SPEC CPU®2017 Floating Point Rate Result

Copyright 2017-2022 Standard Performance Evaluation Corporation

Inspur Corporation

Inspur NF5180M6 (Intel Xeon Gold 6346)

SPECrate®2017_fp_base = 371

SPECrate®2017_fp_peak = 378
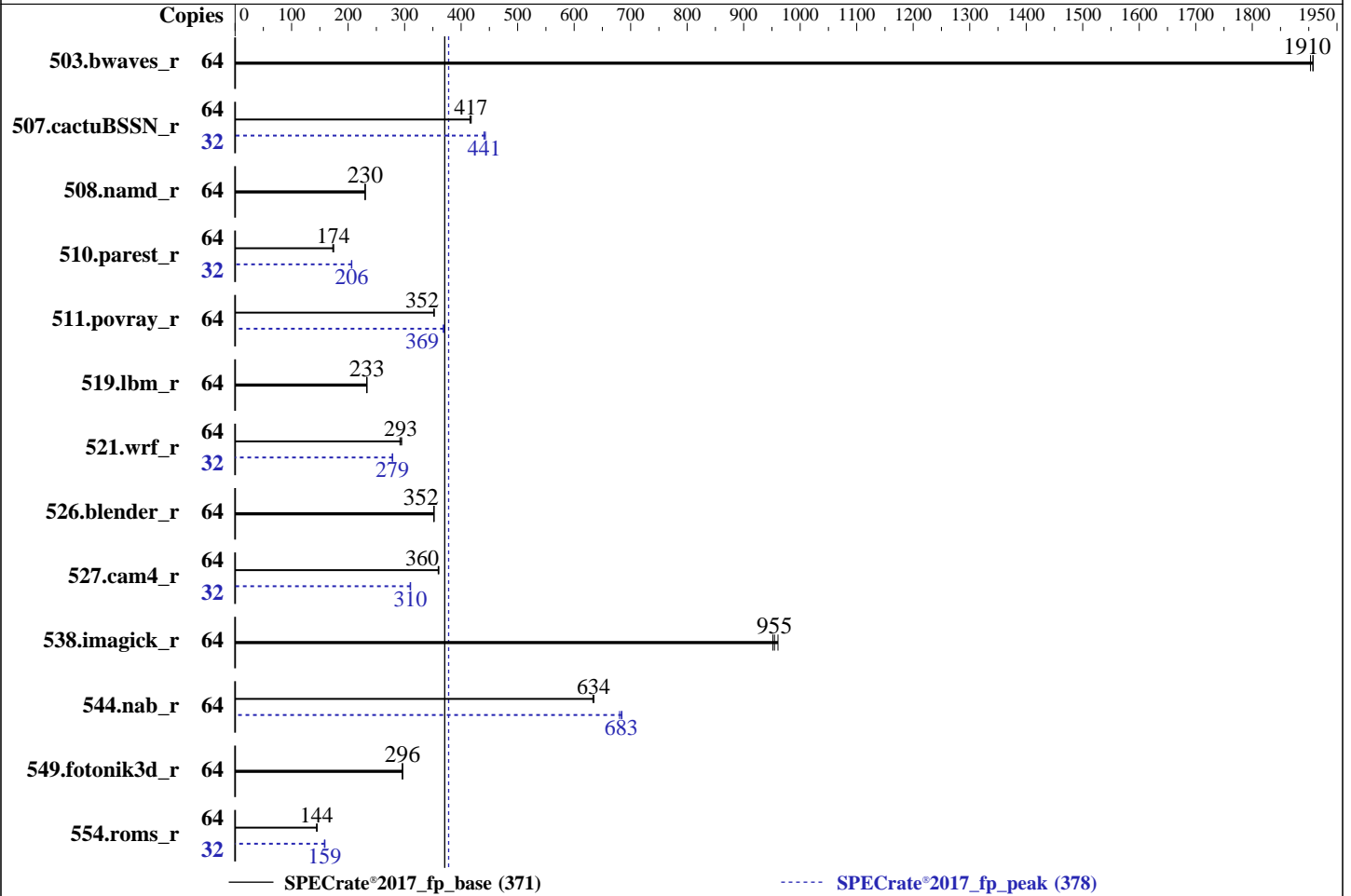
CPU2017 License: 3358
Test Sponsor: Inspur Corporation
Tested by: Inspur Corporation

Test Date: Oct-2022
Hardware Availability: Apr-2021
Software Availability: May-2022

