



# SPEC CPU®2017 Floating Point Rate Result

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## Hewlett Packard Enterprise

(Test Sponsor: HPE)

### ProLiant DL380 Gen9

(2.40 GHz, Intel Xeon E5-2680 v4)

SPECrate®2017\_fp\_base = 129

SPECrate®2017\_fp\_peak = Not Run

CPU2017 License: 3

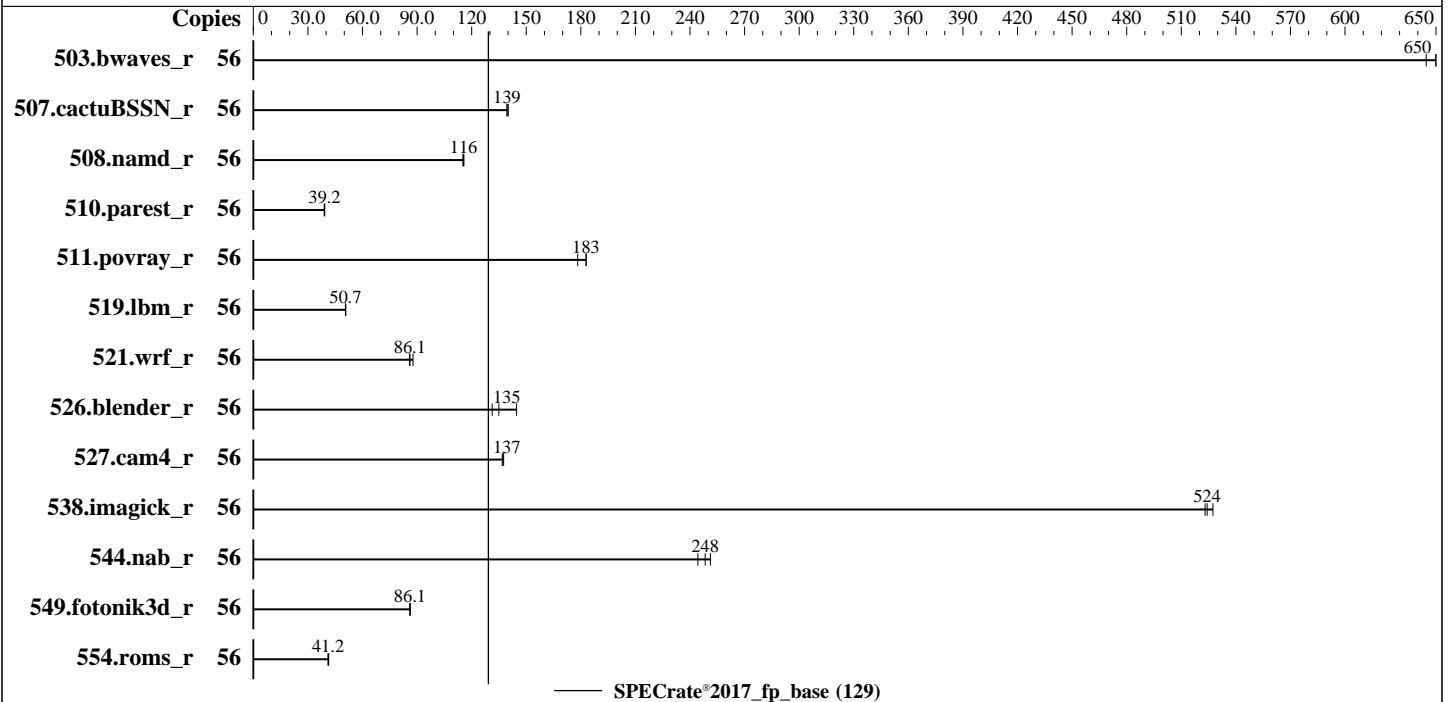
Test Sponsor: HPE

Tested by: HPE

Test Date: May-2023

Hardware Availability: Feb-2023

Software Availability: Dec-2022



### Hardware

CPU Name: Intel Xeon E5-2680 v4  
 Max MHz: 3300  
 Nominal: 2400  
 Enabled: 28 cores, 2 chips, 2 threads/core  
 Orderable: 1, 2 chip (s)  
 Cache L1: 32 KB I + 32 KB D on chip per core  
 L2: 256 KB I+D on chip per core  
 L3: 17.5 MB I+D on chip per chip  
 Other: None  
 Memory: 256 GB (8 x 32 GB 2Rx4 PC4-2400T-R)  
 Storage: 1 x 400 GB SAS SSD, RAID 0  
 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 P89 v3.08 01/12/2023 released Feb-2023  
 File System: xfs  
 System State: Run level 3 (multi-user)  
 Base Pointers: 64-bit  
 Peak Pointers: Not Applicable  
 Other: jemalloc memory allocator V5.0.1  
 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	56	<b>864</b>	<b>650</b>	864	650	871	645							
507.cactuBSSN_r	56	506	140	<b>508</b>	<b>139</b>	508	139							
508.namd_r	56	<b>460</b>	<b>116</b>	462	115	460	116							
510.parest_r	56	<b>3739</b>	<b>39.2</b>	3737	39.2	3762	38.9							
511.povray_r	56	<b>715</b>	<b>183</b>	733	178	715	183							
519.lbm_r	56	<b>1164</b>	<b>50.7</b>	1166	50.6	1161	50.8							
521.wrf_r	56	<b>1457</b>	<b>86.1</b>	1429	87.8	1462	85.8							
526.blender_r	56	650	131	589	145	<b>632</b>	<b>135</b>							
527.cam4_r	56	<b>714</b>	<b>137</b>	712	138	716	137							
538.imagick_r	56	264	527	266	523	<b>266</b>	<b>524</b>							
544.nab_r	56	<b>380</b>	<b>248</b>	386	244	375	251							
549.fotonik3d_r	56	2533	86.2	<b>2534</b>	<b>86.1</b>	2534	86.1							
554.roms_r	56	2149	41.4	2164	41.1	<b>2162</b>	<b>41.2</b>							

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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.

This benchmark result is intended to provide perspective on past performance using the historical hardware and/or software described on this result page.

The system as described on this result page was formerly generally available. At the time of this publication, it may not be shipping, and/or may not be supported, and/or may fail to meet other tests of General Availability described in the SPEC OSG Policy document, <http://www.spec.org/osg/policy.html>. This measured result may not be representative of the result that would be measured were this benchmark run with hardware and software available as of the publication date.

This benchmark run is conducted using the latest binaries based on IC23 and to suffice the minimum software requirement, the Operating System used is RHEL9.0

