



# SPEC CPU®2017 Floating Point Speed Result

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## xFusion

SPECspeed®2017\_fp\_base = 234

FusionServer 2488H V6 (Intel Xeon Gold 6328H)

SPECspeed®2017\_fp\_peak = Not Run

CPU2017 License: 6488

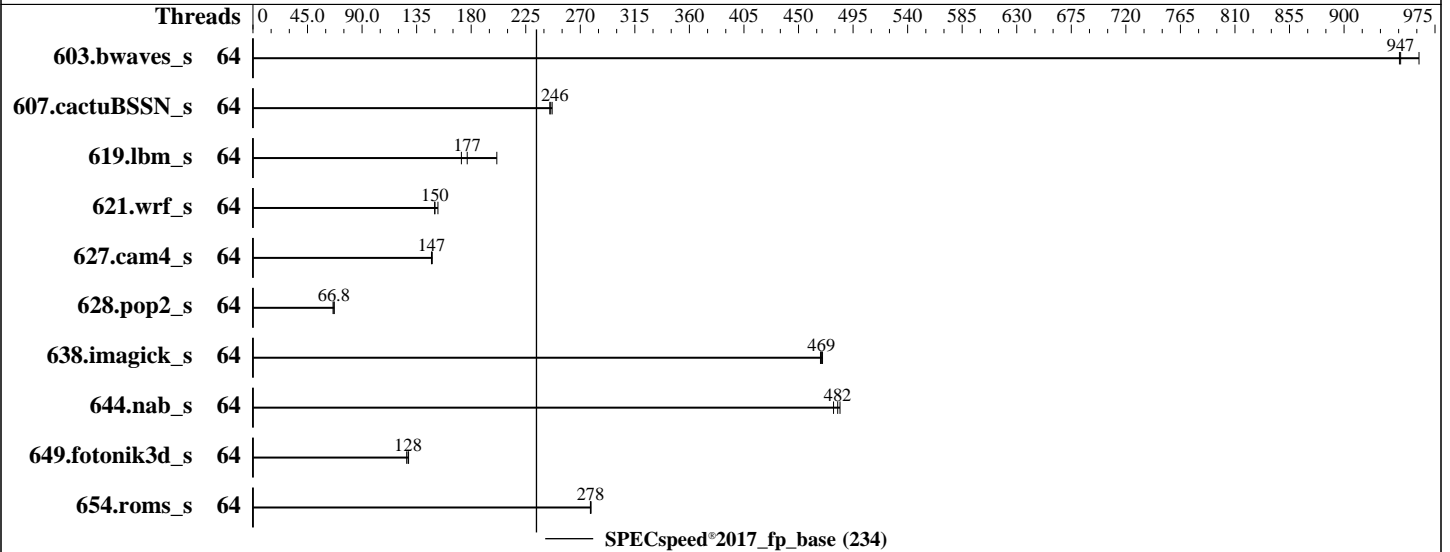
Test Sponsor: xFusion

Tested by: xFusion

Test Date: May-2023

Hardware Availability: Sep-2020

Software Availability: Dec-2022



### Hardware

CPU Name: Intel Xeon Gold 6328H  
 Max MHz: 4300  
 Nominal: 2800  
 Enabled: 64 cores, 4 chips  
 Orderable: 1,2,4 chips  
 Cache L1: 32 KB I + 32 KB D on chip per core  
 L2: 1 MB I+D on chip per core  
 L3: 22 MB I+D on chip per chip  
 Other: None  
 Memory: 1536 GB (48 x 32 GB 2Rx8 PC4-3200AA-R, running at 2933)  
 Storage: 1 x 480 GB SATA SSD  
 Other: None

### Software

OS: Red Hat Enterprise Linux 8.4 (Ootpa)  
 4.18.0-305.el8.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: Version 1.03 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						
	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
603.bwaves_s	64	<b><u>62.3</u></b>	<b><u>947</u></b>	61.3	962	62.4	946							
607.cactuBSSN_s	64	68.1	245	67.5	247	<b><u>67.9</u></b>	<b><u>246</u></b>							
619.lbm_s	64	<b><u>29.6</u></b>	<b><u>177</u></b>	30.5	172	26.0	201							
621.wrf_s	64	<b><u>88.1</u></b>	<b><u>150</u></b>	88.2	150	86.7	153							
627.cam4_s	64	<b><u>60.2</u></b>	<b><u>147</u></b>	59.9	148	60.2	147							
628.pop2_s	64	180	66.1	<b><u>178</u></b>	<b><u>66.8</u></b>	177	67.0							
638.imagick_s	64	30.7	470	30.8	468	<b><u>30.8</u></b>	<b><u>469</u></b>							
644.nab_s	64	<b><u>36.2</u></b>	<b><u>482</u></b>	36.5	479	36.1	484							
649.fotonik3d_s	64	71.9	127	<b><u>71.2</u></b>	<b><u>128</u></b>	71.0	128							
654.roms_s	64	56.6	278	56.5	279	<b><u>56.5</u></b>	<b><u>278</u></b>							

