



SPEC CPU®2017 Floating Point Speed Result

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xFusion

SPECspeed®2017_fp_base = 177

FusionServer 5288 V7 (Intel Xeon Gold 5411N)

SPECspeed®2017_fp_peak = 177

CPU2017 License: 6488

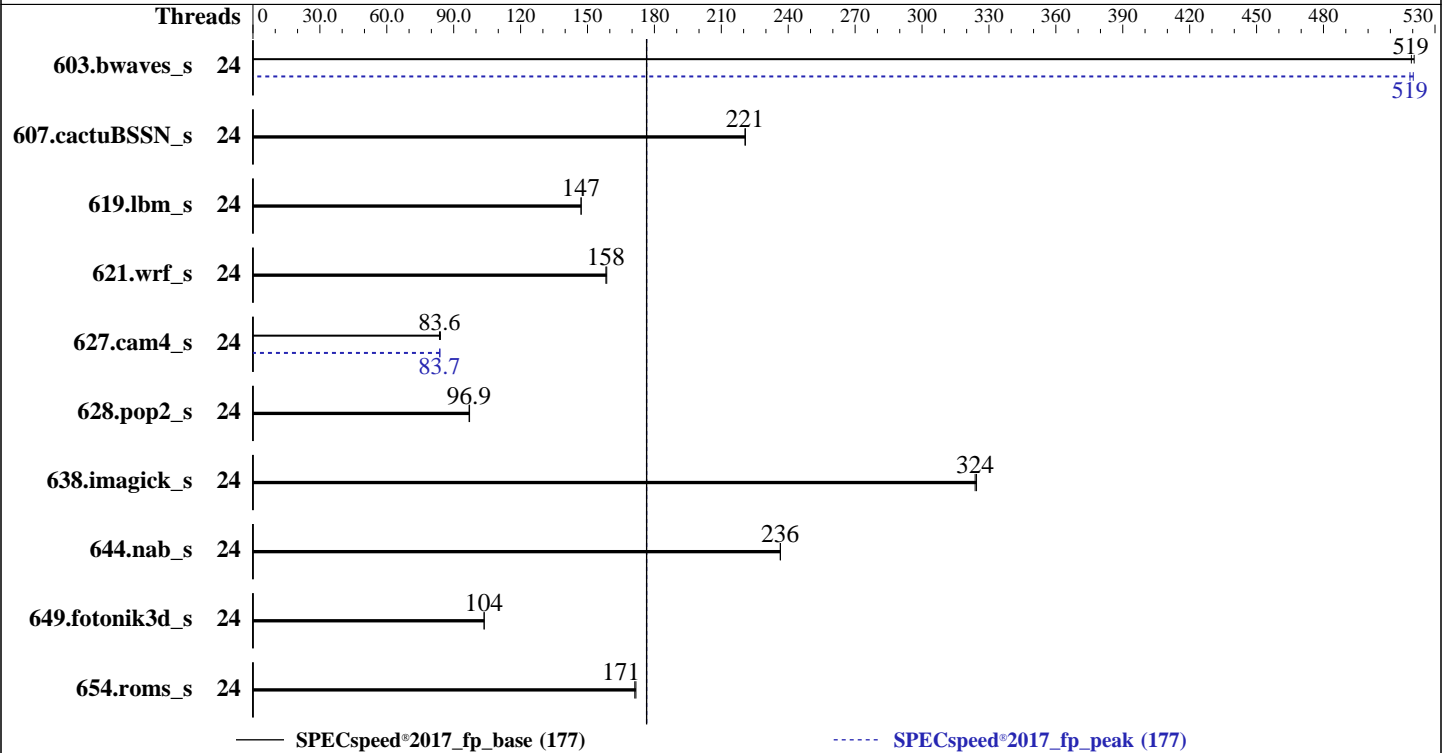
Test Sponsor: xFusion

Tested by: xFusion

Test Date: Aug-2023

Hardware Availability: Jan-2023

Software Availability: Dec-2022



Hardware

CPU Name: Intel Xeon Gold 5411N
 Max MHz: 3900
 Nominal: 1900
 Enabled: 24 cores, 1 chip
 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 1920 GB SATA SSD
 Other: None

