# SPEC CPU® 2017 Floating Point Speed Result

##Cisco Systems

Cisco UCS C225 M6 (AMD EPYC 72F3 8-Core)

<table>
<thead>
<tr>
<th>SPECspeed®2017_fp_base</th>
<th>90.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECspeed®2017_fp_peak</td>
<td>90.1</td>
</tr>
</tbody>
</table>

###CPU2017 License: 9019

<table>
<thead>
<tr>
<th>Test Sponsor:</th>
<th>Cisco Systems</th>
</tr>
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<tbody>
<tr>
<td>Tested by:</td>
<td>Cisco Systems</td>
</tr>
</tbody>
</table>

###Hardware

<table>
<thead>
<tr>
<th>Threads</th>
<th>603.bwaves_s 16</th>
<th>607.cactuBSSN_s 16</th>
<th>619.lbm_s 16</th>
<th>621.wrf_s 16</th>
<th>627.cam4_s 16</th>
<th>628.pop2_s 16</th>
<th>638.imagick_s 16</th>
<th>644.nab_s 16</th>
<th>649.fotonik3d_s 16</th>
<th>654.roms_s 16</th>
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</thead>
<tbody>
<tr>
<td>SPECspeed®2017_fp_base (90.1)</td>
<td>113</td>
<td>42.7</td>
<td>97.9</td>
<td>57.8</td>
<td>69.2</td>
<td>61.4</td>
<td>109</td>
<td>67.5</td>
<td>109</td>
<td></td>
</tr>
</tbody>
</table>

###CPU Name: AMD EPYC 72F3

- **Max MHz:** 4100
- **Nominal:** 3700
- **Enabled:** 8 cores, 1 chip, 2 threads/core
- **Orderable:** 1 chips
- **Cache L1:** 32 KB I + 32 KB D on chip per core
- **L2:** 512 KB I+D on chip per core
- **L3:** 256 MB I+D on chip per core, 32 MB per core
- **Other:** None
- **Memory:** 1 TB (8 x 128 GB 4Rx4 PC4-3200V-L)
- **Storage:** 1 x 960 GB M.2 SSD SATA
- **Other:** None

###Software

- **OS:** SUSE Linux Enterprise Server 15 SP3 (x86_64) kernel version 5.3.18-57-default
- **Compiler:** C/C++/Fortran: Version 3.0.0 of AOCC
- **Parallel:** Yes
- **Firmware:** Version 4.2.1c released Aug-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 v5.1.0
- **Power Management:** BIOS and OS set to prefer performance at the cost of additional power usage
## Cisco Systems

Cisco UCS C225 M6 (AMD EPYC 72F3 8-Core)

<table>
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<tr>
<th>Benchmark</th>
<th>Threads</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
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<td>16</td>
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<td>98.1</td>
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<td>627.cam4_s</td>
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<td>57.8</td>
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<td>16</td>
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<td>109</td>
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<td>109</td>
<td>161</td>
<td>109</td>
<td>161</td>
<td>109</td>
</tr>
<tr>
<td>649.fotonik3d_s</td>
<td>16</td>
<td>136</td>
<td>67.1</td>
<td>135</td>
<td>67.5</td>
<td>134</td>
<td>68.2</td>
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<td>109</td>
<td>144</td>
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<td>109</td>
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<td>109</td>
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</tbody>
</table>

### 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.
\[ \text{'}numactl' was used to bind copies to the cores. \]
See the configuration file for details.

### Operating System Notes

\[ \text{'ulimit –s unlimited' was used to set environment stack size limit} \]
\[ \text{'ulimit –l 2097152' was used to set environment locked pages in memory limit} \]
\[ \text{runcpu command invoked through numactl i.e.:} \]
\[ \text{numactl --interleave=all runcpu <etc>} \]
To limit dirty cache to 8% of memory, \[ \text{'sysctl -w vm.dirty_ratio=8'} \] run as root.
To limit swap usage to minimum necessary, \[ \text{'sysctl -w vm.swappiness=1'} \] run as root.
To free node-local memory and avoid remote memory usage, \[ \text{'sysctl -w vm.zone_reclaim_mode=1'} \] run as root.
To clear filesystem caches, \[ \text{'sync; sysctl –w vm.drop_caches=3'} \] run as root.
To disable address space layout randomization (ASLR) to reduce run-to-run variability, \[ \text{'sysctl –w kernel.randomize_va_space=0'} \] run as root.

