



# SPEC® CPU2017 Integer Rate Result

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## Supermicro

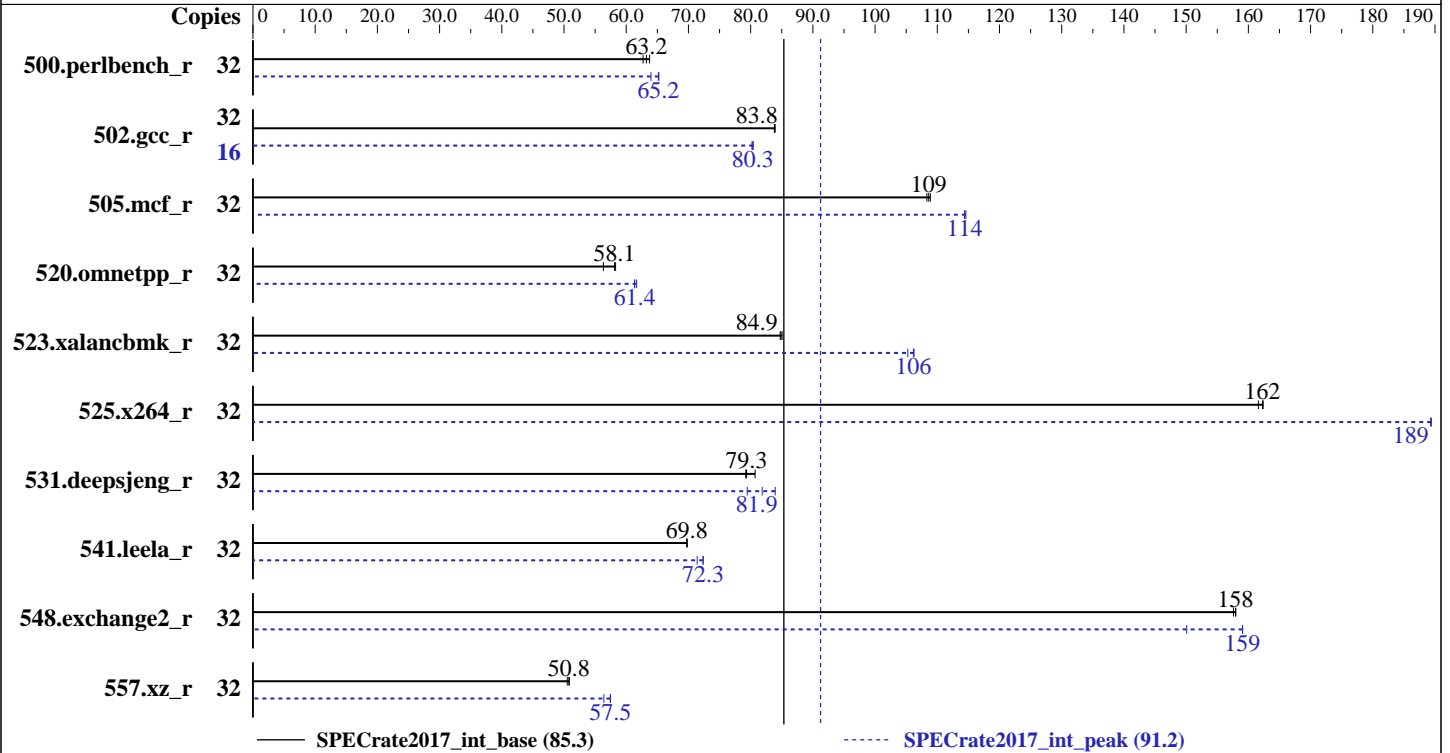
A+ Server 2123BT-HNC0R  
(H11DST-B , AMD EPYC 7251)