## Operating System Notes

```
Stack size set to unlimited using "ulimit -s unlimited"
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>
```



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## 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 8480+ CPU + 512GB RAM memory using Red Hat Enterprise Linux 9.0

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>

## Platform Notes

The system ROM used for this result contains Intel microcode version 0xb000040 for the Intel Xeon E5-2680 v4 processor.

BIOS Configuration:

Power Profile set to Custom

Power Regulator to Static High Performance Mode

Minimum Processor Idle Power Core C-State set to C6 State

Minimum Processor Idle Power Package C-State set to No Package State

QPI Snoop Configuration set to Cluster on Die

Thermal Configuration set to Maximum Cooling

Collaborative Power Control set to Disabled

Processor Power and Utilization Monitoring set to Disabled

Memory Refresh Rate set to 1x Refresh

The reported date by sysinfo is incorrect due to computer clock being not set correctly.

The correct test date is: May-2023.

Sysinfo program /home/cpu2017/bin/sysinfo

Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197

running on localhost.localdomain Thu Apr 7 05:31:54 2022

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)

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## Platform Notes (Continued)

- 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

```
-----
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
   05:31:54 up 1 min,  2 users,  load average: 0.13, 0.11, 0.04
USER      TTY      LOGIN@  IDLE   JCPU   PCPU   WHAT
root      tty1    05:30   1:22   0.00s  0.00s  -bash
root      pts/0   05:31  10.00s 1.54s  0.01s  -bash
-----
```

```
-----
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) 1031019
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) 1031019
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@pts/0
   -bash
   -bash
   runcpu --nobuild --action validate --define default-platform-flags --define numcopies=56 -c
   ic2023.0-lin-core-avx2-rate-20221201.cfg --define smt-on --define cores=28 --define physicalfirst --define
-----
```

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## Platform Notes (Continued)

```
invoke_with_interleave --define drop_caches --tune base -o all fprate
runcpu --nobuild --action validate --define default-platform-flags --define numcopies=56 --configfile
ic2023.0-lin-core-avx2-rate-20221201.cfg --define smt-on --define cores=28 --define physicalfirst --define
invoke_with_interleave --define drop_caches --tune base --output_format all --nopower --runmode rate
--tune base --size refrate fprate --nopreenv --note-preenv --logfile
$SPEC/tmp/CPU2017.004/templogs/preenv.fprate.004.0.log --lognum 004.0 --from_runcpu 2
specperl $SPEC/bin/sysinfo
$SPEC = /home/cpu2017
```