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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"

## Environment Variables Notes

Environment variables set by runcpu before the start of the run:  
KMP\_AFFINITY = "granularity=fine,compact"  
LD\_LIBRARY\_PATH = "/home/speccpu/lib/intel64:/home/speccpu/je5.0.1-64"  
MALLOCONF = "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  
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  
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

BIOS configuration:  
Performance Profile Set to Load Balance  
Hyper-Threading Set to Disabled

Sysinfo program /home/speccpu/bin/sysinfo  
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197  
running on localhost.localdomain Tue May 23 13:09:15 2023

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

### Table of contents

- 1. `uname -a`  
Linux localhost.localdomain 4.18.0-305.el8.x86\_64 #1 SMP Thu Apr 29 08:54:30 EDT 2021 x86\_64 x86\_64 x86\_64 GNU/Linux
- 2. `w`  
13:09:15 up 2:07, 1 user, load average: 2.29, 4.81, 3.17  
USER TTY FROM LOGIN@ IDLE JCPU PCPU WHAT  
root pts/0 172.166.0.211 11:11 1:49m 1.05s 0.03s -bash
- 3. Username  
From environment variable \$USER: root
- 4. `ulimit -a`  
core file size (blocks, -c) unlimited  
data seg size (kbytes, -d) unlimited  
scheduling priority (-e) 0  
file size (blocks, -f) unlimited

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### Platform Notes (Continued)

```

pending signals          (-i) 6185168
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) 6185168
virtual memory          (kbytes, -v) unlimited
file locks              (-x) unlimited

```

```

-----
5. sysinfo process ancestry
/usr/lib/systemd/systemd --switched-root --system --deserialize 18
/usr/sbin/sshd -D
-oCiphers=aes256-gcm@openssh.com,chacha20-poly1305@openssh.com,aes256-ctr,aes256-cbc,aes128-gcm@openssh.com,aes128-ctr,aes128-cbc
-oMACs=hmac-sha2-256-etm@openssh.com,hmac-sha1-etm@openssh.com,umac-128-etm@openssh.com,hmac-sha2-512-etm@openssh.com,hmac-sha2-256,hmac-sha1,umac-128@openssh.com,hmac-sha2-512...
sshd: root [priv]
sshd: root@pts/0
-bash
bash test-speed-cpu2017.sh
runccpu --define default-platform-flags -c ic2023.0-lin-core-avx512-speed-20221201.cfg --define cores=64 --tune base -o all --define drop_caches fpspeed
runccpu --define default-platform-flags --configfile ic2023.0-lin-core-avx512-speed-20221201.cfg --define cores=64 --tune base --output_format all --define drop_caches --nopower --runmode speed --tune base --size refspeed fpspeed --nopreenv --note-preenv --logfile $SPEC/tmp/CPU2017.005/templogs/preenv.fpspeed.005.0.log --lognum 005.0 --from_runccpu 2
specperl $SPEC/bin/sysinfo
$SPEC = /home/speccpu

```

```

-----
6. /proc/cpuinfo
model name      : Intel(R) Xeon(R) Gold 6328H CPU @ 2.80GHz
vendor_id      : GenuineIntel
cpu family     : 6
model          : 85
stepping       : 11
microcode      : 0x7002302
bugs           : spectre_v1 spectre_v2 spec_store_bypass swapgs
cpu cores      : 16
siblings       : 16
4 physical ids (chips)
64 processors (hardware threads)
physical id 0: core ids 0-15
physical id 1: core ids 0-15
physical id 2: core ids 0-15
physical id 3: core ids 0-15
physical id 0: apicids 0,2,4,6,8,10,12,14,16,18,20,22,24,26,28,30
physical id 1: apicids 32,34,36,38,40,42,44,46,48,50,52,54,56,58,60,62
physical id 2: apicids 64,66,68,70,72,74,76,78,80,82,84,86,88,90,92,94
physical id 3: apicids 96,98,100,102,104,106,108,110,112,114,116,118,120,122,124,126
Caution: /proc/cpuinfo data regarding chips, cores, and threads is not necessarily reliable, especially for virtualized systems. Use the above data carefully.

