SPEC CPU®2017 Floating Point Rate Result

Hewlett Packard Enterprise
(Test Sponsor: HPE)

SPECrate®2017_fp_base = 251

ProLiant ML350 Gen11
(2.90 GHz, Intel Xeon Gold 5415+)

SPECrate®2017_fp_peak = 255

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

Benchmark	Copies	Result
503.bwaves_r	32	1180
507.cactuBSSN_r	32	286
507.cactuBSSN_r	16	317
508.namd_r	32	128
510.parest_r	32	143
510.parest_r	16	150
511.povray_r	32	204
511.povray_r	32	211
519.lbm_r	32	179
521.wrf_r	32	232
526.blender_r	32	193
527.cam4_r	32	222
538.imagick_r	32	545
544.nab_r	32	395
549.fotonik3d_r	32	246
554.roms_r	32	136

SPECrate®2017_fp_base (251)
SPECrate®2017_fp_peak (255)

Hardware

CPU Name: Intel Xeon Gold 5415+
Max MHz: 4100
Nominal: 2900
Enabled: 40 cores, 2 chips, 2 threads/core
Orderable: 1, 2 chip(s)
Cache L1: 32 KB I + 48 KB D on chip per core
L2: 2 MB I+D on chip per core
L3: 22.5 MB I+D on chip per chip
Other: None
Memory: 1 TB (16 x 64 GB 2Rx4 PC5-4800B-R, running at 4400)
Storage: 1 x 480 GB SATA SSD
Other: None

Software

OS: Red Hat Enterprise Linux release 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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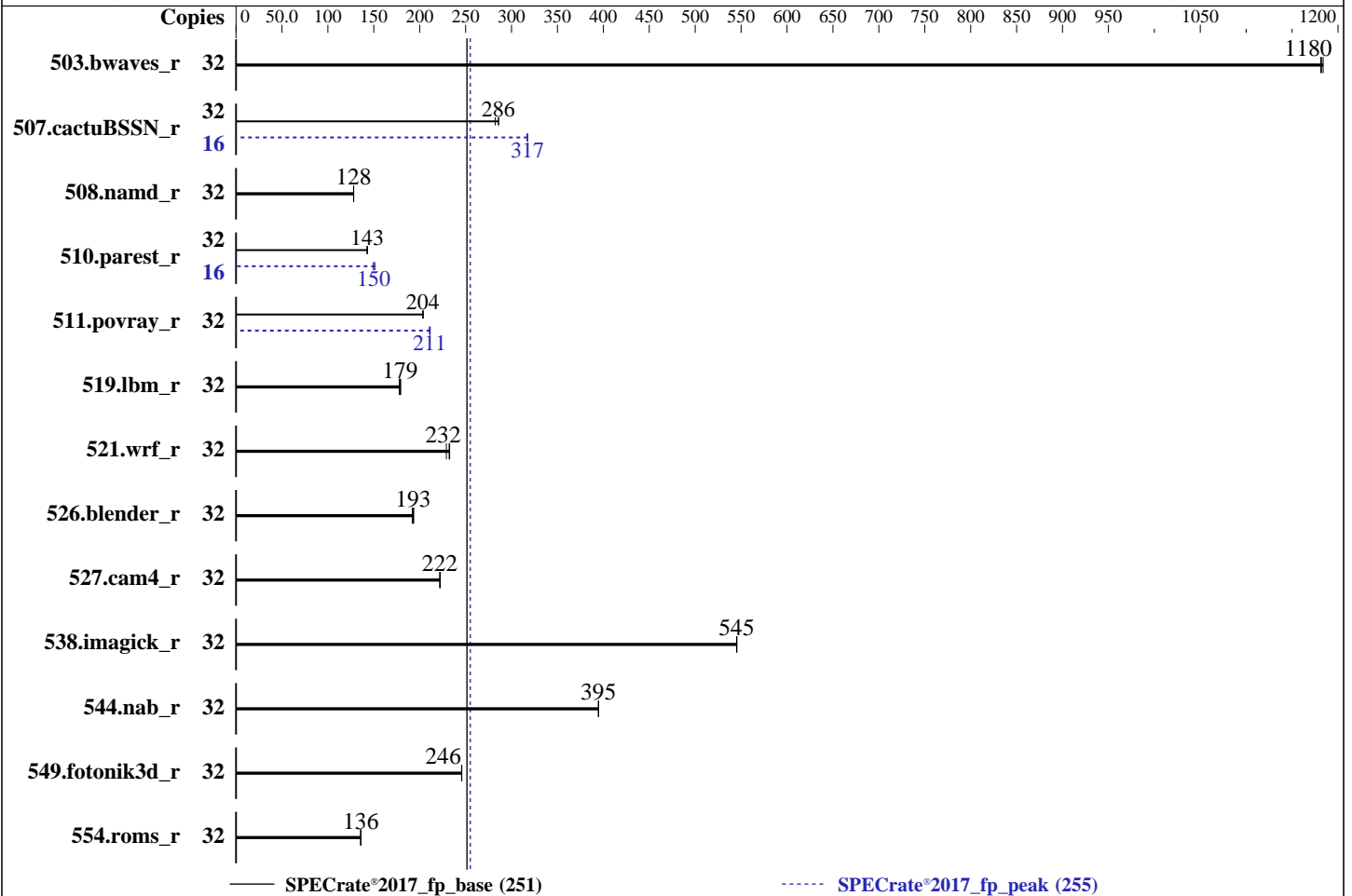SPECrate®2017_fp_peak = 255

