2 13:05:37 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 249 (249.11-0ubuntu3.7)
 12. Failed units, from systemctl list-units --state=failed
 13. Services, from systemctl list-unit-files
 14. Linux kernel boot-time arguments, from /proc/cmdline
 15. cpupower frequency-info
 16. tuned-adm active
 17. sysctl
 18. /sys/kernel/mm/transparent_hugepage
 19. /sys/kernel/mm/transparent_hugepage/khugepaged
 20. OS release
 21. Disk information
```

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Platform Notes (Continued)

```
   22. /sys/devices/virtual/dmi/id
   23. dmidecode
   24. BIOS
   ----------------------------------------------------------


   ----------------------------------------------------------
   1. uname -a
     Linux admin1 5.15.0-69-generic #76-Ubuntu SMP Fri Mar 17 17:19:29 UTC 2023 x86_64 x86_64 x86_64 GNU/Linux


   ----------------------------------------------------------
   2. w
      13:05:37 up 7 min,  3 users,  load average: 0.01, 0.10, 0.08
     USER     TTY      FROM             LOGIN@   IDLE   JCPU   PCPU WHAT
     admin1   tty1     -                13:03    1:53   0.03s  0.01s -bash
     admin1   pts/0    172.16.0.100     13:04    1:27   0.01s  0.01s sshd: admin1 [priv]
     admin1   pts/1    172.16.0.100     13:04    9.00s  0.81s  0.01s sudo -i


   ----------------------------------------------------------
   3. Username
     From environment variable $USER:  root
     From the command 'logname':       admin1


   ----------------------------------------------------------
   4. ulimit -a
     time(seconds)        unlimited
     file(blocks)         unlimited
     data(kbytes)         unlimited
     stack(kbytes)        unlimited
     coredump(blocks)     0
     memory(kbytes)       unlimited
     locked memory(kbytes) 132056340
     process              4126305
     nofiles              1024
     vmemory(kbytes)      unlimited
     locks                unlimited
     rtprio               0


   ----------------------------------------------------------
   5. sysinfo process ancestry
    /sbin/init
    sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups
    sshd: admin1 [priv]
    sshd: admin1@pts/0
    -bash
    sudo -i
    sudo -i
    -bash
    -bash
    runcpu --nobuild --action validate --define default-platform-flags --define numcopies=192 -c
      ic2023.0-lin-sapphirerapids-rate-20221201.cfg --define smt-on --define cores=96 --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=192 --configfile
      ic2023.0-lin-sapphirerapids-rate-20221201.cfg --define smt-on --define cores=96 --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/CPU2017.025/templogs/preenv.fprate.025.0.log --lognum 025.0 --from_runcpu 2
    specperl $SPEC/bin/sysinfo
    $SPEC = /home/cpu2017


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

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Platform Notes (Continued)

```
6. /proc/cpuinfo
     model name        : Intel(R) Xeon(R) Gold 6418H
     vendor_id         : GenuineIntel
     cpu family        : 6
     model             : 143
     stepping          : 7
     microcode         : 0x2b0001b0
     bugs              : spectre_v1 spectre_v2 spec_store_bypass swapgs eibrs_pbrsb
     cpu cores         : 24
     siblings          : 48
     4 physical ids (chips)
     192 processors (hardware threads)
     physical id 0: core ids 0-23
     physical id 1: core ids 0-23
     physical id 2: core ids 0-23
     physical id 3: core ids 0-23
     physical id 0: apicids 0-47
     physical id 1: apicids 128-175
     physical id 2: apicids 256-303
     physical id 3: apicids 384-431
   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):                 192
   On-line CPU(s) list:    0-191
   Vendor ID:              GenuineIntel
   Model name:             Intel(R) Xeon(R) Gold 6418H
   CPU family:             6
   Model:                  143
   Thread(s) per core:     2
   Core(s) per socket:     24
   Socket(s):              4
   Stepping:               7
   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 amx_bf16 avx512_fp16 amx_tile amx_int8 flush_l1d
                           arch_capabilities
```

(Continued on next page)

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Platform Notes (Continued)

```
  Virtualization:                 VT-x
  L1d cache:                      4.5 MiB (96 instances)
  L1i cache:                      3 MiB (96 instances)
  L2 cache:                       192 MiB (96 instances)
  L3 cache:                       240 MiB (4 instances)
  NUMA node(s):                   8
  NUMA node0 CPU(s):              0-11,96-107
  NUMA node1 CPU(s):              12-23,108-119
  NUMA node2 CPU(s):              24-35,120-131
  NUMA node3 CPU(s):              36-47,132-143
  NUMA node4 CPU(s):              48-59,144-155
  NUMA node5 CPU(s):              60-71,156-167
  NUMA node6 CPU(s):              72-83,168-179
  NUMA node7 CPU(s):              84-95,180-191
  Vulnerability Itlb multihit:    Not affected
  Vulnerability L1tf:             Not affected
  Vulnerability Mds:              Not affected
  Vulnerability Meltdown:         Not affected
  Vulnerability Mmio stale data:  Not affected
  Vulnerability Retbleed:         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, PBRSB-eIBRS SW
                                  sequence
  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     4.5M   12 Data            1     64        1             64
      L1i      32K       3M    8 Instruction     1     64        1             64
      L2        2M     192M   16 Unified         2   2048        1             64
      L3       60M     240M   15 Unified         3  65536        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: 0-11,96-107
  node 0 size: 128569 MB
  node 0 free: 127988 MB
  node 1 cpus: 12-23,108-119
  node 1 size: 129018 MB
  node 1 free: 128606 MB
  node 2 cpus: 24-35,120-131
  node 2 size: 129018 MB
  node 2 free: 128344 MB
  node 3 cpus: 36-47,132-143
  node 3 size: 129018 MB
  node 3 free: 128731 MB
  node 4 cpus: 48-59,144-155
  node 4 size: 129018 MB
  node 4 free: 128648 MB
  node 5 cpus: 60-71,156-167
  node 5 size: 129018 MB
  node 5 free: 128764 MB
  node 6 cpus: 72-83,168-179
  node 6 size: 129018 MB
  node 6 free: 128558 MB
  node 7 cpus: 84-95,180-191
```

