

SPEC® CPU2017 Floating Point Speed Result

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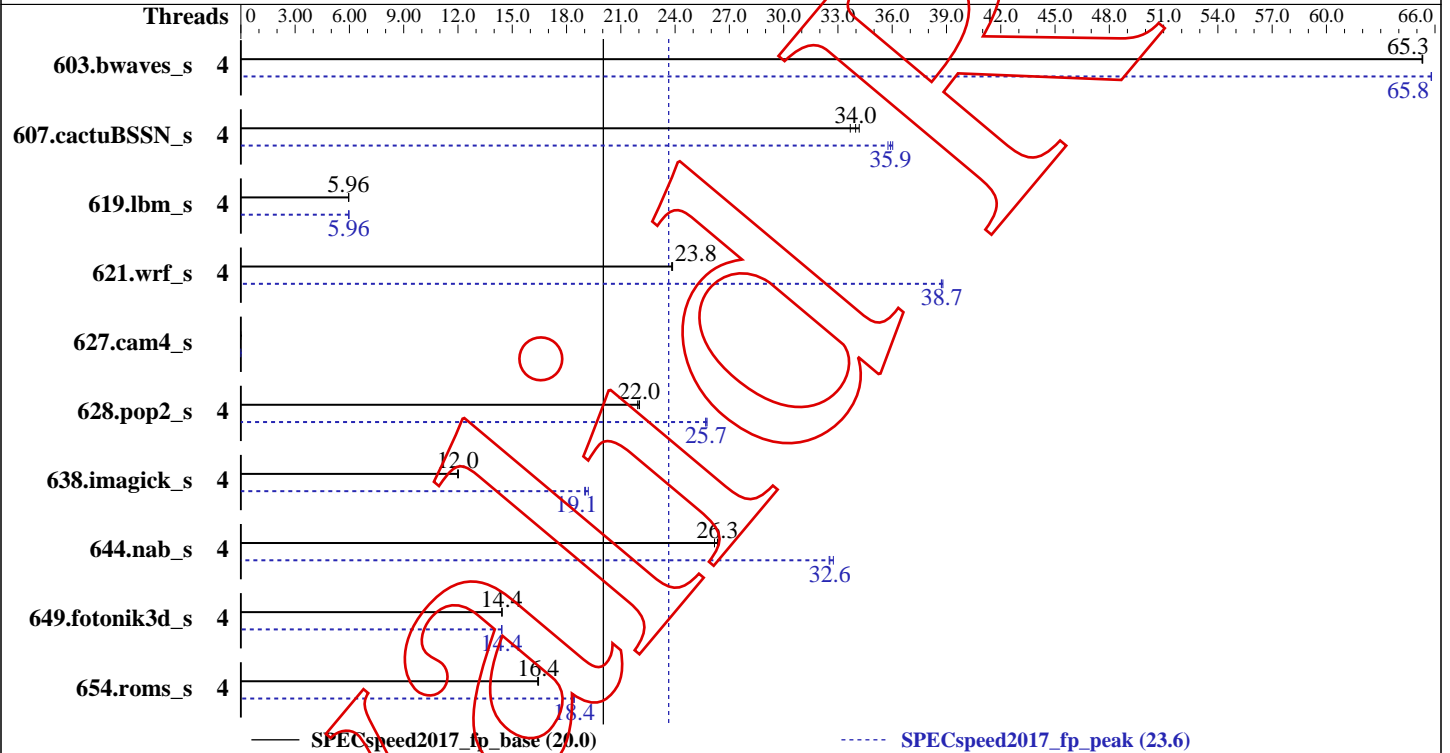
(Test Sponsor: Red Hat, Inc.)

