



# SPEC CPU®2017 Floating Point Speed Result

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## xFusion

SPECspeed®2017\_fp\_base = 148

FusionServer 2288H V6 (Intel Xeon Silver 4310)

SPECspeed®2017\_fp\_peak = 148

CPU2017 License: 6488

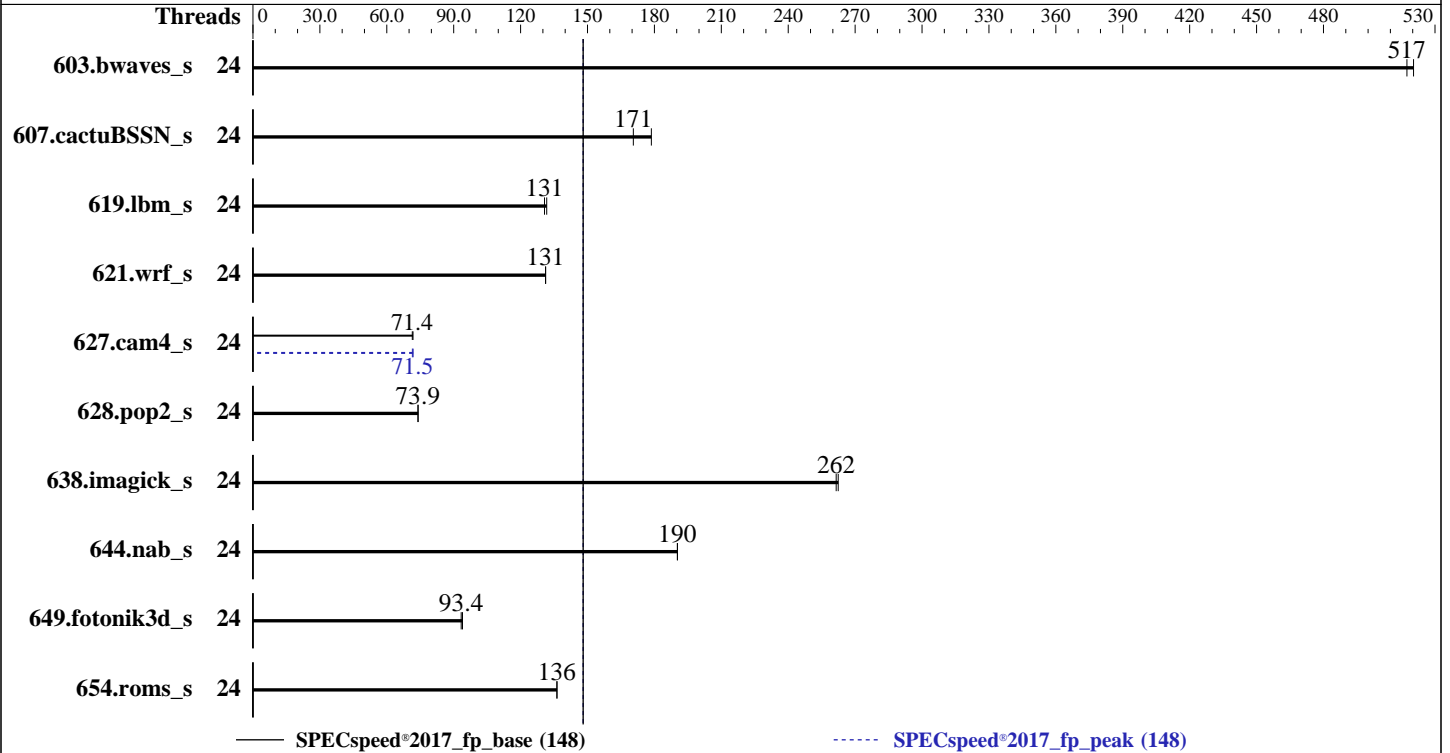
Test Sponsor: xFusion

Tested by: xFusion

Test Date: Jun-2023

Hardware Availability: Apr-2021

Software Availability: Dec-2022



### Hardware

CPU Name: Intel Xeon Silver 4310  
 Max MHz: 3300  
 Nominal: 2100  
 Enabled: 24 cores, 2 chips  
 Orderable: 1,2 chips  
 Cache L1: 32 KB I + 48 KB D on chip per core  
 L2: 1.25 MB I+D on chip per core  
 L3: 18 MB I+D on chip per chip  
 Other: None  
 Memory: 512 GB (16 x 32 GB 2Rx4 PC4-3200AA-R, running at 2666)  
 Storage: 1 x 1920 GB SATA SSD  
 Other: None