Benchmark	Copies	Result
503.bwaves_r	64	1910
507.cactuBSSN_r	64	417
507.cactuBSSN_r	32	441
508.namd_r	64	230
510.parest_r	64	174
510.parest_r	32	206
511.povray_r	64	352
511.povray_r	32	369
519.lbm_r	64	233
521.wrf_r	64	293
521.wrf_r	32	279
526.blender_r	64	352
527.cam4_r	64	360
527.cam4_r	32	310
538.imagick_r	64	955
544.nab_r	64	634
544.nab_r	32	683
549.fotonik3d_r	64	296
554.roms_r	64	144
554.roms_r	32	159

SPECrate®2017_fp_base (371)
SPECrate®2017_fp_peak (378)

Hardware

CPU Name: Intel Xeon Gold 6346
 Max MHz: 3600
 Nominal: 3100
Enabled: 32 cores, 2 chips, 2 threads/core
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: 36 MB I+D on chip per chip
 Other: None
Memory: 1 TB (32 x 32 GB 2Rx8 PC4-3200AA-R)
Storage: 1 x 2 TB NVME SSD
Other: None

Software

OS: Red Hat Enterprise Linux release 8.3 (Ootpa)
 4.18.0-240.el8.x86_64
Compiler: C/C++: Version 2022.1 of Intel oneAPI DPC++/C++
 Compiler Build 20220316 for Linux;
 Fortran: Version 2022.1 of Intel Fortran Compiler
 Build 20220316 for Linux;
Parallel: No
Firmware: Version 04.12.02 released Apr-2021
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_ Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	_Peak_ Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
503.bwaves_r	64	**337**	**1910**	337	1900	336	1910	64	**337**	**1910**	337	1900	336	1910
507.cactuBSSN_r	64	194	418	195	416	**194**	**417**	32	91.4	443	92.0	440	**91.8**	**441**
508.namd_r	64	264	230	264	230	**264**	**230**	64	264	230	264	230	**264**	**230**
510.parest_r	64	**962**	**174**	969	173	961	174	32	406	206	405	207	**406**	**206**
511.povray_r	64	425	352	**424**	**352**	424	352	64	405	369	**405**	**369**	406	368
519.lbm_r	64	290	233	289	233	**289**	**233**	64	290	233	289	233	**289**	**233**
521.wrf_r	64	**489**	**293**	486	295	491	292	32	257	279	**257**	**279**	258	278
526.blender_r	64	277	352	**277**	**352**	277	352	64	277	352	**277**	**352**	277	352
527.cam4_r	64	311	360	**311**	**360**	311	359	32	180	311	**180**	**310**	181	310
538.imagick_r	64	167	952	166	961	**167**	**955**	64	167	952	166	961	**167**	**955**
544.nab_r	64	**170**	**634**	170	635	170	633	64	**158**	**683**	157	685	158	680
549.fotonik3d_r	64	**842**	**296**	842	296	842	296	64	**842**	**296**	842	296	842	296
554.roms_r	64	**704**	**144**	701	145	704	144	32	322	158	320	159	**321**	**159**

SPECrate®2017_fp_base =	**371**
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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.

Operating System Notes

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

Scaling_Governor set to Performance

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 8280M CPU + 384GB RAM memory using Red Hat Enterprise Linux 8.4

(Continued on next page)

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General Notes (Continued)

```
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
```

Platform Notes

```
BIOS configuration:
ENERGY_PERF_BIAS_CFG mode set to Performance
Hardware Prefetch set to Disable
VT Support set to Disable
Sub NUMA Cluster (SNC) set to Enable

Sysinfo program /home/CPU2017/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acafc64d
running on localhost.localdomain Tue Oct 11 15:42:18 2022

SUT (System Under Test) info as seen by some common utilities.
For more information on this section, see
   https://www.spec.org/cpu2017/Docs/config.html#sysinfo

From /proc/cpuinfo
   model name : Intel(R) Xeon(R) Gold 6346 CPU @ 3.10GHz
      2  "physical id"s (chips)
      64 "processors"
   cores, siblings (Caution: counting these is hw and system dependent. The following
   excerpts from /proc/cpuinfo might not be reliable.  Use with caution.)
      cpu cores : 16
      siblings  : 32
      physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
      physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

From lscpu from util-linux 2.32.1:
```

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Platform Notes (Continued)

```
        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:    2
        Core(s) per socket:    16
        Socket(s):             2
        NUMA node(s):          4
        Vendor ID:             GenuineIntel
        CPU family:            6
        Model:                 106
        Model name:            Intel(R) Xeon(R) Gold 6346 CPU @ 3.10GHz
        Stepping:              6
        CPU MHz:               3600.000
        CPU max MHz:           3600.0000
        CPU min MHz:           800.0000
        BogoMIPS:              6200.00
        Virtualization:        VT-x
        L1d cache:             48K
        L1i cache:             32K
        L2 cache:              1280K
        L3 cache:              36864K
        NUMA node0 CPU(s):     0-7,32-39
        NUMA node1 CPU(s):     8-15,40-47
        NUMA node2 CPU(s):     16-24,48-56
        NUMA node3 CPU(s):     25-31,57-63
        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 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
    intel_ppin ssbd mba ibrs ibpb stibp ibrs_enhanced 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 md_clear pconfig flush_l1d
    arch_capabilities

 /proc/cpuinfo cache data
    cache size : 36864 KB

 From numactl --hardware
 WARNING: a numactl 'node' might or might not correspond to a physical chip.
    available: 4 nodes (0-3)
```

