



# SPEC CPU®2017 Floating Point Rate Result

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## Hewlett Packard Enterprise

(Test Sponsor: HPE)

### ProLiant DL110 Gen11

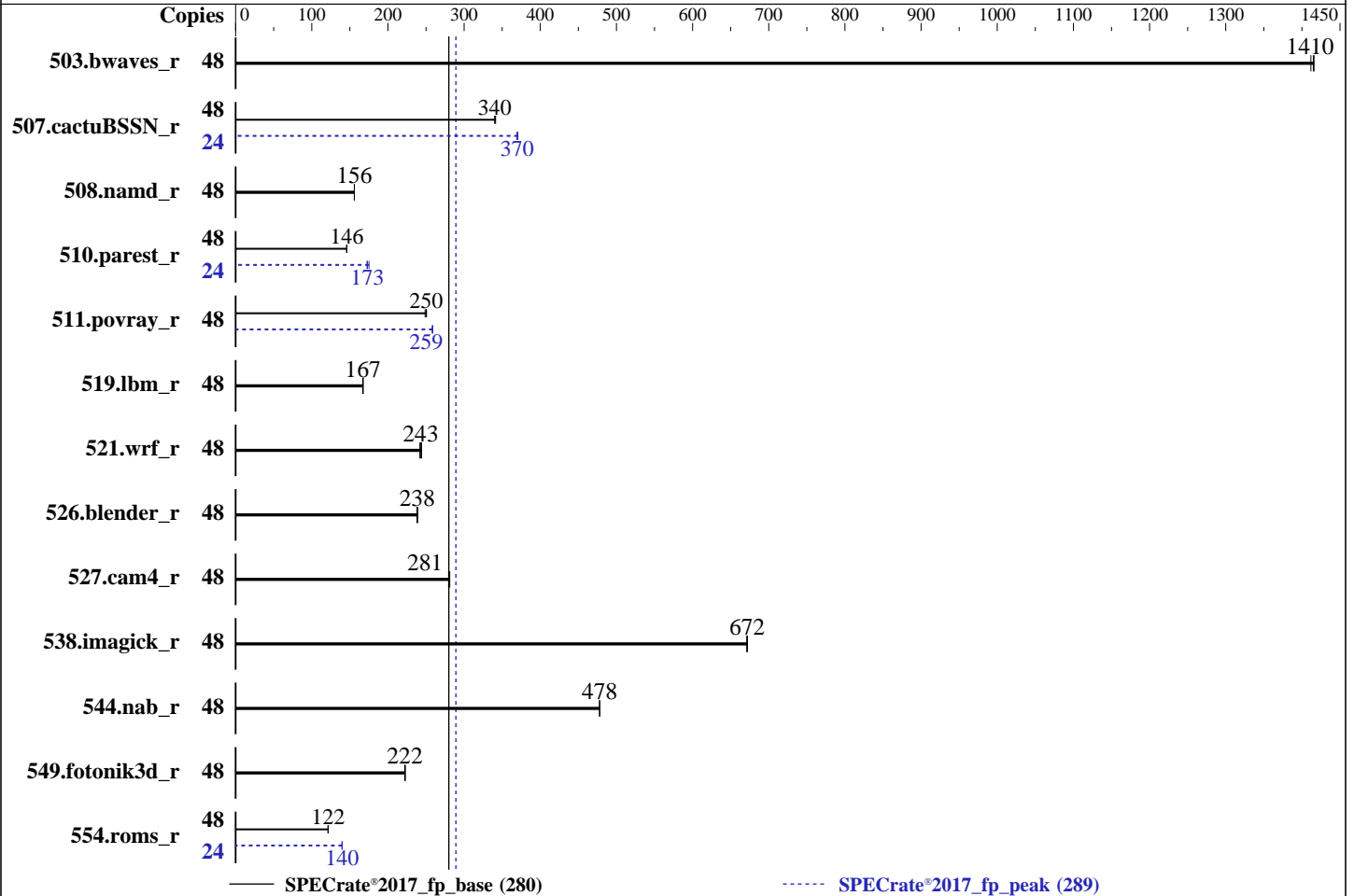
(2.10 GHz, Intel Xeon Gold 5412U)

