SPEC CPU®2017 Floating Point Speed Result

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Hewlett Packard Enterprise

(Test Sponsor: HPE)

$SPECspeed®2017\_fp\_base = 269$

ProLiant ML350 Gen11
(2.00 GHz, Intel Xeon Gold 5420+)

$SPECspeed®2017\_fp\_peak = 269$

CPU2017 License: 3

Test Sponsor: HPE

Tested by: HPE

Test Date: Apr-2023

Hardware Availability: Mar-2023

Software Availability: Mar-2023

Benchmark	Threads	Result
603.bwaves_s	56	918
607.cactuBSSN_s	56	326
619.lbm_s	56	234
621.wrf_s	56	168
627.cam4_s	56	150 / 150
628.pop2_s	56	76.8
638.imagick_s	56	555
644.nab_s	56	470
649.fotonik3d_s	56	161
654.roms_s	56	344

Threads axis: 0 40.0 80.0 120 160 200 240 280 320 360 400 440 480 520 560 600 640 680 720 760 800 840 880 930

——— **SPECspeed®2017_fp_base (269)**   ------ **SPECspeed®2017_fp_peak (269)**

Hardware

CPU Name: Intel Xeon Gold 5420+

Max MHz: 4100

Nominal: 2000

Enabled: 56 cores, 2 chips

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: 52.5 MB I+D on chip per chip

Other: None

Memory: 512 GB (16 x 32 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: Yes

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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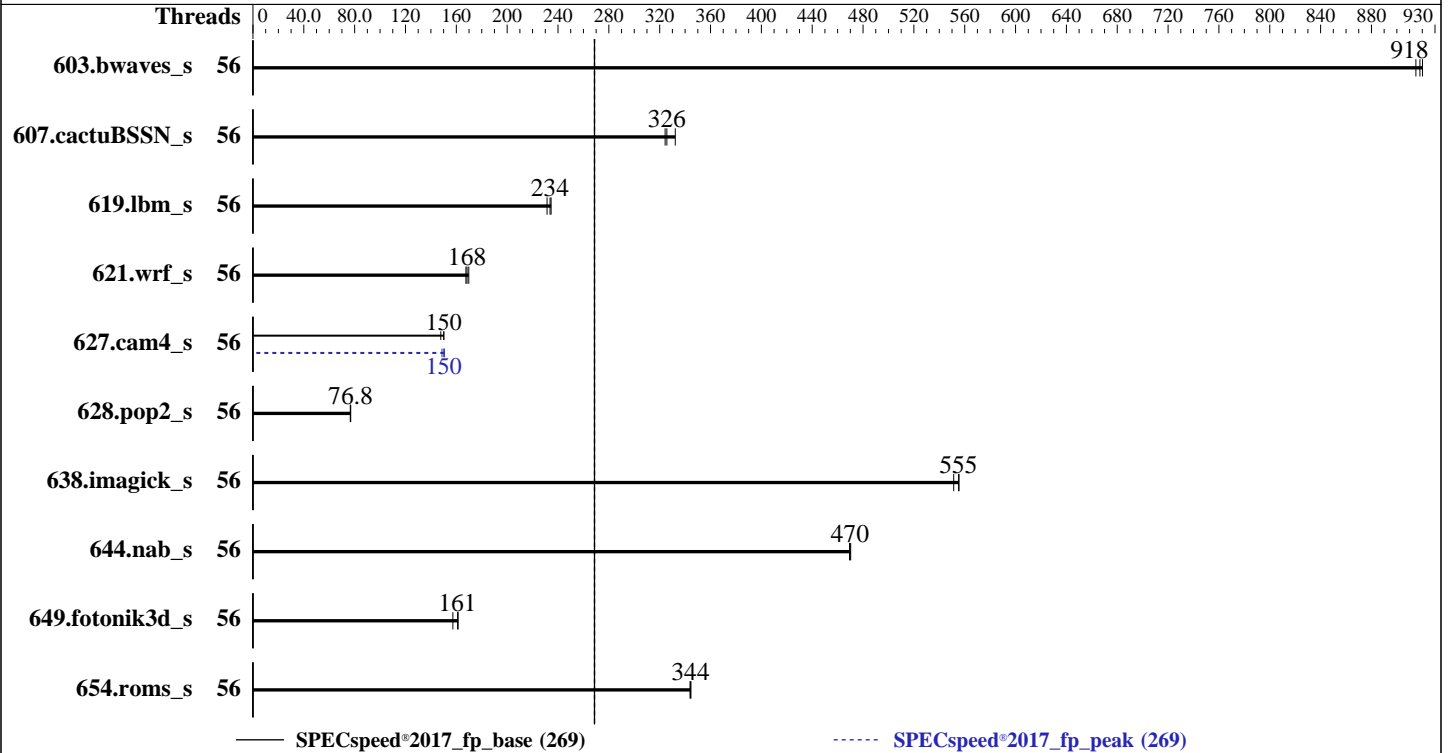SPECspeed®2017_fp_base = 269