```

7. lscpu

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## Platform Notes (Continued)

From lscpu from util-linux 2.32.1:

```

Architecture:          x86_64
CPU op-mode(s):        32-bit, 64-bit
Byte Order:             Little Endian
CPU(s):                 64
On-line CPU(s) list:   0-63
Thread(s) per core:    1
Core(s) per socket:    16
Socket(s):              4
NUMA node(s):          4
Vendor ID:              GenuineIntel
BIOS Vendor ID:        Intel(R) Corporation
CPU family:             6
Model:                  85
Model name:             Intel(R) Xeon(R) Gold 6328H CPU @ 2.80GHz
BIOS Model name:        Intel(R) Xeon(R) Gold 6328H CPU @ 2.80GHz
Stepping:               11
CPU MHz:                1215.278
CPU max MHz:            4300.0000
CPU min MHz:            1000.0000
BogoMIPS:               5600.00
Virtualization:         VT-x
L1d cache:              32K
L1i cache:              32K
L2 cache:               1024K
L3 cache:               22528K
NUMA node0 CPU(s):     0-15
NUMA node1 CPU(s):     16-31
NUMA node2 CPU(s):     32-47
NUMA node3 CPU(s):     48-63
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 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 ssbd mba ibrs ibpb
                        stibp ibrs_enhanced tpr_shadow vnmi flexpriority ept vpid ept_ad fsgsbase tsc_adjust
                        bmi1 hle avx2 smep bmi2 erms invpcid cqm mpx rdt_a avx512f avx512dq rdseed adx smap
                        clflushopt clwb intel_pt avx512cd avx512bw avx512vl xsaveopt xsavec xgetbv1 xsaves
                        cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local avx512_bf16 dtherm ida arat pln pts
                        pku ospke avx512_vnni md_clear flush_l1d arch_capabilities

```

8. numactl --hardware

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

```

available: 4 nodes (0-3)
node 0 cpus: 0-15
node 0 size: 385163 MB
node 0 free: 383962 MB
node 1 cpus: 16-31
node 1 size: 387031 MB
node 1 free: 385246 MB
node 2 cpus: 32-47
node 2 size: 387068 MB
node 2 free: 384119 MB
node 3 cpus: 48-63
node 3 size: 387067 MB
node 3 free: 385876 MB
node distances:

```

(Continued on next page)



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### Platform Notes (Continued)

```

node    0    1    2    3
0:     10   20   20   20
1:     20   10   20   20
2:     20   20   10   20
3:     20   20   20   10

```

```

-----
9. /proc/meminfo
   MemTotal:      1583442616 kB

```

```

-----
10. who -r
    run-level 3 May 23 11:01

```

```

-----
11. Systemd service manager version: systemd 239 (239-45.el8)
    Default Target Status
    multi-user      running

```

```

-----
12. Services, from systemctl list-unit-files
STATE      UNIT FILES
enabled    NetworkManager NetworkManager-dispatcher NetworkManager-wait-online auditd autovt@ crond
           firewallld getty@ import-state irqbalance kdump loadmodules lvm2-monitor mdmonitor microcode
           nis-domainname rhsmcertd rsyslog selinux-autorelabel-mark sshd sssd syslog tuned udisks2
disabled   blk-availability console-getty cpupower debug-shell ebttables iprdump iprint iprupdate kvm_stat
           nftables rdisc rhcd rhsm rhsm-facts serial-getty@ sshd-keygen@ systemd-resolved tcsd
generated  SystemTap compile-server gcc-toolset-10-stap-server gcc-toolset-10-systemtap
           gcc-toolset-9-stap-server gcc-toolset-9-systemtap scripts startup
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-4.18.0-305.el8.x86_64
root=/dev/mapper/rhel-root
ro
crashkernel=auto
resume=/dev/mapper/rhel-swap
rd.lvm.lv=rhel/root
rd.lvm.lv=rhel/swap
rhgb
quiet