SPECspeed2017_fp_base = 20.0

SPECspeed2017_fp_peak = 23.6

CPU2017 License: 0002991
Test Sponsor: Red Hat, Inc.
Tested by: Vladimir Makarov

Test Date: Apr-2024
Hardware Availability: Now
Software Availability:



Hardware

CPU Name: AMD Ryzen 7 3800X 8-Core Processor
Max MHz.:
Nominal: 1882.208
Enabled: 16 cores, 1 chip, threads/core
Orderable:
Cache L1:
L2: 512 KB
L3:
Other:
Memory: 32889052 KB
'N GB (M x N GB nRxn PCn-nnnnnR-n, ECC)'
Storage: 69 GB add more disk info here
Other:

Software

OS: Linux 5.5.11-200.fc31.x86_64
5.5.11-200.fc31.x86_64
Compiler: gcc version 14.0.1 20240414 (experimental) (GCC)
Parallel: Yes
Firmware:
File System: ext4
System State: multiuser
Base Pointers: 64-bit
Peak Pointers: 64-bit
Other:

Errors

'reportable' flag not set during run
627.cam4_s (base) did not have enough runs!
627.cam4_s (base) had invalid runs!
627.cam4_s (peak) did not have enough runs!
627.cam4_s (peak) had invalid runs!

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Errors (Continued)

Run of 627.cam4_s (base) was not valid; status is CE

Run of 627.cam4_s (peak) was not valid; status is CE

Unknown flags were used! See

<https://www.spec.org/cpu2017/Docs/runcpu.html#flagsurl>

for information about how to get rid of this error.

Results Table

Benchmark	Base						Peak							
	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Threads	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
603.bwaves_s	4	903	65.3	904	65.3	903	65.3	4	897	65.8	897	65.8	897	65.8
607.cactuBSSN_s	4	491	34.0	495	33.7	488	34.2	4	466	35.8	463	36.0	464	35.9
619.lbm_s	4	879	5.96	879	5.96	879	5.96	4	878	5.96	878	5.97	878	5.96
621.wrf_s	4	555	23.8	555	23.8	554	23.9	4	342	38.7	341	38.8	341	38.7
627.cam4_s	1	0.00	0.00					1	0.00	0.00				
628.pop2_s	4	541	21.9	539	22.0	539	22.0	4	461	25.8	462	25.7	462	25.7
638.imagick_s	4	1199	12.0	1202	12.0	1204	12.0	4	757	19.1	759	19.0	751	19.2
644.nab_s	4	667	26.2	663	26.3	663	26.4	4	534	32.7	537	32.5	537	32.6
649.fotonik3d_s	4	631	14.4	632	14.4	632	14.4	4	632	14.4	632	14.4	632	14.4
654.roms_s	4	960	16.4	958	16.4	957	16.5	4	855	18.4	857	18.4	855	18.4

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Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

General Notes

Environment variables set by runcpu before the start of the run:

```
LD_LIBRARY_PATH = */notnfs/vmakarov/perf/sbox/gcc/local.spec2017.x86_64/inst.to-ryzen/lib64:/notnfs/vmakarov/perf/sbox/gcc/local.spec2017.x86_64/inst.to-ryzen/lib:/usr/lib64:/usr/lib:/lib64*  
OMP_STACKSIZE = "120M"
```

Platform Notes

Sysinfo program /notnfs/vmakarov/spec2017/bin/sysinfo
Rev: r5797 of 2017-06-14 96c45e4568ad54c135fd618bcc091c0f
running on to-ryzen.usersys.redhat.com Sun Apr 14 22:47:45 2024

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 : AMD Ryzen 7 3800X 8-Core Processor

1 "physical id"s (chips)

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Platform Notes (Continued)

16 "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 : 8
siblings  : 16
physical 0: cores 0 1 2 3 4 5 6 7
```

From lscpu:

