SPEC CPU®2017 Floating Point Rate Result

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Hewlett Packard Enterprise

(Test Sponsor: HPE)

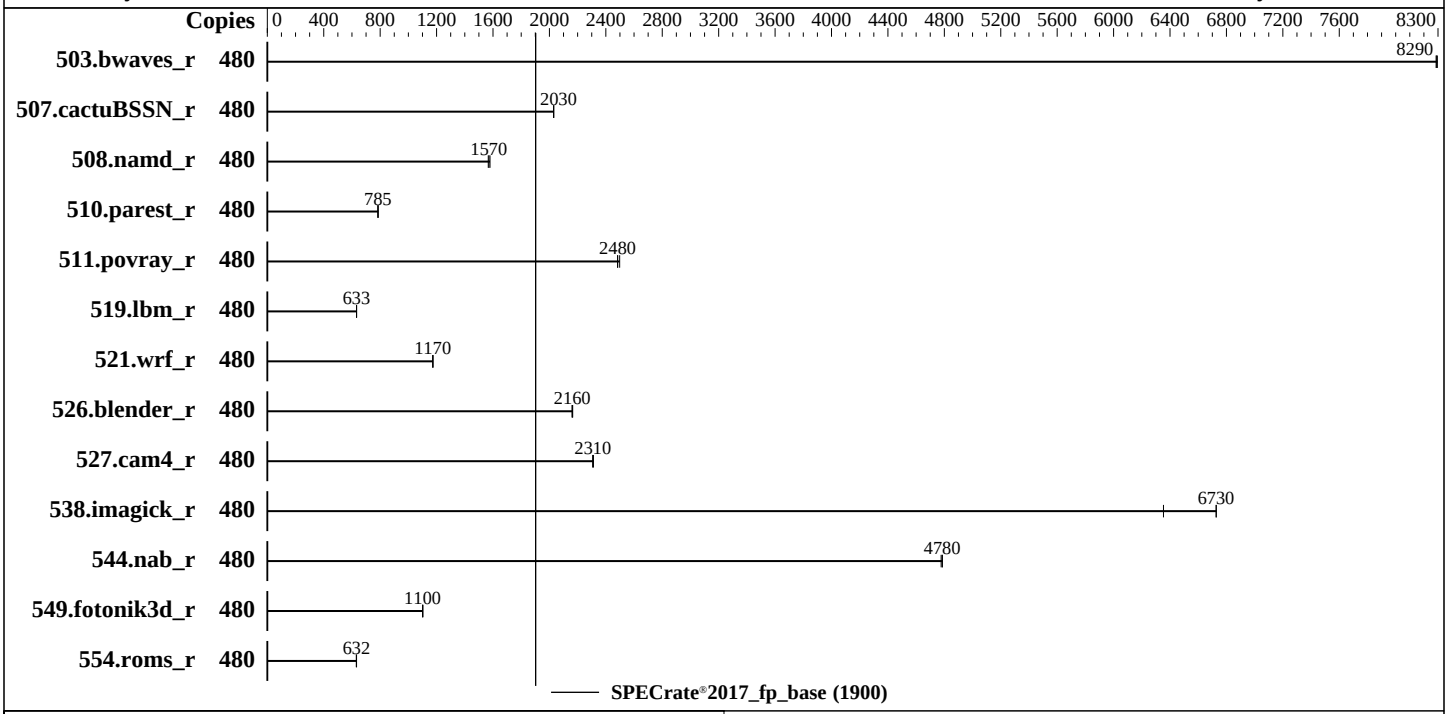
HPE Compute Scale-up Server 3200
(1.90 GHz, Intel Xeon Platinum 8490H)

SPECrate®2017_fp_base = 1900

SPECrate®2017_fp_peak = Not Run

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

Test Date: Jan-2024
Hardware Availability: Dec-2023
Software Availability: Dec-2023



Hardware

CPU Name:	Intel Xeon Platinum 8490H
Max MHz:	3500
Nominal:	1900
Enabled:	240 cores, 4 chips, 2 threads/core
Orderable:	4, 8, 16 chip(s)
Cache L1:	32 KB I + 48 KB D on chip per core
L2:	2 MB I+D on chip per core
L3:	112.5 MB I+D on chip per chip
Other:	None
Memory:	2 TB (32 x 64 GB 2Rx4 PC5-4800B-R)
Storage:	1 x 6.4 TB NVMe SSD
Other:	None