To enable Transparent Hugepages (THP) for all allocations,
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| Test Sponsor:    | Cisco Systems |
| Tested by:       | Cisco Systems |

**Operating System Notes (Continued)**

'echo always > /sys/kernel/mm/transparent_hugepage/enabled' and 'echo always > /sys/kernel/mm/transparent_hugepage/defrag' run as root.
To enable THP only on request for peak runs of 628.pop2_s, and 638.imagick_s, 'echo madvise > /sys/kernel/mm/transparent_hugepage/enabled' run as root.
To disable THP for peak runs of 627.cam4_s, 644.nab_s, 649.fotonik3d_s, and 654.roms_s, 'echo never > /sys/kernel/mm/transparent_hugepage/enabled' run as root.

**Environment Variables Notes**

Environment variables set by runcpu before the start of the run:
GOMP_CPU_AFFINITY = "0-15"
LD_LIBRARY_PATH = 
/home/cpu2017/amd_speed_aocc300_milan_B_lib/lib;/home/cpu2017/amd_speed_aocc300_milan_B_lib/lib32:
MALLOCC_CONF = "retain:true"
OMP_DYNAMIC = "false"
OMP_SCHEDULE = "static"
OMP_STACKSIZE = "128M"
OMP_THREAD_LIMIT = "16"

**General Notes**

Binaries were compiled on a system with 2x AMD EPYC 7742 CPU + 1TiB Memory using openSUSE 15.2

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 v4.8.2 in RHEL 7.4 (No options specified)
jemalloc 5.1.0 is available here:
https://github.com/jemalloc/jemalloc/releases/download/5.1.0/jemalloc-5.1.0.tar.bz2

**Platform Notes**

SMT Mode set to Auto
NUMA nodes per socket set to NPS1
ACPI SRAT L3 Cache As NUMA Domain set to Enabled
DRAM Scrub Time set to Disabled
Determinism Slider set to Power
L1 Stream HW Prefetcher set to Enabled

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Cisco UCS C225 M6 (AMD EPYC 72F3 8-Core)

| SPECspeed®2017_fp_base = 90.1 |
| SPECspeed®2017_fp_peak = 90.1 |

CPU2017 License: 9019  
Test Sponsor: Cisco Systems  
Tested by: Cisco Systems

Test Date: Dec-2021  
Hardware Availability: Jun-2021  
Software Availability: Jun-2021

Platform Notes (Continued)

APBDIS set to 1

Sysinfo program /home/cpu2017/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16aca6d
running on specsrv Tue Dec 7 11:04:18 2021

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 72F3 8-Core Processor
  1 "physical id"s (chips)
  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 from util-linux 2.36.2:
  Architecture: x86_64
  CPU op-mode(s): 32-bit, 64-bit
  Byte Order: Little Endian
  Address sizes: 48 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): 2
  Vendor ID: AuthenticAMD
  CPU family: 25
  Model: 1
  Model name: AMD EPYC 72F3 8-Core Processor
  Stepping: 1
  Frequency boost: enabled
  CPU MHz: 1497.217
  CPU max MHz: 3700.0000
  CPU min MHz: 1500.0000
  BogoMIPS: 7386.58
  Virtualization: AMD-V
  L1d cache: 256 KiB
  L1i cache: 256 KiB
  L2 cache: 4 MiB
  L3 cache: 256 MiB
  NUMA node0 CPU(s): 0-3,8-11

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SPECspeed®2017_fp_base = 90.1
SPECspeed®2017_fp_peak = 90.1

