## SPEC CPU®2017 Integer Speed Result

**Lenovo Global Technology**

ThinkSystem SR655
2.80 GHz, AMD EPYC 7282

<table>
<thead>
<tr>
<th>Test Sponsor</th>
<th>Lenovo Global Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tested by</td>
<td>Lenovo Global Technology</td>
</tr>
<tr>
<td>Test Date</td>
<td>Mar-2020</td>
</tr>
<tr>
<td>Software</td>
<td>Lenovo BIOS Version CFEj07O released Dec-2019</td>
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### Threads

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<th>4</th>
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</tbody>
</table>

### Hardware

- **CPU Name**: AMD EPYC 7282
- **Max MHz**: 3200
- **Nominal**: 2800
- **Enabled**: 16 cores, 1 chip
- **Orderable**: 1 chip
- **Cache L1**: 32 KB I + 32 KB D on chip per core
- **Cache L2**: 512 KB I+D on chip per core
- **Cache L3**: 64 MB I+D on chip per chip, 16 MB shared / 4 cores
- **Memory**: 256 GB (8 x 32 GB 2Rx4 PC4-3200AA-R)
- **Storage**: 1 x 960 GB SATA SSD
- **Other**: None

### Software

- **OS**: Red Hat Enterprise Linux 8.1 (Ootpa)
- **Kernel**: 4.18.0-147.el8.x86_64
- **Compiler**: C/C++/Fortran: Version 2.0.0 of AOCC
- **Parallel**: Yes
- **Firmware**: Lenovo BIOS Version CFEj07O released Dec-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 set to prefer performance at the cost of additional power usage

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**SPECspeed®2017_int_base = 8.28**

**SPECspeed®2017_int_peak = 8.48**
### Lenovo Global Technology

**ThinkSystem SR655**

2.80 GHz, AMD EPYC 7282

---

### SPEC CPU®2017 Integer Speed Result

**Lenovo Global Technology**

**ThinkSystem SR655**

2.80 GHz, AMD EPYC 7282

**CPU2017 License:** 9017

**Test Sponsor:** Lenovo Global Technology

**Tested by:** Lenovo Global Technology

**Test Date:** Mar-2020

**Hardware Availability:** Jan-2020

**Software Availability:** Nov-2019

---

### Results Table

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<tr>
<th>Benchmark</th>
<th>Threads</th>
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<th>Ratio</th>
<th>Seconds</th>
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</tbody>
</table>

**SPECspeed®2017_int_base = 8.28**

**SPECspeed®2017_int_peak = 8.48**

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### Compiler Notes


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### 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)
## Environment Variables Notes

Environment variables set by runcpu before the start of the run:

- `GOMP_CPU_AFFINITY = "0-15"
- `LD_LIBRARY_PATH = 
  
  
  
  
  /home/cpu2017-1.1.0-amd-rome-aocc200-C1/amd_speed_aocc200_rome_C_lib/64 
  
  /home/cpu2017-1.1.0-amd-rome-aocc200-C1/amd_speed_aocc200_rome_C_lib/32
- `MALLOC_CONF = "retain:true"
- `OMP_DYNAMIC = "false"
- `OMP_SCHEDULE = "static"
- `OMP_STACKSIZE = "128M"
- `OMP_THREAD_LIMIT = "16"

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 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"

## 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.

Yes: The test sponsor attests, as of date of publication, that CVE-2018-3640 (Spectre variant 3a) is mitigated in the system as tested and documented.

Yes: The test sponsor attests, as of date of publication, that CVE-2018-3639 (Spectre variant 4) is mitigated in the system as tested and documented.

(Continued on next page)
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<tr>
<th>SPECspeed®2017_int_base</th>
<th>SPECspeed®2017_int_peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>8.28</td>
<td>8.48</td>
</tr>
</tbody>
</table>

### General Notes (Continued)

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 settings:**  
Set Operating Mode set to Maximum Performance  
SMT Mode set to Disabled