### Software

OS: Red Hat Enterprise Linux release 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 1.55 Released May-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: 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	24	113	520	<b><u>114</u></b>	<b><u>517</u></b>			24	113	520	<b><u>114</u></b>	<b><u>517</u></b>		
607.cactuBSSN_s	24	<b><u>97.7</u></b>	<b><u>171</u></b>	93.3	179			24	<b><u>97.7</u></b>	<b><u>171</u></b>	93.3	179		
619.lbm_s	24	39.8	132	<b><u>40.1</u></b>	<b><u>131</u></b>			24	39.8	132	<b><u>40.1</u></b>	<b><u>131</u></b>		
621.wrf_s	24	<b><u>101</u></b>	<b><u>131</u></b>	101	131			24	<b><u>101</u></b>	<b><u>131</u></b>	101	131		
627.cam4_s	24	123	71.8	<b><u>124</u></b>	<b><u>71.4</u></b>			24	<b><u>124</u></b>	<b><u>71.5</u></b>	123	71.8		
628.pop2_s	24	<b><u>161</u></b>	<b><u>73.9</u></b>	160	74.1			24	<b><u>161</u></b>	<b><u>73.9</u></b>	160	74.1		
638.imagick_s	24	55.0	262	<b><u>55.2</u></b>	<b><u>262</u></b>			24	55.0	262	<b><u>55.2</u></b>	<b><u>262</u></b>		
644.nab_s	24	<b><u>91.8</u></b>	<b><u>190</u></b>	91.8	190			24	<b><u>91.8</u></b>	<b><u>190</u></b>	91.8	190		
649.fotonik3d_s	24	<b><u>97.6</u></b>	<b><u>93.4</u></b>	97.0	94.0			24	<b><u>97.6</u></b>	<b><u>93.4</u></b>	97.0	94.0		
654.roms_s	24	115	136	<b><u>116</u></b>	<b><u>136</u></b>			24	115	136	<b><u>116</u></b>	<b><u>136</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 = "/spec2017-icc2023.0/lib/intel64:/spec2017-icc2023.0/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 Red Hat Enterprise Linux 8.4  
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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**Test Sponsor:** xFusion  
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**Test Date:** Jun-2023  
**Hardware Availability:** Apr-2021  
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## Platform Notes

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

Sysinfo program /spec2017-icc2023.0/bin/sysinfo  
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197  
running on localhost.localdomain Tue Jun 20 15:07:18 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  
15:07:18 up 3:16, 2 users, load average: 5.15, 5.67, 3.38  
USER TTY FROM LOGIN@ IDLE JCPU PCPU WHAT  
root tty1 - 11:56 2:50m 1.24s 0.00s -bash  
root pts/0 70.167.0.2 11:57 2:50m 0.04s 0.04s -bash
- 3. Username  
From environment variable \$USER: root
- 4. ulimit -a  
core file size (blocks, -c) 0  
data seg size (kbytes, -d) unlimited  
scheduling priority (-e) 0

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### Platform Notes (Continued)

```

file size                (blocks, -f) unlimited
pending signals          (-i) 2060604
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) 2060604
virtual memory            (kbytes, -v) unlimited
file locks                 (-x) unlimited

```

```

-----
5. sysinfo process ancestry
/usr/lib/systemd/systemd --switched-root --system --deserialize 17
login -- root
-bash
-bash
runcpu --define default-platform-flags -c ic2023.0-lin-core-avx512-speed-20221201.cfg --define cores=24
--tune base,peak --iterations 2 -o all --define drop_caches fpspeed
runcpu --define default-platform-flags --configfile ic2023.0-lin-core-avx512-speed-20221201.cfg --define
cores=24 --tune base,peak --iterations 2 --output_format all --define drop_caches --nopower --runmode
speed --tune base:peak --size refspeed fpspeed --nopreenv --note-preenv --logfile
$SPEC/tmp/CPU2017.028/templogs/preenv.fpspeed.028.0.log --lognum 028.0 --from_runcpu 2
specperl $SPEC/bin/sysinfo
$SPEC = /spec2017-icc2023.0

