# SPEC CPU®2017 Integer Rate Result

## Cisco Systems

Cisco UCS C245 M6 (AMD EPYC 73F3 16-Core, Processor)

SPECrate®2017_int_base =    349

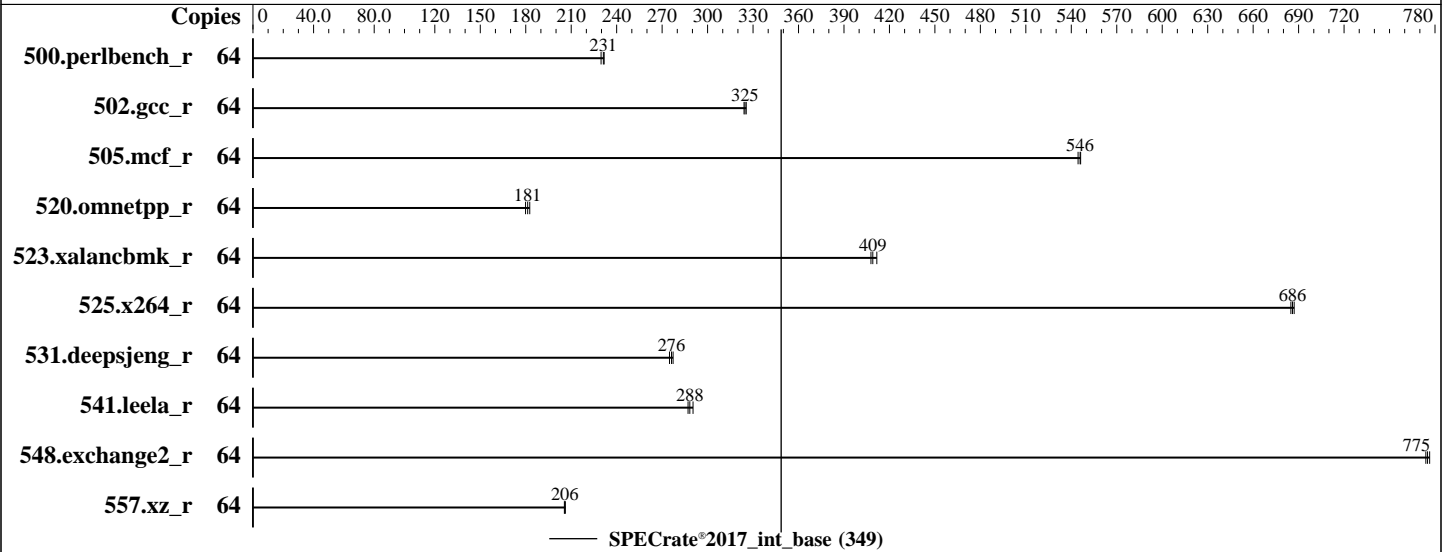SPECrate®2017_int_peak = Not Run

**CPU2017 License:** 9019

**Test Sponsor:** Cisco Systems

**Tested by:** Cisco Systems

**Test Date:** Sep-2021

**Hardware Availability:** Jun-2021

**Software Availability:** Mar-2021

**Copies** | 0   40.0   80.0   120  150  180  210  240  270  300  330  360  390  420  450  480  510  540  570  600  630  660  690  720      780

- 500.perlbench_r  **64**  —  231
- 502.gcc_r  **64**  —  325
- 505.mcf_r  **64**  —  546
- 520.omnetpp_r  **64**  —  181
- 523.xalancbmk_r  **64**  —  409
- 525.x264_r  **64**  —  686
- 531.deepsjeng_r  **64**  —  276
- 541.leela_r  **64**  —  288
- 548.exchange2_r  **64**  —  775
- 557.xz_r  **64**  —  206