CPU2017 License: 9019
Test Sponsor: Cisco Systems
Tested by: Cisco Systems

Platform Notes (Continued)

node 0 1
0: 10 12
1: 12 10

From /proc/meminfo
MemTotal: 1056717764 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

/sys/devices/system/cpu/cpu*/cpufreq/scaling_governor has ondemand

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

os-release:
NAME="SLES"
VERSION="15-SP3"
VERSION_ID="15.3"
PRETTY_NAME="SUSE Linux Enterprise Server 15 SP3"
ID="sles"
ID_LIKE="suse"
ANSI_COLOR="0;32"
CPE_NAME="cpe:/o:suse:sles:15:sp3"

uname -a:
Linux specsrv 5.3.18-57-default #1 SMP Wed Apr 28 10:54:41 UTC 2021 (ba3c2e9) 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/swaps barriers and __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Full AMD retpoline, IBPB: conditional, IBRS_FW, STIBP: always-on, RSB filling
CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
CVE-2019-11135 (TSX Asynchronous Abort): Not affected

run-level 3 Dec 6 15:20

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**CPU2017 License**: 9019  
**Test Sponsor**: Cisco Systems  
**Tested by**: Cisco Systems

**Platform Notes (Continued)**

SPEC is set to: /home/cpu2017

Filesystem    Type  Size  Used  Avail  Use% Mounted on
/dev/sdb2        xfs   223G   30G  194G   14%  /

From /sys/devices/virtual/dmi/id

Vendor:         Cisco Systems Inc  
Product:        UCSC-C225-M6S  
Serial:         WZP2524931G

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:**

8x 0xCE00 M386AAG40AM3-CWE 128 GB 4 rank 3200

**BIOS**

BIOS Vendor:         Cisco Systems, Inc.  
BIOS Version:      C225M6.4.2.1c.0.0806211349  
BIOS Date:         08/06/2021  
BIOS Revision:     5.22

(End of data from sysinfo program)

**Compiler Version Notes**

```
C              619.lbm_s(base, peak) 638.imagick_s(base, peak)  
                  644.nab_s(base, peak)  

AMD clang version 12.0.0 (CLANG: AOCC_3.0.0-Build#78 2020_12_10) (based on LLVM Mirror.Version.12.0.0)  
Target: x86_64-unknown-linux-gnu  
Thread model: posix  
InstalledDir: /opt/AMD/aocc-compiler-3.0.0/bin
```

```
C++, C, Fortran | 607.cactuBSSN_s(base, peak)
```

```
AMD clang version 12.0.0 (CLANG: AOCC_3.0.0-Build#78 2020_12_10) (based on LLVM Mirror.Version.12.0.0)  
Target: x86_64-unknown-linux-gnu  
Thread model: posix  
InstalledDir: /opt/AMD/aocc-compiler-3.0.0/bin
```

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CPU2017 License: 9019
Test Sponsor: Cisco Systems
Tested by: Cisco Systems

Test Date: Dec-2021
Hardware Availability: Jun-2021
Software Availability: Jun-2021

Compiler Version Notes (Continued)

LLVM Mirror.Version.12.0.0
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.0.0/bin
AMD clang version 12.0.0 (CLANG: AOCC_3.0.0-Build#78 2020_12_10) (based on LLVM Mirror.Version.12.0.0)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /opt/AMD/aocc-compiler-3.0.0/bin

Fortran         | 603.bwaves_s(base, peak) 649.fotonik3d_s(base, peak)
| 654.roms_s(base, peak)

Fortran, C      | 621.wrf_s(base, peak) 627.cam4_s(base, peak)
| 628.pop2_s(base, peak)

Base Compiler Invocation

C benchmarks:
clang

Fortran benchmarks:
flang

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**CPU2017 License:** 9019  
**Test Sponsor:** Cisco Systems  
**Tested by:** Cisco Systems

