



SPEC CPU®2017 Floating Point Speed Result

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ASUSTeK Computer Inc.
ASUS RS720-E10-RS12(Z12PP-D32) Server System
(2.30 GHz, Intel Xeon Silver 4316)

SPECspeed®2017_fp_base = 189
SPECspeed®2017_fp_peak = 189

CPU2017 License: 9016

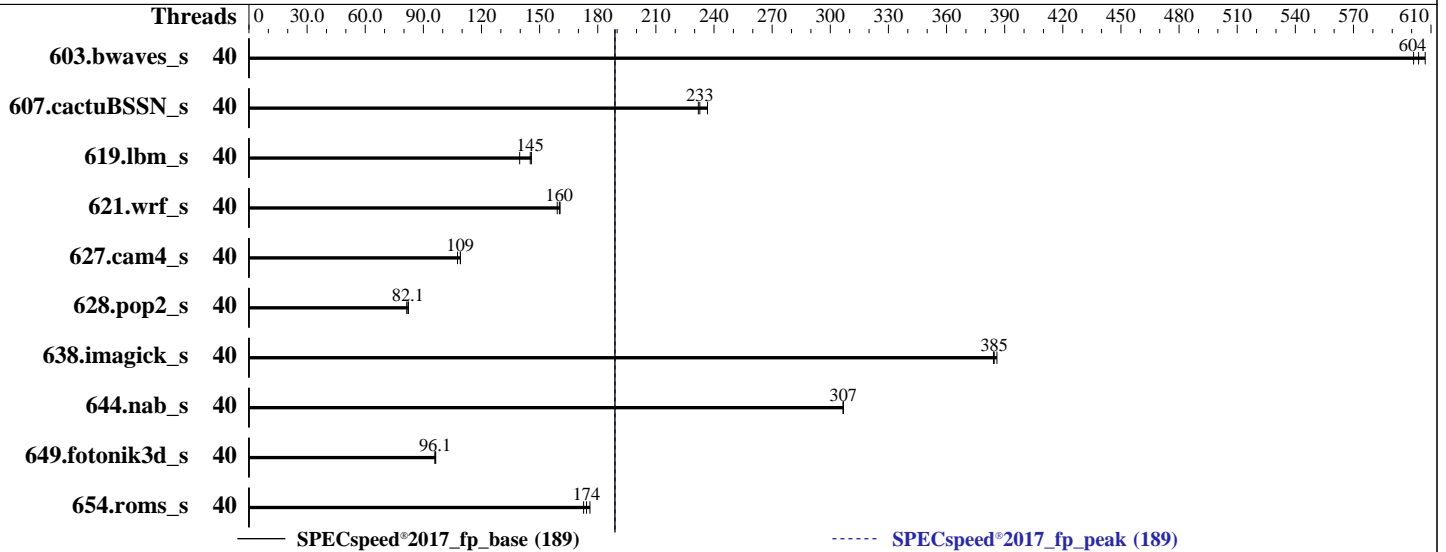
Test Sponsor: ASUSTeK Computer Inc.

Tested by: ASUSTeK Computer Inc.

Test Date: Mar-2023

Hardware Availability: Apr-2022

Software Availability: Dec-2022



Hardware

CPU Name: Intel Xeon Silver 4316
 Max MHz: 3400
 Nominal: 2300
 Enabled: 40 cores, 2 chips
 Orderable: 1, 2 chip(s)
 Cache L1: 32 KB I + 48 KB D on chip per core
 L2: 1.25 MB I+D on chip per core
 L3: 30 MB I+D on chip per chip
 Other: None
 Memory: 1 TB (16 x 64 GB 2Rx4 PC4-3200AA-R, running at 2666)
 Storage: 1 x 1 TB SATA SSD
 Other: None

