



# SPEC® CPU2017 Floating Point Rate Result

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## Supermicro

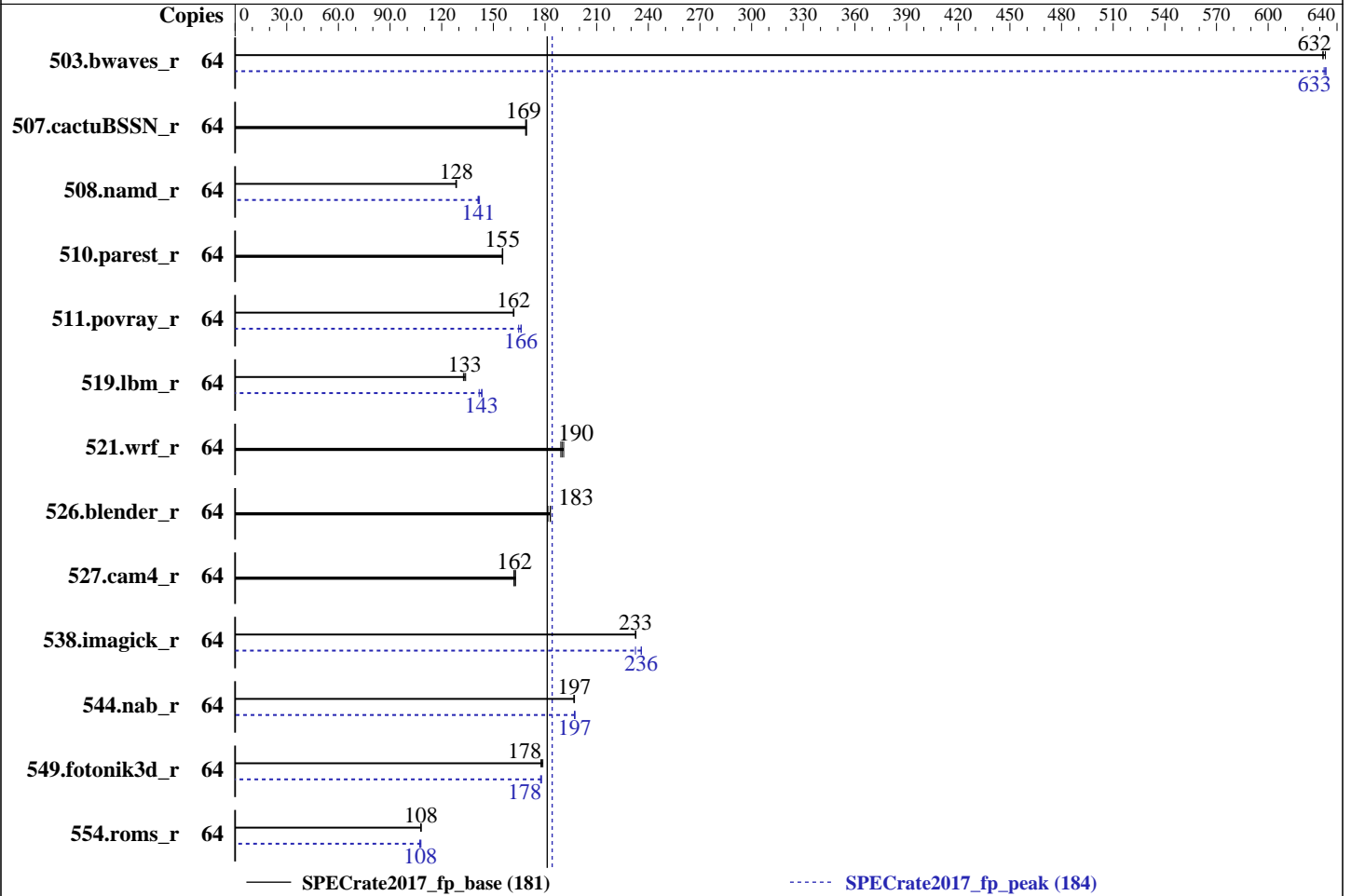
A+ Server 2023US-TR4  
(H11DSU-iN , AMD EPYC 7301)

