



SPEC CPU®2017 Floating Point Rate Result

Copyright 2017-2021 Standard Performance Evaluation Corporation

Inspur Corporation

SPECrate®2017_fp_base = 345

Inspur NF5488A5 (AMD EPYC 7452)

SPECrate®2017_fp_peak = 372

CPU2017 License: 3358

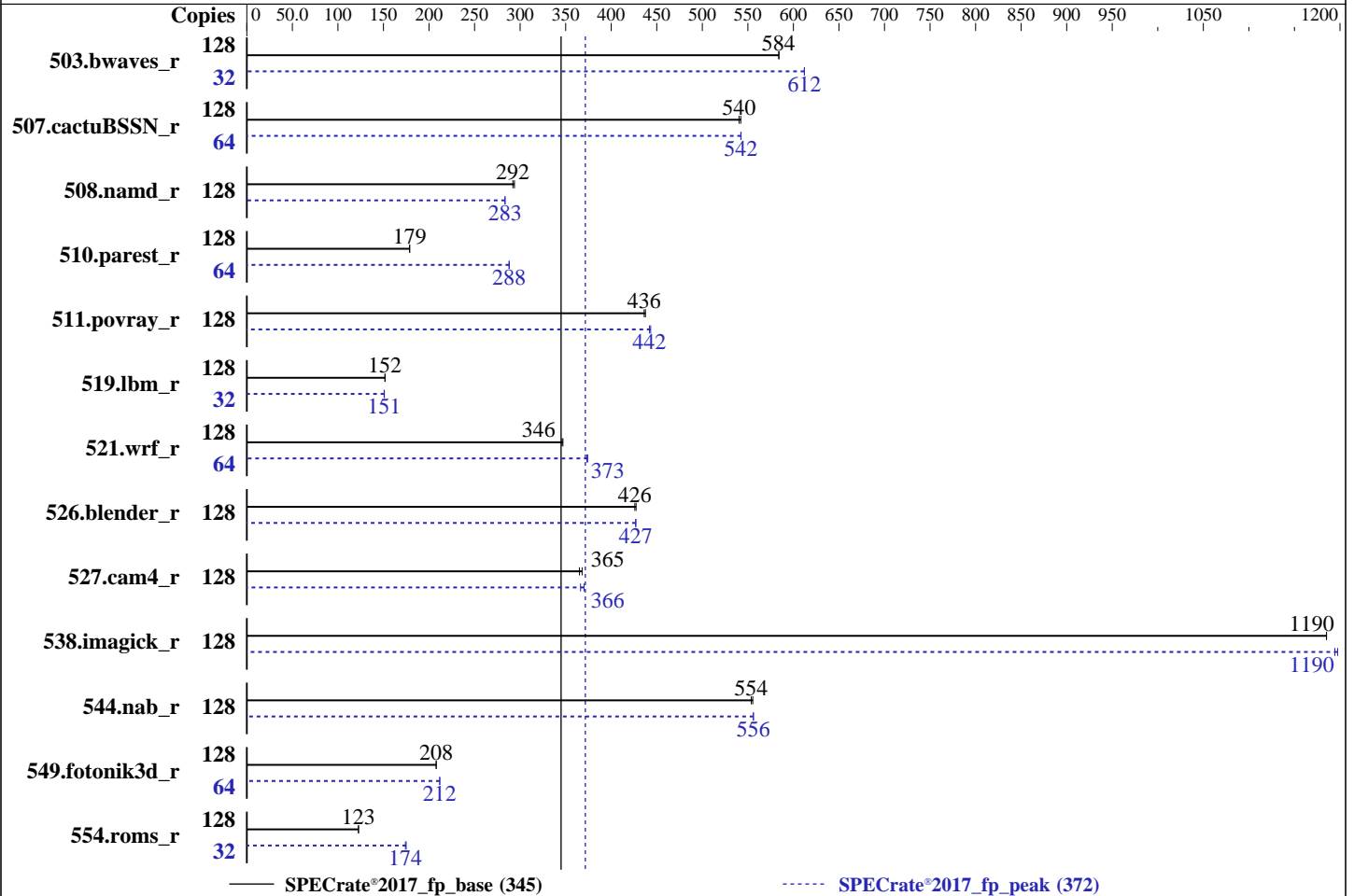
Test Sponsor: Inspur Corporation

Tested by: Inspur Corporation

Test Date: Nov-2021

Hardware Availability: Aug-2019

Software Availability: Nov-2020



Hardware

CPU Name: AMD EPYC 7452
 Max MHz: 3350
 Nominal: 2350
 Enabled: 64 cores, 2 chips, 2 threads/core
 Orderable: 1,2 chips
 Cache L1: 32 KB I + 32 KB D on chip per core
 L2: 512 KB I+D on chip per core
 L3: 128 MB I+D on chip per chip, 16 MB shared / 4 cores
 Other: None
 Memory: 1 TB (32 x 32 GB 2Rx4 PC4-3200AA-R)
 Storage: 1 x 480 GB SATA SSD
 Other: None

Software

OS: Red Hat Enterprise Linux release 8.3 (Ootpa) 4.18.0-240.el8.x86_64
 Compiler: C/C++/Fortran: Version 2.0.0 of AOCC
 Parallel: No
 Firmware: Version 1.00.03 released Nov-2021
 File System: xfs
 System State: Run level 3 (multi-user)
 Base Pointers: 64-bit
 Peak Pointers: 64-bit
 Other: jemalloc: jemalloc memory allocator library v5.2.0
 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						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
503.bwaves_r	128	2197	584	<u>2198</u>	<u>584</u>			32	524	612	<u>524</u>	<u>612</u>		
507.cactuBSSN_r	128	<u>300</u>	<u>540</u>	299	542			64	149	543	<u>149</u>	<u>542</u>		
508.namd_r	128	<u>416</u>	<u>292</u>	414	294			128	429	283	<u>429</u>	<u>283</u>		
510.parest_r	128	<u>1873</u>	<u>179</u>	1873	179			64	<u>582</u>	<u>288</u>	581	288		
511.povray_r	128	<u>685</u>	<u>436</u>	683	438			128	674	443	<u>676</u>	<u>442</u>		