Sysinfo program /home/cpu2017-1.1.0-amd-rome-aocc200-C1/bin/sysinfo  
Rev: r6365 of 2019-08-21 295195f888a3d7ed1e6e4a485a0011  
runtime on localhost.localdomain Fri Mar 13 22:12:42 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)
  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 : 16
siblings : 16
  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
CPU(s): 16
On-line CPU(s) list: 0-15
Thread(s) per core: 1
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: 2854.493
CPU max MHz: 2800.000
```

(Continued on next page)
Platform Notes (Continued)

CPU min MHz: 1500.0000
BogoMIPS: 5589.45
Virtualization: AMD-V
L1d cache: 32K
L1i cache: 32K
L2 cache: 512K
L3 cache: 16384K
NUMA node0 CPU(s): 0-15
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 rdtsscp lm
constant_tsc rep_good nopl xtopology nonstop_tsc cpuid extd_apicid aperfmpref pni
pclmulqdq monitor ssse3 fma cx16 sse4_1 sse4_2 movbe popcnt aes xsave avx f16c
rdseed lahf_lm cmp_legacy svm extapic cr8_legacy abm ssse4 misalignsse 3dnowprefetch
osvw ibr skinit wdt tce topoext perfctr_core perfctr_nb bptest perfctr_llc mwaitx cpb
cat_l3 cdp_l3 hw_pstate sme ssbd mba sev ibpb stibp vmmcall fsqsgbase bmi1 avx2
sse3 fma2 cx16 sse4_1 sse4_2 movbe popcnt aes xsave avx f16c
rdseed lahf_lm cmp_legacy svm extapic cr8_legacy abm ssse4 misalignsse 3dnowprefetch
osvw ibr skinit wdt tce topoext perfctr_core perfctr_nb bptest perfctr_llc mwaitx cpb
cat_l3 cdp_l3 hw_pstate sme ssbd mba sev ibpb stibp vmmcall fsqsgbase bmi1 avx2
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osvw ibr skinit wdt tce topoext perfctr_core perfctr_nb bptest perfctr_llc mwaitx cpb
cat_l3 cdp_l3 hw_pstate sme ssbd mba sev ibpb stibp vmmcall fsqsgbase bmi1 avx2
sse3 fma2 cx16 sse4_1 sse4_2 movbe popcnt aes xsave avx f16c
rdseed lahf_lm cmp_legacy svm extapic cr8Legendary: a numactl 'node' might or might not correspond to a
physical chip.

From numactl --hardware

WARNING: a numactl 'node' might or might not correspond to a
physical chip.

node 0 cpus: 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
node 0 size: 257769 MB
node 0 free: 256834 MB
node distances:

node 0
0: 10

From /proc/meminfo

MemTotal: 263955720 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

e="Red Hat Enterprise Linux"
VERSION="8.1 (Ootpa)"
ID="rhel"
ID_LIKE="fedora"
VERSION_ID="8.1"
PLATFORM_ID="platform:el8"

(Continued on next page)
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CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
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Test Date: Mar-2020
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SPECspeed®2017_int_base = 8.28
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Platform Notes (Continued)

PRETTY_NAME="Red Hat Enterprise Linux 8.1 (Ootpa)"
ANSI_COLOR="0;31"
redhat-release: Red Hat Enterprise Linux release 8.1 (Ootpa)
system-release: Red Hat Enterprise Linux release 8.1 (Ootpa)
system-release-cpe: cpe:/o:redhat:enterprise_linux:8.1:ga

uname -a:
Linux localhost.localdomain 4.18.0-147.el8.x86_64 #1 SMP Thu Sep 26 15:52:44 UTC 2019
ox86_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-2017-5753 (Spectre variant 1): Mitigation: usercopy/swapgs barriers and __user pointer sanitization
CVE-2017-5715 (Spectre variant 2): Mitigation: Full AMD retpoline, IBPB:
run-level 3 Mar 13 22:09
conditional, IBRS_FW, STIBP: disabled, RSB filling

SPEC is set to: /home/cpu2017-1.1.0-amd-rome-aocc200-C1

Filesystem Type Size Used Avail Use% Mounted on
/dev/sdb2 xfs 838G 26G 812G 4% /home

From /sys/devices/virtual/dmi/id
BIOS: Lenovo CFE1070 12/28/2019
Vendor: Lenovo
Product: ThinkSystem SR655 -[7Y00000000]-
Product Family: ThinkSystem
Serial: 0123456789

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.

Memory:
8x Samsung M393A4K40DB2-CWE 32 kB 2 rank 3200
8x Unknown Unknown

(End of data from sysinfo program)
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SPEC CPU®2017 Integer Speed Result

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Compiler Version Notes

==============================================================================
C       | 600.perlbench_s(base, peak) 602.gcc_s(base, peak) 605.mcf_s(base, peak) 625.x264_s(base, peak) 657.xz_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

------------------------------------------------------------------------------
C++     | 623.xalancbmk_s(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: 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)
------------------------------------------------------------------------------