## SPECrate®2017\_fp\_base = 280

## SPECrate®2017\_fp\_peak = 289

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

**Test Date:** Sep-2023  
**Hardware Availability:** Oct-2023  
**Software Availability:** Dec-2022



### Hardware

CPU Name: Intel Xeon Gold 5412U  
 Max MHz: 3900  
 Nominal: 2100  
 Enabled: 24 cores, 1 chip, 2 threads/core  
 Orderable: 1 Chip  
 Cache L1: 32 KB I + 48 KB D on chip per core  
 L2: 2 MB I+D on chip per core  
 L3: 45 MB I+D on chip per chip  
 Other: None  
 Memory: 256 GB (8 x 32 GB 2Rx8 PC5-4800B-R, running at 4400)  
 Storage: 1 x 480 GB Embedded SATA M.2 drive  
 Other: None

### Software

OS: Red Hat Enterprise Linux 9.0 (Plow)  
 Kernel 5.14.0-70.13.1.el9\_0.x86\_64  
 Compiler: C/C++: Version 2023.0 of Intel oneAPI DPC++/C++ Compiler for Linux;  
 Fortran: Version 2023.0 of Intel Fortran Compiler for Linux;  
 Parallel: No  
 Firmware: HPE BIOS Version v1.50 (07/12/2023) released Jul-2023  
 File System: xfs  
 System State: Run level 3 (multi-user)  
 Base Pointers: 64-bit  
 Peak Pointers: 64-bit  
 Other: jemalloc memory allocator V5.0.1  
 Power Management: BIOS and OS set to prefer performance at the cost of additional power usage



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## Results Table

| Benchmark       | Base   |            |            |            |            |            |             | Peak   |             |            |            |            |            |             |
|-----------------|--------|------------|------------|------------|------------|------------|-------------|--------|-------------|------------|------------|------------|------------|-------------|
|                 | Copies | Seconds    | Ratio      | Seconds    | Ratio      | Seconds    | Ratio       | Copies | Seconds     | Ratio      | Seconds    | Ratio      | Seconds    | Ratio       |
| 503.bwaves_r    | 48     | 341        | 1410       | 340        | 1420       | <b>340</b> | <b>1410</b> | 48     | 341         | 1410       | 340        | 1420       | <b>340</b> | <b>1410</b> |
| 507.cactuBSSN_r | 48     | 179        | 340        | 178        | 341        | <b>179</b> | <b>340</b>  | 24     | <b>82.2</b> | <b>370</b> | 82.0       | 371        | 82.2       | 370         |
| 508.namd_r      | 48     | <b>293</b> | <b>156</b> | 292        | 156        | 293        | 156         | 48     | <b>293</b>  | <b>156</b> | 292        | 156        | 293        | 156         |
| 510.parest_r    | 48     | 860        | 146        | <b>860</b> | <b>146</b> | 861        | 146         | 24     | 359         | 175        | 364        | 173        | <b>363</b> | <b>173</b>  |
| 511.povray_r    | 48     | 447        | 251        | 451        | 249        | <b>448</b> | <b>250</b>  | 48     | 433         | 259        | 434        | 258        | <b>433</b> | <b>259</b>  |
| 519.lbm_r       | 48     | <b>303</b> | <b>167</b> | 302        | 167        | 303        | 167         | 48     | <b>303</b>  | <b>167</b> | 302        | 167        | 303        | 167         |
| 521.wrf_r       | 48     | 440        | 244        | 444        | 242        | <b>442</b> | <b>243</b>  | 48     | 440         | 244        | 444        | 242        | <b>442</b> | <b>243</b>  |
| 526.blender_r   | 48     | <b>307</b> | <b>238</b> | 307        | 238        | 306        | 239         | 48     | <b>307</b>  | <b>238</b> | 307        | 238        | 306        | 239         |
| 527.cam4_r      | 48     | <b>299</b> | <b>281</b> | 300        | 280        | 299        | 281         | 48     | <b>299</b>  | <b>281</b> | 300        | 280        | 299        | 281         |
| 538.imagick_r   | 48     | <b>178</b> | <b>672</b> | 178        | 671        | 178        | 672         | 48     | <b>178</b>  | <b>672</b> | 178        | 671        | 178        | 672         |
| 544.nab_r       | 48     | 169        | 478        | <b>169</b> | <b>478</b> | 169        | 478         | 48     | 169         | 478        | <b>169</b> | <b>478</b> | 169        | 478         |
| 549.fotonik3d_r | 48     | 840        | 223        | <b>841</b> | <b>222</b> | 842        | 222         | 48     | 840         | 223        | <b>841</b> | <b>222</b> | 842        | 222         |
| 554.roms_r      | 48     | 627        | 122        | <b>627</b> | <b>122</b> | 629        | 121         | 24     | 273         | 140        | 273        | 140        | <b>273</b> | <b>140</b>  |

SPECrate®2017\_fp\_base = **280**

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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"  
MALLOCONF = "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 0x2b0004b1 for the Intel Xeon Gold 5412U processor.

