# SPEC CPU®2017 Integer Rate Result

## Fujitsu

**PRIMERGY RX2450 M1, AMD EPYC 7643**

**2.30 GHz**

<table>
<thead>
<tr>
<th>Test Sponsor</th>
<th>Fujitsu</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tested by</td>
<td>Fujitsu</td>
</tr>
<tr>
<td>Test Date</td>
<td>Oct-2021</td>
</tr>
<tr>
<td>Hardware Availability</td>
<td>Oct-2021</td>
</tr>
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<td>Software Availability</td>
<td>Mar-2021</td>
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<table>
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<tr>
<th>Copies</th>
<th>SPECrate®2017_int_base = 649</th>
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<tbody>
<tr>
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<td>192</td>
</tr>
<tr>
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<tr>
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<td>523.xalancbmk_r</td>
<td>192</td>
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<tr>
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<td>531.deepsjeng_r</td>
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<td>192</td>
</tr>
<tr>
<td>557.xz_r</td>
<td>192</td>
</tr>
</tbody>
</table>

### Hardware

- **CPU Name:** AMD EPYC 7643
- **Max MHz:** 3600
- **Nominal:** 2300
- **Enabled:** 96 cores, 2 chips, 2 threads/core
- **Orderable:** 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 / 6 cores
- **Other:** None
- **Memory:** 2 TB (32 x 64 GB 2Rx4 PC4-3200V-L)
- **Storage:** 1 x PCIe SSD, 2TB
- **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:** Fujitsu BIOS Version 2.1.V2 Released Oct-2021
- **File System:** xfs
- **System State:** Run level 3 (multi-user)
- **Base Pointers:** 64-bit
- **Peak Pointers:** Not Applicable
- **Other:** jemalloc: jemalloc memory allocator library v5.2.0
- **Power Management:** BIOS set to prefer performance at the cost of additional power usage
Fujitsu
PRIMERGY RX2450 M1, AMD EPYC 7643
2.30 GHz

CPU2017 License: 19
Test Sponsor: Fujitsu
Tested by: Fujitsu
Test Date: Oct-2021
Hardware Availability: Oct-2021
Software Availability: Mar-2021

Results Table

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<tr>
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</tbody>
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SPECR®2017_int_base = 649
SPECR®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)**

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/benchmark/speccpu-milan/amd_rate_aocc300_milan_B_lib/lib;/home/benchmark/speccpu-milan/amd_rate_aocc300_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 5.2.0 is available here:
https://github.com/jemalloc/jemalloc/releases/download/5.2.0/jemalloc-5.2.0.tar.bz2

---

**Platform Notes**

BIOS configuration:
ACPI SRAT L3 Cache As NUMA Domain = Enabled
APBDIS = 1
cTDP Control = Manual
cTDP = 240
Determinism Slider = Power
DRAM Scrub Time = Disabled
EDC Control = Manual
EDC = 300
EDC Platform Limit = 300

(Continued on next page)
## Fujitsu

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### Platform Notes (Continued)

- Fix SOC P-state = P0
- IOMMU = Enabled
- L1 Stream HW Prefetcher = Enabled
- L2 Stream HW Prefetcher = Enabled
- NUMA Nodes Per Socket = NPS4
- Package Power Limit = 240
- Package Power Limit Control = Manual
- SVM Mode = Disabled
- SMT Control = Enabled
- xGMI Link Max Speed = 18Gbps

Sysinfo program /home/benchmark/speccpu-milan/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16aca64d
running on localhost Tue Aug 3 19:03:30 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 7643 48-Core Processor
  - 2 "physical id"s (chips)
  - 192 "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 : 48
  - siblings : 96
- physical 0: cores 0 1 2 3 4 5 8 9 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29 32 33 34 35 36 37 40 41 42 43 44 45 48 49 50 51 52 53 56 57 58 59 60 61
- physical 1: cores 0 1 2 3 4 5 8 9 10 11 12 13 16 17 18 19 20 21 24 25 26 27 28 29 32 33 34 35 36 37 40 41 42 43 44 45 48 49 50 51 52 53 56 57 58 59 60 61

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): 192
- On-line CPU(s) list: 0-191
- Thread(s) per core: 2
- Core(s) per socket: 48
- Socket(s): 2
- NUMA node(s): 16
- Vendor ID: AuthenticAMD
- CPU family: 25
- Model: 1
- Model name: AMD EPYC 7643 48-Core Processor

(Continued on next page)
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Platform Notes (Continued)