Software

OS:	Red Hat Enterprise Linux 8.8 (Ootpa) Kernel 4.18.0-477.10.1.el8_8.x86_64
Compiler:	C/C++: Version 2023.2.3 of Intel oneAPI DPC++/C++ Compiler for Linux; Fortran: Version 2023.2.3 of Intel Fortran Compiler for Linux;
Parallel:	No
Firmware:	HPE Firmware Bundle Version 1.10.342 released Dec-2023
File System:	xfs
System State:	Run level 3 (multi-user)
Base Pointers:	64-bit
Peak Pointers:	Not Applicable
Other:	jemalloc memory allocator V5.0.1 HPE Foundation Software 2.5.0
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	480	580	8300	581	8290	**581**	**8290**							
507.cactuBSSN_r	480	299	2030	299	2030	**299**	**2030**							
508.namd_r	480	291	1570	**290**	**1570**	289	1580							
510.parest_r	480	1601	784	1599	785	**1600**	**785**							
511.povray_r	480	451	2480	449	2500	**451**	**2480**							
519.lbm_r	480	**800**	**633**	800	632	800	633							
521.wrf_r	480	916	1170	**916**	**1170**	916	1170							
526.blender_r	480	338	2170	**338**	**2160**	338	2160							
527.cam4_r	480	364	2310	**364**	**2310**	363	2310							
538.imagick_r	480	188	6350	177	6730	**177**	**6730**							
544.nab_r	480	169	4780	169	4790	**169**	**4780**							
549.fotonik3d_r	480	1697	1100	1698	1100	**1698**	**1100**							
554.roms_r	480	1206	633	**1207**	**632**	1209	631							

SPECrate®2017_fp_base = 1900

SPECrate®2017_fp_peak = Not Run

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>
```

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"
```

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.
```

(Continued on next page)

General Notes (Continued)

```
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 0x2b0004d0 for
the Intel Xeon Platinum 8490H processor.
BIOS Configuration:
 Workload Profile set to Custom
 Energy/Performance Bias set to Maximum Performance
 Energy Efficient Turbo set to Disabled
 Advanced Memory Protection set to Advanced ECC Support
 SR-IOV set to Disabled
 Intel Virtualization Technology (Intel VT, VT-x) set to Disabled
 Adjacent Sector Prefetch set to Disabled
 DCU Stream Prefetcher set to Disabled
 Last Level Cache (LLC) Dead Line Allocation set to Disabled
 Enhanced Processor Performance Profile set to Aggressive
 Memory Patrol Scrubbing set to Disabled

 Sysinfo program /home/cpu2017/bin/sysinfo
 Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
 running on sph-201 Mon Jan 22 18:45:50 2024

 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 239 (239-74.el8_8)
 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. Kernel self-reported vulnerability status, from /sys/devices/system/cpu/vulnerabilities
 22. Disk information
 23. /sys/devices/virtual/dmi/id
 24. dmidecode
 25. BIOS
```

(Continued on next page)

Platform Notes (Continued)

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

------------------------------------------------------------
1. uname -a
  Linux sph-201 4.18.0-477.10.1.el8_8.x86_64 #1 SMP Wed Apr 5 13:35:01 EDT 2023 x86_64 x86_64 x86_64
  GNU/Linux

------------------------------------------------------------
2. w
   18:45:50 up  4:41,  1 user,  load average: 0.05, 0.06, 7.56
  USER     TTY      FROM             LOGIN@   IDLE   JCPU   PCPU WHAT
  test     ttyS0    -                14:05    2.00s  1.02s  0.01s login -- test

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

------------------------------------------------------------
4. ulimit -a
  core file size          (blocks, -c) 0
  data seg size           (kbytes, -d) unlimited
  scheduling priority             (-e) 0
  file size               (blocks, -f) unlimited
  pending signals                 (-i) 8123397
  max locked memory       (kbytes, -l) 64
  max memory size         (kbytes, -m) unlimited
  open files                      (-n) 40000
  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) 8123397
  virtual memory          (kbytes, -v) unlimited
  file locks                      (-x) unlimited

------------------------------------------------------------
5. sysinfo process ancestry
 /usr/lib/systemd/systemd --switched-root --system --deserialize 17
 login -- test
 -bash
 sudo su
 su
 bash
 bash
 runcpu --nobuild --action validate --define default-platform-flags --define numcopies=480 -c
   ic2023.2.3-lin-sapphirerapids-rate-20231121.cfg --define smt-on --define cores=240 --define physicalfirst
   --define invoke_with_interleave --define drop_caches --tune base -o all fprate
 runcpu --nobuild --action validate --define default-platform-flags --define numcopies=480 --configfile
   ic2023.2.3-lin-sapphirerapids-rate-20231121.cfg --define smt-on --define cores=240 --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/CPU2017.020/templogs/preenv.fprate.020.0.log --lognum 020.0 --from_runcpu 2
 specperl $SPEC/bin/sysinfo
$SPEC = /home/cpu2017

------------------------------------------------------------
6. /proc/cpuinfo
    model name      : Intel(R) Xeon(R) Platinum 8490H
```