BIOS Configuration:

Workload Profile set to General Throughput Compute

Thermal Configuration set to Maximum Cooling

Enhanced Processor Performance Profile set to Aggressive

Last Level Cache (LLC) Dead Line Allocation set to Disabled

Memory Patrol Scrubbing set to Disabled

Workload Profile set to Custom

DCU Stream Prefetcher set to Disabled

Adjacent Sector Prefetch set to Disabled

Minimum Processor Idle Power Package C-State set to Package C6 (non-retention) State

Sysinfo program /home/cpu2017/bin/sysinfo

Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197

running on localhost.localdomain Wed Sep 27 13:55:38 2023

SUT (System Under Test) info as seen by some common utilities.

-----  
Table of contents  
-----

1. uname -a
2. w
3. Username
4. ulimit -a
5. sysinfo process ancestry
6. /proc/cpuinfo
7. lscpu
8. numactl --hardware
9. /proc/meminfo
10. who -r
11. Systemd service manager version: systemd 250 (250-6.el9\_0)
12. Services, from systemctl list-unit-files
13. Linux kernel boot-time arguments, from /proc/cmdline
14. cpupower frequency-info
15. tuned-adm active
16. sysctl
17. /sys/kernel/mm/transparent\_hugepage
18. /sys/kernel/mm/transparent\_hugepage/khugepaged
19. OS release
20. Disk information
21. /sys/devices/virtual/dmi/id
22. dmidecode
23. BIOS

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## Platform Notes (Continued)

```

1. uname -a
Linux localhost.localdomain 5.14.0-70.13.1.el9_0.x86_64 #1 SMP PREEMPT Thu Apr 14 12:42:38 EDT 2022 x86_64
x86_64 x86_64 GNU/Linux

```

```

2. w
13:55:38 up 2 min, 0 users, load average: 0.02, 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) 1029811
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) 1029811
virtual memory              (kbytes, -v) unlimited
file locks                  (-x) unlimited

```

```

5. sysinfo process ancestry
/usr/lib/systemd/systemd --switched-root --system --deserialize 18
sshd: /usr/sbin/sshd -D [listener] 0 of 10-100 startups
sshd: root [priv]
sshd: root@notty
bash -c cd $SPEC/ && $SPEC/fprate.sh
runcpu --nobuild --action validate --define default-platform-flags --define numcopies=48 -c
ic2023.0-lin-sapphirerapids-rate-20221201.cfg --define smt-on --define cores=24 --define physicalfirst
--define no- numa --tune base,peak -o all --define drop_caches fprate
runcpu --nobuild --action validate --define default-platform-flags --define numcopies=48 --configfile
ic2023.0-lin-sapphirerapids-rate-20221201.cfg --define smt-on --define cores=24 --define physicalfirst
--define no- numa --tune base,peak --output_format all --define drop_caches --nopower --runmode rate --tune
base:peak --size refrate fprate --nopreenv --note-preenv --logfile
$SPEC/tmp/CPU2017.002/templogs/preenv.fprate.002.0.log --lognum 002.0 --from_runcpu 2
specperl $SPEC/bin/sysinfo
$SPEC = /home/cpu2017

```

```

6. /proc/cpuinfo
model name      : Intel(R) Xeon(R) Gold 5412U
vendor_id      : GenuineIntel
cpu family     : 6
model          : 143

```

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## Platform Notes (Continued)

```
stepping      : 7
microcode     : 0x2b0004b1
bugs          : spectre_v1 spectre_v2 spec_store_bypass swapgs
cpu cores     : 24
siblings      : 48
1 physical ids (chips)
48 processors (hardware threads)
physical id 0: core ids 0-23
physical id 0: apicids 0-47
```

Caution: /proc/cpuinfo data regarding chips, cores, and threads is not necessarily reliable, especially for virtualized systems. Use the above data carefully.