Stepping: 1
CPU MHz: 1846.422
CPU max MHz: 2300.0000
CPU min MHz: 1500.0000
BogoMIPS: 4599.67
Virtualization: AMD-V
L1d cache: 32K
L1i cache: 32K
L2 cache: 512K
L3 cache: 32768K
NUMA node0 CPU(s): 0-5,96-101
NUMA node1 CPU(s): 6-11,102-107
NUMA node2 CPU(s): 12-17,108-113
NUMA node3 CPU(s): 18-23,114-119
NUMA node4 CPU(s): 24-29,120-125
NUMA node5 CPU(s): 30-35,126-131
NUMA node6 CPU(s): 36-41,132-137
NUMA node7 CPU(s): 42-47,138-143
NUMA node8 CPU(s): 48-53,144-149
NUMA node9 CPU(s): 54-59,150-155
NUMA node10 CPU(s): 60-65,156-161
NUMA node11 CPU(s): 66-71,162-167
NUMA node12 CPU(s): 72-77,168-173
NUMA node13 CPU(s): 78-83,174-179
NUMA node14 CPU(s): 84-89,180-185
NUMA node15 CPU(s): 90-95,186-191
Flags: fpu vme de pse tsc msr pae mce 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 avx f16c rdrand lahf_lm cmp_legacy svm extapic cr8_legacy abm sse4a misalignsse 3nowprefetch osfw ibs skinit wdt tce topoext perfctr_core perfctr_nb bext perfctr_llc mwaitx cpb cat_l3 cdp_l3 invpcid_single hw_pstate sbbd mba ibrs ibpb stibp vmmcall fsgsbase bm1 avx2 smep bmi2 erms invvpctid cmq rdt_a rdseed adx smap clflushopt clwb sha ni xsavesopt xsavec xgetbv1 xsaves cqm_llc cqm_occurr_llc cqm_mbb_total cqm_mbb_local clzero irperf xsaveerpr 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 overlow_recov succor smc

/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 2 3 4 5 96 97 98 99 100 101
node 0 size: 128752 MB

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**Test Sponsor:** Fujitsu  
**Tested by:** Fujitsu  
**Test Date:** Oct-2021  
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## Platform Notes (Continued)

```plaintext
node 0 free: 128299 MB
node 1 cpus:  6  7  8  9  10  11  102  103  104  105  106  107
node 1 size: 129018 MB
node 1 free: 128766 MB
node 2 cpus: 12 13 14 15 16 17 108 109 110 111 112 113
node 2 size: 129020 MB
node 2 free: 128825 MB
node 3 cpus:  18  19  20  21  22  23  114  115  116  117  118  119
node 3 size: 129018 MB
node 3 free: 128829 MB
node 4 cpus:  24  25  26  27  28  29  120  121  122  123  124  125
node 4 size: 129020 MB
node 4 free: 128826 MB
node 5 cpus:  30  31  32  33  34  35  126  127  128  129  130  131
node 5 size: 128985 MB
node 5 free: 128798 MB
node 6 cpus:  36  37  38  39  40  41  132  133  134  135  136  137
node 6 size: 129020 MB
node 6 free: 128825 MB
node 7 cpus:  42  43  44  45  46  47  138  139  140  141  142  143
node 7 size: 129006 MB
node 7 free: 128683 MB
node 8 cpus:  48  49  50  51  52  53  144  145  146  147  148  149
node 8 size: 129020 MB
node 8 free: 128852 MB
node 9 cpus:  54  55  56  57  58  59  150  151  152  153  154  155
node 9 size: 129018 MB
node 9 free: 128864 MB
node 10 cpus: 60 61 62 63 64 65 156 157 158 159 160 161
node 10 size: 129020 MB
node 10 free: 128831 MB
node 11 cpus:  66  67  68  69  70  71  162  163  164  165  166  167
node 11 size: 129018 MB
node 11 free: 128850 MB
node 12 cpus:  72  73  74  75  76  77  168  169  170  171  172  173
node 12 size: 129020 MB
node 12 free: 128836 MB
node 13 cpus:  78  79  80  81  82  83  174  175  176  177  178  179
node 13 size: 129018 MB
node 13 free: 128860 MB
node 14 cpus:  84  85  86  87  88  89  180  181  182  183  184  185
node 14 size: 129020 MB
node 14 free: 128869 MB
node 15 cpus:  90  91  92  93  94  95  186  187  188  189  190  191
node 15 size: 128778 MB
node 15 free: 128633 MB
node distances:
```