(Continued on next page)

Platform Notes (Continued)

```
     vendor_id       : GenuineIntel
     cpu family      : 6
     model           : 143
     stepping        : 8
     microcode       : 0x2b0004d0
     bugs            : spectre_v1 spectre_v2 spec_store_bypass swapgs eibrs_pbrsb
     cpu cores       : 60
     siblings        : 120
     4 physical ids (chips)
     480 processors (hardware threads)
     physical id 0: core ids 0-59
     physical id 1: core ids 0-59
     physical id 2: core ids 0-59
     physical id 3: core ids 0-59
     physical id 0: apicids 0-119
     physical id 1: apicids 128-247
     physical id 2: apicids 256-375
     physical id 3: apicids 384-503
   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 2.32.1:
   Architecture:        x86_64
   CPU op-mode(s):      32-bit, 64-bit
   Byte Order:          Little Endian
   CPU(s):              480
   On-line CPU(s) list: 0-479
   Thread(s) per core:  2
   Core(s) per socket:  60
   Socket(s):           4
   NUMA node(s):        4
   Vendor ID:           GenuineIntel
   BIOS Vendor ID:      Intel(R) Corporation
   CPU family:          6
   Model:               143
   Model name:          Intel(R) Xeon(R) Platinum 8490H
   BIOS Model name:     Intel(R) Xeon(R) Platinum 8490H
   Stepping:            8
   CPU MHz:             3500.000
   CPU max MHz:         3500.0000
   CPU min MHz:         800.0000
   BogoMIPS:            3800.02
   L1d cache:           48K
   L1i cache:           32K
   L2 cache:            2048K
   L3 cache:            115200K
   NUMA node0 CPU(s):   0-59,240-299
   NUMA node1 CPU(s):   60-119,300-359
   NUMA node2 CPU(s):   120-179,360-419
   NUMA node3 CPU(s):   180-239,420-479
   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
                        arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc cpuid aperfmperf pni
                        pclmulqdq dtes64 monitor ds_cpl 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 intel_ppin
                        cdp_l2 ssbd mba ibrs ibpb stibp ibrs_enhanced fsgsbase tsc_adjust bmi1 avx2 smep bmi2
```

(Continued on next page)