### 7. lscpu

From lscpu from util-linux 2.37.4:

```
Architecture:          x86_64
CPU op-mode(s):        32-bit, 64-bit
Address sizes:         46 bits physical, 57 bits virtual
Byte Order:            Little Endian
CPU(s):                48
On-line CPU(s) list:   0-47
Vendor ID:             GenuineIntel
BIOS Vendor ID:       Intel(R) Corporation
Model name:            Intel(R) Xeon(R) Gold 5412U
BIOS Model name:      Intel(R) Xeon(R) Gold 5412U
CPU family:            6
Model:                 143
Thread(s) per core:    2
Core(s) per socket:    24
Socket(s):              1
Stepping:              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 avx512_fp16 amx_tile flush_lld arch_capabilities

Virtualization:        VT-x
L1d cache:             1.1 MiB (24 instances)
L1i cache:             768 KiB (24 instances)
L2 cache:              48 MiB (24 instances)
L3 cache:              45 MiB (1 instance)
NUMA node(s):          1
NUMA node0 CPU(s):    0-47
Vulnerability Itlb multihit: Not affected
Vulnerability L1tf:    Not affected
Vulnerability Mds:     Not affected
```

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## Platform Notes (Continued)

Vulnerability Meltdown: Not affected  
Vulnerability Spec store bypass: Mitigation; Speculative Store Bypass disabled via prctl  
Vulnerability Spectre v1: Mitigation; usercopy/swaps barriers and \_\_user pointer sanitization  
Vulnerability Spectre v2: Mitigation; Enhanced IBRS, IBPB conditional, RSB filling  
Vulnerability Srbds: Not affected  
Vulnerability Tsx async abort: Not affected

From lscpu --cache:

| NAME | ONE-SIZE | ALL-SIZE | WAYS | TYPE        | LEVEL | SETS  | PHY-LINE | COHERENCY-SIZE |
|------|----------|----------|------|-------------|-------|-------|----------|----------------|
| L1d  | 48K      | 1.1M     | 12   | Data        | 1     | 64    | 1        | 64             |
| L1i  | 32K      | 768K     | 8    | Instruction | 1     | 64    | 1        | 64             |
| L2   | 2M       | 48M      | 16   | Unified     | 2     | 2048  | 1        | 64             |
| L3   | 45M      | 45M      | 15   | Unified     | 3     | 49152 | 1        | 64             |

8. numactl --hardware

NOTE: a numactl 'node' might or might not correspond to a physical chip.

available: 1 nodes (0)  
node 0 cpus: 0-47  
node 0 size: 257492 MB  
node 0 free: 256434 MB  
node distances:  
node 0  
0: 10

9. /proc/meminfo

MemTotal: 263672508 kB

10. who -r

run-level 3 Sep 27 13:53

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<br>dbus-broker firewalld getty@ irqbalance kdump lvm2-monitor mdmonitor microcode<br>nis-domainname rhsmcertd rsyslog selinux-autorelabel-mark sshd sssd<br>systemd-network-generator tuned udisks2  |
| enabled-runtime | systemd-remount-fs  |
| disabled        | blk-availability chrony-wait console-getty cpupower debug-shell hwloc-dump-hwdata kvm_stat<br>man-db-restart-cache-update nftables powertop rdisc rhsm rhsm-facts rpmdb-rebuild<br>serial-getty@ sshd-keygen@ systemd-boot-check-no-failures systemd-pstore systemd-sysext<br>indirect sssd-autofs sssd-kcm sssd-nss sssd-pac sssd-pam sssd-ssh sssd-sudo |

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

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## Platform Notes (Continued)

```

-----
14. cpupower frequency-info
   analyzing CPU 0:
     Unable to determine current policy
   boost state support:
     Supported: yes
     Active: yes
-----

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

16. sysctl
   kernel.numa_balancing          0
   kernel.randomize_va_space     2
   vm.compaction_proactiveness    20
   vm.dirty_background_bytes     0
   vm.dirty_background_ratio     10
   vm.dirty_bytes                 0
   vm.dirty_expire_centisecs     3000
   vm.dirty_ratio                 40
   vm.dirty_writeback_centisecs  500
   vm.dirtytime_expire_seconds   43200
   vm.extfrag_threshold           500
   vm.min_unmapped_ratio         1
   vm.nr_hugepages                0
   vm.nr_hugepages_mempolicy     0
   vm.nr_overcommit_hugepages    0
   vm.swappiness                  10
   vm.watermark_boost_factor     15000
   vm.watermark_scale_factor     10
   vm.zone_reclaim_mode          0
-----

17. /sys/kernel/mm/transparent_hugepage
   defrag          always defer defer+madvice [madvice] never
   enabled         [always] madvice never
   hpage_pmd_size 2097152
   shmem_enabled  always within_size advise [never] deny force
-----

18. /sys/kernel/mm/transparent_hugepage/khugepaged
   alloc_sleep_millisecs  60000
   defrag                  1
   max_ptes_none          511
   max_ptes_shared        256
   max_ptes_swap          64
   pages_to_scan          4096
   scan_sleep_millisecs   10000
-----

19. OS release
   From /etc/*-release /etc/*-version
   os-release      Red Hat Enterprise Linux 9.0 (Plow)
   redhat-release  Red Hat Enterprise Linux release 9.0 (Plow)
   system-release  Red Hat Enterprise Linux release 9.0 (Plow)
-----

20. Disk information