SPECrate2017\_int\_base = 85.3

SPECrate2017\_int\_peak = 91.2

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

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



### Hardware

CPU Name: AMD EPYC 7251  
Max MHz.: 2900  
Nominal: 2100  
Enabled: 16 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: 32 MB I+D on chip per chip  
Other: None  
Memory: 1 TB (16 x 64 GB 4Rx4 PC4-2666V-L, running at 2400)  
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 1.0b released Feb-2018  
File System: xfs  
System State: Run level 3 (multi-user)  
Base Pointers: 64-bit  
Peak Pointers: 32/64-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
500.perlbench_r	32	799	63.8	<b>806</b>	<b>63.2</b>	812	62.7	32	781	65.2	796	64.0	<b>782</b>	<b>65.2</b>
502.gcc_r	32	<b>540</b>	<b>83.8</b>	540	83.9	541	83.8	16	282	80.2	282	80.4	<b>282</b>	<b>80.3</b>
505.mcf_r	32	477	108	<b>476</b>	<b>109</b>	475	109	32	<b>452</b>	<b>114</b>	452	114	451	115
520.omnetpp_r	32	720	58.3	745	56.3	<b>722</b>	<b>58.1</b>	32	684	61.3	681	61.7	<b>684</b>	<b>61.4</b>
523.xalancbmk_r	32	397	85.1	399	84.8	<b>398</b>	<b>84.9</b>	32	318	106	321	105	<b>318</b>	<b>106</b>
525.x264_r	32	<b>345</b>	<b>162</b>	345	162	347	162	32	296	189	<b>296</b>	<b>189</b>	296	189
531.deepsjeng_r	32	463	79.2	454	80.7	<b>462</b>	<b>79.3</b>	32	<b>448</b>	<b>81.9</b>	462	79.5	437	83.9
541.leela_r	32	760	69.7	<b>760</b>	<b>69.8</b>	759	69.8	32	<b>733</b>	<b>72.3</b>	732	72.4	742	71.4
548.exchange2_r	32	532	158	531	158	<b>531</b>	<b>158</b>	32	559	150	527	159	<b>527</b>	<b>159</b>
557.xz_r	32	684	50.5	<b>680</b>	<b>50.8</b>	680	50.8	32	613	56.4	<b>602</b>	<b>57.5</b>	602	57.5

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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:26"

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 Mon May 28 12:49:29 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 7251 8-Core Processor

2 "physical id"s (chips)

32 "processors"

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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 : 8
siblings  : 16
physical 0: cores 0 4 8 12 16 20 24 28
physical 1: cores 0 4 8 12 16 20 24 28
```

From lscpu:

```
Architecture:          x86_64
CPU op-mode(s):        32-bit, 64-bit
Byte Order:            Little Endian
CPU(s):                32
On-line CPU(s) list:   0-31
Thread(s) per core:    2
Core(s) per socket:    8
Socket(s):              2
NUMA node(s):          8
Vendor ID:              AuthenticAMD
CPU family:             23
Model:                  1
Model name:             AMD EPYC 7251 8-Core Processor
Stepping:               2
CPU MHz:                2100.000
CPU max MHz:           2100.0000
CPU min MHz:           1200.0000
BogoMIPS:               4199.88
Virtualization:        AMD-V
L1d cache:             32K
L1i cache:             64K
L2 cache:              512K
L3 cache:              4096K
NUMA node0 CPU(s):     0,1,16,17
NUMA node1 CPU(s):     2,3,18,19
NUMA node2 CPU(s):     4,5,20,21
NUMA node3 CPU(s):     6,7,22,23
NUMA node4 CPU(s):     8,9,24,25
NUMA node5 CPU(s):     10,11,26,27
NUMA node6 CPU(s):     12,13,28,29
NUMA node7 CPU(s):     14,15,30,31
```

```
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 16 17
node 0 size: 128850 MB
node 0 free: 128701 MB
node 1 cpus: 2 3 18 19
node 1 size: 129021 MB
node 1 free: 128914 MB
node 2 cpus: 4 5 20 21
node 2 size: 129021 MB
node 2 free: 128899 MB
node 3 cpus: 6 7 22 23
node 3 size: 129021 MB
node 3 free: 128882 MB
node 4 cpus: 8 9 24 25
node 4 size: 129021 MB
node 4 free: 128918 MB
node 5 cpus: 10 11 26 27
node 5 size: 129021 MB
node 5 free: 128930 MB
node 6 cpus: 12 13 28 29
node 6 size: 129021 MB
node 6 free: 128926 MB
node 7 cpus: 14 15 30 31
node 7 size: 129019 MB
node 7 free: 128929 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: 1056765636 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 May 28 11:35

SPEC is set to: /home/cpu2017

Filesystem	Type	Size	Used	Avail	Use%	Mounted on
/dev/sda4	xf	145G	2.9G	142G	2%	/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. 1.0b 02/07/2018

Memory:

16x Samsung M386A8K40BM2-CTD 64 GB 4 rank 2667, configured at 2400

(End of data from sysinfo program)

### Compiler Version Notes

=====  
CC 502.gcc\_r(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: i386-unknown-linux-gnu

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### Compiler Version Notes (Continued)

Thread model: posix  
InstalledDir: /root/work/compilers/AOCC-1.0-Compiler/bin

=====  
CXXC 523.xalanbmk\_r(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: i386-unknown-linux-gnu  
Thread model: posix  
InstalledDir: /root/work/compilers/AOCC-1.0-Compiler/bin

=====  
CC 500.perlbench\_r(base) 502.gcc\_r(base) 505.mcf\_r(base, peak)  
525.x264\_r(base) 557.xz\_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

