SPEC® CPU2017 Floating Point Rate Result

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Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant DL385 Gen10
(2.20 GHz, AMD EPYC 7601)

SPECrate2017_fp_base = 259

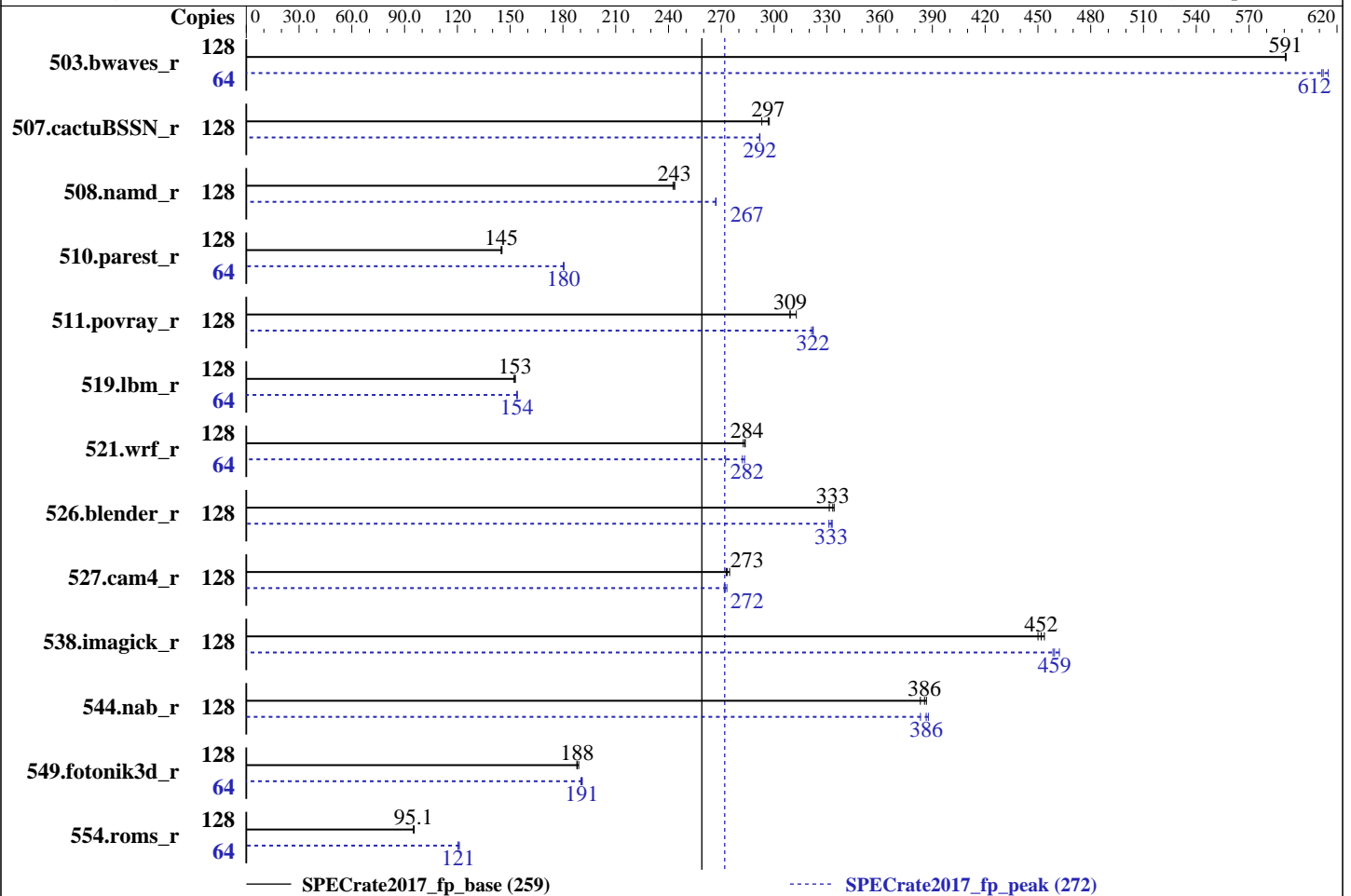SPECrate2017_fp_peak = 272

CPU2017 License: 3

Test Sponsor: HPE

Tested by: HPE

Test Date: Nov-2017

Hardware Availability: Nov-2017

Software Availability: Sep-2017

Benchmark results bar chart. Copies and scores:

- **503.bwaves_r**: 128 copies base = 591; 64 copies peak = 612
- **507.cactuBSSN_r**: 128 copies base = 297; peak = 292
- **508.namd_r**: 128 copies base = 243; peak = 267
- **510.parest_r**: 128 copies base = 145; 64 copies peak = 180
- **511.povray_r**: 128 copies base = 309; peak = 322
- **519.lbm_r**: 128 copies base = 153; 64 copies peak = 154
- **521.wrf_r**: 128 copies base = 284; 64 copies peak = 282
- **526.blender_r**: 128 copies base = 333; peak = 333
- **527.cam4_r**: 128 copies base = 273; peak = 272
- **538.imagick_r**: 128 copies base = 452; peak = 459
- **544.nab_r**: 128 copies base = 386; peak = 386
- **549.fotonik3d_r**: 128 copies base = 188; 64 copies peak = 191
- **554.roms_r**: 128 copies base = 95.1; 64 copies peak = 121

SPECrate2017_fp_base (259)   SPECrate2017_fp_peak (272)

Hardware

CPU Name: AMD EPYC 7601

Max MHz.: 3200

Nominal: 2200

Enabled: 64 cores, 2 chips, 2 threads/core

Orderable: 1, 2 chip(s)

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 / 4 cores

Other: None

Memory: 1 TB (16 x 64 GB 4Rx4 PC4-2666V-L)

Storage: 1 x 300 GB 15 K RPM SAS, RAID 0

Other: None

Software

OS: SUSE Linux Enterprise Server 12 (x86_64) SP3
Kernel 4.4.73-5-default

Compiler: C/C++: Version 1.0.0 of AOCC
Fortran: Version 4.8.2 of GCC

Parallel: No

Firmware: HPE BIOS Version A40 released Nov-2017 (tested with A40 10/13/2017)

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	128	**2173**	**591**	2173	591	2172	591	64	1050	611	1044	615	**1048**	**612**
507.cactuBSSN_r	128	**546**	**297**	553	293	545	297	128	555	292	**555**	**292**	555	292
508.namd_r	128	**500**	**243**	501	243	499	243	128	**456**	**267**	455	267	456	267
510.parest_r	128	2310	145	2303	145	**2309**	**145**	64	929	180	**928**	**180**	927	181
511.povray_r	128	**967**	**309**	967	309	956	313	128	930	321	**928**	**322**	928	322
519.lbm_r	128	886	152	882	153	**883**	**153**	64	438	154	438	154	**438**	**154**
521.wrf_r	128	1011	284	1015	283	**1011**	**284**	64	526	272	**508**	**282**	506	283
526.blender_r	128	588	331	583	334	**585**	**333**	128	589	331	585	333	**586**	**333**
527.cam4_r	128	**819**	**273**	815	275	821	273	128	820	273	824	272	**822**	**272**
538.imagick_r	128	702	454	707	450	**705**	**452**	128	**693**	**459**	689	462	694	459
544.nab_r	128	562	383	**559**	**386**	557	387	128	562	383	556	388	**557**	**386**
549.fotonik3d_r	128	2655	188	2640	189	**2652**	**188**	64	**1308**	**191**	1306	191	1311	190
554.roms_r	128	2140	95.1	2131	95.5	**2138**	**95.1**	64	840	121	**844**	**121**	845	120
SPECrate2017_fp_base =	**259**												
SPECrate2017_fp_peak =	**272**												

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
Linux governor set to performance with cpupower "cpupower frequency-set -r -g performance"

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)
```

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Operating System Notes (Continued)

```
Huge pages were not configured for this run.
```

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:"
MALLOC_CONF = "lg_chunk:28"

The AMD64 AOCC Compiler Suite is available at
http://developer.amd.com/tools-and-sdks/cpu-development/amd-optimizing-cc-compiler/

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 MALLOC_CONF 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 = 2MiB.

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/
```

Platform Notes

```
 BIOS Configuration:
  Thermal Configuration set to Maximum Cooling
  Performance Determinism set to Power Deterministic
  Processor Power and Utilization Monitoring set to Disabled
  Workload Profile set to General Throughput Compute
   Minimum Processor Idle Power Core C-State set to C6 State

 Sysinfo program /home/cpu2017/bin/sysinfo
 Rev: r5797 of 2017-06-14 96c45e4568ad54c135fd618bcc091c0f
 running on linux-d9tl Fri Nov  3 11:02:07 2017

 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
```