```
Architecture:          x86_64
CPU op-mode(s):        32-bit, 64-bit
Byte Order:            Little Endian
Address sizes:         43 bits physical, 48 bits virtual
CPU(s):                16
On-line CPU(s) list:   0-15
Thread(s) per core:    2
Core(s) per socket:    8
Socket(s):             1
NUMA node(s):         1
Vendor ID:             AuthenticAMD
CPU family:            23
Model:                113
Model name:            AMD Ryzen 7 3800X 8-Core Processor
Stepping:              0
Frequency boost:       enabled
CPU MHz:               2686.044
CPU max MHz:           3900.0000
CPU min MHz:           2200.0000
BogoMIPS:              7785.73
Virtualization:        AMD-V
L1d cache:             256 KiB
L1i cache:             256 KiB
L2 cache:              4 MiB
L3 cache:              32 MiB
NUMA node0 CPU(s):    0-15
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 and seccomp
Vulnerability Spectre v1: Mitigation; usercopy/swapgs barriers and __user pointer sanitization
Vulnerability Spectre v2: Mitigation; Full AMD retpoline, IBPB conditional, STIBP always-on, RSB filling
Vulnerability Tsx async abort: Not affected
Flags:                 fpu vme de pse tsc msr pae mce cx8 apic sep mtrr pge mca cmov pat pse36 clflush mmx fxsr sse sse2 ht syscall nx mmxext fxsr_opt
```

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Platform Notes (Continued)

```
pdpe1gb rdtscp lm constant_tsc rep_good nopl nonstop_tsc cpuid extd_apicid
aperfperf pni pclmulqdq monitor ssse3 fma cx16 sse4_1 sse4_2 movbe popcnt aes xsave
avx f16c rdrand lahf_lm cmp_legacy svm extapic cr8_legacy abm sse4a misalignsse
3dnowprefetch osvw ibs skinit wdt tce topoext perfctr_core perfctr_nb bpeext
perfctr_llc mwaitx cpb cat_l3 cdp_l3 hw_pstate sme ssbd mba sev ibpb stibp vmmcall
fsgsbase bmi1 avx2 smep bmi2 cqm rdt_a rdseed adx smap clflushopt clwb sha_ni
xsaveopt xsavec xgetbv1 xsaves cqm_llc cqm_occup_llc cqm_mbm_total cqm_mbm_local
clzero irperf xsaveerptr rdpru wbnoinvd arat npt lbrv svm_lock nrip_save tsc_scale
vmcb_clean flushbyasid decodeassists pausefilter pfthreshold avic v_vmsave_vmload
vgif umip rdpid overflow_redov succor smca
```

```
/proc/cpuinfo cache data
cache size : 512 KB
```

```
From numactl --hardware WARNING: a numactl 'node' might or might not correspond to a
physical chip.
```

```
From /proc/meminfo
MemTotal: 32889052 kB
HugePages_Total: 0
Hugepagesize: 2048 kB
```

```
From /etc/*release* /etc/*version*
fedora-release: Fedora release 31 (Thirty One)
os-release:
NAME=Fedora
VERSION="31 (Workstation Edition)"
ID=fedora
VERSION_ID=31
VERSION_CODENAME=""
PLATFORM_ID="platform:f31"
PRETTY_NAME="Fedora 31 (Workstation Edition)"
ANSI_COLOR="0;34"
redhat-release: Fedora release 31 (Thirty One)
system-release: Fedora release 31 (Thirty One)
system-release-cpe: cpe:/o:fedoraproject:fedora:31
```

```
uname -a:
Linux to-ryzen.usersys.redhat.com 5.5.11-200.fc31.x86_64 #1 SMP Mon Mar 23 17:32:43
UTC 2020 x86_64 x86_64 x86_64 GNU/Linux
```

```
run-level 3 2024-02-27 12:34
```

```
SPEC is set to: /notnfs/vmakarov/spec2017
```

Filesystem	Type	Size	Used	Avail	Use%	Mounted on
/dev/mapper/fedora_localhost--live-root	ext4	69G	63G	2.4G	97%	/

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Platform Notes (Continued)

Additional information from dmidecode 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.

(End of data from sysinfo program)

Compiler Version Notes

=====
FC 607.cactuBSSN_s(base, peak)
=====

Using built-in specs.

COLLECT_GCC=/notnfs/vmakarov/perf/sbox/gcc/local.spec2017.x86_64/inst.to-ryzen/bin/g++

COLLECT_LTO_WRAPPER=/notnfs/vmakarov/perf/sbox/gcc/local.spec2017.x86_64/inst.to-ryzen/libexec/gcc/x86_64-pc-linux-gnu/14.0.1/lto-wrapper

Target: x86_64-pc-linux-gnu

Configured with:

```
/notnfs/vmakarov/perf/sbox/gcc/local.spec2017.x86_64/src/configure  
--prefix=/notnfs/vmakarov/perf/sbox/gcc/local.spec2017.x86_64/inst.to-ryzen  
--srcdir=/notnfs/vmakarov/perf/sbox/gcc/local.spec2017.x86_64/src  
--disable-bootstrap --disable-libcilkrts --enable-checking=release  
--enable-languages=c,c++,fortran
```

Thread model: posix

Supported LTO compression algorithms: zlib

gcc version 14.0.1 20240414 (experimental) (GCC)

Using built-in specs.

COLLECT_GCC=/notnfs/vmakarov/perf/sbox/gcc/local.spec2017.x86_64/inst.to-ryzen/bin/gcc

COLLECT_LTO_WRAPPER=/notnfs/vmakarov/perf/sbox/gcc/local.spec2017.x86_64/inst.to-ryzen/libexec/gcc/x86_64-pc-linux-gnu/14.0.1/lto-wrapper

Target: x86_64-pc-linux-gnu

Configured with:

```
/notnfs/vmakarov/perf/sbox/gcc/local.spec2017.x86_64/src/configure  
--prefix=/notnfs/vmakarov/perf/sbox/gcc/local.spec2017.x86_64/inst.to-ryzen  
--srcdir=/notnfs/vmakarov/perf/sbox/gcc/local.spec2017.x86_64/src  
--disable-bootstrap --disable-libcilkrts --enable-checking=release  
--enable-languages=c,c++,fortran
```

Thread model: posix

Supported LTO compression algorithms: zlib

gcc version 14.0.1 20240414 (experimental) (GCC)

Using built-in specs.

COLLECT_GCC=/notnfs/vmakarov/perf/sbox/gcc/local.spec2017.x86_64/inst.to-ryzen/bin/gfortran

COLLECT_LTO_WRAPPER=/notnfs/vmakarov/perf/sbox/gcc/local.spec2017.x86_64/inst.to-ryzen/libexec/gcc/x86_64-pc-linux-gnu/14.0.1/lto-wrapper

Target: x86_64-pc-linux-gnu

Configured with:

```
/notnfs/vmakarov/perf/sbox/gcc/local.spec2017.x86_64/src/configure  
--prefix=/notnfs/vmakarov/perf/sbox/gcc/local.spec2017.x86_64/inst.to-ryzen  
--srcdir=/notnfs/vmakarov/perf/sbox/gcc/local.spec2017.x86_64/src
```

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Compiler Version Notes (Continued)