—— **SPECrate®2017_int_base (349)**

## Hardware

CPU Name: AMD EPYC 73F3
 Max MHz: 4000
 Nominal: 3500
Enabled: 32 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: 256 MB I+D on chip per chip,
  32 MB shared / 2 cores
 Other: None
Memory: 2 TB (16 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 SP2 (x86_64)
  kernel version 5.3.18-22-default
Compiler: C/C++/Fortran: Version 3.0.0 of AOCC
Parallel: No
Firmware: Version 4.2.1c released Aug-2021
File System: btrfs
System State: Run level 5 (multi-user)
Base Pointers: 64-bit
Peak Pointers: Not Applicable
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

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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 | 64 | 444 | 230 | 440 | 232 | **441** | **231** | | | | | | | |
| 502.gcc_r | 64 | **279** | **325** | 280 | 324 | 278 | 326 | | | | | | | |
| 505.mcf_r | 64 | 190 | 544 | 189 | 546 | **189** | **546** | | | | | | | |
| 520.omnetpp_r | 64 | 467 | 180 | 460 | 183 | **463** | **181** | | | | | | | |
| 523.xalancbmk_r | 64 | **165** | **409** | 166 | 408 | 164 | 412 | | | | | | | |
| 525.x264_r | 64 | 164 | 685 | 163 | 687 | **163** | **686** | | | | | | | |
| 531.deepsjeng_r | 64 | 267 | 275 | 265 | 277 | **266** | **276** | | | | | | | |
| 541.leela_r | 64 | 365 | 290 | **368** | **288** | 369 | 287 | | | | | | | |
| 548.exchange2_r | 64 | 217 | 774 | **216** | **775** | 216 | 776 | | | | | | | |
| 557.xz_r | 64 | **336** | **206** | 336 | 205 | 335 | 206 | | | | | | | |
| **SPECrate®2017_int_base =** | | **349** | | | | | | | | | | | | |
| **SPECrate®2017_int_peak =** | | **Not Run** | | | | | | | | | | | | |

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 limit
'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>

To limit dirty cache to 8% of memory, 'sysctl -w vm.dirty_ratio=8' run as root.
To limit swap usage to minimum necessary, 'sysctl -w vm.swappiness=1' run as root.
To free node-local memory and avoid remote memory usage,
'sysctl -w vm.zone_reclaim_mode=1' run as root.
To clear filesystem caches, 'sync; sysctl -w vm.drop_caches=3' run as root.
To disable address space layout randomization (ASLR) to reduce run-to-run
variability, 'sysctl -w kernel.randomize_va_space=0' run as root.
```

**(Continued on next page)**

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## Operating System Notes (Continued)

'cpupowerÂ frequency-set -g performance' run as root to set the scaling governor to
performance.
To enable Transparent Hugepages (THP) only on request for base runs,
'echo madvise > /sys/kernel/mm/transparent_hugepage/enabled' run as root.
To enable THP for all allocations for peak runs,
'echo always > /sys/kernel/mm/transparent_hugepage/enabled' and
'echo always > /sys/kernel/mm/transparent_hugepage/defrag' run as root.

## Environment Variables Notes

Environment variables set by runcpu before the start of the run:
LD_LIBRARY_PATH =
     "/home/cpu2017/amd_rate_aocc300_milan_B_lib/lib;/home/cpu2017/amd_rate_a
     occ300_milan_B_lib/lib32:"
MALLOC_CONF = "retain:true"

## 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

BIOS Configuration
 SMT Mode set to Auto
 NUMA nodes per socket set to NPS4
 ACPI SRAT L3 Cache As NUMA Domain set to Enabled
 DRAM Scrub Time set to Disabled
 Determinism Slider set to Power
 cTDP Control set to Manual
 cTDP set to 280
 EDC Control set to Manual
 EDC set to 300

**(Continued on next page)**

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## Platform Notes (Continued)

```
 L2 Stream HW Prefetcher set to Disabled
 Memory Interleaving set to Disabled
 APBDIS set to 1
 xGMI Link config set to 4

