SPEC CPU®2017 Integer Speed Result

ASUSTeK Computer Inc.
ASUS RS500A-E10(KRPA-U16) Server System
2.80 GHz, AMD EPYC 7282

SPECspeed®2017_int_base = 8.28
SPECspeed®2017_int_peak = 8.53

CPU2017 License: 9016
Test Sponsor: ASUSTeK Computer Inc.
Test Date: Mar-2020
Tested by: ASUSTeK Computer Inc.
Hardware Availability: Nov-2019

Software Availability: Jun-2019

Threads

<table>
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<td>641.leela_s</td>
</tr>
<tr>
<td>648.exchange2_s</td>
<td>657.xz_s</td>
</tr>
</tbody>
</table>

Hardware

CPU Name: AMD EPYC 7282
Max MHz: 3200
Nominal: 2800
Enabled: 16 cores, 1 chip, 2 threads/core
Orderable: 1 chip
Cache L1: 32 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, 16 MB shared / 4 cores
Other: None
Memory: 512 GB (8 x 64 GB 2Rx4 PC4-3200AA-R)
Storage: 1 x 240 GB SATA SSD
Other: None

Software

OS: SUSE Linux Enterprise Server 15 SP1 (x86_64)
Kernel 4.12.14-195-default
Compiler: C/C++/Fortran: Version 2.0.0 of AOCC
Parallel: Yes
Firmware: Version 0501 released Nov-2019
File System: xfs
System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: 32/64-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.
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Results Table

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<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
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<th>Seconds</th>
<th>Ratio</th>
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<td>4.41</td>
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<td>368</td>
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<tr>
<td>620.omnetpp_s</td>
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<td>352</td>
<td>4.63</td>
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<td>4.63</td>
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<td>4.64</td>
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<td>623.xalanchmk_s</td>
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<td>625.x264_s</td>
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<tr>
<td>631.deepsjeng_s</td>
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<tr>
<td>641.leela_s</td>
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<td>16</td>
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<td>1</td>
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<tr>
<td>657.xz_s</td>
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<td>344</td>
<td>18.0</td>
<td>345</td>
<td>17.9</td>
<td>344</td>
</tr>
</tbody>
</table>

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
'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>

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 set to 'always' for this run (OS default)

(Continued on next page)
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Operating System Notes (Continued)
OS set to performance mode via cpupower frequency-set -g performance.

Environment Variables Notes
Environment variables set by runcpu before the start of the run:
GOMP_CPU_AFFINITY = "0-31"
LD_LIBRARY_PATH = "/spec2017c3/amd_speed_aocc200_rome_C_lib/64;/spec2017c3/amd_speed_aocc200_rome_C_lib/32:"
MALLOC_CONF = "retain:true"
OMP_DYNAMIC = "false"
OMP_SCHEDULE = "static"
OMP_STACKSIZE = "128M"
OMP_THREAD_LIMIT = "32"

Environment variables set by runcpu during the 600.perlbench_s peak run:
GOMP_CPU_AFFINITY = "0"

Environment variables set by runcpu during the 602.gcc_s peak run:
GOMP_CPU_AFFINITY = "0"

Environment variables set by runcpu during the 605.mcf_s peak run:
GOMP_CPU_AFFINITY = "0"

Environment variables set by runcpu during the 620.omnetpp_s peak run:
GOMP_CPU_AFFINITY = "0"

Environment variables set by runcpu during the 623.xalancbmk_s peak run:
GOMP_CPU_AFFINITY = "0"
OMP_STACKSIZE = "128M"

Environment variables set by runcpu during the 625.x264_s peak run:
GOMP_CPU_AFFINITY = "0"

Environment variables set by runcpu during the 631.deepsjeng_s peak run:
GOMP_CPU_AFFINITY = "0"

Environment variables set by runcpu during the 648.exchange2_s peak run:
GOMP_CPU_AFFINITY = "0"

Environment variables set by runcpu during the 657.xz_s peak run:
GOMP_CPU_AFFINITY = "0-15"
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General Notes

Binaries were compiled on a system with 2x AMD EPYC 7601 CPU + 512GB Memory using Fedora 26