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Platform Notes (Continued)

```
From /proc/cpuinfo
   model name : AMD EPYC 7601 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
      physical 1: 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
      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:                 1
      Model name:            AMD EPYC 7601 32-Core Processor
      Stepping:              2
      CPU MHz:               2200.000
      CPU max MHz:           2200.0000
      CPU min MHz:           1200.0000
      BogoMIPS:              4391.66
      Virtualization:        AMD-V
      L1d cache:             32K
      L1i cache:             64K
      L2 cache:              512K
      L3 cache:              8192K
      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
      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
```

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Platform Notes (Continued)

```
     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 npt lbrv svm_lock nrip_save tsc_scale vmcb_clean flushbyasid decodeassists
     pausefilter pfthreshold vmmcall avic fsgsbase bmi1 avx2 smep bmi2 rdseed adx smap
     clflushopt sha_ni xsaveopt xsavec xgetbv1 clzero irperf 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: 128846 MB
    node 0 free: 128639 MB
    node 1 cpus: 8 9 10 11 12 13 14 15 72 73 74 75 76 77 78 79
    node 1 size: 129021 MB
    node 1 free: 128800 MB
    node 2 cpus: 16 17 18 19 20 21 22 23 80 81 82 83 84 85 86 87
    node 2 size: 129021 MB
    node 2 free: 128827 MB
    node 3 cpus: 24 25 26 27 28 29 30 31 88 89 90 91 92 93 94 95
    node 3 size: 129021 MB
    node 3 free: 128820 MB
    node 4 cpus: 32 33 34 35 36 37 38 39 96 97 98 99 100 101 102 103
    node 4 size: 129021 MB
    node 4 free: 128851 MB
    node 5 cpus: 40 41 42 43 44 45 46 47 104 105 106 107 108 109 110 111
    node 5 size: 129021 MB
    node 5 free: 128853 MB
    node 6 cpus: 48 49 50 51 52 53 54 55 112 113 114 115 116 117 118 119
    node 6 size: 129021 MB
    node 6 free: 128850 MB
    node 7 cpus: 56 57 58 59 60 61 62 63 120 121 122 123 124 125 126 127
    node 7 size: 129020 MB
    node 7 free: 128852 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
```

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Platform Notes (Continued)

```
From /proc/meminfo
   MemTotal:       1056761416 kB
   HugePages_Total:         0
   Hugepagesize:         2048 kB

/usr/bin/lsb_release -d
   SUSE Linux Enterprise Server 12 SP3

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-d9tl 4.4.73-5-default #1 SMP Tue Jul 4 15:33:39 UTC 2017 (b7ce4e4) x86_64
   x86_64 x86_64 GNU/Linux

run-level 3 Nov 1 11:55

SPEC is set to: /home/cpu2017
   Filesystem      Type  Size  Used Avail Use% Mounted on
   /dev/sda4       xfs   238G  112G  126G  48% /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 HPE A40 10/14/2017
   Memory:
    16x UNKNOWN NOT AVAILABLE
    16x UNKNOWN NOT AVAILABLE 64 GB 4 rank 2666

(End of data from sysinfo program)
```

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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)
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
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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
```

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Compiler Version Notes (Continued)

```
InstalledDir: /root/work/compilers/AOCC-1.0-Compiler/bin
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
--------------------------------------------------------------------------


==========================================================================
  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.
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You may redistribute copies of GNU Fortran
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For more information about these matters, see the file named COPYING
--------------------------------------------------------------------------


==========================================================================
  CC  521.wrf_r(base, peak) 527.cam4_r(base, peak)
--------------------------------------------------------------------------
GNU Fortran (GCC) 4.8.2
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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
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
--------------------------------------------------------------------------
```

Base Compiler Invocation

C benchmarks:
clang

C++ benchmarks:
clang++

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Base Compiler Invocation (Continued)

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
```

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

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Base Optimization Flags (Continued)