(Continued on next page)
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**SPECCrate®2017_int_base = 649**  
**SPECCrate®2017_int_peak = Not Run**

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<thead>
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<th>Platform Notes (Continued)</th>
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</table>

```
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  
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  10  11  12  12  12  12  12  12  
11: 32  32  32  32  32  32  32  32  12  12  10  11  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  10  11  12  12  
14: 32  32  32  32  32  32  32  32  12  12  12  12  10  11  12  12  
15: 32  32  32  32  32  32  32  32  12  12  12  12  10  11  12  12  
```

From /proc/meminfo
MemTotal:       2113294716 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 localhost 5.3.18-22-default #1 SMP Wed Jun 3 12:16:43 UTC 2020  
(720aeba/1p-la956f1) 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

(Continued on next page)
### Platform Notes (Continued)

- **CVE-2018-3639** (Speculative Store Bypass): Mitigation: Speculative Store Bypass disabled via prctl and seccomp
- **CVE-2017-5753** (Spectre variant 1):
- **CVE-2017-5715** (Spectre variant 2):
- **CVE-2020-0543** (Special Register Buffer Data Sampling): Not affected
- **CVE-2019-11135** (TSX Asynchronous Abort): Not affected

---

**run-level 3 Aug 3 19:01**

**SPEC is set to:** /home/benchmark/speccpu-milan

<table>
<thead>
<tr>
<th>Filesystem</th>
<th>Type</th>
<th>Size</th>
<th>Used</th>
<th>Avail</th>
<th>Use%</th>
<th>Mounted on</th>
</tr>
</thead>
<tbody>
<tr>
<td>/dev/nvme0n1p3</td>
<td>xfs</td>
<td>1.3T</td>
<td>46G</td>
<td>1.3T</td>
<td>4%</td>
<td>/home</td>
</tr>
</tbody>
</table>

**From /sys/devices/virtual/dmi/id**

- **Vendor:** FUJITSU
- **Product:** PRIMERGY RX2450 M1
- **Serial:** MACUxxxxxx

**Memory:**

32x Samsung M393A8G40AB2-CWE 64 GB 2 rank 3200

**BIOS:**

- **BIOS Vendor:** American Megatrends Inc.
- **BIOS Version:** 2.1.V2
- **BIOS Date:** 08/02/2021
- **BIOS Revision:** 5.22

---

### Compiler Version Notes

```
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**AMD clang version 12.0.0** (CLANG: AOCC_3.0.0-Build#78 2020_12_10) (based on LLVM Mirror.Version.12.0.0)
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## Compiler Version Notes (Continued)

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) 541.leela_r(base) |

---

AMD clang version 12.0.0 (CLANG: A0CC_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: A0CC_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

(Continued on next page)
Fujitsu
PRIMERGY RX2450 M1, AMD EPYC 7643
2.30 GHz

SPECrate®2017_int_base = 649
SPECrate®2017_int_peak = Not Run

Base Portability Flags (Continued)

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

Base Optimization Flags

C benchmarks:
-m64 -Wl,-allow-multiple-definition -Wl,-mllvm -Wl,-enable-lcm-vrp
-flto -Wl,-mllvm -Wl,-region-vectorize
-Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-align-all-nofallthr-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-lcm-vrp -mllvm -reduce-array-computations=3 -z muldefs
-lamdlibm -ljemalloc -lflang -ljemangrti

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-nofallthr-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 -ljemangrti

Fortran benchmarks:
-m64 -Wl,-mllvm -Wl,-inline-recursion=4
-Wl,-mllvm -Wl,-isr-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-nofallthr-blocks=6
-Wl,-mllvm -Wl,-reduce-array-computations=3 -O3 -ffast-math

(Continued on next page)
SPEC CPU®2017 Integer Rate Result

Fujitsu
PRIMERGY RX2450 M1, AMD EPYC 7643
2.30 GHz

SPECrate®2017_int_base = 649
SPECrate®2017_int_peak = Not Run

CPU2017 License: 19
Test Sponsor: Fujitsu
Tested by: Fujitsu

Test Date: Oct-2021
Hardware Availability: Oct-2021
Software Availability: Mar-2021

Base Optimization Flags (Continued)

Fortran benchmarks (continued):
- 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

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

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:
http://www.spec.org/cpu2017/flags/Fujitsu-Platform-Settings-V1.0-MILAN-RevB.xml

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