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 v9.1.0 in Ubuntu 19.04 with -O3 -znver2 -flto
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:
Power phase shedding = Disabled
SVM Mode = Disabled
SR-IOV support = Disabled
DRAM Scrub time = Disabled
Determinism Slider = Power
APBDIS = 1

Sysinfo program /spec2017c3/bin/sysinfo
Rev: r6365 of 2019-08-21 295195f888a3d7edbble6e46a485a0011
running on linux-wv9n Thu Mar 19 10:47:33 2020

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 7282 16-Core Processor
  1 "physical id"s (chips)
  32 "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

From lscpu:
  Architecture: x86_64
  CPU op-mode(s): 32-bit, 64-bit
  Byte Order: Little Endian

(Continued on next page)
Platform Notes (Continued)

Address sizes: 43 bits physical, 48 bits virtual
CPU(s): 32
On-line CPU(s) list: 0-31
Thread(s) per core: 2
Core(s) per socket: 16
Socket(s): 1
NUMA node(s): 1
Vendor ID: AuthenticAMD
CPU family: 23
Model: 49
Model name: AMD EPYC 7282 16-Core Processor
Stepping: 0
CPU MHz: 2800.000
CPU max MHz: 2800.0000
CPU min MHz: 1500.0000
BogoMIPS: 5656.13
Virtualization: AMD-V
L1d cache: 32K
L1i cache: 32K
L2 cache: 512K
L3 cache: 16384K
NUMA node0 CPU(s): 0-31
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 xtopology nonstop_tsc cpuid extd_apicid aperf perfctr pni pclmulqdq monitor ds cuo16 sse4_1 sse4_2 movbe popcnt aes avx avx2 f16c rdrand lahf_lm cmp_legacy svm extapic cr8_legacy abm sse4a misalignsse 3dnowprefetch osuw ibs skinit wdt tce topoext perfctr_core perfctr_nb bpext perfctr_l2 mwai tx cpb cat_l3 cdp_l3 hw_pstate sme ssbd sev ibrs ibpb stibp vmmcall fsgsbase bmi1 avx2 smep bmi2 cqm rdt_a rdseed adx smap clflushopt clwb sha ni xsaveopt xsavec xgetbv xsaveopt xsaves cqm_l1c cqm_occup_llc cqm_mbb_total cqm_mbb_local clzero irperf xsaveerptr arat npt lbv svm lock nrip save tsc_scale vmcb_clean flushbyasid decodeassist pausefilter pfthreshold avic v_vmsave_vmload vgif umip rdpid overflow_recov succor smca

From numactl --hardware
WARNING: a numactl 'node' might or might not correspond to a physical chip.
  available: 1 nodes (0)
  node 0 cpus: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31
  node 0 size: 515818 MB
  node 0 free: 515063 MB
  node distances:
  node 0
  0: 10

(Continued on next page)
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Platform Notes (Continued)

From /proc/meminfo
   MemTotal:       528197632 kB
   HugePages_Total:       0
   Hugepagesize:       2048 kB

From /etc/*release* /etc/*version*
   os-release:
      NAME="SLES"
      VERSION="15-SP1"
      VERSION_ID="15.1"
      PRETTY_NAME="SUSE Linux Enterprise Server 15 SP1"
      ID="sles"
      ID_LIKE="suse"
      ANSI_COLOR="0;32"
      CPE_NAME="cpe:/o:suse:sles:15:sp1"

uname -a:
   Linux linux-wv9n 4.12.14-195-default #1 SMP Tue May 7 10:55:11 UTC 2019 (8fba516)
   x86_64 x86_64 x86_64 GNU/Linux

Kernel self-reported vulnerability status:

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-2017-5715 (Spectre variant 1): Mitigation: __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Full AMD retropoline, IBPB: conditional, IBRS_FW, STIBP: conditional, RSB filling

run-level 3 Mar 19 10:44

SPEC is set to: /spec2017c3
   Filesystem Type Size Used Avail Use% Mounted on
   /dev/sdd4 xfs 199G 18G 182G 9% /

From /sys/devices/virtual/dmi/id
   BIOS: American Megatrends Inc. 0501 11/07/2019
   Vendor: ASUSTeK COMPUTER INC.
   Product: KRPA-U16 Series
   Product Family: Server
   Serial: System Serial Number