Fortran benchmarks:
```
-flto -Wl,-plugin-opt= -merge-constant
-Wl,-plugin-opt=-lsr-in-nested-loop -disable-vect-cmp -O3 -mavx -madx
-funroll-loops -ffast-math -z muldefs -fplugin=dragonegg.so
-fplugin-arg-dragonegg-llvm-option="-merge-constant -disable-vect-cmp"
-ljemalloc -lgfortran  -lamdlibm
```

Benchmarks using both Fortran and C:
```
-flto -Wl,-plugin-opt= -merge-constant
-Wl,-plugin-opt=-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 -mavx -madx
-funroll-loops -z muldefs -fplugin=dragonegg.so
-fplugin-arg-dragonegg-llvm-option="-merge-constant -disable-vect-cmp"
-ljemalloc -lgfortran  -lamdlibm
```

Benchmarks using both C and C++:
```
-flto -Wl,-plugin-opt= -merge-constant
-Wl,-plugin-opt=-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
-Wl,-plugin-opt=-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
-mavx -madx -funroll-loops -z muldefs -fplugin=dragonegg.so
-fplugin-arg-dragonegg-llvm-option="-merge-constant -disable-vect-cmp"
-ljemalloc
```

Peak Compiler Invocation

C benchmarks:
```
clang
```

C++ benchmarks:
```
clang++
```

Fortran benchmarks:
```
clang gfortran
```

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SPEC CPU2017 Floating Point Rate Result

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Hewlett Packard Enterprise
(Test Sponsor: HPE)

SPECrate2017_fp_base = 259

ProLiant DL385 Gen10
(2.20 GHz, AMD EPYC 7601)

SPECrate2017_fp_peak = 272

CPU2017 License: 3		**Test Date:**	Nov-2017
Test Sponsor:	HPE	**Hardware Availability:**	Nov-2017
Tested by:	HPE	**Software Availability:**	Sep-2017

Peak Compiler Invocation (Continued)

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
```

Peak Portability Flags

```
Same as Base Portability Flags
```

Peak Optimization Flags

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

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

Benchmarks using both Fortran and C:

```
 521.wrf_r: -flto -Wl,-plugin-opt= -merge-constant
-Wl,-plugin-opt=-lsr-in-nested-loop -O3 -mavx -ffast-math
-funroll-loops -fplugin=dragonegg.so
-fplugin-arg-dragonegg-llvm-option="-merge-constant
-inline-threshold:1000" -ljemalloc -lgfortran  -lamdlibm
```

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CPU2017 License:	3	**Test Date:**	Nov-2017
Test Sponsor:	HPE	**Hardware Availability:**	Nov-2017
Tested by:	HPE	**Software Availability:**	Sep-2017

Peak Optimization Flags (Continued)

```
527.cam4_r: -flto -Wl,-plugin-opt= -merge-constant
-Wl,-plugin-opt=-lsr-in-nested-loop -Ofast -march=znver1
-fstruct-layout=3 -mllvm -vectorize-memory-aggressively
-mno-avx2 -unroll-threshold=100 -fremap-arrays
-inline-threshold=1000 -O3 -mavx2 -madx -funroll-loops
-ffast-math -fplugin=dragonegg.so
-fplugin-arg-dragonegg-llvm-option="-merge-constant
-inline-threshold:1000" -ljemalloc -lgfortran  -lamdlibm
```

Benchmarks using both C and C++:
```
-flto -Wl,-plugin-opt= -merge-constant
-Wl,-plugin-opt=-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
```

Benchmarks using Fortran, C, and C++:
```
-flto -Wl,-plugin-opt= -merge-constant
-Wl,-plugin-opt=-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 -O3 -mavx2 -madx -funroll-loops -ffast-math
-fplugin=dragonegg.so
-fplugin-arg-dragonegg-llvm-option="-merge-constant
-inline-threshold:1000" -ljemalloc
```

The flags files that were used to format this result can be browsed at
```
http://www.spec.org/cpu2017/flags/aocc100-flags-revC-I.html
http://www.spec.org/cpu2017/flags/gcc.2017-11-20.html
http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-AMD-V1.2-EPYC-revB.html
```

You can also download the XML flags sources by saving the following links:
```
http://www.spec.org/cpu2017/flags/aocc100-flags-revC-I.xml
http://www.spec.org/cpu2017/flags/gcc.2017-11-20.xml
http://www.spec.org/cpu2017/flags/HPE-Platform-Flags-AMD-V1.2-EPYC-revB.xml
```

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

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