=====  
CXXC 520.omnetpp\_r(base, peak) 523.xalanbmk\_r(base) 531.deepsjeng\_r(base,  
peak) 541.leela\_r(base)

-----  
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 500.perlbench\_r(peak) 525.x264\_r(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

=====  
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### Compiler Version Notes (Continued)

CXXC 541.leela\_r(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  
-----

=====  
FC 548.exchange2\_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  
-----

### Base Compiler Invocation

C benchmarks:  
clang

C++ benchmarks:  
clang++

Fortran benchmarks:  
clang gfortran

### Base Portability Flags

500.perlbench\_r: -DSPEC\_LINUX\_X64 -DSPEC\_LP64  
502.gcc\_r: -DSPEC\_LP64  
505.mcf\_r: -DSPEC\_LP64  
520.omnetpp\_r: -DSPEC\_LP64  
523.xalancbmk\_r: -DSPEC\_LINUX -DSPEC\_LP64  
525.x264\_r: -DSPEC\_LP64  
531.deepsjeng\_r: -DSPEC\_LP64  
541.leela\_r: -DSPEC\_LP64  
548.exchange2\_r: -DSPEC\_LP64  
557.xz\_r: -DSPEC\_LP64





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## 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 -Ofast -fdefault-integer-8  
-fplugin=dragonegg.so -fplugin-arg-dragonegg-llvm-option="  
-enable-iv-split -inline-threshold:1000 -disable-vect-cmp" -ljemalloc  
-lgfortran -lamdlibm
```

## Peak Compiler Invocation

C benchmarks:

clang

C++ benchmarks:

clang++

Fortran benchmarks:

clang gfortran

## Peak Portability Flags

```
500.perlbench_r: -DSPEC_LINUX_X64 -DSPEC_LP64  
502.gc_r: -D_FILE_OFFSET_BITS=64  
505.mcf_r: -DSPEC_LP64  
520.omnetpp_r: -DSPEC_LP64  
523.xalancbmk_r: -DSPEC_LINUX -D_FILE_OFFSET_BITS=64  
525.x264_r: -DSPEC_LP64  
531.deepsjeng_r: -DSPEC_LP64  
541.leela_r: -DSPEC_LP64
```

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## Peak Portability Flags (Continued)

548.exchange2\_r: -DSPEC\_LP64  
557.xz\_r: -DSPEC\_LP64

## Peak Optimization Flags

C benchmarks:

```
500.perlbench_r: -flto -Wl, -plugin-opt= -merge-constant  
-lsr-in-nested-loop -fprofile-instr-generate(pass 1)  
-fprofile-instr-use(pass 2) -Ofast -march=znver1  
-fstruct-layout=3 -mllvm -vectorize-memory-aggressively  
-mno-avx2 -unroll-threshold=100 -fremap-arrays  
-inline-threshold=1000 -ljemalloc
```

```
502.gcc_r: -m32 -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 -fgnu89-inline  
-L/root/work/lib/jemalloc/lib32 -ljemalloc
```

```
505.mcf_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 -ljemalloc
```

525.x264\_r: Same as 500.perlbench\_r

557.xz\_r: Same as 505.mcf\_r

C++ benchmarks:

```
520.omnetpp_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
```

```
523.xalancbmk_r: -m32 -flto -Wl, -plugin-opt= -merge-constant  
-lsr-in-nested-loop -Ofast -march=znver1  
-finline-aggressive -mllvm -unroll-threshold=100  
-fremap-arrays -inline-threshold=1000  
-L/root/work/lib/jemalloc/lib32 -ljemalloc
```

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## Peak Optimization Flags (Continued)

531.deepsjeng\_r: Same as 520.omnetpp\_r

```
541.leela_r: -flto -Wl, -plugin-opt= -merge-constant  
-lsr-in-nested-loop -fprofile-instr-generate(pass 1)  
-fprofile-instr-use(pass 2) -Ofast -march=znver1 -mllvm  
-unroll-count=8 -unroll-threshold=100 -ljemalloc
```

Fortran benchmarks:

```
-flto -Wl, -plugin-opt= -merge-constant -lsr-in-nested-loop  
-O3(gfortran) -O3(clang) -mavx2 -madx -funroll-loops -ffast-math  
-Ofast -fdefault-integer-8 -fplugin=dragonegg.so  
-fplugin-arg-dragonegg-llvm-option=" -enable-iv-split  
-inline-threshold:1000 -disable-vect-cmp" -ljemalloc -lgfortran  
-lamdlibm
```

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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For questions about this result, please contact the tester. For other inquiries, please contact [info@spec.org](mailto:info@spec.org).

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