CPU2017 License: 3	**Test Date:** Mar-2023
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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	32	272	1180	**271**	**1180**	271	1180	32	272	1180	**271**	**1180**	271	1180
507.cactuBSSN_r	32	142	286	**142**	**286**	144	282	16	63.8	318	**63.8**	**317**	63.9	317
508.namd_r	32	**237**	**128**	237	128	238	128	32	**237**	**128**	237	128	238	128
510.parest_r	32	**586**	**143**	587	143	585	143	16	**279**	**150**	280	150	277	151
511.povray_r	32	367	204	**367**	**204**	367	203	32	353	212	**354**	**211**	355	211
519.lbm_r	32	190	178	188	179	**189**	**179**	32	190	178	188	179	**189**	**179**
521.wrf_r	32	**309**	**232**	313	229	308	233	32	**309**	**232**	313	229	308	233
526.blender_r	32	254	192	**253**	**193**	252	193	32	254	192	**253**	**193**	252	193
527.cam4_r	32	252	222	**252**	**222**	252	222	32	252	222	**252**	**222**	252	222
538.imagick_r	32	146	545	146	545	**146**	**545**	32	146	545	146	545	**146**	**545**
544.nab_r	32	136	395	**136**	**395**	136	395	32	136	395	**136**	**395**	136	395
549.fotonik3d_r	32	**508**	**246**	507	246	508	246	32	**508**	**246**	507	246	508	246
554.roms_r	32	375	136	374	136	**374**	**136**	32	375	136	374	136	**374**	**136**
SPECrate®2017_fp_base =	**251**											
SPECrate®2017_fp_peak =	**255**											

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 5415+ 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 Fri Mar 31 17:37:48 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. sysctl
 16. /sys/kernel/mm/transparent_hugepage
 17. /sys/kernel/mm/transparent_hugepage/khugepaged
 18. OS release
 19. Disk information
 20. /sys/devices/virtual/dmi/id
 21. dmidecode
 22. BIOS
 ------------------------------------------------------------
```

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Standard Performance Evaluation Corporation (info@spec.org)

https://www.spec.org/

Hewlett Packard Enterprise

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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
       17:37:48 up 15 min,  0 users,  load average: 0.07, 0.02, 0.00
      USER     TTY        LOGIN@   IDLE   JCPU   PCPU WHAT

    -----------------------------------------------------------
    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) 4127242
      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) 4127242
      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@notty
     bash -c cd $SPEC/ && $SPEC/SPR_fprate.sh
     runcpu --nobuild --action validate --define default-platform-flags --define numcopies=32 -c
       ic2023.0-lin-sapphirerapids-rate-20221201.cfg --define smt-on --define cores=16 --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=32 --configfile
       ic2023.0-lin-sapphirerapids-rate-20221201.cfg --define smt-on --define cores=16 --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/CPU2017.001/templogs/preenv.fprate.001.0.log --lognum 001.0 --from_runcpu 2
     specperl $SPEC/bin/sysinfo
    $SPEC = /home/cpu2017

    -----------------------------------------------------------
    6. /proc/cpuinfo
        model name     : Intel(R) Xeon(R) Gold 5415+
        vendor_id      : GenuineIntel
        cpu family     : 6
        model          : 143
        stepping       : 8
```

(Continued on next page)

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Hardware Availability: Mar-2023

Software Availability: Mar-2023

Platform Notes (Continued)

```
    microcode       : 0x2b0001b0
    bugs            : spectre_v1 spectre_v2 spec_store_bypass swapgs
    cpu cores       : 8
    siblings        : 16
    2 physical ids (chips)
    32 processors (hardware threads)
    physical id 0: core ids 0-7
    physical id 1: core ids 0-7
    physical id 0: apicids 0-15
    physical id 1: apicids 128-143
  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):                    32
    On-line CPU(s) list:       0-31
    Vendor ID:                 GenuineIntel
    BIOS Vendor ID:            Intel(R) Corporation
    Model name:                Intel(R) Xeon(R) Gold 5415+
    BIOS Model name:           Intel(R) Xeon(R) Gold 5415+
    CPU family:                6
    Model:                     143
    Thread(s) per core:        2
    Core(s) per socket:        8
    Socket(s):                 2
    Stepping:                  8
    BogoMIPS:                  5800.00
    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:                 768 KiB (16 instances)
    L1i cache:                 512 KiB (16 instances)
    L2 cache:                  32 MiB (16 instances)
    L3 cache:                  45 MiB (2 instances)
    NUMA node(s):              2
    NUMA node0 CPU(s):         0-7,16-23
    NUMA node1 CPU(s):         8-15,24-31
    Vulnerability Itlb multihit: Not affected
```