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Platform Notes (Continued)

```
   node 0 cpus: 0 1 2 3 4 5 6 7 32 33 34 35 36 37 38 39
   node 0 size: 253519 MB
   node 0 free: 248338 MB
   node 1 cpus: 8 9 10 11 12 13 14 15 40 41 42 43 44 45 46 47
   node 1 size: 253724 MB
   node 1 free: 251024 MB
   node 2 cpus: 16 17 18 19 20 21 22 23 24 48 49 50 51 52 53 54 55 56
   node 2 size: 253315 MB
   node 2 free: 250258 MB
   node 3 cpus: 25 26 27 28 29 30 31 57 58 59 60 61 62 63
   node 3 size: 254037 MB
   node 3 free: 251780 MB
   node distances:
   node   0   1   2   3
     0:  10  11  20  20
     1:  11  10  20  20
     2:  20  20  10  11
     3:  20  20  11  10

 From /proc/meminfo
    MemTotal:       1056492600 kB
    HugePages_Total:        0
    Hugepagesize:        2048 kB

 /sbin/tuned-adm active
    Current active profile: throughput-performance

 /sys/devices/system/cpu/cpu*/cpufreq/scaling_governor has
    performance

 From /etc/*release* /etc/*version*
    os-release:
       NAME="Red Hat Enterprise Linux"
       VERSION="8.3 (Ootpa)"
       ID="rhel"
       ID_LIKE="fedora"
       VERSION_ID="8.3"
       PLATFORM_ID="platform:el8"
       PRETTY_NAME="Red Hat Enterprise Linux 8.3 (Ootpa)"
       ANSI_COLOR="0;31"
    redhat-release: Red Hat Enterprise Linux release 8.3 (Ootpa)
    system-release: Red Hat Enterprise Linux release 8.3 (Ootpa)
    system-release-cpe: cpe:/o:redhat:enterprise_linux:8.3:ga

 uname -a:
    Linux localhost.localdomain 4.18.0-240.el8.x86_64 #1 SMP Wed Sep 23 05:13:10 EDT 2020
    x86_64 x86_64 x86_64 GNU/Linux
```

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Platform Notes (Continued)

```
Kernel self-reported vulnerability status:

CVE-2018-12207 (iTLB Multihit):               Not affected
CVE-2018-3620 (L1 Terminal Fault):            Not affected
Microarchitectural Data Sampling:             Not affected
CVE-2017-5754 (Meltdown):                     Not affected
CVE-2018-3639 (Speculative Store Bypass):     Mitigation: Speculative Store
                                              Bypass disabled via prctl and
                                              seccomp
CVE-2017-5753 (Spectre variant 1):            Mitigation: usercopy/swapgs
                                              barriers and __user pointer
                                              sanitization
CVE-2017-5715 (Spectre variant 2):            Mitigation: Enhanced IBRS, IBPB:
                                              conditional, RSB filling
CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
CVE-2019-11135 (TSX Asynchronous Abort):      Not affected

run-level 3 Oct 11 09:50

SPEC is set to: /home/CPU2017
   Filesystem              Type  Size  Used Avail Use% Mounted on
   /dev/mapper/rhel-home xfs   1.4T  129G  1.3T  10% /home

From /sys/devices/virtual/dmi/id
   Vendor:          Inspur
   Product:         NF5180M6
   Product Family:  Family
   Serial:          380827124

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:
    32x Micron 18ASF4G72PDZ-3G2E1 32 GB 2 rank 3200

BIOS:
   BIOS Vendor:       American Megatrends Inc.
   BIOS Version:      04.12.02
   BIOS Date:         04/02/2021
   BIOS Revision:     5.21

(End of data from sysinfo program)
```