**SPECspeed**\textsuperscript{2017}\_fp\_base = 90.1  
**SPECspeed**\textsuperscript{2017}\_fp\_peak = 90.1

**Test Date:** Dec-2021  
**Hardware Availability:** Jun-2021  
**Software Availability:** Jun-2021

### Base Compiler Invocation (Continued)

Benchmarks using both Fortran and C:
flang clang

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

### Base Portability Flags

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Flags</th>
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<tbody>
<tr>
<td>603.bwaves_s</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>607.cactuBSSN_s</td>
<td>-DSPEC_LP64</td>
</tr>
<tr>
<td>619.ibm_s</td>
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<td>621.wrf_s</td>
<td>-DSPEC_CASE_FLAG -Mbyteswapio -DSPEC_LP64</td>
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<tr>
<td>654.roms_s</td>
<td>-DSPEC_LP64</td>
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</table>

### Base Optimization Flags

**C benchmarks:**
-m64 -mno-adx -mno-sse4a -Wl,-mllvm -Wl,-region-vectorize  
-Wl,-mllvm -Wl,-function-specialize  
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6  
-Wl,-mllvm -Wl,-reduce-array-computations=3 -O3 -march=znver3  
-fveclib=AMDLIBM -ffast-math -flto -fstruct-layout=5  
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000  
-freemap-arrays -mllvm -function-specialize -flv-function-specialization  
-mllvm -enable-gvn-hoist -mllvm -global-vectorize-slp=true  
-mllvm -enable-licm-vrp -mllvm -reduce-array-computations=3 -z muldefs  
-DSPEC_OPENMP -fopenmp -fopenmp=libomp -lomp -lamdlibm -ljemalloc  
-lflang -lflangrti

**Fortran benchmarks:**
-m64 -mno-adx -mno-sse4a -Wl,-mllvm -Wl,-enable-X86-prefetching  
-Wl,-mllvm -Wl,-enable-licm-vrp -Wl,-mllvm -Wl,-region-vectorize  
-Wl,-mllvm -Wl,-function-specialize  
-Wl,-mllvm -Wl,-align-all-nofallthru-blocks=6  
-Wl,-mllvm -Wl,-reduce-array-computations=3 -Hz,1,0x1 -O3  
-march=znver3 -fveclib=AMDLIBM -ffast-math -Mrecursive  
-mllvm -fuse-tile-inner-loop -funroll-loops

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SPECspeed®2017_fp_peak = 90.1

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Test Sponsor: Cisco Systems
Tested by: Cisco Systems
Test Date: Dec-2021
Hardware Availability: Jun-2021
Software Availability: Jun-2021

Base Optimization Flags (Continued):

Fortran benchmarks (continued):
-mlvm -extra-vectorizer-passes -mlvm -lsr-in-nested-loop
-mlvm -enable-licm-vrp -mlvm -reduce-array-computations=3
-mlvm -global-vectorize-slp=true -z muldefs -DSPEC_OPENMP -fopenmp
-fopenmp=libomp -lomp -lamdlibm -ljemalloc -lflang -lflangrti

Benchmarks using both Fortran and C:
-m64 -mno-adx -mno-sse4a -W1,-mlvm -W1,--enable-X86-prefetching
-W1,-mlvm -W1,-enable-licm-vrp -W1,-mlvm -W1,-region-vectorize
-W1,-mlvm -W1,-function-specialize
-W1,-mlvm -W1,-align-all-nofallthru-blocks=6
-W1,-mlvm -W1,-reduce-array-computations=3 -O3 -March=znver3
-fvecclib=AMDLIBM -ffast-math -flto -fsstruct-layout=5
-mlvm -unroll-threshold=50 -mlvm -inline-threshold=1000
-fremap-arrays -mlvm -function-specialize -flv-function-specialization
-mlvm -enable-gvn-hoist -mlvm -global-vectorize-slp=true
-Mrecursive -mlvm -fuse-tile-inner-loop -funroll-loops
-mlvm -extra-vectorizer-passes -mlvm -lsr-in-nested-loop -z muldefs
-DSPEC_OPENMP -fopenmp -fopenmp=libomp -lomp -lamdlibm -ljemalloc
-lflang -lflangrti