```
--disable-bootstrap --disable-libcilkrts --enable-checking=release
--enable-languages=c,c++,fortran
Thread model: posix
Supported LTO compression algorithms: zlib
gcc version 14.0.1 20240414 (experimental) (GCC)
-----
CC 619.lbm_s(base, peak) 638.imagick_s(base, peak) 644.nab_s(base, peak)
-----
Using built-in specs.
COLLECT_GCC=/notnfs/vmakarov/perf/sbox/gcc/local.spec2017.x86_64/inst.to-ryzen/bin/gcc
COLLECT_LTO_WRAPPER=/notnfs/vmakarov/perf/sbox/gcc/local.spec2017.x86_64/inst.to-ryzen/libexec/gcc/x86_64-pc-linux-gnu/14.0.1/lto-wrapper
Target: x86_64-pc-linux-gnu
Configured with:
 /notnfs/vmakarov/perf/sbox/gcc/local.spec2017.x86_64/src/configure
--prefix=/notnfs/vmakarov/perf/sbox/gcc/local.spec2017.x86_64/inst.to-ryzen
--srcdir=/notnfs/vmakarov/perf/sbox/gcc/local.spec2017.x86_64/src
--disable-bootstrap --disable-libcilkrts --enable-checking=release
--enable-languages=c,c++,fortran
Thread model: posix
Supported LTO compression algorithms: zlib
gcc version 14.0.1 20240414 (experimental) (GCC)
-----
FC 603.bwaves_s(base, peak) 649.fotonik3d_s(base, peak) 654.roms_s(base,
  peak)
-----
Using built-in specs.
COLLECT_GCC=/notnfs/vmakarov/perf/sbox/gcc/local.spec2017.x86_64/inst.to-ryzen/bin/gfortran
COLLECT_LTO_WRAPPER=/notnfs/vmakarov/perf/sbox/gcc/local.spec2017.x86_64/inst.to-ryzen/libexec/gcc/x86_64-pc-linux-gnu/14.0.1/lto-wrapper
Target: x86_64-pc-linux-gnu
Configured with:
 /notnfs/vmakarov/perf/sbox/gcc/local.spec2017.x86_64/src/configure
--prefix=/notnfs/vmakarov/perf/sbox/gcc/local.spec2017.x86_64/inst.to-ryzen
--srcdir=/notnfs/vmakarov/perf/sbox/gcc/local.spec2017.x86_64/src
--disable-bootstrap --disable-libcilkrts --enable-checking=release
--enable-languages=c,c++,fortran
Thread model: posix
Supported LTO compression algorithms: zlib
gcc version 14.0.1 20240414 (experimental) (GCC)
-----
CC 621.wrf_s(base, peak) 628.pop2_s(base, peak)
-----
```

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Compiler Version Notes (Continued)

Using built-in specs.

COLLECT_GCC=/notnfs/vmakarov/perf/sbox/gcc/local.spec2017.x86_64/inst.to-ryzen/bin/gfortran

COLLECT_LTO_WRAPPER=/notnfs/vmakarov/perf/sbox/gcc/local.spec2017.x86_64/inst.to-ryzen/libexec/gcc/x86_64-pc-linux-gnu/14.0.1/lto-wrapper

Target: x86_64-pc-linux-gnu

Configured with:

```
/notnfs/vmakarov/perf/sbox/gcc/local.spec2017.x86_64/src/configure
--prefix=/notnfs/vmakarov/perf/sbox/gcc/local.spec2017.x86_64/inst.to-ryzen
--srcdir=/notnfs/vmakarov/perf/sbox/gcc/local.spec2017.x86_64/src
--disable-bootstrap --disable-libcilkrts --enable-checking=release
--enable-languages=c,c++,fortran
```

Thread model: posix

Supported LTO compression algorithms: zlib

gcc version 14.0.1 20240414 (experimental) (GCC)

Using built-in specs.

COLLECT_GCC=/notnfs/vmakarov/perf/sbox/gcc/local.spec2017.x86_64/inst.to-ryzen/bin/gcc

COLLECT_LTO_WRAPPER=/notnfs/vmakarov/perf/sbox/gcc/local.spec2017.x86_64/inst.to-ryzen/libexec/gcc/x86_64-pc-linux-gnu/14.0.1/lto-wrapper

Target: x86_64-pc-linux-gnu

Configured with:

```
/notnfs/vmakarov/perf/sbox/gcc/local.spec2017.x86_64/src/configure
--prefix=/notnfs/vmakarov/perf/sbox/gcc/local.spec2017.x86_64/inst.to-ryzen
--srcdir=/notnfs/vmakarov/perf/sbox/gcc/local.spec2017.x86_64/src
--disable-bootstrap --disable-libcilkrts --enable-checking=release
--enable-languages=c,c++,fortran
```

Thread model: posix

Supported LTO compression algorithms: zlib

gcc version 14.0.1 20240414 (experimental) (GCC)

Base Unknown Flags

603.bwaves_s: "-fallow-argument-mismatchARRAY(0xa541a68)

"-fallow-argument-mismatchARRAY(0xa57a688)

607.cactuBSSN_s: "-fcommon -std=c++14ARRAY(0xa57a6e8)

"-fcommonARRAY(0xa563af8)

"-fallow-argument-mismatchARRAY(0xa59e3a0)

"-fcommon -std=c++14ARRAY(0xa59e8e0)

619.lbm_s: "-fcommonARRAY(0xa558ff0) "-fcommonARRAY(0xa55fc18)

621.wrf_s: "-fallow-argument-mismatchARRAY(0xa546918)

"-fcommonARRAY(0xa59dbd8)

"-fallow-argument-mismatchARRAY(0xa6c5790)

628.pop2_s: "-fallow-argument-mismatchARRAY(0xa536b80)

"-fcommonARRAY(0xa5b0010)

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Base Unknown Flags (Continued)

628.pop2_s (continued):

"-fallow-argument-mismatchARRAY(0xa6c6090)

638.imagick_s: "-fcommonARRAY(0xa59e700) "-fcommonARRAY(0xa6c70c0)

644.nab_s: "-fcommonARRAY(0xa59e760) "-fcommonARRAY(0xa6c7870)

649.fotonik3d_s: "-fallow-argument-mismatchARRAY(0xa59e6b8)

"-fallow-argument-mismatchARRAY(0xa6c7de0)

654.roms_s: "-fallow-argument-mismatchARRAY(0xa5a64d0)

"-fallow-argument-mismatchARRAY(0xa652bb8)

Peak Unknown Flags

603.bwaves_s: "-fallow-argument-mismatchARRAY(0xa541a68)

"-fallow-argument-mismatchARRAY(0xa57a688)

607.cactuBSSN_s: "-fcommon -std=c++14ARRAY(0xa57a6e8)

"-fcommonARRAY(0xa5e3af8)

"-fallow-argument-mismatchARRAY(0xa59e3a0)

"-fcommon -std=c++14ARRAY(0xa59e8e0)

619.lbm_s: "-fcommonARRAY(0xa558ff0) "-fcommonARRAY(0xa55fc18)

621.wrf_s: "-fallow-argument-mismatchARRAY(0xa546918)

"-fcommonARRAY(0xa59dbd8)

"-fallow-argument-mismatchARRAY(0xa6c5790)

628.pop2_s: "-fallow-argument-mismatchARRAY(0xa536b80)

"-fcommonARRAY(0xa5b0010)

"-fallow-argument-mismatchARRAY(0xa6c6090)

638.imagick_s: "-fcommonARRAY(0xa59e700) "-fcommonARRAY(0xa6c70c0)

644.nab_s: "-fcommonARRAY(0xa59e760) "-fcommonARRAY(0xa6c7870)

649.fotonik3d_s: "-fallow-argument-mismatchARRAY(0xa59e6b8)

"-fallow-argument-mismatchARRAY(0xa6c7de0)

654.roms_s: "-fallow-argument-mismatchARRAY(0xa5a64d0)

"-fallow-argument-mismatchARRAY(0xa652bb8)

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Peak Unknown Flags (Continued)

603.bwaves_s: "-fallow-argument-mismatchARRAY(0xa6c4340)

"-fallow-argument-mismatchARRAY(0xa652f88)

"-fltoARRAY(0xa736d48)

607.cactuBSSN_s: "-fcommon -std=c++14ARRAY(0xa653180)

"-fcommonARRAY(0xa741250)

"-fallow-argument-mismatchARRAY(0xa63ee80)

"-fcommon -std=c++14ARRAY(0xa72f688)

"-fltoARRAY(0xa73d2f0)

619.lbm_s: "-fcommonARRAY(0xa7290a0) "-fcommonARRAY(0xa741280)

"-fltoARRAY(0xa72abd8)

621.wrf_s: "-fallow-argument-mismatchARRAY(0xa7413e8)

"-fcommonARRAY(0xa73d470)

"-fallow-argument-mismatchARRAY(0xa73d458)

"-fltoARRAY(0xa740cc8)

628.pop2_s: "-fallow-argument-mismatchARRAY(0xa741040)