```

```

-----
6. /proc/cpuinfo
model name      : Intel(R) Xeon(R) Silver 4310 CPU @ 2.10GHz
vendor_id      : GenuineIntel
cpu family     : 6
model          : 106
stepping       : 6
microcode      : 0xd000363
bugs           : spectre_v1 spectre_v2 spec_store_bypass swapgs
cpu cores      : 12
siblings       : 12
2 physical ids (chips)
24 processors (hardware threads)
physical id 0: core ids 0-11
physical id 1: core ids 0-11
physical id 0: apicids 0,2,4,6,8,10,12,14,16,18,20,22
physical id 1: apicids 64,66,68,70,72,74,76,78,80,82,84,86
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 2.32.1:
Architecture:      x86_64
CPU op-mode(s):    32-bit, 64-bit
Byte Order:        Little Endian
CPU(s):            24
On-line CPU(s) list: 0-23
Thread(s) per core: 1
Core(s) per socket: 12

```

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### Platform Notes (Continued)

```

Socket(s):                2
NUMA node(s):            2
Vendor ID:                GenuineIntel
BIOS Vendor ID:          Intel(R) Corporation
CPU family:               6
Model:                    106
Model name:               Intel(R) Xeon(R) Silver 4310 CPU @ 2.10GHz
BIOS Model name:          Intel(R) Xeon(R) Silver 4310 CPU @ 2.10GHz
Stepping:                 6
CPU MHz:                  3227.975
CPU max MHz:              2101.0000
CPU min MHz:              800.0000
BogoMIPS:                 4200.00
Virtualization:           VT-x
L1d cache:                48K
L1i cache:                32K
L2 cache:                 1280K
L3 cache:                 18432K
NUMA node0 CPU(s):        0-11
NUMA node1 CPU(s):        12-23
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 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 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 wbnoinvd
                          dtherm ida arat pln pts avx512vbmi umip pku ospke avx512_vbmi2 gfni vaes vpclmulqdq
                          avx512_vnni avx512_bitalg tme avx512_vpopcntdq la57 rdpid fsrm md_clear pconfig
                          flush_l1d arch_capabilities

```

```

-----
8. numactl --hardware
NOTE: a numactl 'node' might or might not correspond to a physical chip.
available: 2 nodes (0-1)
node 0 cpus: 0-11
node 0 size: 257145 MB
node 0 free: 254940 MB
node 1 cpus: 12-23
node 1 size: 258042 MB
node 1 free: 252447 MB
node distances:
node  0  1
 0:  10  20
 1:  20  10

```

```

-----
9. /proc/meminfo
MemTotal:          527552308 kB

```

```

-----
10. who -r
run-level 3 Jun 20 11:51

```

```

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

```

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### Platform Notes (Continued)

multi-user      running

-----  
12. Services, from systemctl list-unit-files

STATE	UNIT FILES
enabled	NetworkManager NetworkManager-dispatcher NetworkManager-wait-online atd auditd autovt@ chronyd crond firewalld getty@ import-state irqbalance iscsi iscsi-onboot kdump libstoragemgmt loadmodules lvm2-monitor mcelog mdmonitor microcode multipathd nis-domainname nvmeFc-boot-connections rhsmcertd rsyslog selinux-autorelabel-mark smartd sshd sssd syslog sysstat timedatex tuned udisks2 vdo
disabled	arp-ethers blk-availability chrony-wait console-getty cpupower debug-shell ebttables iprdump iprinit iprupdate ipsec iscsid iscsiuiop kpatch kvm_stat ledmon nftables nvme-autoconnect oddjobd psacct 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
masked	systemd-timedated

-----  
13. Linux kernel boot-time arguments, from /proc/cmdline  
 BOOT\_IMAGE=(hd0,gpt3)/boot/vmlinuz-4.18.0-305.el8.x86\_64  
 root=UUID=711de346-1631-4b60-a626-37488271d525  
 ro  
 crashkernel=auto  
 resume=UUID=d6a3ac10-1eal-4e42-a80b-54c427bcad19  
 rhgb  
 quiet

-----  
14. cpupower frequency-info  
 analyzing CPU 0:  
 current policy: frequency should be within 800 MHz and 2.10 GHz.  
                   The governor "performance" may decide which speed to use  
                   within this range.  
 boost state support:  
   Supported: yes  
   Active: yes

-----  
15. tuned-adm active  
 No current active profile.