(Continued on next page)

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Platform Notes (Continued)

```
  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     768K   12 Data           1    64    1              64
    L1i      32K     512K    8 Instruction    1    64    1              64
    L2        2M      32M   16 Unified        2  2048    1              64
    L3     22.5M      45M   15 Unified        3 24576    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: 0-7,16-23
  node 0 size: 515768 MB
  node 0 free: 514773 MB
  node 1 cpus: 8-15,24-31
  node 1 size: 516081 MB
  node 1 free: 515478 MB
  node distances:
  node   0   1
    0:  10  20
    1:  20  10


---------------------------------------------------------------
9. /proc/meminfo
   MemTotal:      1056614692 kB


---------------------------------------------------------------
10. who -r
   run-level 3 Mar 31 17:22


---------------------------------------------------------------
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 iscsi iscsi-onboot kdump libstoragemgmt
                    lvm2-monitor mdmonitor microcode multipathd nis-domainname rhsmcertd rpcbind rsyslog
                    selinux-autorelabel-mark sshd sssd sysstat systemd-network-generator udisks2 upower
                    virtqemud
   enabled-runtime  systemd-remount-fs
   disabled         blk-availability brltty canberra-system-bootup canberra-system-shutdown
                    canberra-system-shutdown-reboot chrony-wait console-getty cpupower debug-shell dnsmasq
                    gssproxy httpd httpd@ hwloc-dump-hwdata ipa-custodia iscsid iscsiuio kvm_stat
                    libvirt-guests libvirtd man-db-restart-cache-update ndctl-monitor nfs-blkmap nfs-server
                    nftables nmb numad pmcd pmfind pmie pmie_farm pmlogger pmlogger_farm pmproxy radiusd rdisc
                    rhsm rhsm-facts rpmdb-rebuild saslauthd serial-getty@ smb speech-dispatcherd sshd-keygen@
                    systemd-boot-check-no-failures systemd-nspawn@ systemd-pstore systemd-sysext virtnetworkd
```

(Continued on next page)

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Platform Notes (Continued)

```
                 virtproxyd virtsecretd virtstoraged winbind
  indirect       pcscd sssd-autofs sssd-kcm sssd-nss sssd-pac sssd-pam sssd-ssh sssd-sudo virtlockd
                 virtlogd


  -------------------------------------------------------------
  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. 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                 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                  60
    vm.watermark_boost_factor   15000
    vm.watermark_scale_factor      10
    vm.zone_reclaim_mode            0


  -------------------------------------------------------------
  16. /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


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

```
      ----------------------------------------------------------
      18. 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)

      ----------------------------------------------------------
      19. Disk information
      SPEC is set to: /home/cpu2017
        Filesystem          Type  Size  Used Avail Use% Mounted on
        /dev/mapper/rhel-home xfs   372G  159G  213G  43% /home

      ----------------------------------------------------------
      20. /sys/devices/virtual/dmi/id
          Vendor:        HPE
          Product:       ProLiant ML350 Gen11
          Product Family: ProLiant
          Serial:        CNX20800P4

      ----------------------------------------------------------
      21. 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:
          16x Samsung M321R8GA0BB0-CQKDG 64 GB 2 rank 4800, configured at 4400

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

(Continued on next page)

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Compiler Version Notes (Continued)

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


==============================================================================================================
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
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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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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
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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`

SPEC CPU®2017 Floating Point Rate Result

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Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant ML350 Gen11
(2.90 GHz, Intel Xeon Gold 5415+)

SPECrate®2017_fp_base = 251

SPECrate®2017_fp_peak = 255

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

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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Hewlett Packard Enterprise
(Test Sponsor: HPE)

SPECrate®2017_fp_base = 251

ProLiant ML350 Gen11
(2.90 GHz, Intel Xeon Gold 5415+)

SPECrate®2017_fp_peak = 255

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

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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Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant ML350 Gen11
(2.90 GHz, Intel Xeon Gold 5415+)

SPECrate®2017_fp_base = 251

SPECrate®2017_fp_peak = 255

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

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

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: `basepeak = yes`

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`

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CPU2017 License: 3		**Test Date:**	Mar-2023
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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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