519.lbm_r	128	889	152	<u>890</u>	<u>152</u>			32	223	151	<u>224</u>	<u>151</u>		
521.wrf_r	128	<u>828</u>	<u>346</u>	826	347			64	383	374	<u>384</u>	<u>373</u>		
526.blender_r	128	<u>458</u>	<u>426</u>	456	427			128	<u>457</u>	<u>427</u>	456	427		
527.cam4_r	128	608	368	<u>613</u>	<u>365</u>			128	605	370	<u>611</u>	<u>366</u>		
538.imagick_r	128	269	1190	<u>269</u>	<u>1190</u>			128	<u>267</u>	<u>1190</u>	266	1200		
544.nab_r	128	<u>389</u>	<u>554</u>	388	555			128	387	556	<u>387</u>	<u>556</u>		
549.fotonik3d_r	128	<u>2400</u>	<u>208</u>	2399	208			64	<u>1178</u>	<u>212</u>	1177	212		
554.roms_r	128	<u>1660</u>	<u>123</u>	1659	123			32	<u>292</u>	<u>174</u>	291	175		

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

Compiler Notes

The AMD64 AOCC Compiler Suite is available at <http://developer.amd.com/amd-aocc/>

Submit Notes

The config file option 'submit' was used.
'numactl' was used to bind copies to the cores.
See the configuration file for details.

Operating System Notes

'ulimit -s unlimited' was used to set environment stack size
'ulimit -l 2097152' was used to set environment locked pages in memory limit

runcpu command invoked through numactl i.e.:
numactl --interleave=all runcpu <etc>

Set dirty_ratio=8 to limit dirty cache to 8% of memory
Set swappiness=1 to swap only if necessary
Set zone_reclaim_mode=1 to free local node memory and avoid remote memory
sync then drop_caches=3 to reset caches before invoking runcpu

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Operating System Notes (Continued)

dirty_ratio, swappiness, zone_reclaim_mode and drop_caches were all set using privileged echo (e.g. echo 1 > /proc/sys/vm/swappiness).