Additional information from dmidecode follows. WARNING: Use caution when you interpret

(Continued on next page)
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Platform Notes (Continued)
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 Samsung M393A8G40AB2-CWE 64 kB 2 rank 3200
  8x Unknown Unknown

(End of data from sysinfo program)

Compiler Version Notes

==============================================================================
<table>
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<tr>
<th>C</th>
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<td></td>
</tr>
<tr>
<td>Target: x86_64-unknown-linux-gnu</td>
<td></td>
</tr>
<tr>
<td>InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin</td>
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(Continued on next page)
## Compiler Version Notes (Continued)

AOCC.LLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins
   AOCC_2_0_0-Build#191) (based on LLVM AOCC.LLVM.2.0.0.B191.2019_07_19)
Target: i386-unknown-linux-gnu
Thread model: posix
InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin

---

C++
   620.omnetpp_s(base, peak) 623.xalancbmk_s(base)
   631.deepsjeng_s(base, peak) 641.leela_s(base, peak)

---

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   AOCC_2_0_0-Build#191) (based on LLVM AOCC.LLVM.2.0.0.B191.2019_07_19)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin

---

Fortran
   648.exchange2_s(base, peak)

---

AOCC.LLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins
   AOCC_2_0_0-Build#191) (based on LLVM AOCC.LLVM.2.0.0.B191.2019_07_19)
Target: x86_64-unknown-linux-gnu
Thread model: posix
InstalledDir: /sppo/dev/compilers/aocc-compiler-2.0.0/bin

---

## Base Compiler Invocation

C benchmarks:
   clang

C++ benchmarks:
   clang++

Fortran benchmarks:
   flang

## Base Portability Flags

600.perlbench_s: -DSPEC_LINUX_X64 -DSPEC_LP64
602.gcc_s: -DSPEC_LP64

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Base Portability Flags (Continued)

605.mcf_s: -DSPEC_LP64
620.omnetpp_s: -DSPEC_LP64
623.xalancbmk_s: -DSPEC_LINUX -DSPEC_LP64
625.x264_s: -DSPEC_LP64
631.deepsjeng_s: -DSPEC_LP64
641.leela_s: -DSPEC_LP64
648.exchange2_s: -DSPEC_LP64
657.xz_s: -DSPEC_LP64

Base Optimization Flags

C benchmarks:
-flto -Wl,-ml LLVM -Wl,-function-specialize
-Wl,-ml LLVM -Wl,-region-vectorize -Wl,-ml LLVM -Wl,-vector-library=LIBMVEC
-Wl,-ml LLVM -Wl,-reduce-array-computations=3 -O3 -ffast-math
-march=znver2 -fstruct-layout=3 -ml LLVM -unroll-threshold=50
-fremap-arrays -ml LLVM -function-specialize -ml LLVM -enable-gvn-hoist
-ml LLVM -reduce-array-computations=3 -ml LLVM -global-vectorize-slp
-ml LLVM -vector-library=LIBMVEC -ml LLVM -inline-threshold=1000
-flv-function-specialization -z muldefs -DSPEC_OPENMP -fopenmp
-fopenmp=libomp -lomp -lpthread -ldl -lmvec -lamdlibm -ljemalloc
-llflang

C++ benchmarks:
-flto -Wl,-ml LLVM -Wl,-function-specialize
-Wl,-ml LLVM -Wl,-region-vectorize -Wl,-ml LLVM -Wl,-vector-library=LIBMVEC
-Wl,-ml LLVM -Wl,-reduce-array-computations=3
-Wl,-ml LLVM -Wl,-suppress-fmas -O3 -ffast-math -march=znver2
-ml LLVM -loop-unswitch-threshold=200000 -ml LLVM -vector-library=LIBMVEC
-ml LLVM -unroll-threshold=100 -flv-function-specialization
-ml LLVM -enable-partial-unswitch -z muldefs -DSPEC_OPENMP -fopenmp
-fopenmp=libomp -lomp -lpthread -ldl -lmvec -lamdlibm -ljemalloc
-llflang