Software

OS: Red Hat Enterprise Linux release 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: Yes
 Firmware: Version 2.00.55 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: 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	<u>114</u>	<u>519</u>	113	521			24	<u>114</u>	<u>519</u>	113	520		
607.cactuBSSN_s	24	75.5	221	<u>75.6</u>	<u>221</u>			24	75.5	221	<u>75.6</u>	<u>221</u>		
619.lbm_s	24	35.6	147	<u>35.6</u>	<u>147</u>			24	35.6	147	<u>35.6</u>	<u>147</u>		
621.wrf_s	24	<u>83.6</u>	<u>158</u>	83.4	159			24	<u>83.6</u>	<u>158</u>	83.4	159		
627.cam4_s	24	105	84.1	<u>106</u>	<u>83.6</u>			24	<u>106</u>	<u>83.7</u>	106	83.8		
628.pop2_s	24	122	97.1	<u>123</u>	<u>96.9</u>			24	122	97.1	<u>123</u>	<u>96.9</u>		
638.imagick_s	24	<u>44.6</u>	<u>324</u>	44.5	324			24	<u>44.6</u>	<u>324</u>	44.5	324		
644.nab_s	24	73.9	237	<u>73.9</u>	<u>236</u>			24	73.9	237	<u>73.9</u>	<u>236</u>		
649.fotonik3d_s	24	87.9	104	<u>88.0</u>	<u>104</u>			24	87.9	104	<u>88.0</u>	<u>104</u>		
654.roms_s	24	91.7	172	<u>92.0</u>	<u>171</u>			24	91.7	172	<u>92.0</u>	<u>171</u>		

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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/spec2017-1.1.9-ic2023/lib/intel64:/home/spec2017-1.1.9-ic2023/je5.0.1-64"
MALLOC_CONF = "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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Platform Notes

BIOS configuration:
Performance Profile Set to Load Balance
Enable LP [Global] Set to Single LP

Sysinfo program /home/spec2017-1.1.9-ic2023/bin/sysinfo
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
running on localhost.localdomain Wed Aug 16 10:43:35 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. Failed units, from systemctl list-units --state=failed
13. Services, from systemctl list-unit-files
14. Linux kernel boot-time arguments, from /proc/cmdline
15. cpupower frequency-info
16. tuned-adm active
17. sysctl
18. /sys/kernel/mm/transparent_hugepage
19. /sys/kernel/mm/transparent_hugepage/khugepaged
20. OS release
21. Disk information
22. /sys/devices/virtual/dmi/id
23. dmidecode
24. 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
10:43:35 up 11 min, 1 user, load average: 0.00, 0.01, 0.02
USER      TTY      LOGIN@  IDLE   JCPU   PCPU WHAT
root     tty1      10:42   1:03   0.88s  0.00s -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
```

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Platform Notes (Continued)

```

file size                (blocks, -f) unlimited
pending signals          (-i) 1027300
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) 1027300
virtual memory          (kbytes, -v) unlimited
file locks              (-x) unlimited

```

```

-----
5. sysinfo process ancestry
/usr/lib/systemd/systemd --switched-root --system --deserialize 18
login -- root
-bash
-runcpu
-runcpu --define default-platform-flags -c ic2023.0-lin-sapphirerapids-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-sapphirerapids-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/CPU2017.219/templogs/preenv.fpspeed.219.0.log --lognum 219.0 --from_runcpu 2
specperl $SPEC/bin/sysinfo
$SPEC = /home/spec2017-1.1.9-ic2023

```

```

-----
6. /proc/cpuinfo
model name      : Intel(R) Xeon(R) Gold 5411N
vendor_id      : GenuineIntel
cpu family     : 6
model          : 143
stepping      : 7
microcode     : 0x2b000111
bugs           : spectre_v1 spectre_v2 spec_store_bypass swapsg
cpu cores     : 24
siblings      : 24
1 physical ids (chips)
24 processors (hardware threads)
physical id 0: core ids 0-23
physical id 0: apicids 0,2,4,6,8,10,12,14,16,18,20,22,24,26,28,30,32,34,36,38,40,42,44,46
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):                24
On-line CPU(s) list:  0-23
Vendor ID:             GenuineIntel
BIOS Vendor ID:       Intel(R) Corporation
Model name:            Intel(R) Xeon(R) Gold 5411N

```

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Platform Notes (Continued)