Transparent huge pages set to 'always' for this run (OS default)

Environment Variables Notes

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

```
LD_LIBRARY_PATH =  
    "/home/CPU2017/amd_rate_aocc200_rome_C_lib/64;/home/CPU2017/amd_rate_aoc  
    c200_rome_C_lib/32:"  
MALLOCONF = "retain:true"
```

General Notes

Binaries were compiled on a system with 2x AMD EPYC 7601 CPU + 512GB Memory using Fedora 26

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: configured and built with GCC v9.1.0 in Ubuntu 19.04 with -O3 -znver2 -flto
jemalloc 5.2.0 is available here:

<https://github.com/jemalloc/jemalloc/releases/download/5.2.0/jemalloc-5.2.0.tar.bz2>

Platform Notes

BIOS configuration:

NUMA nodes per socket set to NPS4

DRAM Scrub time set to Disable

cTDP Control set to Manual

cTDP set to 155

APBDIS set to 1

Sysinfo program /home/CPU2017/bin/sysinfo

Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acafc64d

running on localhost.localdomain Wed Jan 1 09:04:30 2020

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

For more information on this section, see

(Continued on next page)



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Platform Notes (Continued)

<https://www.spec.org/cpu2017/Docs/config.html#sysinfo>

From /proc/cpuinfo

```
model name : AMD EPYC 7452 32-Core Processor
 2 "physical id"s (chips)
128 "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 : 32
siblings  : 64
physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
25 26 27 28 29 30 31
physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
25 26 27 28 29 30 31
```

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): 128
On-line CPU(s) list: 0-127
Thread(s) per core: 2
Core(s) per socket: 32
Socket(s): 2
NUMA node(s): 8
Vendor ID: AuthenticAMD
CPU family: 23
Model: 49
Model name: AMD EPYC 7452 32-Core Processor
Stepping: 0
CPU MHz: 1812.804
CPU max MHz: 2350.0000
CPU min MHz: 1500.0000
BogoMIPS: 4691.06
Virtualization: AMD-V
L1d cache: 32K
L1i cache: 32K
L2 cache: 512K
L3 cache: 16384K
NUMA node0 CPU(s): 0-7,64-71
NUMA node1 CPU(s): 8-15,72-79
NUMA node2 CPU(s): 16-23,80-87
NUMA node3 CPU(s): 24-31,88-95
NUMA node4 CPU(s): 32-39,96-103
NUMA node5 CPU(s): 40-47,104-111
NUMA node6 CPU(s): 48-55,112-119
NUMA node7 CPU(s): 56-63,120-127
```

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Platform Notes (Continued)

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 pdpelgb rdtscp lm constant_tsc rep_good nopl nonstop_tsc cpuid extd_apicid aperfmperf 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 bpxt perfctr_llc mwaitx cpb cat_l3 cdp_l3 hw_pstate sme ssbd mba sev ibrs 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 wbnoinvd amd_ppin arat npt lbrv svm_lock nrip_save tsc_scale vmcb_clean flushbyasid decodeassists pausefilter pfthreshold avic v_vmsave_vmload vgif umip rdpid overflow_recov 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.