### 6. /proc/cpuinfo

```
model name      : Intel(R) Xeon(R) CPU E5-2680 v4 @ 2.40GHz
vendor_id      : GenuineIntel
cpu family     : 6
model          : 79
stepping       : 1
microcode      : 0xb000040
bugs           : cpu_meltdown spectre_v1 spectre_v2 spec_store_bypass l1tf mds swapgs taa itlb_multihit
cpu cores      : 14
siblings       : 28
2 physical ids (chips)
56 processors (hardware threads)
physical id 0: core ids 0-6,8-14
physical id 1: core ids 0-6,8-14
physical id 0: apicids 0-13,16-29
physical id 1: apicids 32-45,48-61
```

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, 48 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) CPU E5-2680 v4 @ 2.40GHz
BIOS Model name:      Intel(R) Xeon(R) CPU E5-2680 v4 @ 2.40GHz
CPU family:            6
Model:                 79
Thread(s) per core:    2
Core(s) per socket:    14
Socket(s):             2
Stepping:              1
BogoMIPS:              4794.58
Flags:                 fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36
                        clflush dts acpi mmx fxsr sse sse2 ss ht tm pbe syscall nx pdpe1gb rdtscp
                        lm constant_tsc arch_perfmon pebs bts rep_good nopl xtopology nonstop_tsc
                        cpuid aperfmperf pni pclmulqdq dtes64 monitor ds_cpl 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 cdp_l3 invpcid_single pti intel_ppin ssbd ibrs ibpb
                        stibp tpr_shadow vnmi flexpriority ept vpid ept_ad fsgsbase tsc_adjust
                        bmi1 hle avx2 smep bmi2 erms invpcid rtm cqm rdt_a rdseed adx smap
                        intel_pt xsaveopt cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local dtherm
```

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## Platform Notes (Continued)

```

Virtualization:
L1d cache:
L1i cache:
L2 cache:
L3 cache:
NUMA node(s):
NUMA node0 CPU(s):
NUMA node1 CPU(s):
NUMA node2 CPU(s):
NUMA node3 CPU(s):
Vulnerability Itlb multihit:
Vulnerability L1tf:
Vulnerability Mds:
Vulnerability Meltdown:
Vulnerability Spec store bypass:
Vulnerability Spectre v1:
Vulnerability Spectre v2:
Vulnerability Srbds:
Vulnerability Tsx async abort:

```

ida arat pln pts md\_clear flush\_l1d  
VT-x  
896 KiB (28 instances)  
896 KiB (28 instances)  
7 MiB (28 instances)  
70 MiB (4 instances)  
4  
0-6,28-34  
7-13,35-41  
14-20,42-48  
21-27,49-55  
KVM: Mitigation: VMX disabled  
Mitigation; PTE Inversion; VMX conditional cache flushes, SMT vulnerable  
Mitigation; Clear CPU buffers; SMT vulnerable  
Mitigation; PTI  
Mitigation; Speculative Store Bypass disabled via prctl  
Mitigation; usercopy/swaps barriers and \_\_user pointer sanitization  
Mitigation; Retpolines, IBPB conditional, IBRS\_FW, STIBP conditional, RSB filling  
Not affected  
Mitigation; Clear CPU buffers; SMT vulnerable

From lscpu --cache:

NAME	ONE-SIZE	ALL-SIZE	WAYS	TYPE	LEVEL	SETS	PHY-LINE	COHERENCY-SIZE
L1d	32K	896K	8	Data	1	64	1	64
L1i	32K	896K	8	Instruction	1	64	1	64
L2	256K	7M	8	Unified	2	512	1	64
L3	17.5M	70M	20	Unified	3	14336	1	64

8. numactl --hardware

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

```

available: 4 nodes (0-3)
node 0 cpus: 0-6,28-34
node 0 size: 64313 MB
node 0 free: 63926 MB
node 1 cpus: 7-13,35-41
node 1 size: 64472 MB
node 1 free: 64163 MB
node 2 cpus: 14-20,42-48
node 2 size: 64508 MB
node 2 free: 64009 MB
node 3 cpus: 21-27,49-55
node 3 size: 64500 MB
node 3 free: 64140 MB
node distances:
node  0  1  2  3
0:  10  21  31  31
1:  21  10  31  31
2:  31  31  10  21
3:  31  31  21  10

```

9. /proc/meminfo

MemTotal: 263981736 kB

10. who -r

run-level 3 Apr 7 05:30

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## Platform Notes (Continued)

11. Systemd service manager version: systemd 250 (250-6.e19\_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 kdump lvm2-monitor mdmonitor microcode nis-domainname rhsmcertd rsyslog selinux-autorelabel-mark sshd sssd systemd-network-generator tuned udisks2
enabled-runtime	systemd-remount-fs
disabled	blk-availability chrony-wait console-getty cpupower debug-shell kvm_stat man-db-restart-cache-update nftables powertop rdisc rhsm rhsm-facts rpmdb-rebuild 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=(hd1,gpt2)/vmlinuz-5.14.0-70.13.1.e19\_0.x86\_64  
root=/dev/mapper/rhel100-root  
ro  
resume=/dev/mapper/rhel100-swap  
rd.lvm.lv=rhel100/root  
rd.lvm.lv=rhel100/swap

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	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	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

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## Platform Notes (Continued)