 Sysinfo program /home/cpu2017/bin/sysinfo
 Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acafc64d
 running on install Mon Sep 13 17:05:38 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 73F3 16-Core Processor
       2  "physical id"s (chips)
       64 "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 : 16
       siblings  : 32
       physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
       physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15

 From lscpu from util-linux 2.33.1:
      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):              64
      On-line CPU(s) list: 0-63
      Thread(s) per core:  2
      Core(s) per socket:  16
      Socket(s):           2
      NUMA node(s):        16
      Vendor ID:           AuthenticAMD
      CPU family:          25
      Model:               1
      Model name:          AMD EPYC 73F3 16-Core Processor
      Stepping:            1
      CPU MHz:             1795.849
      CPU max MHz:         3500.0000
      CPU min MHz:         1500.0000
      BogoMIPS:            6986.94
      Virtualization:      AMD-V
      L1d cache:           32K
      L1i cache:           32K
```

**(Continued on next page)**

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### Platform Notes (Continued)

```
      L2 cache:               512K
      L3 cache:               32768K
      NUMA node0 CPU(s):      0,1,32,33
      NUMA node1 CPU(s):      2,3,34,35
      NUMA node2 CPU(s):      4,5,36,37
      NUMA node3 CPU(s):      6,7,38,39
      NUMA node4 CPU(s):      8,9,40,41
      NUMA node5 CPU(s):      10,11,42,43
      NUMA node6 CPU(s):      12,13,44,45
      NUMA node7 CPU(s):      14,15,46,47
      NUMA node8 CPU(s):      16,17,48,49
      NUMA node9 CPU(s):      18,19,50,51
      NUMA node10 CPU(s):     20,21,52,53
      NUMA node11 CPU(s):     22,23,54,55
      NUMA node12 CPU(s):     24,25,56,57
      NUMA node13 CPU(s):     26,27,58,59
      NUMA node14 CPU(s):     28,29,60,61
      NUMA node15 CPU(s):     30,31,62,63
      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 cpuid extd_apicid aperfmperf pni pclmulqdq
    monitor ssse3 fma cx16 pcid 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 bpext perfctr_llc mwaitx cpb
    cat_l3 cdp_l3 invpcid_single hw_pstate ssbd mba ibrs ibpb stibp vmmcall fsgsbase
    bmi1 avx2 smep bmi2 invpcid 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 arat npt lbrv svm_lock nrip_save tsc_scale
    vmcb_clean flushbyasid decodeassists pausefilter pfthreshold v_vmsave_vmload vgif
    umip pku ospke vaes vpclmulqdq 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: 16 nodes (0-15)
    node 0 cpus: 0 1 32 33
    node 0 size: 128839 MB
    node 0 free: 128434 MB
    node 1 cpus: 2 3 34 35
    node 1 size: 129020 MB
    node 1 free: 128804 MB
    node 2 cpus: 4 5 36 37
    node 2 size: 129022 MB
    node 2 free: 128725 MB
    node 3 cpus: 6 7 38 39
```

**(Continued on next page)**

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## Platform Notes (Continued)