```
available: 8 nodes (0-7)
node 0 cpus: 0 1 2 3 4 5 6 7 64 65 66 67 68 69 70 71
node 0 size: 128346 MB
node 0 free: 128589 MB
node 1 cpus: 8 9 10 11 12 13 14 15 72 73 74 75 76 77 78 79
node 1 size: 128567 MB
node 1 free: 128790 MB
node 2 cpus: 16 17 18 19 20 21 22 23 80 81 82 83 84 85 86 87
node 2 size: 128593 MB
node 2 free: 128768 MB
node 3 cpus: 24 25 26 27 28 29 30 31 88 89 90 91 92 93 94 95
node 3 size: 128565 MB
node 3 free: 128764 MB
node 4 cpus: 32 33 34 35 36 37 38 39 96 97 98 99 100 101 102 103
node 4 size: 128535 MB
node 4 free: 128704 MB
node 5 cpus: 40 41 42 43 44 45 46 47 104 105 106 107 108 109 110 111
node 5 size: 128623 MB
node 5 free: 128710 MB
node 6 cpus: 48 49 50 51 52 53 54 55 112 113 114 115 116 117 118 119
node 6 size: 128605 MB
node 6 free: 128769 MB
node 7 cpus: 56 57 58 59 60 61 62 63 120 121 122 123 124 125 126 127
node 7 size: 128561 MB
node 7 free: 128709 MB
node distances:
node  0  1  2  3  4  5  6  7
 0:  10 12 12 12 32 32 32 32
 1:  12 10 12 12 32 32 32 32
```

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Platform Notes (Continued)

2:	12	12	10	12	32	32	32	32
3:	12	12	12	10	32	32	32	32
4:	32	32	32	32	10	12	12	12
5:	32	32	32	32	12	10	12	12
6:	32	32	32	32	12	12	10	12
7:	32	32	32	32	12	12	12	10

From /proc/meminfo

MemTotal: 1056682940 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

```

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

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Platform Notes (Continued)

CVE-2017-5715 (Spectre variant 2): sanitization
 Mitigation: Full AMD retpoline,
 IBPB: conditional, IBRS_FW, STIBP:
 conditional, RSB filling

CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected

CVE-2019-11135 (TSX Asynchronous Abort): Not affected

run-level 3 Jan 1 03:19

SPEC is set to: /home/CPU2017

Filesystem	Type	Size	Used	Avail	Use%	Mounted on
/dev/mapper/rhel00-home	xfs	372G	9.2G	363G	3%	/home

From /sys/devices/virtual/dmi/id

Vendor: Inspur
 Product: NF5488A5
 Product Family: Not specified
 Serial: 230250914

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 Technology 36ASF4G72PZ-3G2R1 32 GB 2 rank 3200

BIOS:

BIOS Vendor: Inspur
 BIOS Version: 1.00.03
 BIOS Date: 11/03/2021
 BIOS Revision: 1.0

(End of data from sysinfo program)

Compiler Version Notes

```
=====
C          | 519.lbm_r(base, peak) 538.imagick_r(base, peak)
          | 544.nab_r(base, peak)
-----
AOCC.LLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins
AOCC_2_0_0-Build#191) (based on LLVM AOCC.LLVM.2.0.0.B191.2019_07_19)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin
=====
```

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Compiler Version Notes (Continued)

=====
C++ | 508.namd_r(base, peak) 510.parest_r(base, peak)
=====

AOCC.LLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins
AOCC_2_0_0-Build#191) (based on LLVM AOCC.LLVM.2.0.0.B191.2019_07_19)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin
=====

=====
C++, C | 511.povray_r(base, peak) 526.blender_r(base, peak)
=====

AOCC.LLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins
AOCC_2_0_0-Build#191) (based on LLVM AOCC.LLVM.2.0.0.B191.2019_07_19)
Target: x86_64-unknown-linux-gnu
Thread model: posix
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AOCC_2_0_0-Build#191) (based on LLVM AOCC.LLVM.2.0.0.B191.2019_07_19)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin
=====

=====
C++, C, Fortran | 507.cactuBSSN_r(base, peak)
=====

AOCC.LLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins
AOCC_2_0_0-Build#191) (based on LLVM AOCC.LLVM.2.0.0.B191.2019_07_19)
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Compiler Version Notes (Continued)

Fortran | 503.bwaves_r(base, peak) 549.fotonik3d_r(base, peak)
| 554.roms_r(base, peak)

AOCC.LLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins
AOCC_2_0_0-Build#191) (based on LLVM AOCC.LLVM.2.0.0.B191.2019_07_19)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin

=====
Fortran, C | 521.wrf_r(base, peak) 527.cam4_r(base, peak)

AOCC.LLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins
AOCC_2_0_0-Build#191) (based on LLVM AOCC.LLVM.2.0.0.B191.2019_07_19)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin
AOCC.LLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins
AOCC_2_0_0-Build#191) (based on LLVM AOCC.LLVM.2.0.0.B191.2019_07_19)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin

Base Compiler Invocation

C benchmarks:

clang

C++ benchmarks:

clang++

Fortran benchmarks:

flang

Benchmarks using both Fortran and C:

flang clang

Benchmarks using both C and C++:

clang++ clang

Benchmarks using Fortran, C, and C++:

clang++ clang flang



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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
521.wrf_r: -DSPEC_CASE_FLAG -Mbyteswapio -DSPEC_LP64
526.blender_r: -funsigned-char -D__BOOL_DEFINED -DSPEC_LP64
527.cam4_r: -DSPEC_CASE_FLAG -DSPEC_LP64
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:

```

-flto -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-vector-library=LIBMVEC
-Wl,-mllvm -Wl,-reduce-array-computations=3 -O3 -ffast-math
-march=znver2 -fstruct-layout=3 -mllvm -unroll-threshold=50
-freemap-arrays -mllvm -function-specialize -mllvm -enable-gvn-hoist
-mllvm -reduce-array-computations=3 -mllvm -global-vectorize-slp
-mllvm -vector-library=LIBMVEC -mllvm -inline-threshold=1000
-flv-function-specialization -z muldefs -lmvec -lamdlibm -ljemalloc
-lflang

```

C++ benchmarks:

```

-std=c++98 -flto -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-vector-library=LIBMVEC
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-suppress-fmas -O3 -ffast-math -march=znver2
-mllvm -loop-unswitch-threshold=200000 -mllvm -vector-library=LIBMVEC
-mllvm -unroll-threshold=100 -flv-function-specialization
-mllvm -enable-partial-unswitch -z muldefs -lmvec -lamdlibm
-ljemalloc -lflang

```

Fortran benchmarks:

```

-flto -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-vector-library=LIBMVEC
-Wl,-mllvm -Wl,-reduce-array-computations=3 -O3 -march=znver2
-funroll-loops -Mrecursive -mllvm -vector-library=LIBMVEC -z muldefs
-Kieee -fno-finite-math-only -lmvec -lamdlibm -ljemalloc -lflang

```

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SPEC CPU®2017 Floating Point Rate Result

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SPECrate®2017_fp_base = 345

Inspur NF5488A5 (AMD EPYC 7452)

SPECrate®2017_fp_peak = 372

CPU2017 License: 3358

Test Sponsor: Inspur Corporation

Tested by: Inspur Corporation

Test Date: Nov-2021

Hardware Availability: Aug-2019

Software Availability: Nov-2020

Base Optimization Flags (Continued)

Benchmarks using both Fortran and C:

```
-flto -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-vector-library=LIBMVEC
-Wl,-mllvm -Wl,-reduce-array-computations=3 -O3 -ffast-math
-march=znver2 -fstruct-layout=3 -mllvm -unroll-threshold=50
-freemap-arrays -mllvm -function-specialize -mllvm -enable-gvn-hoist
-mllvm -reduce-array-computations=3 -mllvm -global-vectorize-slp
-mllvm -vector-library=LIBMVEC -mllvm -inline-threshold=1000
-flv-function-specialization -funroll-loops -Mrecursive -z muldefs
-Kieee -fno-finite-math-only -lmvec -lamdlibm -ljemalloc -lflang
```

Benchmarks using both C and C++:

```
-std=c++98 -flto -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-vector-library=LIBMVEC
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-suppress-fmas -O3 -ffast-math -march=znver2
-fstruct-layout=3 -mllvm -unroll-threshold=50 -freemap-arrays
-mllvm -function-specialize -mllvm -enable-gvn-hoist
-mllvm -reduce-array-computations=3 -mllvm -global-vectorize-slp
-mllvm -vector-library=LIBMVEC -mllvm -inline-threshold=1000
-flv-function-specialization -mllvm -loop-unswitch-threshold=200000
-mllvm -unroll-threshold=100 -mllvm -enable-partial-unswitch -z muldefs
-lmvec -lamdlibm -ljemalloc -lflang
```