SPECspeed®2017_fp_peak = 269

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

Results Table

Benchmark	Base						Peak						
	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
603.bwaves_s	56	**64.3**	**918**	64.1	920	64.5	915	56	**64.3**	**918**	64.1	920	64.5	915
607.cactuBSSN_s	56	50.2	332	51.4	324	**51.2**	**326**	56	50.2	332	51.4	324	**51.2**	**326**
619.lbm_s	56	22.3	235	**22.4**	**234**	22.6	231	56	22.3	235	**22.4**	**234**	22.6	231
621.wrf_s	56	**78.5**	**168**	77.9	170	78.9	168	56	**78.5**	**168**	77.9	170	78.9	168
627.cam4_s	56	**59.0**	**150**	60.0	148	59.0	150	56	**59.0**	**150**	58.9	151	59.6	149
628.pop2_s	56	155	76.6	**155**	**76.8**	154	76.9	56	155	76.6	**155**	**76.8**	154	76.9
638.imagick_s	56	26.2	551	**26.0**	**555**	26.0	556	56	26.2	551	**26.0**	**555**	26.0	556
644.nab_s	56	37.2	469	**37.2**	**470**	37.2	470	56	37.2	469	**37.2**	**470**	37.2	470
649.fotonik3d_s	56	**56.6**	**161**	58.0	157	56.5	161	56	**56.6**	**161**	58.0	157	56.5	161
654.roms_s	56	45.8	344	45.7	345	**45.7**	**344**	56	45.8	344	45.7	345	**45.7**	**344**
SPECspeed®2017_fp_base =		**269**												
SPECspeed®2017_fp_peak =		**269**												

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

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:
KMP_AFFINITY = "granularity=fine,compact"
LD_LIBRARY_PATH = "/home/cpu2017/lib/intel64:/home/cpu2017/je5.0.1-64"
MALLOC_CONF = "retain:true"
OMP_STACKSIZE = "192M"
```

General Notes

```
Binaries compiled on a system with 2x Intel Xeon Platinum 8280M CPU + 384GB RAM
memory using Redhat Enterprise Linux 8.0
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
```

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Platform Notes

```
The system ROM used for this result contains Intel microcode version 0x2b0001b0 for
the Intel Xeon Gold 5420+ processor.
BIOS Configuration:
 Workload Profile set to General Peak Frequency Compute
 Thermal Configuration set to Maximum Cooling
 Intel Hyper-Threading set to Disabled
 Memory Patrol Scrubbing set to Disabled
 Last Level Cache (LLC) Prefetch set to Enabled
 Last Level Cache (LLC) Dead Line Allocation set to Disabled
 Enhanced Processor Performance Profile set to Aggressive
 Dead Block Predictor set to Enabled
 Workload Profile set to Custom
  Intel DMI Link Frequency set to Gen2 Speed
  Adjacent Sector Prefetch set to Disabled
  Minimum Processor Idle Power Package C-State set to No Package State

 Sysinfo program /home/cpu2017/bin/sysinfo
 Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
 running on localhost.localdomain Wed Apr 12 12:15:17 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
 ------------------------------------------------------------