Software

OS: Red Hat Enterprise Linux release 8.4 (Ootpa) 4.18.0-305.25.1.el8_4.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 0802 released Apr-2022
 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							
	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
603.bwaves_s	40	97.2	607	98.2	601	<u>97.7</u>	<u>604</u>	40	97.2	607	98.2	601	<u>97.7</u>	<u>604</u>
607.cactuBSSN_s	40	71.9	232	70.5	237	<u>71.6</u>	<u>233</u>	40	71.9	232	70.5	237	<u>71.6</u>	<u>233</u>
619.lbm_s	40	37.5	140	<u>36.1</u>	<u>145</u>	35.9	146	40	37.5	140	<u>36.1</u>	<u>145</u>	35.9	146
621.wrf_s	40	83.1	159	82.4	161	<u>82.6</u>	<u>160</u>	40	83.1	159	82.4	161	<u>82.6</u>	<u>160</u>
627.cam4_s	40	81.2	109	82.3	108	<u>81.2</u>	<u>109</u>	40	81.2	109	82.3	108	<u>81.2</u>	<u>109</u>
628.pop2_s	40	146	81.4	<u>145</u>	<u>82.1</u>	144	82.3	40	146	81.4	<u>145</u>	<u>82.1</u>	144	82.3
638.imagick_s	40	37.4	386	<u>37.5</u>	<u>385</u>	37.5	384	40	37.4	386	<u>37.5</u>	<u>385</u>	37.5	384
644.nab_s	40	57.0	307	<u>57.0</u>	<u>307</u>	57.0	307	40	57.0	307	<u>57.0</u>	<u>307</u>	57.0	307
649.fotonik3d_s	40	95.0	96.0	<u>94.8</u>	<u>96.1</u>	94.6	96.4	40	95.0	96.0	<u>94.8</u>	<u>96.1</u>	94.6	96.4
654.roms_s	40	89.5	176	<u>90.4</u>	<u>174</u>	91.2	173	40	89.5	176	<u>90.4</u>	<u>174</u>	91.2	173

SPECSpeed®2017_fp_base = **189**

SPECSpeed®2017_fp_peak = **189**

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"
OS set to performance mode via cpupower frequency-set -g performance

Environment Variables Notes

Environment variables set by runcpu before the start of the run:
KMP_AFFINITY = "granularity=fine,compact"
LD_LIBRARY_PATH = "/home/ic23/lib/intel64:/home/ic23/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

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General Notes (Continued)

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

BIOS Configuration:
VT-d = Disabled
Patrol Scrub = Disabled
Hyper-Threading = Disable
Engine Boost = Aggressive
SR-IOV Support = Disabled
BMC Configuration:
Fan mode = Full speed mode

Sysinfo program /home/ic23/bin/sysinfo
Rev: r6732 of 2022-11-07 fe91c89b7ed5c36ae2c92cc097bec197
running on localhost.localdomain Wed Mar 1 12:55:29 2023

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

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Platform Notes (Continued)

24. BIOS

1. uname -a

```
Linux localhost.localdomain 4.18.0-305.25.1.el8_4.x86_64 #1 SMP Mon Oct 18 14:34:11 EDT 2021 x86_64 x86_64
x86_64 GNU/Linux
```

2. w

```
12:55:29 up 3:55, 1 user, load average: 5.38, 5.78, 3.42
USER      TTY      FROM          LOGIN@      IDLE        JCPU       PCPU WHAT
root      tty1     -             09:01      3:53m     1.06s     0.00s /bin/bash ./speed.sh
```

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
file size               (blocks, -f) unlimited
pending signals         (-i) 4126718
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) 4126718
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
/bin/bash ./speed.sh
/bin/bash ./speed.sh
runcpu --nobuild --action validate --define default-platform-flags -c
ic2023.0-lin-core-avx512-speed-20221201.cfg --define cores=40 --tune base,peak -o all --define drop_caches
fpspeed
```

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Platform Notes (Continued)

```
runcpu --nobuild --action validate --define default-platform-flags --configfile
ic2023.0-lin-core-avx512-speed-20221201.cfg --define cores=40 --tune base,peak --output_format all
--define drop_caches --nopower --runmode speed --tune base:peak --size refspeed fpspeed --nopreenv
--note-preenv --logfile $SPEC/tmp/CPU2017.032/templogs/preenv.fpspeed.032.0.log --lognum 032.0
--from_runcpu 2
specperl $SPEC/bin/sysinfo
$SPEC = /home/ic23
```