Benchmarks using Fortran, C, and C++:
-m64 -mno-adx -mno-sse4a -std=c++98
-W1,-mlvm -W1,-x86-use-vzeroupper=false
-W1,-mlvm -W1,-region-vectorize -W1,-mlvm -W1,-function-specialize
-W1,-mlvm -W1,-align-all-nofallthru-blocks=6
-W1,-mlvm -W1,-reduce-array-computations=3 -O3 -March=znver3
-fvecclib=AMDLIBM -ffast-math -flto -fsstruct-layout=5
-mlvm -unroll-threshold=50 -mlvm -inline-threshold=1000
-fremap-arrays -mlvm -function-specialize -flv-function-specialization
-mlvm -enable-gvn-hoist -mlvm -global-vectorize-slp=true
-mlvm -enable-licm-vrp -mlvm -reduce-array-computations=3
-mlvm -enable-partial-unswitch -mlvm -unroll-threshold=100
-finline-aggressive -mlvm -loop-unswitch-threshold=200000
-mlvm -reroll-loops -mlvm -aggressive-loop-unswitch
-mlvm -extra-vectorizer-passes -mlvm -convert-pow-exp-to-int=false
-Hz,1,0x1 -Mrecursive -mlvm -fuse-tile-inner-loop -funroll-loops
-mlvm -lsr-in-nested-loop -z muldefs -DSPEC_OPENMP -fopenmp
-fopenmp=libomp -lomp -lamdlibm -ljemalloc -lflang -lflangrti
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Cisco UCS C225 M6 (AMD EPYC 72F3 8-Core)

SPEC Speed®2017_fp_base = 90.1
SPEC Speed®2017_fp_peak = 90.1

---

**Base Other Flags**

- C benchmarks:
  - `-Wno-unused-command-line-argument` `-Wno-return-type`

- Fortran benchmarks:
  - `-Wno-unused-command-line-argument` `-Wno-return-type`

- Benchmarks using both Fortran and C:
  - `-Wno-unused-command-line-argument` `-Wno-return-type`

- Benchmarks using Fortran, C, and C++:
  - `-Wno-unused-command-line-argument` `-Wno-return-type`

---

**Peak Compiler Invocation**

- C benchmarks:
  - `clang`

- Fortran benchmarks:
  - `flang`

- Benchmarks using both Fortran and C:
  - `flang clang`

- Benchmarks using Fortran, C, and C++:
  - `clang++ clang flang`

---

**Peak Portability Flags**

Same as Base Portability Flags

---

**Peak Optimization Flags**

- C benchmarks:
  - `619.lbm_s: basepeak = yes`
  - `638.imagick_s: basepeak = yes`
  - `644.nab_s: basepeak = yes`

(Continued on next page)
Cisco Systems
Cisco UCS C225 M6 (AMD EPYC 72F3 8-Core)

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CPU2017 License: 9019
Test Sponsor: Cisco Systems
Tested by: Cisco Systems
Test Date: Dec-2021
Hardware Availability: Jun-2021
Software Availability: Jun-2021

Peak Optimization Flags (Continued)

Fortran benchmarks:
603.bwaves_s: basepeak = yes
649.fotonik3d_s: basepeak = yes
654.roms_s: basepeak = yes

Benchmarks using both Fortran and C:
621.wrf_s: basepeak = yes
627.cam4_s: basepeak = yes
628.pop2_s: basepeak = yes

Benchmarks using Fortran, C, and C++:
607.cactuBSSN_s: basepeak = yes

Peak Other Flags

C benchmarks:
-Wno-unused-command-line-argument -Wno-return-type

Fortran benchmarks:
-Wno-unused-command-line-argument -Wno-return-type

Benchmarks using both Fortran and C:
-Wno-unused-command-line-argument -Wno-return-type

Benchmarks using Fortran, C, and C++:
-Wno-unused-command-line-argument -Wno-return-type

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

You can also download the XML flags sources by saving the following links:
### SPEC CPU®2017 Floating Point Speed Result

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**Cisco Systems**

Cisco UCS C225 M6 (AMD EPYC 72F3 8-Core)

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