 ------------------------------------------------------------
 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
    12:15:17 up 15 min,  0 users,  load average: 0.08, 0.04, 0.07
   USER     TTY       LOGIN@   IDLE   JCPU   PCPU WHAT

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

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Platform Notes (Continued)

```
  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) 2062839
    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) 2062839
    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_fpspeed.sh
   runcpu --nobuild --action validate --define default-platform-flags -c
     ic2023.0-lin-sapphirerapids-speed-20221201.cfg --define cores=56 --tune base,peak -o all --define
     drop_caches fpspeed
   runcpu --nobuild --action validate --define default-platform-flags --configfile
     ic2023.0-lin-sapphirerapids-speed-20221201.cfg --define cores=56 --tune base,peak --output_format all
     --define drop_caches --nopower --runmode speed --tune base:peak --size refspeed fpspeed --nopreenv
     --note-preenv --logfile $SPEC/tmp/CPU2017.001/templogs/preenv.fpspeed.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 5420+
    vendor_id       : GenuineIntel
    cpu family      : 6
    model           : 143
    stepping        : 7
    microcode       : 0x2b0001b0
    bugs            : spectre_v1 spectre_v2 spec_store_bypass swapgs
    cpu cores       : 28
    siblings        : 28
    2 physical ids (chips)
    56 processors (hardware threads)
    physical id 0: core ids 0-27
    physical id 1: core ids 0-27
    physical id 0: apicids 0,2,4,6,8,10,12,14,16,18,20,22,24,26,28,30,32,34,36,38,40,42,44,46,48,50,52,54
    physical id 1: apicids
    128,130,132,134,136,138,140,142,144,146,148,150,152,154,156,158,160,162,164,166,168,170,172,174,176,178,1
    80,182
```

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Platform Notes (Continued)

```
   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):                      56
  On-line CPU(s) list:         0-55
  Vendor ID:                   GenuineIntel
  BIOS Vendor ID:              Intel(R) Corporation
  Model name:                  Intel(R) Xeon(R) Gold 5420+
  BIOS Model name:             Intel(R) Xeon(R) Gold 5420+
  CPU family:                  6
  Model:                       143
  Thread(s) per core:          1
  Core(s) per socket:          28
  Socket(s):                   2
  Stepping:                    7
  BogoMIPS:                    4000.00
  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:                   2.6 MiB (56 instances)
  L1i cache:                   1.8 MiB (56 instances)
  L2 cache:                    112 MiB (56 instances)
  L3 cache:                    105 MiB (2 instances)
  NUMA node(s):                2
  NUMA node0 CPU(s):           0-13,28-41
  NUMA node1 CPU(s):           14-27,42-55
  Vulnerability Itlb multihit: Not affected
  Vulnerability L1tf:          Not affected
  Vulnerability Mds:           Not affected
  Vulnerability Meltdown:      Not affected
  Vulnerability Spec store bypass: Mitigation; Speculative Store Bypass disabled via prctl
  Vulnerability Spectre v1:    Mitigation; usercopy/swapgs barriers and __user pointer sanitization
  Vulnerability Spectre v2:    Mitigation; Enhanced IBRS, IBPB conditional, RSB filling
  Vulnerability Srbds:         Not affected
  Vulnerability Tsx async abort:  Not affected

  From lscpu --cache:
```

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Platform Notes (Continued)

```
        NAME ONE-SIZE ALL-SIZE WAYS TYPE        LEVEL  SETS PHY-LINE COHERENCY-SIZE
        L1d      48K     2.6M   12 Data             1    64        1             64
        L1i      32K     1.8M    8 Instruction      1    64        1             64
        L2        2M     112M   16 Unified          2  2048        1             64
        L3     52.5M     105M   15 Unified          3 57344        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: 0-13,28-41
     node 0 size: 257754 MB
     node 0 free: 256936 MB
     node 1 cpus: 14-27,42-55
     node 1 size: 257994 MB
     node 1 free: 257048 MB
     node distances:
     node   0   1
       0:  10  20
       1:  20  10


   -------------------------------------------------------------
   9. /proc/meminfo
     MemTotal:      528127604 kB


   -------------------------------------------------------------
   10. who -r
     run-level 3 Apr 12 12:00


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

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Platform Notes (Continued)