```
-----
6. /proc/cpuinfo
   model name      : Intel(R) Xeon(R) Silver 4316 CPU @ 2.30GHz
   vendor_id       : GenuineIntel
   cpu family      : 6
   model           : 106
   stepping        : 6
   microcode       : 0xd000331
   bugs            : spectre_v1 spectre_v2 spec_store_bypass swapgs
   cpu cores       : 20
   siblings        : 20
   2 physical ids (chips)
   40 processors (hardware threads)
   physical id 0:  core ids 0-19
   physical id 1:  core ids 0-19
   physical id 0:  apicids 0,2,4,6,8,10,12,14,16,18,20,22,24,26,28,30,32,34,36,38
   physical id 1:  apicids 64,66,68,70,72,74,76,78,80,82,84,86,88,90,92,94,96,98,100,102
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):            40
On-line CPU(s) list: 0-39
Thread(s) per core: 1
Core(s) per socket: 20
Socket(s):         2
NUMA node(s):     2
Vendor ID:         GenuineIntel
BIOS Vendor ID:   Intel
CPU family:        6
Model:            106
Model name:        Intel(R) Xeon(R) Silver 4316 CPU @ 2.30GHz
BIOS Model name:   Intel(R) Xeon(R) Silver 4316 CPU @ 2.30GHz
```

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Platform Notes (Continued)

Stepping: 6
CPU MHz: 2923.057
CPU max MHz: 3400.0000
CPU min MHz: 800.0000
BogoMIPS: 4600.00
Virtualization: VT-x
L1d cache: 48K
L1i cache: 32K
L2 cache: 1280K
L3 cache: 30720K
NUMA node0 CPU(s): 0-19
NUMA node1 CPU(s): 20-39

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 intel_ppin 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 hwp hwp_act_window hwp_epp hwp_pkg_req 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: 0-19
node 0 size: 515667 MB
node 0 free: 510845 MB
node 1 cpus: 20-39
node 1 size: 516051 MB
node 1 free: 512651 MB
node distances:
node  0  1
  0:  10  20
  1:  20  10
```

9. /proc/meminfo

```
MemTotal: 1056480756 kB
```

10. who -r

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Platform Notes (Continued)

run-level 3 Mar 1 09:00

11. Systemd service manager version: systemd 239 (239-45.el8_4.3)
Default Target Status
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 insights-client-boot irqbalance iscsi iscsi-onboot kdump
  libstoragemgmt lm_sensors loadmodules lvm2-monitor mcelog mdmonitor microcode multipathd
  nvme-fc-boot-connections pmcd pmie pmlogger 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 fancontrol
  grafana-server iprump iprinit iprupdate ipsec iscsid iscsiui kpatch kvm_stat ledmon nftables
  nis-domainname nvme-autoconnect oddjobd pmfind pmie-check pmlogger-check pmlogger-daily-report
  pmlogger-daily-report-poll pmproxy podman-auto-update postfix powertop psacct ras-mc-ctl
  rasdaemon rdisc rhcd rhsm rhsm-facts rrdcached sasauthd serial-getty@ sshd-keygen@
  systemd-resolved tcsd
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,gpt2)/vmlinuz-4.18.0-305.25.1.el8_4.x86_64
root=/dev/mapper/rhel-root
ro
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 800 MHz and 3.40 GHz.
                  The governor "performance" may decide which speed to use
                  within this range.

  boost state support:
    Supported: yes
    Active: yes
```

15. tuned-adm active

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Platform Notes (Continued)

Current active profile: throughput-performance

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                 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+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_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)

```

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Platform Notes (Continued)

```

-----
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/swaps 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/ic23

Filesystem	Type	Size	Used	Avail	Use%	Mounted on
/dev/mapper/rhel-home	xfs	878G	130G	749G	15%	/home

22. /sys/devices/virtual/dmi/id

```

Vendor:      ASUSTeK COMPUTER INC.
Product:     RS720-E10-RS12
Product Family: Server
Serial:      012345678901

```

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:

16x Samsung M393A8G40AB2-CWE 64 GB 2 rank 3200, configured at 2666

24. BIOS

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

```

BIOS Vendor:      American Megatrends Inc.
BIOS Version:     0802
BIOS Date:        04/29/2022
BIOS Revision:    8.2

```



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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,
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SPECspeed®2017_fp_base = 189
SPECspeed®2017_fp_peak = 189

CPU2017 License: 9016
Test Sponsor: ASUSTeK Computer Inc.
Tested by: ASUSTeK Computer Inc.

Test Date: Mar-2023
Hardware Availability: Apr-2022
Software Availability: Dec-2022

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
-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
```

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SPEC CPU®2017 Floating Point Speed Result

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Base Optimization Flags (Continued)

Benchmarks using both Fortran and C (continued):

```
-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
```

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
```

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Peak Optimization Flags (Continued)

Fortran benchmarks:

603.bwaves_s: basepeak = yes

649.fotonik3d_s: basepeak = yes

654.roms_s: basepeak = yes

Benchmarks using both Fortran and C:

621.wrf_s: basepeak = yes

627.cam4_s: basepeak = yes

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/ASUSTekPlatform-Settings-z12-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/ASUSTekPlatform-Settings-z12-V1.2.xml>

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For questions about this result, please contact the tester. For other inquiries, please contact info@spec.org.

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