SPECrate2017\_fp\_base = 181

SPECrate2017\_fp\_peak = 184

CPU2017 License: 001176  
Test Sponsor: Supermicro  
Tested by: Supermicro

Test Date: Aug-2018  
Hardware Availability: Jun-2017  
Software Availability: Feb-2018



### Hardware

CPU Name: AMD EPYC 7301  
 Max MHz.: 2700  
 Nominal: 2200  
 Enabled: 32 cores, 2 chips, 2 threads/core  
 Orderable: 1,2 chips  
 Cache L1: 64 KB I + 32 KB D on chip per core  
 L2: 512 KB I+D on chip per core  
 L3: 64 MB I+D on chip per chip, 8 MB shared / 2 cores  
 Other: None  
 Memory: 1 TB (16 x 64 GB 4Rx4 PC4-2666V-L)  
 Storage: 1 x 200 GB SATAIII SSD  
 Other: None

### Software

OS: SUSE Linux Enterprise Server 12 SP3 (x86\_64)  
 kernel 4.4.114-94.11-default  
 Compiler: C/C++: Version 1.0.0 of AOCC  
 Fortran: Version 4.8.2 of GCC  
 Parallel: No  
 Firmware: Supermicro BIOS version 1.1a released Apr-2018  
 File System: xfs  
 System State: Run level 3 (multi-user)  
 Base Pointers: 64-bit  
 Peak Pointers: 64-bit  
 Other: jemalloc general purpose malloc implementation  
 V4.5.0



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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	64	1013	633	<b>1016</b>	<b>632</b>	1016	632	64	1013	634	1015	633	<b>1013</b>	<b>633</b>
507.cactuBSSN_r	64	479	169	<b>479</b>	<b>169</b>	480	169	64	479	169	<b>479</b>	<b>169</b>	480	169
508.namd_r	64	474	128	473	129	<b>473</b>	<b>128</b>	64	<b>430</b>	<b>141</b>	428	142	431	141
510.parest_r	64	1079	155	<b>1078</b>	<b>155</b>	1077	155	64	1079	155	<b>1078</b>	<b>155</b>	1077	155
511.povray_r	64	923	162	<b>924</b>	<b>162</b>	924	162	64	<b>900</b>	<b>166</b>	899	166	907	165
519.lbm_r	64	509	133	504	134	<b>506</b>	<b>133</b>	64	476	142	<b>471</b>	<b>143</b>	470	143
521.wrf_r	64	<b>755</b>	<b>190</b>	758	189	751	191	64	<b>755</b>	<b>190</b>	758	189	751	191
526.blender_r	64	532	183	<b>533</b>	<b>183</b>	536	182	64	532	183	<b>533</b>	<b>183</b>	536	182
527.cam4_r	64	691	162	687	163	<b>690</b>	<b>162</b>	64	691	162	687	163	<b>690</b>	<b>162</b>
538.imagick_r	64	684	233	684	233	<b>684</b>	<b>233</b>	64	<b>675</b>	<b>236</b>	675	236	684	233
544.nab_r	64	547	197	<b>547</b>	<b>197</b>	546	197	64	546	197	546	197	<b>546</b>	<b>197</b>
549.fotonik3d_r	64	<b>1401</b>	<b>178</b>	1395	179	1404	178	64	1402	178	1406	177	<b>1402</b>	<b>178</b>
554.roms_r	64	<b>942</b>	<b>108</b>	943	108	941	108	64	942	108	<b>945</b>	<b>108</b>	949	107

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

## 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

runspec command invoked through numactl i.e.:  
numactl --interleave=all runspec <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

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 were enabled for this run (OS default)

Huge pages were not configured for this run.



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## General Notes

Environment variables set by runcpu before the start of the run:  
LD\_LIBRARY\_PATH = "/home/cpu2017/amd1704-rate-libs-revC/64;/home/cpu2017/amd1704-rate-libs-revC/32:"  
MALLOCONF = "lg\_chunk:28"

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

The AOCC Gold Linker plugin was installed and used for the link stage.

