



SPEC CPU®2017 Floating Point Rate Result

Copyright 2017-2023 Standard Performance Evaluation Corporation

Hewlett Packard Enterprise

(Test Sponsor: HPE)

ProLiant ML110 Gen11

(2.00 GHz, Intel Xeon Silver 4416+)

SPECrate®2017_fp_base = 234

SPECrate®2017_fp_peak = 241

CPU2017 License: 3

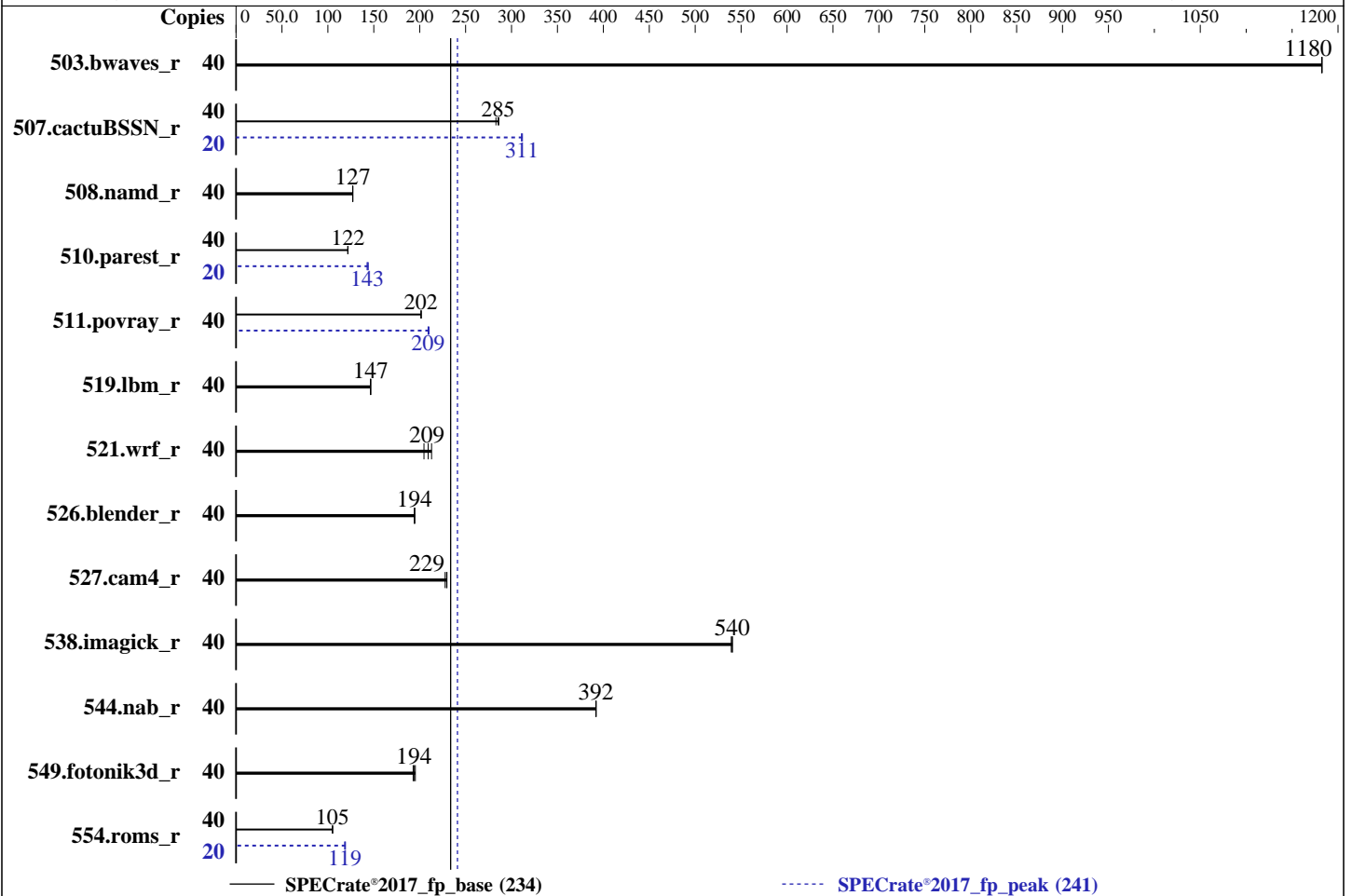
Test Sponsor: HPE

Tested by: HPE

Test Date: Apr-2023

Hardware Availability: May-2023

Software Availability: Dec-2022



Hardware

CPU Name: Intel Xeon Silver 4416+
 Max MHz: 3900
 Nominal: 2000
 Enabled: 20 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: 37.5 MB I+D on chip per chip
 Other: None
 Memory: 256 GB (8 x 32 GB 2Rx8 PC5-4800B-R, running at 4000)
 Storage: 1 x 240 GB SATA SSD
 Other: None