```

```

-----
14. cpupower frequency-info
    analyzing CPU 0:
        current policy: frequency should be within 1000 MHz and 4.30 GHz.
                        The governor "performance" may decide which speed to use
                        within this range.

    boost state support:
        Supported: yes
        Active: yes

```

```

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

```

```

-----
16. sysctl
    kernel.numa_balancing      1

```

(Continued on next page)



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### Platform Notes (Continued)

```

kernel.randomize_va_space      2
vm.compaction_proactiveness    0
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_swap          64
pages_to_scan          4096
scan_sleep_millisecs  10000

```

```

-----
19. OS release
From /etc/*-release /etc/*-version
os-release      Red Hat Enterprise Linux 8.4 (Ootpa)
redhat-release Red Hat Enterprise Linux release 8.4 (Ootpa)
system-release Red Hat Enterprise Linux release 8.4 (Ootpa)

```

```

-----
20. Kernel self-reported vulnerability status, from /sys/devices/system/cpu/vulnerabilities
itlb_multihit      Not affected
lltf                Not affected
mds                 Not affected
meltdown           Not affected
spec_store_bypass  Mitigation: Speculative Store Bypass disabled via prctl and seccomp
spectre_v1         Mitigation: usercopy/swapgs barriers and __user pointer sanitization
spectre_v2         Mitigation: Enhanced IBRS, IBPB: conditional, RSB filling
srbds              Not affected
tsx_async_abort    Not affected
For more information, see the Linux documentation on hardware vulnerabilities, for example
https://www.kernel.org/doc/html/latest/admin-guide/hw-vuln/index.html

```

```

-----
21. Disk information
SPEC is set to: /home/speccpu
Filesystem      Type  Size  Used Avail Use% Mounted on

```

(Continued on next page)



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### Platform Notes (Continued)

/dev/mapper/rhel-home xfs 372G 51G 321G 14% /home

-----  
22. /sys/devices/virtual/dmi/id  
Vendor: xFusion  
Product: 2488H V6  
Product Family: Cedar Island  
Serial: 2102313CWY10MA000018  
-----

23. dmidecode  
Additional information from dmidecode 3.2 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:  
48x Samsung M393A4K40DB3-CWE 32 GB 2 rank 3200, configured at 2933  
-----

24. BIOS  
(This section combines info from /sys/devices and dmidecode.)  
BIOS Vendor: Byosoft Corporation  
BIOS Version: 1.03  
BIOS Date: 11/25/2022  
-----

### Compiler Version Notes

=====  
C | 619.lbm\_s(base) 638.imagick\_s(base) 644.nab\_s(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, Fortran | 607.cactuBSSN\_s(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.  
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) 649.fotonik3d\_s(base) 654.roms\_s(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 | 621.wrf\_s(base) 627.cam4\_s(base) 628.pop2\_s(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.  
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## Compiler Version Notes (Continued)

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 -xCORE-AVX512 -Ofast -ffast-math -flto
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -fiopenmp
-DSPEC_OPENMP -Wno-implicit-int -L/usr/local/jemalloc64-5.0.1/lib
-ljemalloc
```

Fortran benchmarks:

```
-m64 -Wl,-z,muldefs -DSPEC_OPENMP -xCORE-AVX512 -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -fiopenmp
```

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## Base Optimization Flags (Continued)

Fortran benchmarks (continued):

```
-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 -xCORE-AVX512 -Ofast -ffast-math -flto  
-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -fiopenmp  
-DSPEC_OPENMP -Wno-implicit-int -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 -xCORE-AVX512 -Ofast  
-ffast-math -flto -mfpmath=sse -funroll-loops  
-qopt-mem-layout-trans=4 -fiopenmp -DSPEC_OPENMP -Wno-implicit-int  
-nostandard-realloc-lhs -align array32byte -auto  
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

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

<http://www.spec.org/cpu2017/flags/Intel-ic2023-official-linux64.html>  
<http://www.spec.org/cpu2017/flags/xFusion-Platform-Settings-CPX-V1.4.html>

You can also download the XML flags sources by saving the following links:

<http://www.spec.org/cpu2017/flags/Intel-ic2023-official-linux64.xml>  
<http://www.spec.org/cpu2017/flags/xFusion-Platform-Settings-CPX-V1.4.xml>

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For questions about this result, please contact the tester. For other inquiries, please contact [info@spec.org](mailto:info@spec.org).

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