The AOCC Fortran Plugin version 1.0 was used to leverage AOCC optimizers with gfortran. It is available here:  
<http://developer.amd.com/amd-aocc/>

Binaries were compiled on a system with 2x AMD EPYC 7601 CPU + 512GB Memory using RHEL 7.4

jemalloc, a general purpose malloc implementation, was obtained at  
<https://github.com/jemalloc/jemalloc/releases/download/4.5.0/jemalloc-4.5.0.tar.bz2>  
jemalloc was built with GCC v4.8.5 in RHEL v7.2 under default conditions.

jemalloc uses environment variable MALLOCONF with values narenas and lg\_chunk:  
narenas: sets the maximum number of arenas to use for automatic multiplexing of threads and arenas.

lg\_chunk: set the virtual memory chunk size (log base 2). For example,  
lg\_chunk:21 sets the default chunk size to  $2^{21} = 2\text{MiB}$ .

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.

## Platform Notes

BIOS Settings:

Determinism Slider = Power

Sysinfo program /home/cpu2017/bin/sysinfo

Rev: r5797 of 2017-06-14 96c45e4568ad54c135fd618bcc091c0f

running on linux-pm02 Tue Aug 7 01:38:50 2018

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 EPYC 7301 16-Core Processor

2 "physical id"s (chips)

64 "processors"

(Continued on next page)



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### Platform Notes (Continued)

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 4 5 8 9 12 13 16 17 20 21 24 25 28 29
physical 1: cores 0 1 4 5 8 9 12 13 16 17 20 21 24 25 28 29
```

From lscpu:

```
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):         8
Vendor ID:             AuthenticAMD
CPU family:            23
Model:                 1
Model name:            AMD EPYC 7301 16-Core Processor
Stepping:              2
CPU MHz:               2200.000
CPU max MHz:           2200.0000
CPU min MHz:           1200.0000
BogoMIPS:              4400.22
Virtualization:        AMD-V
L1d cache:             32K
L1i cache:             64K
L2 cache:              512K
L3 cache:              8192K
NUMA node0 CPU(s):    0-3,32-35
NUMA node1 CPU(s):    4-7,36-39
NUMA node2 CPU(s):    8-11,40-43
NUMA node3 CPU(s):    12-15,44-47
NUMA node4 CPU(s):    16-19,48-51
NUMA node5 CPU(s):    20-23,52-55
NUMA node6 CPU(s):    24-27,56-59
NUMA node7 CPU(s):    28-31,60-63
```

```
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 pdpe1gb rdtscp lm
constant_tsc rep_good nopl nonstop_tsc extd_apicid amd_dcm aperfmperf eagerfpu 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 skinit wdt tce topoext perfctr_core perfctr_nb bpext perfctr_l2 mwaitx arat cpb
hw_pstate retpoline retpoline_amd npt lbrv svm_lock nrip_save tsc_scale vmcb_clean
flushbyasid decodeassists pausefilter pfthreshold vmmcall avic fsgsbase bmi1 avx2
```

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### Platform Notes (Continued)

smep bmi2 rdseed adx smap clflushopt sha\_ni xsaveopt xsavec xgetbv1 clzero irperf  
ibpb 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 32 33 34 35
node 0 size: 128848 MB
node 0 free: 128679 MB
node 1 cpus: 4 5 6 7 36 37 38 39
node 1 size: 129021 MB
node 1 free: 128881 MB
node 2 cpus: 8 9 10 11 40 41 42 43
node 2 size: 129021 MB
node 2 free: 128888 MB
node 3 cpus: 12 13 14 15 44 45 46 47
node 3 size: 129021 MB
node 3 free: 128886 MB
node 4 cpus: 16 17 18 19 48 49 50 51
node 4 size: 129021 MB
node 4 free: 128905 MB
node 5 cpus: 20 21 22 23 52 53 54 55
node 5 size: 129021 MB
node 5 free: 128906 MB
node 6 cpus: 24 25 26 27 56 57 58 59
node 6 size: 129021 MB
node 6 free: 128907 MB
node 7 cpus: 28 29 30 31 60 61 62 63
node 7 size: 116923 MB
node 7 free: 116810 MB
node distances:
node  0  1  2  3  4  5  6  7
0:  10 16 16 16 32 32 32 32
1:  16 10 16 16 32 32 32 32
2:  16 16 10 16 32 32 32 32
3:  16 16 16 10 32 32 32 32
4:  32 32 32 32 10 16 16 16
5:  32 32 32 32 16 10 16 16
6:  32 32 32 32 16 16 10 16
7:  32 32 32 32 16 16 16 10
```

```
From /proc/meminfo
MemTotal: 1044377084 kB
HugePages_Total: 0
```