-----  
16. sysctl

kernel.numa_balancing	1
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	20
vm.dirty_writeback_centisecs	500
vm.dirtytime_expire_seconds	43200
vm.extfrag_threshold	500
vm.min_unmapped_ratio	1
vm.nr_hugepages	0
vm.nr_hugepages_mempolicy	0
vm.nr_overcommit_hugepages	0
vm.swappiness	60

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### Platform Notes (Continued)

```
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
l1tf                  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: /spec2017-icc2023.0
Filesystem      Type  Size  Used Avail Use% Mounted on
/dev/sda3       xfs   420G  42G  378G  10% /
```

```
-----
22. /sys/devices/virtual/dmideid
Vendor:          XFUSION
Product:         2288H V6
Product Family: Whitley
Serial:          Serial
```

```
-----
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.
```

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## Platform Notes (Continued)

Memory:  
16x Samsung M393A4K40DB3-CWE 32 GB 2 rank 3200, configured at 2666

-----  
24. BIOS  
(This section combines info from /sys/devices and dmidecode.)  
BIOS Vendor: XFUSION  
BIOS Version: 1.55  
BIOS Date: 05/09/2023  
BIOS Revision: 1.55

## Compiler Version Notes

-----  
C | 619.lbm\_s(base, peak) 638.imagick\_s(base, peak) 644.nab\_s(base, peak)  
-----

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

-----  
C++, C, Fortran | 607.cactuBSSN\_s(base, peak)  
-----

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

-----  
Fortran | 603.bwaves\_s(base, peak) 649.fotonik3d\_s(base, peak) 654.roms\_s(base, peak)  
-----

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

-----  
Fortran, C | 621.wrf\_s(base, peak) 627.cam4\_s(base, peak) 628.pop2\_s(base, peak)  
-----

Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version 2023.0.0 Build 20221201  
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-----

## Base Compiler Invocation

C benchmarks:  
icx

Fortran benchmarks:  
ifx

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## Base Compiler Invocation (Continued)

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
-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
```

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# SPEC CPU®2017 Floating Point Speed Result

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**xFusion**

SPECspeed®2017\_fp\_base = 148

FusionServer 2288H V6 (Intel Xeon Silver 4310)

SPECspeed®2017\_fp\_peak = 148

**CPU2017 License:** 6488  
**Test Sponsor:** xFusion  
**Tested by:** xFusion

**Test Date:** Jun-2023  
**Hardware Availability:** Apr-2021  
**Software Availability:** Dec-2022

## Base Optimization Flags (Continued)

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
```

## Peak Compiler Invocation

C benchmarks:  
icx

Fortran benchmarks:  
ifx

Benchmarks using both Fortran and C:  
ifx icx

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

## Peak Portability Flags

Same as Base Portability Flags

## Peak Optimization Flags

C benchmarks:

```
619.lbm_s: basepeak = yes
638.imagick_s: basepeak = yes
644.nab_s: basepeak = yes
```

Fortran benchmarks:

```
603.bwaves_s: basepeak = yes
```

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## xFusion

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## Peak Optimization Flags (Continued)

649.fotonik3d\_s: basepeak = yes

654.roms\_s: basepeak = yes

Benchmarks using both Fortran and C:

621.wrf\_s: basepeak = yes

```
627.cam4_s: -m64 -std=c11 -Wl,-z,muldefs -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
```

628.pop2\_s: basepeak = yes

Benchmarks using Fortran, C, and C++:

607.cactuBSSN\_s: basepeak = yes

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

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

<http://www.spec.org/cpu2017/flags/xFusion-Platform-Settings-ICX-V1.2.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-ICX-V1.2.xml>

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