(Continued on next page)

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Platform Notes (Continued)

```
   node 7 size: 129011 MB
   node 7 free: 128515 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
     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:       1056450744 kB


  -----------------------------------------------------------
10. who -r
   run-level 5 Mar 2 13:00


  -----------------------------------------------------------
11. Systemd service manager version: systemd 249 (249.11-0ubuntu3.7)
   Default Target  Status
   graphical       degraded


  -----------------------------------------------------------
12. Failed units, from systemctl list-units --state=failed
     UNIT                               LOAD   ACTIVE SUB    DESCRIPTION
   * systemd-networkd-wait-online.service loaded failed failed Wait for Network to be Configured


  -----------------------------------------------------------
13. Services, from systemctl list-unit-files
   STATE            UNIT FILES
   enabled          ModemManager apparmor blk-availability cloud-config cloud-final cloud-init
                    cloud-init-local console-setup cron dmesg e2scrub_reap finalrd getty@ gpu-manager
                    grub-common grub-initrd-fallback irqbalance keyboard-setup lvm2-monitor lxd-agent
                    multipathd networkd-dispatcher open-iscsi open-vm-tools pollinate rsyslog secureboot-db
                    setvtrgb snapd ssh systemd-networkd systemd-networkd-wait-online systemd-pstore
                    systemd-resolved systemd-timesyncd thermald tuned ua-reboot-cmds ubuntu-advantage udisks2
                    ufw unattended-upgrades vgauth
   enabled-runtime  netplan-ovs-cleanup systemd-fsck-root systemd-remount-fs
   disabled         console-getty debug-shell iscsid nftables powertop rsync serial-getty@
                    systemd-boot-check-no-failures systemd-network-generator systemd-sysext
                    systemd-time-wait-sync upower
   generated        apport
   indirect         uuidd
   masked           cryptdisks cryptdisks-early hwclock lvm2 multipath-tools-boot rc rcS screen-cleanup sudo
                    x11-common


  -----------------------------------------------------------
14. Linux kernel boot-time arguments, from /proc/cmdline
   BOOT_IMAGE=/vmlinuz-5.15.0-69-generic
   root=/dev/mapper/ubuntu--vg-ubuntu--lv
   ro


  -----------------------------------------------------------
15. cpupower frequency-info
   analyzing CPU 0:
     Unable to determine current policy
```

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Platform Notes (Continued)

```
    boost state support:
      Supported: yes
      Active: yes


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


    -------------------------------------------------------------
 17. 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


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


    -------------------------------------------------------------
 19. /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


    -------------------------------------------------------------
 20. OS release
   From /etc/*-release /etc/*-version
   os-release Ubuntu 22.04.1 LTS


    -------------------------------------------------------------
 21. Disk information
 SPEC is set to: /home/cpu2017
   Filesystem                      Type  Size  Used Avail Use% Mounted on
   /dev/mapper/ubuntu--vg-ubuntu--lv ext4  437G  349G   70G  84% /


    -------------------------------------------------------------
 22. /sys/devices/virtual/dmi/id
```

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Platform Notes (Continued)

```
      Vendor:         HPE
      Product:        ProLiant DL560 Gen11
      Product Family: ProLiant
      Serial:         CNX2250G5V


   --------------------------------------------------------------
 23. 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:
     3x Samsung M321R4GA3BB0-CQKDG 32 GB 2 rank 4800
     29x Samsung M321R4GA3BB6-CQKDG 32 GB 2 rank 4800
     32x UNKNOWN NOT AVAILABLE



   --------------------------------------------------------------
 24. 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, 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
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
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201
```

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SPEC CPU®2017 Floating Point Rate Result

Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL560 Gen11
(2.10 GHz, Intel Xeon Gold 6418H)

SPECrate®2017_fp_base = 1130

SPECrate®2017_fp_peak = 1160

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

Compiler Version Notes (Continued)

```
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
-------------------------------------------------------------------------------------------


===========================================================================================
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
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
-------------------------------------------------------------------------------------------


===========================================================================================
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
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
-------------------------------------------------------------------------------------------
```

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`

(Continued on next page)

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

Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL560 Gen11
(2.10 GHz, Intel Xeon Gold 6418H)

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SPECrate®2017_fp_peak = 1160

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

Test Date: Apr-2023
Hardware Availability: May-2023
Software Availability: Mar-2023

Base Portability Flags (Continued)

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
-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
```

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Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL560 Gen11
(2.10 GHz, Intel Xeon Gold 6418H)

SPECrate®2017_fp_base = 1130

SPECrate®2017_fp_peak = 1160

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

Base Optimization Flags (Continued)

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

538.imagick_r: `basepeak = yes`

544.nab_r: `basepeak = yes`

C++ benchmarks:

(Continued on next page)

Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant DL560 Gen11
(2.10 GHz, Intel Xeon Gold 6418H)

SPECrate®2017_fp_base = 1130

SPECrate®2017_fp_peak = 1160

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

Peak Optimization Flags (Continued)

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
-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

SPEC CPU®2017 Floating Point Rate Result

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Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL560 Gen11
(2.10 GHz, Intel Xeon Gold 6418H)

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SPECrate®2017_fp_peak = 1160

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

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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