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### Platform Notes (Continued)

Hugepagesize: 2048 kB

From /etc/\*release\* /etc/\*version\*

SuSE-release:

SUSE Linux Enterprise Server 12 (x86\_64)

VERSION = 12

PATCHLEVEL = 3

# This file is deprecated and will be removed in a future service pack or release.

# Please check /etc/os-release for details about this release.

os-release:

NAME="SLES"

VERSION="12-SP3"

VERSION\_ID="12.3"

PRETTY\_NAME="SUSE Linux Enterprise Server 12 SP3"

ID="sles"

ANSI\_COLOR="0;32"

CPE\_NAME="cpe:/o:suse:sles:12:sp3"

uname -a:

Linux linux-pm02 4.4.114-94.11-default #1 SMP Thu Feb 1 19:28:26 UTC 2018 (4309ff9)  
x86\_64 x86\_64 x86\_64 GNU/Linux

run-level 3 Aug 6 15:10

SPEC is set to: /home/cpu2017

Filesystem	Type	Size	Used	Avail	Use%	Mounted on
/dev/sda4	xf	145G	3.0G	142G	3%	/home

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.

BIOS American Megatrends Inc. 1.1a 04/26/2018

Memory:

16x NO DIMM NO DIMM

16x Samsung M386A8K40BM2-CTD 64 GB 4 rank 2667

(End of data from sysinfo program)

### Compiler Version Notes

=====  
CC 519.lbm\_r(base, peak) 538.imagick\_r(base, peak) 544.nab\_r(base, peak)  
-----

AOCC.LLVM.4.0.0.B35.2017\_04\_26 clang version 4.0.0 (CLANG:) (based on LLVM  
AOCC.LLVM.4.0.0.B35.2017\_04\_26)

(Continued on next page)



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### Compiler Version Notes (Continued)

Target: x86\_64-unknown-linux-gnu  
Thread model: posix  
InstalledDir: /root/work/compilers/AOCC-1.0-Compiler/bin

=====  
CXXC 508.namd\_r(base, peak) 510.parest\_r(base, peak)  
=====

AOCC.LLVM.4.0.0.B35.2017\_04\_26 clang version 4.0.0 (CLANG:) (based on LLVM  
AOCC.LLVM.4.0.0.B35.2017\_04\_26)  
Target: x86\_64-unknown-linux-gnu  
Thread model: posix  
InstalledDir: /root/work/compilers/AOCC-1.0-Compiler/bin

=====  
CC 511.povray\_r(base, peak) 526.blender\_r(base, peak)  
=====

AOCC.LLVM.4.0.0.B35.2017\_04\_26 clang version 4.0.0 (CLANG:) (based on LLVM  
AOCC.LLVM.4.0.0.B35.2017\_04\_26)  
Target: x86\_64-unknown-linux-gnu  
Thread model: posix  
InstalledDir: /root/work/compilers/AOCC-1.0-Compiler/bin  
AOCC.LLVM.4.0.0.B35.2017\_04\_26 clang version 4.0.0 (CLANG:) (based on LLVM  
AOCC.LLVM.4.0.0.B35.2017\_04\_26)  
Target: x86\_64-unknown-linux-gnu  
Thread model: posix  
InstalledDir: /root/work/compilers/AOCC-1.0-Compiler/bin