Benchmarks using Fortran, C, and C++:

```
-std=c++98 -flto -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-vector-library=LIBMVEC
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-suppress-fmas -O3 -ffast-math -march=znver2
-fstruct-layout=3 -mllvm -unroll-threshold=50 -freemap-arrays
-mllvm -function-specialize -mllvm -enable-gvn-hoist
-mllvm -reduce-array-computations=3 -mllvm -global-vectorize-slp
-mllvm -vector-library=LIBMVEC -mllvm -inline-threshold=1000
-flv-function-specialization -mllvm -loop-unswitch-threshold=200000
-mllvm -unroll-threshold=100 -mllvm -enable-partial-unswitch
-funroll-loops -Mrecursive -z muldefs -Kieee -fno-finite-math-only
-lmvec -lamdlibm -ljemalloc -lflang
```

Peak Compiler Invocation

C benchmarks:
clang

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Peak Compiler Invocation (Continued)

C++ benchmarks:

clang++

Fortran benchmarks:

flang

Benchmarks using both Fortran and C:

flang clang

Benchmarks using both C and C++:

clang++ clang

Benchmarks using Fortran, C, and C++:

clang++ clang flang

Peak Portability Flags

Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:

```
-flto -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-vector-library=LIBMVEC
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast -march=znver2
-mno-sse4a -fstruct-layout=5 -mllvm -vectorize-memory-aggressively
-mllvm -function-specialize -mllvm -enable-gvn-hoist
-mllvm -unroll-threshold=50 -fremap-arrays
-mllvm -vector-library=LIBMVEC -mllvm -reduce-array-computations=3
-mllvm -global-vectorize-slp -mllvm -inline-threshold=1000
-flv-function-specialization -lmvec -lamdlibm -ljemalloc -lflang
```

C++ benchmarks:

```
508.namd_r: -std=c++98 -flto -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-region-vectorize
-Wl,-mllvm -Wl,-vector-library=LIBMVEC
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast
-march=znver2 -flv-function-specialization
-mllvm -unroll-threshold=100
-mllvm -enable-partial-unswitch
-mllvm -loop-unswitch-threshold=200000
```

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Peak Optimization Flags (Continued)

508.namd_r (continued):

```
-mllvm -vector-library=LIBMVEC  
-mllvm -inline-threshold=1000 -lmvec -lamdlibm -ljemalloc  
-lflang
```

510.parest_r: -std=c++98 -flto -Wl,-mllvm -Wl,-function-specialize

```
-Wl,-mllvm -Wl,-region-vectorize  
-Wl,-mllvm -Wl,-vector-library=LIBMVEC  
-Wl,-mllvm -Wl,-reduce-array-computations=3  
-Wl,-mllvm -Wl,-suppress-fmas -Ofast -march=znver2  
-flv-function-specialization -mllvm -unroll-threshold=100  
-mllvm -enable-partial-unswitch  
-mllvm -loop-unswitch-threshold=200000  
-mllvm -vector-library=LIBMVEC  
-mllvm -inline-threshold=1000 -lmvec -lamdlibm -ljemalloc  
-lflang
```

Fortran benchmarks:

503.bwaves_r: -flto -Wl,-mllvm -Wl,-function-specialize

```
-Wl,-mllvm -Wl,-region-vectorize  
-Wl,-mllvm -Wl,-vector-library=LIBMVEC  
-Wl,-mllvm -Wl,-reduce-array-computations=3 -O3  
-march=znver2 -funroll-loops -Mrecursive  
-mllvm -vector-library=LIBMVEC -Kieee  
-fno-finite-math-only -lmvec -lamdlibm -ljemalloc  
-lflang
```

549.fotonik3d_r: Same as 503.bwaves_r

554.roms_r: -flto -Wl,-mllvm -Wl,-function-specialize

```
-Wl,-mllvm -Wl,-region-vectorize  
-Wl,-mllvm -Wl,-vector-library=LIBMVEC  
-Wl,-mllvm -Wl,-reduce-array-computations=3  
-Wl,-mllvm -Wl,-enable-X86-prefetching -O3 -march=znver2  
-funroll-loops -Mrecursive -mllvm -vector-library=LIBMVEC  
-Kieee -fno-finite-math-only -lmvec -lamdlibm -ljemalloc  
-lflang
```