Platform Notes (Continued)

```
                    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 hwp hwp_act_window hwp_pkg_req 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

  ------------------------------------------------------------
  8. numactl --hardware
  NOTE: a numactl 'node' might or might not correspond to a physical chip.
    available: 4 nodes (0-3)
    node 0 cpus: 0-59,240-299
    node 0 size: 507266 MB
    node 0 free: 481218 MB
    node 1 cpus: 60-119,300-359
    node 1 size: 508063 MB
    node 1 free: 483589 MB
    node 2 cpus: 120-179,360-419
    node 2 size: 508063 MB
    node 2 free: 484574 MB
    node 3 cpus: 180-239,420-479
    node 3 size: 507512 MB
    node 3 free: 484093 MB
    node distances:
    node   0   1   2   3
      0:  10  16  16  18
      1:  16  10  18  16
      2:  16  18  10  16
      3:  18  16  16  10

  ------------------------------------------------------------
  9. /proc/meminfo
     MemTotal:       2079648500 kB

  ------------------------------------------------------------
  10. who -r
    run-level 3 Jan 22 14:04

  ------------------------------------------------------------
  11. Systemd service manager version: systemd 239 (239-74.el8_8)
    Default Target  Status
    multi-user      degraded

  ------------------------------------------------------------
  12. Failed units, from systemctl list-units --state=failed
      UNIT                              LOAD   ACTIVE SUB    DESCRIPTION
    * dcdchkgracefulshutdown.service loaded failed failed Check if previous system shutdown was graceful

  ------------------------------------------------------------
  13. Services, from systemctl list-unit-files
    STATE     UNIT FILES
    enabled   ModemManager NetworkManager NetworkManager-dispatcher NetworkManager-wait-online
              abrt-journal-core abrt-oops abrt-vmcore abrt-xorg abrtd accounts-daemon atd auditd autovt@
              avahi-daemon chronyd cpuset_cpunodemap cpuset_memory_spread crond dcd dcdchkgracefulshutdown
              dcdshutdown display-manager gdm getty@ hpe-auto-config hpe_irqbalance import-state
              insights-client-boot iscsi iscsi-onboot kdump ksm ksmtuned libstoragemgmt libvirtd lm_sensors
              loadmodules lvm2-monitor mcelog mdmonitor microcode multipathd nis-domainname
              nvmefc-boot-connections ostree-remount pmcd pmie pmlogger qemu-guest-agent rpcbind rsyslog
```

(Continued on next page)

Platform Notes (Continued)

```
            rtkit-daemon selinux-autorelabel-mark smartd sshd sssd syslog sysstat timedatex tuned udisks2 vdo
            vgauthd vmtoolsd vsftpd
  disabled  abrt-ccpp abrt-pstoreoops arp-ethers autofs blk-availability bluetooth brltty
            canberra-system-bootup canberra-system-shutdown canberra-system-shutdown-reboot cgdcbxd
            chrony-wait cni-dhcp console-getty cpupower cups cups-browsed debug-shell dnf-system-upgrade
            dnsmasq dovecot ebtables fancontrol fcoe firewalld grafana-server gssproxy httpd httpd@ ibacm
            iprdump iprinit iprupdate ipsec irqbalance iscsid iscsiuio kpatch kvm_stat ledmon libvirt-guests
            lldpad man-db-restart-cache-update named named-chroot ndctl-monitor netcf-transaction nfs-blkmap
            nfs-convert nfs-server nftables nmb numad nvmf-autoconnect oddjobd pmfind pmie_farm pmlogger_farm
            pmproxy podman podman-auto-update podman-clean-transient podman-kube@ podman-restart postfix
            powertop psacct ras-mc-ctl rasdaemon rdisc rhcd rrdcached saslauthd sendmail sm-client smb snmpd
            snmptrapd spamassassin speech-dispatcherd srp_daemon srp_daemon_port@ sshd-keygen@
            switcheroo-control systemd-nspawn@ systemd-pstore systemd-resolved target targetclid tcsd
            tog-pegasus trace-cmd upower virtinterfaced virtnetworkd virtnodedevd virtnwfilterd virtproxyd
            virtqemud virtsecretd virtstoraged wpa_supplicant ypbind
  indirect  pcscd serial-getty@ spice-vdagentd sssd-autofs sssd-kcm sssd-nss sssd-pac sssd-pam sssd-ssh
            sssd-sudo virtlockd virtlogd vsftpd@
  masked    systemd-timedated

------------------------------------------------------------
14. Linux kernel boot-time arguments, from /proc/cmdline
  BOOT_IMAGE=(hd2,gpt4)/boot/vmlinuz-4.18.0-477.10.1.el8_8.x86_64
  root=UUID=e65a817a-ecea-4172-8f09-b6a7120f7868
  ro
  loglevel=3
  rd.auto=1
  console=ttyS0,115200n8
  selinux=0
  security=
  console=ttyS0,115200
  udev.children-max=512
  nmi_watchdog=0
  uv_nmi.action=kdump
  add_efi_memmap
  tsc=nowatchdog
  bau=0
  earlyprintk=ttyS0,115200
  log_buf_len=8M
  numa_balancing=disable
  crashkernel=512M,high

------------------------------------------------------------
15. cpupower frequency-info
  analyzing CPU 0:
    current policy: frequency should be within 3.50 GHz and 3.50 GHz.
                    The governor "performance" may decide which speed to use
                    within this range.
    boost state support:
      Supported: yes
      Active: yes

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

------------------------------------------------------------
17. sysctl
  kernel.numa_balancing               0
  kernel.randomize_va_space           2
  vm.compaction_proactiveness         0
```