=====  
FC 507.cactuBSSN\_r(base, peak)  
=====

AOCC.LLVM.4.0.0.B35.2017\_04\_26 clang version 4.0.0 (CLANG:) (based on LLVM  
AOCC.LLVM.4.0.0.B35.2017\_04\_26)  
Target: x86\_64-unknown-linux-gnu  
Thread model: posix  
InstalledDir: /root/work/compilers/AOCC-1.0-Compiler/bin  
AOCC.LLVM.4.0.0.B35.2017\_04\_26 clang version 4.0.0 (CLANG:) (based on LLVM  
AOCC.LLVM.4.0.0.B35.2017\_04\_26)  
Target: x86\_64-unknown-linux-gnu  
Thread model: posix  
InstalledDir: /root/work/compilers/AOCC-1.0-Compiler/bin  
GNU Fortran (GCC) 4.8.2  
Copyright (C) 2013 Free Software Foundation, Inc.  
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You may redistribute copies of GNU Fortran

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### Compiler Version Notes (Continued)

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=====  
FC 503.bwaves\_r(base, peak) 549.fotonik3d\_r(base, peak) 554.roms\_r(base, peak)

-----  
GNU Fortran (GCC) 4.8.2  
Copyright (C) 2013 Free Software Foundation, Inc.  
GNU Fortran comes with NO WARRANTY, to the extent permitted by law.  
You may redistribute copies of GNU Fortran  
under the terms of the GNU General Public License.  
For more information about these matters, see the file named COPYING

=====  
CC 521.wrf\_r(base, peak) 527.cam4\_r(base, peak)

-----  
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AOCC.LLVM.4.0.0.B35.2017\_04\_26)  
Target: x86\_64-unknown-linux-gnu  
Thread model: posix  
InstalledDir: /root/work/compilers/AOCC-1.0-Compiler/bin

### Base Compiler Invocation

C benchmarks:  
clang

C++ benchmarks:  
clang++

Fortran benchmarks:  
clang gfortran

Benchmarks using both Fortran and C:  
clang gfortran

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## Base Compiler Invocation (Continued)

Benchmarks using both C and C++:

clang++ clang

Benchmarks using Fortran, C, and C++:

clang++ clang gfortran

## 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 -fconvert=big-endian -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, -plugin-opt= -merge-constant -lsr-in-nested-loop  
-disable-vect-cmp -O3 -ffast-math -march=znver1 -fstruct-layout=2  
-mllvm -unroll-threshold=100 -fremap-arrays -mno-avx2  
-inline-threshold=1000 -z muldefs -ljemalloc

C++ benchmarks:

-flto -Wl, -plugin-opt= -merge-constant -lsr-in-nested-loop  
-disable-vect-cmp -O3 -march=znver1 -mllvm -unroll-threshold=100  
-finline-aggressive -fremap-arrays -inline-threshold=1000 -z muldefs  
-ljemalloc

Fortran benchmarks:

-flto -Wl, -plugin-opt= -merge-constant -lsr-in-nested-loop  
-disable-vect-cmp -O3(gfortran) -O3(clang) -mavx -madox  
-funroll-loops -ffast-math -z muldefs -fplugin=dragonegg.so  
-fplugin-arg-dragonegg-llvm-option=" -disable-vect-cmp" -ljemalloc  
-lgfortran -lamdlibm

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## Base Optimization Flags (Continued)

Benchmarks using both Fortran and C:

```
-flto -Wl, -plugin-opt= -merge-constant -lsr-in-nested-loop
-disable-vect-cmp -O3(clang) -ffast-math -march=znver1
-fstruct-layout=2 -mllvm -unroll-threshold=100 -fremap-arrays
-mno-avx2 -inline-threshold=1000 -O3(gfortran) -mavx -madox
-funroll-loops -z muldefs -fplugin=dragonegg.so
-fplugin-arg-dragonegg-llvm-option=" -disable-vect-cmp" -ljemalloc
-lgfortran -lamdlibm
```

Benchmarks using both C and C++:

```
-flto -Wl, -plugin-opt= -merge-constant -lsr-in-nested-loop
-disable-vect-cmp -O3 -ffast-math -march=znver1 -fstruct-layout=2
-mllvm -unroll-threshold=100 -fremap-arrays -mno-avx2
-inline-threshold=1000 -finline-aggressive -z muldefs -ljemalloc
```