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Compiler Version Notes

```
================================================================================
C                    | 519.lbm_r(base, peak) 538.imagick_r(base, peak)
                     | 544.nab_r(base, peak)
--------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
  Version 2022.1.0 Build 20220316
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
--------------------------------------------------------------------------------


================================================================================
C++                  | 508.namd_r(base, peak) 510.parest_r(base, peak)
--------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
  Version 2022.1.0 Build 20220316
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
--------------------------------------------------------------------------------


================================================================================
C++, C               | 511.povray_r(base, peak) 526.blender_r(base, peak)
--------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
  Version 2022.1.0 Build 20220316
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
  Version 2022.1.0 Build 20220316
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
--------------------------------------------------------------------------------


================================================================================
C++, C, Fortran | 507.cactuBSSN_r(base, peak)
--------------------------------------------------------------------------------
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
  Version 2022.1.0 Build 20220316
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
  Version 2022.1.0 Build 20220316
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version
  2022.1.0 Build 20220316
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
--------------------------------------------------------------------------------


================================================================================
Fortran              | 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak)
                     | 554.roms_r(base, peak)
--------------------------------------------------------------------------------
Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version
```

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https://www.spec.org/

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Compiler Version Notes (Continued)

```
   2022.1.0 Build 20220316
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
------------------------------------------------------------------------


==============================================================================
Fortran, C       | 521.wrf_r(base, peak) 527.cam4_r(base, peak)
------------------------------------------------------------------------
Intel(R) Fortran Compiler for applications running on Intel(R) 64, Version
  2022.1.0 Build 20220316
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
Intel(R) oneAPI DPC++/C++ Compiler for applications running on Intel(R) 64,
  Version 2022.1.0 Build 20220316
Copyright (C) 1985-2022 Intel Corporation. All rights reserved.
------------------------------------------------------------------------
```

Base Compiler Invocation

C benchmarks:
`icx`

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`

(Continued on next page)

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Base Portability Flags (Continued)

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

C++ benchmarks:
`-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math -flto`
`-mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -ljemalloc`
`-L/usr/local/jemalloc64-5.0.1/lib`

Fortran benchmarks:
`-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -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-AVX512 -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 C and C++:
`-w -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math`
`-flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -ljemalloc`
`-L/usr/local/jemalloc64-5.0.1/lib`

Benchmarks using Fortran, C, and C++:
`-w -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -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`

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Peak Compiler Invocation

C benchmarks:
`icx`

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`

Peak Portability Flags

```
Same as Base Portability Flags
```

Peak Optimization Flags

C benchmarks:

519.lbm_r: `basepeak = yes`

538.imagick_r: `basepeak = yes`

544.nab_r: `-w -std=c11 -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math -flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -qopt-zmm-usage=high -ljemalloc -L/usr/local/jemalloc64-5.0.1/lib`

C++ benchmarks:

508.namd_r: `basepeak = yes`

510.parest_r: `-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -Ofast -ffast-math -flto -mfpmath=sse -funroll-loops -qopt-mem-layout-trans=4 -ljemalloc`

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Peak Optimization Flags (Continued)

510.parest_r (continued):
`-L/usr/local/jemalloc64-5.0.1/lib`

Fortran benchmarks:

503.bwaves_r: `basepeak = yes`

549.fotonik3d_r: `basepeak = yes`

554.roms_r: `-w -m64 -Wl,-z,muldefs -xCORE-AVX512 -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-AVX512 -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 C and C++:

511.povray_r: `-w -m64 -std=c11 -Wl,-z,muldefs`
`-fprofile-generate`(pass 1)
`-fprofile-use=default.profdata`(pass 2) `-xCORE-AVX512`
`-Ofast -ffast-math -flto -mfpmath=sse -funroll-loops`
`-qopt-mem-layout-trans=4 -ljemalloc`
`-L/usr/local/jemalloc64-5.0.1/lib`

526.blender_r: `basepeak = yes`

Benchmarks using Fortran, C, and C++:
`-w -m64 -std=c11 -Wl,-z,muldefs -xCORE-AVX512 -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`

The flags files that were used to format this result can be browsed at
`http://www.spec.org/cpu2017/flags/Intel-ic2022-official-linux64_revA.html`
`http://www.spec.org/cpu2017/flags/Inspur-Platform-Settings-V2.5.html`

You can also download the XML flags sources by saving the following links:
`http://www.spec.org/cpu2017/flags/Intel-ic2022-official-linux64_revA.xml`
`http://www.spec.org/cpu2017/flags/Inspur-Platform-Settings-V2.5.xml`

SPEC CPU®2017 Floating Point Rate Result

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Inspur Corporation

Inspur NF5180M6 (Intel Xeon Gold 6346)

SPECrate®2017_fp_base = 371

SPECrate®2017_fp_peak = 378

CPU2017 License: 3358
Test Sponsor: Inspur Corporation
Tested by: Inspur Corporation

Test Date: Oct-2022
Hardware Availability: Apr-2021
Software Availability: May-2022

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

Tested with SPEC CPU®2017 v1.1.8 on 2022-10-11 15:42:18-0400.
Report generated on 2022-11-08 22:22:27 by CPU2017 PDF formatter v6442.
Originally published on 2022-11-08.