Software

OS: Red Hat Enterprise Linux 9.0 (Plow)
 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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Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
503.bwaves_r	40	339	1180	339	1180	339	1180	40	339	1180	339	1180	339	1180
507.cactuBSSN_r	40	179	283	177	285	177	286	20	81.5	311	81.4	311	81.2	312
508.namd_r	40	299	127	299	127	299	127	40	299	127	299	127	299	127
510.parest_r	40	859	122	859	122	859	122	20	366	143	366	143	363	144
511.povray_r	40	464	201	463	202	463	202	40	447	209	444	210	446	209
519.lbm_r	40	288	146	288	147	287	147	40	288	146	288	147	287	147
521.wrf_r	40	428	209	438	205	421	213	40	428	209	438	205	421	213
526.blender_r	40	313	195	314	194	314	194	40	313	195	314	194	314	194
527.cam4_r	40	307	228	305	229	305	230	40	307	228	305	229	305	230
538.imagick_r	40	184	539	184	541	184	540	40	184	539	184	541	184	540
544.nab_r	40	172	392	172	392	172	392	40	172	392	172	392	172	392
549.fotonik3d_r	40	798	195	808	193	804	194	40	798	195	808	193	804	194
554.roms_r	40	606	105	605	105	604	105	20	268	119	268	118	267	119

SPECrate®2017_fp_base = **234**

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

Submit Notes

The taskset mechanism was used to bind copies to processors. The config file option 'submit' was used to generate taskset 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
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"
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

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General Notes (Continued)

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 Silver 4416+ processor.

BIOS Configuration:

Workload Profile set to General Throughput Compute
Memory Patrol Scrubbing set to Disabled
Workload Profile set to Custom
Minimum Processor Idle Power Package C-State set to Package C6 (non-retention) State
DCU Stream Prefetcher set to Disabled
Adjacent Sector Prefetch set to Disabled
Last Level Cache (LLC) Dead Line Allocation set to Disabled
Enhanced Processor Performance Profile set to Aggressive
Thermal Configuration set to Maximum Cooling

Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
running on localhost.localdomain Thu Apr 20 02:04:45 2023

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

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 10. who -r
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 12. Services, from systemctl list-unit-files
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-

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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
 02:04:45 up 2 min, 0 users, load average: 0.10, 0.04, 0.01
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) 1029895
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) 1029895
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/fprate.sh
runcpu --nobuild --action validate --define default-platform-flags --define numcopies=40 -c
ic2023.0-lin-sapphirerapids-rate-20221201.cfg --define smt-on --define cores=20 --define physicalfirst
--define no-numa --tune base,peak -o all --define drop_caches fprate
runcpu --nobuild --action validate --define default-platform-flags --define numcopies=40 --configfile
ic2023.0-lin-sapphirerapids-rate-20221201.cfg --define smt-on --define cores=20 --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) Silver 4416+
vendor_id : GenuineIntel
cpu family : 6
model : 143
stepping : 8
microcode : 0x2b0001b0

```

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## Platform Notes (Continued)

```
bugs : spectre_v1 spectre_v2 spec_store_bypass swappg
cpu cores : 20
siblings : 40
1 physical ids (chips)
40 processors (hardware threads)
physical id 0: core ids 0-19
physical id 0: apicids 0-39
```

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): 40
On-line CPU(s) list: 0-39
Vendor ID: GenuineIntel
BIOS Vendor ID: Intel(R) Corporation
Model name: Intel(R) Xeon(R) Silver 4416+
BIOS Model name: Intel(R) Xeon(R) Silver 4416+
CPU family: 6
Model: 143
Thread(s) per core: 2
Core(s) per socket: 20
Socket(s): 1
Stepping: 8
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_lld arch_capabilities

Virtualization: VT-x
L1d cache: 960 KiB (20 instances)
L1i cache: 640 KiB (20 instances)
L2 cache: 40 MiB (20 instances)
L3 cache: 37.5 MiB (1 instance)
NUMA node(s): 1
NUMA node0 CPU(s): 0-39
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
```