Benchmarks using Fortran, C, and C++:

```
-flto -Wl, -plugin-opt= -merge-constant -lsr-in-nested-loop
-disable-vect-cmp -O3(clang) -ffast-math -march=znver1
-fstruct-layout=2 -mllvm -unroll-threshold=100 -fremap-arrays
-mno-avx2 -inline-threshold=1000 -finline-aggressive -O3(gfortran)
-mavx -madox -funroll-loops -z muldefs -fplugin=dragonegg.so
-fplugin-arg-dragonegg-llvm-option=" -disable-vect-cmp" -ljemalloc
```

## Peak Compiler Invocation

C benchmarks:  
clang

C++ benchmarks:  
clang++

Fortran benchmarks:  
clang gfortran

Benchmarks using both Fortran and C:  
clang gfortran

Benchmarks using both C and C++:  
clang++ clang

Benchmarks using Fortran, C, and C++:  
clang++ clang gfortran



# SPEC CPU2017 Floating Point Rate Result

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## Supermicro

A+ Server 2023US-TR4  
(H11DSU-iN , AMD EPYC 7301)

SPECrate2017\_fp\_base = 181

SPECrate2017\_fp\_peak = 184

**CPU2017 License:** 001176  
**Test Sponsor:** Supermicro  
**Tested by:** Supermicro

**Test Date:** Aug-2018  
**Hardware Availability:** Jun-2017  
**Software Availability:** Feb-2018

## Peak Portability Flags

Same as Base Portability Flags

## Peak Optimization Flags

### C benchmarks:

```
-flto -Wl, -plugin-opt= -merge-constant -lsr-in-nested-loop -Ofast
-march=znver1 -fstruct-layout=3 -mllvm -vectorize-memory-aggressively
-mno-avx2 -unroll-threshold=100 -fremap-arrays -inline-threshold=1000
-ljemalloc
```

### C++ benchmarks:

```
508.namd_r: -flto -Wl, -plugin-opt= -merge-constant
-lsr-in-nested-loop -Ofast -march=znver1
-finline-aggressive -mllvm -unroll-threshold=100
-fremap-arrays -inline-threshold=1000 -ljemalloc
```

510.parest\_r: basepeak = yes

### Fortran benchmarks:

```
-flto -Wl, -plugin-opt= -merge-constant -lsr-in-nested-loop
-O3(gfortran) -O3(clang) -mavx2 -madx -funroll-loops -ffast-math
-fplugin=dragonegg.so -fplugin-arg-dragonegg-llvm-option="
-inline-threshold:1000" -ljemalloc -lgfortran -lamdlibm
```

### Benchmarks using both Fortran and C:

521.wrf\_r: basepeak = yes

527.cam4\_r: basepeak = yes

### Benchmarks using both C and C++:

```
511.povray_r: -flto -Wl, -plugin-opt= -merge-constant
-lsr-in-nested-loop -Ofast -march=znver1
-fstruct-layout=3 -mllvm -vectorize-memory-aggressively
-mno-avx2 -unroll-threshold=100 -fremap-arrays
-inline-threshold=1000 -finline-aggressive -ljemalloc
```

526.blender\_r: basepeak = yes

### Benchmarks using Fortran, C, and C++:

(Continued on next page)



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## Peak Optimization Flags (Continued)

507.cactuBSSN\_r: basepeak = yes

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

<http://www.spec.org/cpu2017/flags/gcc.2018-02-16.html>  
<http://www.spec.org/cpu2017/flags/aocc100-flags-revC-I.2018-02-16.html>  
<http://www.spec.org/cpu2017/flags/Supermicro-Platform-Settings-V1.2-Naples-revD.html>

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

<http://www.spec.org/cpu2017/flags/gcc.2018-02-16.xml>  
<http://www.spec.org/cpu2017/flags/aocc100-flags-revC-I.2018-02-16.xml>  
<http://www.spec.org/cpu2017/flags/Supermicro-Platform-Settings-V1.2-Naples-revD.xml>

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