```
   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


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

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Platform Notes (Continued)

```
  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:
     3x Hynix HMCG88AEBRA168N 32 GB 2 rank 4800, configured at 4400
     9x Hynix HMCG88MEBRA113N 32 GB 2 rank 4800, configured at 4400
     4x Hynix HMCG88MEBRA115N 32 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               | 619.lbm_s(base, peak) 638.imagick_s(base, peak) 644.nab_s(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, Fortran | 607.cactuBSSN_s(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
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
------------------------------------------------------------------------------


==============================================================================
Fortran         | 603.bwaves_s(base, peak) 649.fotonik3d_s(base, peak) 654.roms_s(base, peak)
------------------------------------------------------------------------------
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 Speed Result

Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant ML350 Gen11
(2.00 GHz, Intel Xeon Gold 5420+)

SPECspeed®2017_fp_base = 269

SPECspeed®2017_fp_peak = 269

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

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

Compiler Version Notes (Continued)

```
Fortran, C    | 621.wrf_s(base, peak) 627.cam4_s(base, peak) 628.pop2_s(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`

Fortran benchmarks:
`ifx`

Benchmarks using both Fortran and C:
`ifx icx`

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

Base Portability Flags

603.bwaves_s: `-DSPEC_LP64`
607.cactuBSSN_s: `-DSPEC_LP64`
619.lbm_s: `-DSPEC_LP64`
621.wrf_s: `-DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian`
627.cam4_s: `-DSPEC_LP64 -DSPEC_CASE_FLAG`
628.pop2_s: `-DSPEC_LP64 -DSPEC_CASE_FLAG -convert big_endian`
`-assume byterecl`
638.imagick_s: `-DSPEC_LP64`
644.nab_s: `-DSPEC_LP64`
649.fotonik3d_s: `-DSPEC_LP64`
654.roms_s: `-DSPEC_LP64`

Base Optimization Flags

C benchmarks:
`-m64 -std=c11 -Wl,-z,muldefs -xsapphirerapids -Ofast -ffast-math`
`-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -fiopenmp`
`-DSPEC_OPENMP -Wno-implicit-int -mprefer-vector-width=512`
`-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc`

(Continued on next page)

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Base Optimization Flags (Continued)

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

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

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

Peak Compiler Invocation

C benchmarks:
```
icx
```

Fortran benchmarks:
```
ifx
```

Benchmarks using both Fortran and C:
```
ifx icx
```

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

Peak Portability Flags

```
Same as Base Portability Flags
```

SPEC CPU®2017 Floating Point Speed Result

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Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant ML350 Gen11
(2.00 GHz, Intel Xeon Gold 5420+)

SPECspeed®2017_fp_base = 269

SPECspeed®2017_fp_peak = 269

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

Peak Optimization Flags

C benchmarks:

619.lbm_s: basepeak = yes

638.imagick_s: basepeak = yes

644.nab_s: basepeak = yes

Fortran benchmarks:

603.bwaves_s: basepeak = yes

649.fotonik3d_s: basepeak = yes

654.roms_s: basepeak = yes

Benchmarks using both Fortran and C:

621.wrf_s: basepeak = yes

627.cam4_s: -m64 -std=c11 -Wl,-z,muldefs -xsapphirerapids -Ofast
-ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -fiopenmp -DSPEC_OPENMP
-Wno-implicit-int -mprefer-vector-width=512
-nostandard-realloc-lhs -align array32byte -auto
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc

628.pop2_s: basepeak = yes

Benchmarks using Fortran, C, and C++:

607.cactuBSSN_s: basepeak = yes

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

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$SPECspeed®2017\_fp\_base = 269$

$SPECspeed®2017\_fp\_peak = 269$

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

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