Fortran benchmarks:
-flto -Wl,-ml LLVM -Wl,-function-specialize
-Wl,-ml LLVM -Wl,-region-vectorize -Wl,-ml LLVM -Wl,-vector-library=LIBMVEC
-Wl,-ml LLVM -Wl,-reduce-array-computations=3 -ffast-math
-Wl,-ml LLVM -Wl,-inline-recursion=4 -Wl,-ml LLVM -Wl,-lsr-in-nested-loop
-Wl,-ml LLVM -Wl,-enable-iv-split -O3 -march=znver2 -funroll-loops
-Mrecursive -ml LLVM -vector-library=LIBMVEC -z muldefs
-ml LLVM -disable-indvar-simplify -ml LLVM -unroll-aggressive
-ml LLVM -unroll-threshold=150 -DSPEC_OPENMP -fopenmp -fopenmp=libomp
-lomp -lpthread -ldl -lmvec -lamdlibm -ljemalloc -llflang
SPEC CPU®2017 Integer Speed Result

ASUSTeK Computer Inc.
ASUS RS500A-E10(KRPA-U16) Server System
2.80 GHz, AMD EPYC 7282

SPECspeed®2017_int_base = 8.28
SPECspeed®2017_int_peak = 8.53

CPU2017 License: 9016
Test Sponsor: ASUSTeK Computer Inc.
Test Date: Mar-2020
Hardware Availability: Nov-2019
Tested by: ASUSTeK Computer Inc.
Software Availability: Jun-2019

Base Other Flags

C benchmarks:
-Wno-return-type

C++ benchmarks:
-Wno-return-type

Fortran benchmarks:
-Wno-return-type

Peak Compiler Invocation

C benchmarks:
clang

C++ benchmarks:
clang++

Fortran benchmarks:
flang

Peak Portability Flags

600.perlbench_s: -DSPEC_LINUX_X64 -DSPEC_LP64
602.gcc_s: -DSPEC_LP64
605.mcf_s: -DSPEC_LP64
620.omnetpp_s: -DSPEC_LP64
623.xalancbmk_s: -DSPEC_LINUX -D_FILE_OFFSET_BITS=64
625.x264_s: -DSPEC_LP64
631.deepsjeng_s: -DSPEC_LP64
641.leela_s: -DSPEC_LP64
648.exchange2_s: -DSPEC_LP64
657.xz_s: -DSPEC_LP64

Peak Optimization Flags

C benchmarks:
600.perlbench_s: -flto -Wl, -mllvm -Wl, -function-specialize
-Wl, -mllvm -Wl, -region-vectorize
-Wl, -mllvm -Wl, -vector-library=LIBMVEC

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Peak Optimization Flags (Continued)

600.perlbench_s (continued):
-WI,-mlvm -W1,-reduce-array-computations=3
-fprofile-instr-generate(pass 1)
-fprofile-instr-use(pass 2) -Ofast -march=znver2
-mno-sse4a -fstruct-layout=5
-mlvm -vectorize-memory-aggressively
-mlvm -function-specialize -mlvm -enable-gvn-hoist
-mlvm -unroll-threshold=50 -fremap-arrays
-mlvm -vector-library=LIBMVEC
-mlvm -reduce-array-computations=3
-mlvm -global-vectorize-slp -mlvm -inline-threshold=1000
-flv-function-specialization -DSPEC_OPENMP -fopenmp
-lmvec -landlibm -fopenmp=libomp -lomp -lpthread -ldl
-ljemalloc -lflang

602.gcc_s: -flto -W1,-mlvm -W1,-function-specialize
-W1,-mlvm -W1,-region-vectorize
-W1,-mlvm -W1,-vector-library=LIBMVEC
-W1,-mlvm -W1,-reduce-array-computations=3 -Ofast
-march=znver2 -mno-sse4a -fstruct-layout=5
-mlvm -vectorize-memory-aggressively
-mlvm -function-specialize -mlvm -enable-gvn-hoist
-mlvm -unroll-threshold=50 -fremap-arrays
-mlvm -vector-library=LIBMVEC
-mlvm -reduce-array-computations=3
-mlvm -global-vectorize-slp -mlvm -inline-threshold=1000
-flv-function-specialization -z muldefs -DSPEC_OPENMP
-fopenmp -fgnu89-inline -fopenmp=libomp -lomp -lpthread
-lflang