AOCC.LLVM.2.0.0.B191.2019_07_19 clang version 8.0.0 (CLANG: Jenkins
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**Compiler Version Notes (Continued)**

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

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**Base 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 -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  

SPECspeed®2017_int_base = 8.28  
SPECspeed®2017_int_peak = 8.48
### Lenovo Global Technology

**ThinkSystem SR655**  
2.80 GHz, AMD EPYC 7282

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<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
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<td><strong>CPU2017 License</strong>:</td>
<td>9017</td>
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<td><strong>Test Date</strong>:</td>
<td>Mar-2020</td>
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<td><strong>Test Sponsor</strong>:</td>
<td>Lenovo Global Technology</td>
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<td><strong>Hardware Availability</strong>:</td>
<td>Jan-2020</td>
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<td>Lenovo Global Technology</td>
</tr>
<tr>
<td><strong>Software Availability</strong>:</td>
<td>Nov-2019</td>
</tr>
</tbody>
</table>

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### Base Optimization Flags

**C benchmarks:**
- `-flto -Wl, -mllvm -Wl, -function-specialize`  
- `-Wl, -mllvm -Wl, -region-vectorize -Wl, -mllvm -Wl, -vector-library=LIBMVEC`  
- `-Wl, -mllvm -Wl, -reduce-array-computations=3 -O3 -ffast-math -march=znver2 -fstruct-layout=3 -mllvm -unroll-threshold=50`  
- `-flv-function-specialization -z muldefs -DSPEC_OPENMP -fopenmp -DUSE_OPENMP -fopenmp=libomp -lomp -lpthread -ldl -lmvec -lamdlibm -ljemalloc -lflang`

**C++ benchmarks:**
- `-flto -Wl, -mllvm -Wl, -function-specialize`  
- `-Wl, -mllvm -Wl, -region-vectorize -Wl, -mllvm -Wl, -vector-library=LIBMVEC`  
- `-Wl, -mllvm -Wl, -reduce-array-computations=3`  

**Fortran benchmarks:**
- `-flto -Wl, -mllvm -Wl, -function-specialize`  
- `-Wl, -mllvm -Wl, -region-vectorize -Wl, -mllvm -Wl, -vector-library=LIBMVEC`  

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### Base Other Flags

**C benchmarks:**
- `-Wno-return-type`

**C++ benchmarks:**
- `-Wno-return-type`

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(Continued on next page)
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SPECspeed®2017_int_base = 8.28
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Base Other Flags (Continued)

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:


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Peak Optimization Flags (Continued)

600.perlbench_s (continued):
-mlir -unroll-threshold=50 -fremap-arrays
-mlir -vector-library=LIBMVEC
-mlir -reduce-array-computations=3
-mlir -global-vectorize-slp mlir -inline-threshold=1000
-flv-function-specialization -DSPEC_OPENMP -fopenmp
-DUSE_OPENMP -lmvec -lamdlibm -fopenmp=libomp -lomp
-lpthread -ldl -ljemalloc -lflang

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

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

625.x264_s: Same as 600.perlbench_s

657.xz_s: basepeak = yes

C++ benchmarks:

(Continued on next page)
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Peak Optimization Flags (Continued)

620.omnetpp_s: basepeak = yes

623.xalancbmk_s: -m32 -flto -Wl,-mlllvm -Wl,-function-specialize
-mlllvm -Wl,-region-vectorize
-mlllvm -Wl,-vector-library=LIBMVEC
-march=znver2 -Ofast
-unroll-threshold=100
-enable-partial-unswitch
-loop-unswitch-threshold=200000
-vector-library=LIBMVEC
-inline-threshold=1000 -DSPEC_OPENMP -fopenmp
-DUSE_OPENMP -fopenmp=libomp -lomp -lpthread -ldl
-ljemalloc

631.deepsjeng_s: -flto -Wl,-mlllvm -Wl,-function-specialize
-mlllvm -Wl,-region-vectorize
-mlllvm -Wl,-vector-library=LIBMVEC
-march=znver2 -Ofast
-unroll-threshold=100
-enable-partial-unswitch
-loop-unswitch-threshold=200000
-vector-library=LIBMVEC
-inline-threshold=1000 -DSPEC_OPENMP -fopenmp
-DUSE_OPENMP -fopenmp=libomp -lomp -lpthread -ldl
-ljemalloc

641.leela_s: basepeak = yes

Fortran benchmarks:

648.exchange2_s: basepeak = yes

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

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Peak Other Flags (Continued)

Fortran benchmarks:
-Wno-return-type

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-Rome-E.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-Rome-E.xml

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