```
-----
17. /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
-----
```

```
-----
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
/dev/mapper/rhel00-home xfs   297G  51G  246G  18% /home
-----
```

```
-----
21. /sys/devices/virtual/dmi/id
Vendor:              HP
Product:             ProLiant DL380 Gen9
Product Family:     ProLiant
Serial:              USE440BJ51
-----
```

```
-----
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 UNKNOWN NOT AVAILABLE 32 GB 2 rank 2400
-----
```

```
-----
23. BIOS
(This section combines info from /sys/devices and dmidecode.)
BIOS Vendor:        HP
BIOS Version:       P89
BIOS Date:          01/12/2023
BIOS Revision:      3.0
Firmware Revision:  2.50
-----
```





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## Compiler Version Notes

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

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

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

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

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

Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64, Version 2023.0.0 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)  
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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) 549.fotonik3d\_r(base) 554.roms\_r(base)  
=====

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) 527.cam4\_r(base)  
=====

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  
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=====

## Base Compiler Invocation

C benchmarks:  
icx

(Continued on next page)



# SPEC CPU®2017 Floating Point Rate Result

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**Hewlett Packard Enterprise**

(Test Sponsor: HPE)

**ProLiant DL380 Gen9**

(2.40 GHz, Intel Xeon E5-2680 v4)

SPECrate®2017\_fp\_base = 129

SPECrate®2017\_fp\_peak = Not Run

**CPU2017 License:** 3

**Test Sponsor:** HPE

**Tested by:** HPE

**Test Date:** May-2023

**Hardware Availability:** Feb-2023

**Software Availability:** Dec-2022

## Base Compiler Invocation (Continued)

C++ benchmarks:

icpx

Fortran benchmarks:

ifx

Benchmarks using both Fortran and C:

ifx icx

Benchmarks using both C and C++:

icpx icx

Benchmarks using Fortran, C, and C++:

icpx icx ifx

## Base Portability Flags

503.bwaves\_r: -DSPEC\_LP64  
 507.cactuBSSN\_r: -DSPEC\_LP64  
 508.namd\_r: -DSPEC\_LP64  
 510.parest\_r: -DSPEC\_LP64  
 511.povray\_r: -DSPEC\_LP64  
 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 -xCORE-AVX2 -Ofast -ffast-math  
 -flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4  
 -Wno-implicit-int -ljemalloc -L/usr/local/jemalloc64-5.0.1/lib

C++ benchmarks:

-w -std=c++14 -m64 -Wl,-z,muldefs -xCORE-AVX2 -Ofast -ffast-math  
 -flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -ljemalloc  
 -L/usr/local/jemalloc64-5.0.1/lib

(Continued on next page)



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**Hardware Availability:** Feb-2023

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## Base Optimization Flags (Continued)

Fortran benchmarks:

```
-w -m64 -Wl,-z,muldefs -xCORE-AVX2 -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 -xCORE-AVX2 -Ofast -ffast-math  
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4  
-Wno-implicit-int -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 -xCORE-AVX2 -Ofast  
-ffast-math -flto -mfpmath=sse -funroll-loops  
-qopt-mem-layout-trans=4 -Wno-implicit-int -ljemalloc  
-L/usr/local/jemalloc64-5.0.1/lib
```

Benchmarks using Fortran, C, and C++:

```
-w -std=c++14 -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX2 -Ofast  
-ffast-math -flto -mfpmath=sse -funroll-loops  
-qopt-mem-layout-trans=4 -Wno-implicit-int -nostandard-realloc-lhs  
-align array32byte -auto -ljemalloc -L/usr/local/jemalloc64-5.0.1/lib
```

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

<http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-Intel-V1.1-HSW-revB.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-V1.1-HSW-revB.xml>

<http://www.spec.org/cpu2017/flags/Intel-ic2023-official-linux64.xml>

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