"-fcommonARRAY(0xa6c4550)

"-fallow-argument-mismatchARRAY(0xa740d70)

"-fltoARRAY(0xa749280)

638.imagick_s: "-fcommonARRAY(0xa741850) "-fcommonARRAY(0xa7157c8)

"-fltoARRAY(0xa749760)

644.nab_s: "-fcommonARRAY(0xa6c5e80) "-fcommonARRAY(0xa73d578)

"-fltoARRAY(0xa74a6e8)

649.fotonik3d_s: "-fallow-argument-mismatchARRAY(0xa741238)

"-fallow-argument-mismatchARRAY(0xa740e48)

"-fltoARRAY(0xa74b220)

654.roms_s: "-fallow-argument-mismatchARRAY(0xa73d338)

"-fallow-argument-mismatchARRAY(0xa7499d0)

"-fltoARRAY(0xa74bd30)

Base Compiler Invocation

C benchmarks:

gcc

Fortran benchmarks:

gfortran

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Base Compiler Invocation (Continued)

Benchmarks using both Fortran and C (except as noted below):

gfortran gcc

Benchmarks using Fortran, C, and C++:

g++ gcc gfortran

Base Portability Flags

603.bwaves_s: -DSPEC_LP64

607.cactuBSSN_s: -DSPEC_LP64

619.lbm_s: -DSPEC_LP64

621.wrf_s: -DSPEC_CASE_FLAG -fconvert=big-endian -DSPEC_LP64

628.pop2_s: -DSPEC_CASE_FLAG -fconvert=big-endian -DSPEC_LP64

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:

-O2 -mtune=generic -fopenmp -DSPEC_OPENMP

Fortran benchmarks:

-O2 -mtune=generic -DSPEC_OPENMP -fopenmp

Benchmarks using both Fortran and C:

621.wrf_s: -O2 -mtune=generic -DSPEC_OPENMP -fopenmp

628.pop2_s: Same as 621.wrf_s

Benchmarks using Fortran, C, and C++:

-O2 -mtune=generic -fopenmp -DSPEC_OPENMP

SPEC CPU2017 Floating Point Speed Result

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(Test Sponsor: Red Hat, Inc.)

SPECspeed2017_fp_base = 20.0

SPECspeed2017_fp_peak = 23.6

CPU2017 License: 0002991
Test Sponsor: Red Hat, Inc.
Tested by: Vladimir Makarov

Test Date: Apr-2024
Hardware Availability: Now
Software Availability:

Peak Compiler Invocation

C benchmarks:

gcc

Fortran benchmarks:

gfortran

Benchmarks using both Fortran and C (except as noted below):

gfortran gcc

Benchmarks using Fortran, C, and C++:

g++ gcc gfortran

Peak Portability Flags

Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:

-Ofast -mtune=corei7 -march=core-avx2 -fopenmp -DSPEC_OPENMP

Fortran benchmarks:

603.bwaves_s: -Ofast -mtune=corei7 -march=core-avx2 -DSPEC_OPENMP
-fopenmp -fno-stack-arrays

649.fotonik3d_s: -Ofast -mtune=corei7 -march=core-avx2 -DSPEC_OPENMP
-fopenmp

654.roms_s: Same as 649.fotonik3d_s

Benchmarks using both Fortran and C:

621.wrf_s: -Ofast -mtune=corei7 -march=core-avx2 -DSPEC_OPENMP
-fopenmp

628.pop2_s: Same as 621.wrf_s

Benchmarks using Fortran, C, and C++:

-Ofast -mtune=corei7 -march=core-avx2 -fopenmp -DSPEC_OPENMP

SPEC CPU2017 Floating Point Speed Result

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SPECspeed2017_fp_base = 20.0

SPECspeed2017_fp_peak = 23.6

CPU2017 License: 0002991

Test Sponsor: Red Hat, Inc.

Tested by: Vladimir Makarov

Test Date: Apr-2024

Hardware Availability: Now

Software Availability:

INVALID

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Tested with SPEC CPU2017 v1.0.1 on 2024-04-14 22:47:45-0400.

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