Benchmarks using both Fortran and C:

```
-flto -Wl,-mllvm -Wl,-function-specialize  
-Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-vector-library=LIBMVEC  
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast -march=znver2  
-mno-sse4a -fstruct-layout=5 -mllvm -vectorize-memory-aggressively  
-mllvm -function-specialize -mllvm -enable-gvn-hoist  
-mllvm -unroll-threshold=50 -fremap-arrays
```

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Peak Optimization Flags (Continued)

Benchmarks using both Fortran and C (continued):

```
-mllvm -vector-library=LIBMVEC -mllvm -reduce-array-computations=3
-mllvm -global-vectorize-slp -mllvm -inline-threshold=1000
-flv-function-specialization -O3 -funroll-loops -Mrecursive -Kieee
-fno-finite-math-only -lmvec -lamdlibm -ljemalloc -lflang
```

Benchmarks using both C and C++:

```
511.povray_r: -std=c++98 -flto -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-region-vectorize
-Wl,-mllvm -Wl,-vector-library=LIBMVEC
-Wl,-mllvm -Wl,-reduce-array-computations=3
-Wl,-mllvm -Wl,-x86-use-vzeroupper=false -Ofast
-march=znver2 -mno-sse4a -fstruct-layout=5
-mllvm -vectorize-memory-aggressively
-mllvm -function-specialize -mllvm -enable-gvn-hoist
-mllvm -unroll-threshold=50 -fremap-arrays
-mllvm -vector-library=LIBMVEC
-mllvm -reduce-array-computations=3
-mllvm -global-vectorize-slp -mllvm -inline-threshold=1000
-flv-function-specialization -mllvm -unroll-threshold=100
-mllvm -enable-partial-unswitch
-mllvm -loop-unswitch-threshold=200000 -lmvec -lamdlibm
-ljemalloc -lflang
```

```
526.blender_r: -std=c++98 -flto -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-region-vectorize
-Wl,-mllvm -Wl,-vector-library=LIBMVEC
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast
-march=znver2 -mno-sse4a -fstruct-layout=5
-mllvm -vectorize-memory-aggressively
-mllvm -function-specialize -mllvm -enable-gvn-hoist
-mllvm -unroll-threshold=50 -fremap-arrays
-mllvm -vector-library=LIBMVEC
-mllvm -reduce-array-computations=3
-mllvm -global-vectorize-slp -mllvm -inline-threshold=1000
-flv-function-specialization -mllvm -unroll-threshold=100
-mllvm -enable-partial-unswitch
-mllvm -loop-unswitch-threshold=200000 -lmvec -lamdlibm
-ljemalloc -lflang
```

Benchmarks using Fortran, C, and C++:

```
-std=c++98 -flto -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-vector-library=LIBMVEC
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Ofast -march=znver2
-mno-sse4a -fstruct-layout=5 -mllvm -vectorize-memory-aggressively
```

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Peak Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++ (continued):

```
-mllvm -function-specialize -mllvm -enable-gvn-hoist
-mllvm -unroll-threshold=50 -fremap-arrays
-mllvm -vector-library=LIBMVEC -mllvm -reduce-array-computations=3
-mllvm -global-vectorize-slp -mllvm -inline-threshold=1000
-flv-function-specialization -mllvm -unroll-threshold=100
-mllvm -enable-partial-unswitch -mllvm -loop-unswitch-threshold=200000
-O3 -funroll-loops -mrecursive -Kieee -fno-finite-math-only -lmvec
-lamdlibm -ljemalloc -lflang
```

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

<http://www.spec.org/cpu2017/flags/aocc200-flags-C4.html>

<http://www.spec.org/cpu2017/flags/Inspur-Platform-Settings-amd-V1.2.html>

You can also download the XML flags sources by saving the following links:

<http://www.spec.org/cpu2017/flags/aocc200-flags-C4.xml>

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

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