```

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## Platform Notes (Continued)

SPEC is set to: /home/cpu2017

| Filesystem            | Type | Size | Used | Avail | Use% | Mounted on |
|-----------------------|------|------|------|-------|------|------------|
| /dev/mapper/rhel-home | xfs  | 372G | 89G  | 283G  | 24%  | /home      |

-----  
21. /sys/devices/virtual/dmi/id

```
Vendor:      HPE
Product:    ProLiant DL110 Gen11
Product Family: ProLiant
Serial:     7CE244P9LL
```

-----  
22. dmidecode

Additional information from dmidecode 3.3 follows. WARNING: Use caution when you interpret this section. The 'dmidecode' program reads system data which is "intended to allow hardware to be accurately determined", but the intent may not be met, as there are frequent changes to hardware, firmware, and the "DMTF SMBIOS" standard.

Memory:

```
7x Hynix HMC88MEBRA113N 32 GB 2 rank 4800, configured at 4400
1x Hynix HMC88MEBRA115N 32 GB 2 rank 4800, configured at 4400
```

-----  
23. BIOS

(This section combines info from /sys/devices and dmidecode.)

```
BIOS Vendor:    HPE
BIOS Version:   1.50
BIOS Date:     07/12/2023
BIOS Revision: 1.50
Firmware Revision: 1.50
```

## 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)
=====
```

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# SPEC CPU®2017 Floating Point Rate Result

Copyright 2017-2023 Standard Performance Evaluation Corporation

**Hewlett Packard Enterprise**

(Test Sponsor: HPE)

**ProLiant DL110 Gen11**

(2.10 GHz, Intel Xeon Gold 5412U)

**SPECrate®2017\_fp\_base = 280**

**SPECrate®2017\_fp\_peak = 289**

**CPU2017 License:** 3

**Test Sponsor:** HPE

**Tested by:** HPE

**Test Date:** Sep-2023

**Hardware Availability:** Oct-2023

**Software Availability:** Dec-2022

## Compiler Version Notes (Continued)

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 | 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

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## Base Portability Flags (Continued)

```

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
-ljemalloc -L/usr/local/jemalloc64-5.0.1/lib

```

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## Base Optimization Flags (Continued)

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

538.imagick\_r: basepeak = yes

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## Peak Optimization Flags (Continued)

544.nab\_r: basepeak = yes

C++ benchmarks:

508.namd\_r: basepeak = yes

```
510.parest_r: -w -std=c++14 -m64 -Wl,-z,muldefs -xsapphirerapids
-Ofast -ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -mprefer-vector-width=512
-ljemalloc -L/usr/local/jemalloc64-5.0.1/lib
```

Fortran benchmarks:

503.bwaves\_r: basepeak = yes

549.fotonik3d\_r: basepeak = yes

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

Benchmarks using both Fortran and C:

521.wrf\_r: basepeak = yes

527.cam4\_r: basepeak = yes

Benchmarks using both C and C++:

```
511.povray_r: -w -std=c++14 -m64 -std=c11 -Wl,-z,muldefs
-fprofile-generate(pass 1)
-fprofile-use=default.profddata(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
```

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**Software Availability:** Dec-2022

## Peak Optimization Flags (Continued)

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

`-L/usr/local/jemalloc64-5.0.1/lib`

The flags files that were used to format this result can be browsed at

<http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-SPR-rev2.4.html>

[http://www.spec.org/cpu2017/flags/Intel-ic2023-official-linux64\\_revB.2023-10-11.html](http://www.spec.org/cpu2017/flags/Intel-ic2023-official-linux64_revB.2023-10-11.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-rev2.4.xml>

[http://www.spec.org/cpu2017/flags/Intel-ic2023-official-linux64\\_revB.2023-10-11.xml](http://www.spec.org/cpu2017/flags/Intel-ic2023-official-linux64_revB.2023-10-11.xml)

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