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## Platform Notes (Continued)

|                                |                                                                     |
|--------------------------------|---------------------------------------------------------------------|
| 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      | 960K     | 12   | Data        | 1     | 64    | 1        | 64             |
| L1i  | 32K      | 640K     | 8    | Instruction | 1     | 64    | 1        | 64             |
| L2   | 2M       | 40M      | 16   | Unified     | 2     | 2048  | 1        | 64             |
| L3   | 37.5M    | 37.5M    | 15   | Unified     | 3     | 40960 | 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: 0-39
node 0 size: 257513 MB
node 0 free: 256640 MB
node distances:
node 0
0: 10

```

9. /proc/meminfo

MemTotal: 263693988 kB

10. who -r

run-level 3 Apr 20 02:02

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 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-sysex                                      |
| 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/rhel00-root
ro
resume=/dev/mapper/rhel00-swap
rd.lvm.lv=rhel00/root
rd.lvm.lv=rhel00/swap

```

14. cpupower frequency-info

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## Platform Notes (Continued)

```

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
SPEC is set to: /home/cpu2017
 Filesystem Type Size Used Avail Use% Mounted on

```

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## Platform Notes (Continued)

/dev/mapper/rhel00-home xfs 148G 58G 91G 39% /home

-----  
21. /sys/devices/virtual/dmi/id  
Vendor: HPE  
Product: ProLiant ML110 Gen11  
Product Family: ProLiant  
Serial: CNX2230TMQ  
-----

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:  
8x Hynix HMC88MEBRA113N 32 GB 2 rank 4800, configured at 4000  
-----

23. 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: 1.10  
-----

## Compiler Version Notes

=====  
C | 519.lbm\_r(base, peak) 538.imagick\_r(base, peak) 544.nab\_r(base, peak)  
-----

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201  
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.  
-----

=====  
C++ | 508.namd\_r(base, peak) 510.parest\_r(base, peak)  
-----

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201  
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.  
-----

=====  
C++, C | 511.povray\_r(base, peak) 526.blender\_r(base, peak)  
-----

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201  
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.  
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201  
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.  
-----

=====  
C++, C, Fortran | 507.cactuBSSN\_r(base, peak)  
-----

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201  
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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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## Compiler Version Notes (Continued)

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  
508.namd\_r: -DSPEC\_LP64  
510.parest\_r: -DSPEC\_LP64

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**CPU2017 License:** 3

**Test Sponsor:** HPE

**Tested by:** HPE

**Test Date:** Apr-2023

**Hardware Availability:** May-2023

**Software Availability:** Dec-2022

## Base Portability Flags (Continued)

```

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

```

### Benchmarks using Fortran, C, and C++:

```

-w -m64 -std=c++14 -std=c11 -Wl,-z,muldefs -xsapphirerapids -Ofast

```

(Continued on next page)



# SPEC CPU®2017 Floating Point Rate Result

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**Hewlett Packard Enterprise**

(Test Sponsor: HPE)

ProLiant ML110 Gen11

(2.00 GHz, Intel Xeon Silver 4416+)

SPECrate®2017\_fp\_base = 234

SPECrate®2017\_fp\_peak = 241

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**Test Sponsor:** HPE

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**Test Date:** Apr-2023

**Hardware Availability:** May-2023

**Software Availability:** Dec-2022

## Base Optimization Flags (Continued)

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

```
-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

544.nab\_r: basepeak = yes

(Continued on next page)



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## Peak Optimization Flags (Continued)

C++ benchmarks:

508.namd\_r: basepeak = yes

```
510.parest_r: -w -std=c++14 -m64 -Wl,-z,muldefs -xsaphirerapids
-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 -xsaphirerapids -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 -xsaphirerapids -Ofast
-ffast-math -flto -mfpmath=sse -funroll-loops
-qopt-mem-layout-trans=4 -Wno-implicit-int -mprefer-vector-width=512
-nostandard-realloc-lhs -align array32byte -auto -ljemalloc
-L/usr/local/jemalloc64-5.0.1/lib
```



# SPEC CPU®2017 Floating Point Rate Result

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**ProLiant ML110 Gen1**

(2.00 GHz, Intel Xeon Silver 4416+)

**SPECrate®2017\_fp\_base = 234**

**SPECrate®2017\_fp\_peak = 241**

**CPU2017 License:** 3

**Test Sponsor:** HPE

**Tested by:** HPE

**Test Date:** Apr-2023

**Hardware Availability:** May-2023

**Software Availability:** Dec-2022

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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