```
     node 3 size: 129020 MB
     node 3 free: 128661 MB
     node 4 cpus: 8 9 40 41
     node 4 size: 129022 MB
     node 4 free: 128699 MB
     node 5 cpus: 10 11 42 43
     node 5 size: 129020 MB
     node 5 free: 128837 MB
     node 6 cpus: 12 13 44 45
     node 6 size: 129022 MB
     node 6 free: 128724 MB
     node 7 cpus: 14 15 46 47
     node 7 size: 128974 MB
     node 7 free: 128773 MB
     node 8 cpus: 16 17 48 49
     node 8 size: 129022 MB
     node 8 free: 128843 MB
     node 9 cpus: 18 19 50 51
     node 9 size: 129020 MB
     node 9 free: 128830 MB
     node 10 cpus: 20 21 52 53
     node 10 size: 129022 MB
     node 10 free: 128856 MB
     node 11 cpus: 22 23 54 55
     node 11 size: 129020 MB
     node 11 free: 128827 MB
     node 12 cpus: 24 25 56 57
     node 12 size: 129022 MB
     node 12 free: 128852 MB
     node 13 cpus: 26 27 58 59
     node 13 size: 129020 MB
     node 13 free: 128854 MB
     node 14 cpus: 28 29 60 61
     node 14 size: 129022 MB
     node 14 free: 128785 MB
     node 15 cpus: 30 31 62 63
     node 15 size: 129020 MB
     node 15 free: 128818 MB
     node distances:
     node   0    1    2    3    4    5    6    7    8    9   10   11   12   13   14   15
       0:  10   11   12   12   12   12   12   12   32   32   32   32   32   32   32   32
       1:  11   10   12   12   12   12   12   12   32   32   32   32   32   32   32   32
       2:  12   12   10   11   12   12   12   12   32   32   32   32   32   32   32   32
       3:  12   12   11   10   12   12   12   12   32   32   32   32   32   32   32   32
       4:  12   12   12   12   10   11   12   12   32   32   32   32   32   32   32   32
       5:  12   12   12   12   11   10   12   12   32   32   32   32   32   32   32   32
       6:  12   12   12   12   12   12   10   11   32   32   32   32   32   32   32   32
```

**(Continued on next page)**

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## Platform Notes (Continued)

```
    7:  12  12  12  12  12  12  11  10  32  32  32  32  32  32  32  32
    8:  32  32  32  32  32  32  32  32  10  11  12  12  12  12  12  12
    9:  32  32  32  32  32  32  32  32  11  10  12  12  12  12  12  12
   10:  32  32  32  32  32  32  32  32  12  12  10  11  12  12  12  12
   11:  32  32  32  32  32  32  32  32  12  12  11  10  12  12  12  12
   12:  32  32  32  32  32  32  32  32  12  12  12  12  10  11  12  12
   13:  32  32  32  32  32  32  32  32  12  12  12  12  11  10  12  12
   14:  32  32  32  32  32  32  32  32  12  12  12  12  12  12  10  11
   15:  32  32  32  32  32  32  32  32  12  12  12  12  12  12  11  10

 From /proc/meminfo
    MemTotal:        2113656384 kB
    HugePages_Total:         0
    Hugepagesize:         2048 kB

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

 From /etc/*release* /etc/*version*
    os-release:
        NAME="SLES"
        VERSION="15-SP2"
        VERSION_ID="15.2"
        PRETTY_NAME="SUSE Linux Enterprise Server 15 SP2"
        ID="sles"
        ID_LIKE="suse"
        ANSI_COLOR="0;32"
        CPE_NAME="cpe:/o:suse:sles:15:sp2"

 uname -a:
    Linux install 5.3.18-22-default #1 SMP Wed Jun 3 12:16:43 UTC 2020 (720aeba) 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
                                              sanitization
 CVE-2017-5715 (Spectre variant 2):           Mitigation: Full AMD retpoline,
                                           IBPB: conditional, IBRS_FW, STIBP:
```

**(Continued on next page)**

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## Platform Notes (Continued)

```
                                                  always-on, RSB filling
 CVE-2020-0543 (Special Register Buffer Data Sampling): Not affected
 CVE-2019-11135 (TSX Asynchronous Abort):               Not affected

 run-level 5 Apr 17 06:12

 SPEC is set to: /home/cpu2017
    Filesystem      Type  Size  Used Avail Use% Mounted on
    /dev/sdb2       btrfs 222G   17G  204G   8% /home

 From /sys/devices/virtual/dmi/id
    Vendor:         Cisco Systems Inc
    Product:        UCSC-C245-M6SX
    Serial:         WZP25130VQH

 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:
     16x 0xCE00 M386AAG40AM3-CWE 128 GB 4 rank 3200
     16x Unknown Unknown