```

BIOS Model name: Intel(R) Xeon(R) Gold 5411N
CPU family: 6
Model: 143
Thread(s) per core: 1
Core(s) per socket: 24
Socket(s): 1
Stepping: 7
Frequency boost: enabled
CPU max MHz: 1901.0000
CPU min MHz: 800.0000
BogoMIPS: 3800.00
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 intel_ppin cdp_l2 ssbd mba ibrs ibpb stibp ibrs_enhanced
tpr_shadow vnmi flexpriority ept vpid ept_ad fsgsbase tsc_adjust bmlil 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 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): 0-23
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
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: 0-23
node 0 size: 256865 MB
node 0 free: 255898 MB
node distances:

```

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Platform Notes (Continued)

node 0
0: 10

9. /proc/meminfo
MemTotal: 263030036 kB

10. who -r
run-level 3 Aug 16 10:31

11. Systemd service manager version: systemd 250 (250-6.el9_0)
Default Target Status
multi-user degraded

12. Failed units, from systemctl list-units --state=failed
UNIT LOAD ACTIVE SUB DESCRIPTION
* sep5.service loaded failed failed systemd script to load sep5 driver at boot time

13. Services, from systemctl list-unit-files
STATE UNIT FILES
enabled NetworkManager NetworkManager-dispatcher NetworkManager-wait-online auditd chronyd crond
dbus-broker getty@ irqbalance kdump lvm2-monitor mdmonitor microcode nis-domainname
rhsmcertd rsyslog selinux-autorelabel-mark sep5 sshd sssd sysstat
systemd-network-generator tuned udisks2 upower
enabled-runtime systemd-remount-fs
disabled arp-ethers blk-availability canberra-system-bootup canberra-system-shutdown
canberra-system-shutdown-reboot chrony-wait console-getty cpupower debug-shell firewallld
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

14. 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
crashkernel=1G-4G:192M,4G-64G:256M,64G-:512M
resume=/dev/mapper/rhel-swap
rd.lvm.lv=rhel/root
rd.lvm.lv=rhel/swap

15. cpupower frequency-info
analyzing CPU 0:
current policy: frequency should be within 800 MHz and 1.90 GHz.
The governor "performance" may decide which speed to use
within this range.
boost state support:
Supported: yes
Active: yes

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

(Continued on next page)



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Platform Notes (Continued)

```

17. 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

-----

18. /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

-----

19. /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

-----

20. 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)

-----

21. Disk information
   SPEC is set to: /home/spec2017-1.1.9-ic2023
   Filesystem      Type  Size  Used Avail Use% Mounted on
   /dev/mapper/rhel-home xfs   1.7T   75G  1.6T   5% /home

-----

22. /sys/devices/virtual/dmi/id
   Vendor:      XFUSION
   Product:     5288 V7
   Product Family: Eagle Stream
   Serial:      serial

-----

23. dmidecode

```

(Continued on next page)



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Platform Notes (Continued)

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 Samsung M321R4GA3BB6-CQKDG 32 GB 2 rank 4800, configured at 4400

24. BIOS

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

BIOS Vendor: XFUSION
BIOS Version: 2.00.55
BIOS Date: 03/07/2023
BIOS Revision: 0.55

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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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)



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Base Compiler Invocation (Continued)

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 -xsaphirerapids -Ofast -ffast-math
-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -fiopenmp
-DSPEC_OPENMP -Wno-implicit-int -mprefer-vector-width=512
-L/usr/local/jemalloc64-5.0.1/lib -ljemalloc
```

Fortran benchmarks:

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

(Continued on next page)



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Software Availability: Dec-2022

Base Optimization Flags (Continued)

Benchmarks using both Fortran and C (continued):

```
-DSPEC_OPENMP -Wno-implicit-int -mprefer-vector-width=512  
-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 -xsapphirerapids -Ofast  
-ffast-math -flto -mfpmath=sse -funroll-loops  
-qopt-mem-layout-trans=4 -fiopenmp -DSPEC_OPENMP -Wno-implicit-int  
-mprefer-vector-width=512 -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

(Continued on next page)



SPEC CPU®2017 Floating Point Speed Result

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xFusion

SPECspeed®2017_fp_base = 177

FusionServer 5288 V7 (Intel Xeon Gold 5411N)

SPECspeed®2017_fp_peak = 177

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

Test Date: Aug-2023
Hardware Availability: Jan-2023
Software Availability: Dec-2022

Peak Optimization Flags (Continued)

Fortran benchmarks:

```
603.bwaves_s: -m64 -Wl,-z,muldefs -DSPEC_OPENMP -xsapphirerapids  
-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
```

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 -xsapphirerapids -Ofast  
-ffast-math -flto -mfpmath=sse -funroll-loops  
-qopt-mem-layout-trans=4 -fiopenmp -DSPEC_OPENMP  
-Wno-implicit-int -mprefer-vector-width=512  
-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-SPR-V1.1-revC.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-SPR-V1.1-revC.xml>

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