(Continued on next page)

Platform Notes (Continued)

```
  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_swap              64
  pages_to_scan            4096
  scan_sleep_millisecs    10000

------------------------------------------------------------
20. OS release
  From /etc/*-release /etc/*-version
  os-release             Red Hat Enterprise Linux 8.8 (Ootpa)
  hpe-foundation-release HPE Foundation Software 2.5.0, Build 750.0880.240110T0100.a.rhel88hpe-240110T0100
  redhat-release         Red Hat Enterprise Linux release 8.8 (Ootpa)
  system-release         Red Hat Enterprise Linux release 8.8 (Ootpa)

------------------------------------------------------------
21. Kernel self-reported vulnerability status, from /sys/devices/system/cpu/vulnerabilities
  itlb_multihit        Not affected
  l1tf                 Not affected
  mds                  Not affected
  meltdown             Not affected
  mmio_stale_data      Not affected
  retbleed             Not affected
  spec_store_bypass    Mitigation: Speculative Store Bypass disabled via prctl
  spectre_v1           Mitigation: usercopy/swapgs barriers and __user pointer sanitization
  spectre_v2           Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling, PBRSB-eIBRS: SW sequence
  srbds                Not affected
  tsx_async_abort      Not affected
For more information, see the Linux documentation on hardware vulnerabilities, for example
     https://www.kernel.org/doc/html/latest/admin-guide/hw-vuln/index.html

------------------------------------------------------------
22. Disk information
SPEC is set to: /home/cpu2017
```

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Platform Notes (Continued)

```
  Filesystem     Type  Size  Used Avail Use% Mounted on
  /dev/nvme0n1p4 xfs   2.3T  499G  1.8T  22% /

------------------------------------------------------------
23. /sys/devices/virtual/dmi/id
    Vendor:         HPE
    Product:        Compute Scale-up Server 3200
    Product Family: 1590PID03030201
    Serial:         5UF2491412-000

------------------------------------------------------------
24. 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:
    32x Samsung M321R8GA0BB0-CQKZH 64 GB 2 rank 4800


------------------------------------------------------------
25. BIOS
(This section combines info from /sys/devices and dmidecode.)
   BIOS Vendor:       HPE
   BIOS Version:      Bundle:1.10.342-20231206_161054 SFW:009.010.108.000.2312042027
   BIOS Date:         12/04/2023
```

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 2023.2.3 Build x
Copyright (C) 1985-2023 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 2023.2.3 Build x
Copyright (C) 1985-2023 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 2023.2.3 Build x
Copyright (C) 1985-2023 Intel Corporation. All rights reserved.
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.2.3 Build x
Copyright (C) 1985-2023 Intel Corporation. All rights reserved.
--------------------------------------------------------------------------------------------------------------

==============================================================================================================
C++, C, Fortran | 507.cactuBSSN_r(base)
--------------------------------------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.2.3 Build x
Copyright (C) 1985-2023 Intel Corporation. All rights reserved.
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.2.3 Build x
Copyright (C) 1985-2023 Intel Corporation. All rights reserved.
```

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Compiler Version Notes (Continued)

```
Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2023.2.3 Build x
Copyright (C) 1985-2023 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------------------------------------------------

==============================================================================================================
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 2023.2.3 Build x
Copyright (C) 1985-2023 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------------------------------------------------

==============================================================================================================
Fortran, C      | 521.wrf_r(base) 527.cam4_r(base)
------------------------------------------------------------------------------------------------------------------------
Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2023.2.3 Build x
Copyright (C) 1985-2023 Intel Corporation. All rights reserved.
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.2.3 Build x
Copyright (C) 1985-2023 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

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Base Portability Flags (Continued)

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
-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

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Base 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/Intel-ic2023p2-official-linux64.html
http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-SDSS-rev1.0.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/Intel-ic2023p2-official-linux64.xml
http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-SDSS-rev1.0.xml

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

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