605.mcf_s: -flto -W1,-mlvm -W1,-function-specialize
-W1,-mlvm -W1,-region-vectorize
-W1,-mlvm -W1,-vector-library=LIBMVEC
-W1,-mlvm -W1,-reduce-array-computations=3 -Ofast
-march=znver2 -mno-sse4a -fstruct-layout=5
-mlvm -vectorize-memory-aggressively
-mlvm -function-specialize -mlvm -enable-gvn-hoist
-mlvm -unroll-threshold=50 -fremap-arrays
-mlvm -vector-library=LIBMVEC
-mlvm -reduce-array-computations=3
-mlvm -global-vectorize-slp -mlvm -inline-threshold=1000
-flv-function-specialization -DSPEC_OPENMP -fopenmp
-lmvec -landlibm -fopenmp=libomp -lomp -lpthread
-ljemalloc -lflang

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Peak Optimization Flags (Continued)

625.x264_s: Same as 600.perlbench_s

657.xz_s: -flto -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-region-vectorize
-Wl,-mllvm -Wl,-vector-library=LIBMVEC
-march=znerver2 -mno-sse4a -fstruct-layout=5
-mllvm -vectorize-memory-aggressively
-mllvm -function-specialize -mllvm -enable-gvn-hoist
-mllvm -unroll-threshold=50 -fremap-arrays
-mllvm -vector-library=LIBMVEC
-mllvm -reduce-array-computations=3
-mllvm -global-vectorize-slp -mllvm -inline-threshold=1000
-flv-function-specialization -DSPEC_OPENMP -fopenmp
-fopenmp=libomp -lomp -lpthread -ldl -lmvec -lamdlibm
-ljemalloc -lflang

C++ benchmarks:

620.omnetpp_s: -flto -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-region-vectorize
-Wl,-mllvm -Wl,-vector-library=LIBMVEC
-march=znerver2 -flv-function-specialization
-mllvm -unroll-threshold=100
-mllvm -enable-partial-unswitch
-mllvm -loop-unswitch-threshold=200000
-mllvm -vector-library=LIBMVEC
-mllvm -inline-threshold=1000 -DSPEC_OPENMP -fopenmp
-fopenmp=libomp -lomp -lpthread -ldl -lmvec -lamdlibm
-ljemalloc -lflang

623.xalancbmk_s: -m32 -flto -Wl,-mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-region-vectorize
-Wl,-mllvm -Wl,-vector-library=LIBMVEC
-march=znerver2 -flv-function-specialization
-mllvm -unroll-threshold=100
-mllvm -enable-partial-unswitch
-mllvm -loop-unswitch-threshold=200000
-mllvm -vector-library=LIBMVEC
-mllvm -inline-threshold=1000 -DSPEC_OPENMP -fopenmp
-fopenmp=libomp -lomp -lpthread -ldl -lmvec -lamdlibm
-ljemalloc -lflang

631.deepsjeng_s: Same as 620.omnetpp_s

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Peak Optimization Flags (Continued)

641.leela_s: basepeak = yes

Fortran benchmarks:
-fflt -mllvm -Wl,-function-specialize
-Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-vector-library=LIBMVEC
-Wl,-mllvm -Wl,-reduce-array-computations=3 -ffast-math
-Wl,-mllvm -Wl,-inline-recursion=4 -Wl,-mllvm -Wl,-lsr-in-nested-loop
-Wl,-mllvm -Wl,-enable-iv-split -O3 -march=znver2 -funroll-loops
-Mrecursive -mllvm -vector-library=LIBMVEC
-mllvm -disable-indvar-simplify -mllvm -unroll-aggressive
-mllvm -unroll-threshold=150 -DSPEC_OPENMP -fopenmp -fopenmp=libomp
-lomp -lpthread -ldl -lmvec -lamdlibm -ljemalloc -lflang

Peak Other Flags

C benchmarks:
-Wno-return-type

C++ benchmarks (except as noted below):
-Wno-return-type

623.xalancbmk_s: -Wno-return-type
-L/sppo/dev/cpu2017/v110/amd_speed_aocc200_rome_C_lib/32

Fortran benchmarks:
-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:

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