 BIOS:
    BIOS Vendor:        Cisco Systems, Inc.
    BIOS Version:       C245M6.4.2.1c.0.0806211349
    BIOS Date:          08/06/2021
    BIOS Revision:      5.22

 (End of data from sysinfo program)
```

## Compiler Version Notes

```
==============================================================================
C       | 500.perlbench_r(base) 502.gcc_r(base) 505.mcf_r(base)
        | 525.x264_r(base) 557.xz_r(base)
------------------------------------------------------------------------------
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++     | 520.omnetpp_r(base) 523.xalancbmk_r(base) 531.deepsjeng_r(base)
```

**(Continued on next page)**

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## Compiler Version Notes (Continued)

```
         | 541.leela_r(base)
-------------------------------------------------------------------------
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 | 548.exchange2_r(base)
-------------------------------------------------------------------------
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
-------------------------------------------------------------------------
```

## Base Compiler Invocation

C benchmarks:
`clang`

C++ benchmarks:
`clang++`

Fortran benchmarks:
`flang`

## 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:
```
-m64 -Wl,-allow-multiple-definition -Wl,-mllvm -Wl,-enable-licm-vrp
-flto -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 -ffast-math
-march=znver3 -fveclib=AMDLIBM -fstruct-layout=5
-mllvm -unroll-threshold=50 -mllvm -inline-threshold=1000
-fremap-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
-lamdlibm -ljemalloc -lflang -lflangrti
```

C++ benchmarks:
```
-m64 -std=c++98 -Wl,-mllvm -Wl,-do-block-reorder=aggressive -flto
-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 -ffast-math
-march=znver3 -fveclib=AMDLIBM -mllvm -enable-partial-unswitch
-mllvm -unroll-threshold=100 -finline-aggressive
-flv-function-specialization -mllvm -loop-unswitch-threshold=200000
-mllvm -reroll-loops -mllvm -aggressive-loop-unswitch
-mllvm -extra-vectorizer-passes -mllvm -reduce-array-computations=3
-mllvm -global-vectorize-slp=true -mllvm -convert-pow-exp-to-int=false
-z muldefs -mllvm -do-block-reorder=aggressive
-fvirtual-function-elimination -fvisibility=hidden -lamdlibm
-ljemalloc -lflang -lflangrti
```

Fortran benchmarks:
```
-m64 -Wl,-mllvm -Wl,-inline-recursion=4
-Wl,-mllvm -Wl,-lsr-in-nested-loop -Wl,-mllvm -Wl,-enable-iv-split
-flto -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 -ffast-math
-march=znver3 -fveclib=AMDLIBM -z muldefs -mllvm -unroll-aggressive
-mllvm -unroll-threshold=500 -lamdlibm -ljemalloc -lflang -lflangrti
```

# Base Other Flags

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

**(Continued on next page)**

Standard Performance Evaluation Corporation (info@spec.org)        https://www.spec.org/

## Cisco Systems

Cisco UCS C245 M6 (AMD EPYC 73F3 16-Core, Processor)

SPECrate®2017_int_base =      349

SPECrate®2017_int_peak = Not Run

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

**Test Date:** Sep-2021
**Hardware Availability:** Jun-2021
**Software Availability:** Mar-2021

# Base Other Flags (Continued)

C++ benchmarks:

```
-Wno-unused-command-line-argument
```

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

```
http://www.spec.org/cpu2017/flags/aocc300-flags-B2.html
http://www.spec.org/cpu2017/flags/Cisco-Platform-Settings-AMD-v2-revD.html
```

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

```
http://www.spec.org/cpu2017/flags/aocc300-flags-B2.xml
http://www.spec.org/cpu2017/flags/Cisco-Platform-Settings-AMD-v2-revD.xml
```

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

Tested with SPEC CPU®2017 v1.1.8 on 2021-09-13 20:05:37-0400.
Report generated on 2021-10-25 17:06:50 by CPU2017 PDF formatter v6442.
Originally published on 2021-10-25.