**Lenovo Global Technology**

**ThinkSystem SR635**
3.20 GHz, AMD EPYC 74F3

<table>
<thead>
<tr>
<th>SPECspeed(^\text{2017_fp_base}) = 137</th>
<th>SPECspeed(^\text{2017_fp_peak}) = 138</th>
</tr>
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</table>

**CPU2017 License:** 9017

**Test Sponsor:** Lenovo Global Technology

**Tested by:** Lenovo Global Technology

**Test Date:** Jul-2021

**Hardware Availability:** Jun-2021

**Software Availability:** Mar-2021

<table>
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<tr>
<th>Threads</th>
<th>SPECspeed(^\text{2017_fp_base}) (137)</th>
<th>SPECspeed(^\text{2017_fp_peak}) (138)</th>
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<tbody>
<tr>
<td>603.bwaves_s</td>
<td>205</td>
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<tr>
<td>607.cactuBSSN_s</td>
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<tr>
<td>619.lbm_s</td>
<td>171</td>
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<td>621.wrf_s</td>
<td>94.5</td>
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<td>627.cam4_s</td>
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<td>628.pop2_s</td>
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<td>638.imagick_s</td>
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<td>649.fotonik3d_s</td>
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<td></td>
</tr>
<tr>
<td>654.roms_s</td>
<td>155</td>
<td></td>
</tr>
</tbody>
</table>

**Software**

- **OS:** SUSE Linux Enterprise Server 15 SP2 (x86_64)
  
  Kernel 5.3.18-22-default

- **Compiler:** C/C++/Fortran: Version 3.0.0 of AOCC

- **Parallel:** Yes

- **Firmware:** Lenovo BIOS Version CFE125U 6.0 released May-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

**Hardware**

- **CPU Name:** AMD EPYC 74F3

- **Max MHz:** 4000

- **Nominal:** 3200

- **Enabled:** 24 cores, 1 chip

- **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:** 256 MB I+D on chip per chip, 32 MB shared / 3 cores

- **Other:** None

- **Memory:** 256 GB (8 x 32 GB 2Rx4 PC4-3200AA-R)

- **Storage:** 1 x 960 GB SATA SSD

- **Other:** None
## Lenovo Global Technology

ThinkSystem SR635 3.20 GHz, AMD EPYC 74F3

### SPEC®2017 Floating Point Speed Result

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**Lenovo Global Technology**

**3.20 GHz, AMD EPYC 74F3**

**SPECspeed®2017_fp_base** = 137

**SPECspeed®2017_fp_peak** = 138

### Results Table

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<th>Seconds</th>
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<td>147</td>
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<td>130</td>
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<td>98.2</td>
<td>160</td>
<td>102</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 numacl i.e.:
numacl --interleave=all runcpu <etc>
'echo 8 > /proc/sys/vm/dirty_ratio' run as root to limit dirty cache to 8% of memory.
'echo 1 > /proc/sys/vm/swappiness' run as root to limit swap usage to minimum necessary.
'echo 1 > /proc/sys/vm/zone_reclaim_mode' run as root to free node-local memory and avoid remote memory usage.
'sync; echo 3 > /proc/sys/vm/drop_caches' run as root to reset filesystem caches.
'sysctl -w kernel.randomize_va_space=0' run as root to disable address space layout randomization (ASLR) to reduce run-to-run variability.
To enable Transparent Hugepages (THP) for all allocations,
'echo always > /sys/kernel/mm/transparent_hugepage/enabled' and

(Continued on next page)
Lenovo Global Technology

ThinkSystem SR635
3.20 GHz, AMD EPYC 74F3

SPEC CPU®2017 Floating Point Speed Result

Copyright 2017-2021 Standard Performance Evaluation Corporation

SPECspeed®2017_fp_base = 137
SPECspeed®2017_fp_peak = 138

Lenovo Global Technology

Test Date: Jul-2021
Hardware Availability: Jun-2021
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Operating System Notes (Continued)

'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 = "0-23"
LD_LIBRARY_PATH = 
	"/home/cpu2017-1.1.8-amd-aocc300-milan-B1/amd_speed_aocc300_milan_B_lib/
	64;/home/cpu2017-1.1.8-amd-aocc300-milan-B1/amd_speed_aocc300_milan_B_lib/32;:
MALLOC_CONF = "retain:true"
OMP_DYNAMIC = "false"
OMP_SCHEDULE = "static"
OMP_STACKSIZE = "128M"
OMP_THREAD_LIMIT = "24"

Environment variables set by runcpu during the 654.roms_s peak run:
GOMP_CPU_AFFINITY = "0-23"

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:
Choose Operating Mode set to Maximum Performance
L1 Stream HW Prefetcher set to Disable
SMT Mode set to Disable

(Continued on next page)
Lenovo Global Technology

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SPECspeed®2017_fp_base = 137
SPECspeed®2017_fp_peak = 138

CPU2017 License: 9017
Test Sponsor: Lenovo Global Technology
Tested by: Lenovo Global Technology

Test Date: Jul-2021
Hardware Availability: Jun-2021
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Platform Notes (Continued)

Sysinfo program /home/cpu2017-1.1.8-amd-aocc300-milan-B1/bin/sysinfo
Rev: r6622 of 2021-04-07 982a61ec0915b55891ef0e16acaf64d
running on localhost Mon Jul 5 21:21:56 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 74F3 24-Core Processor
 1 "physical id"s (chips)
 24 "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 : 24
siblings : 24
physical 0: cores 0 1 2 4 5 6 8 9 10 12 13 14 16 17 18 20 21 22 24 25 26 28 29 30

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): 24
On-line CPU(s) list: 0-23
Thread(s) per core: 1
Core(s) per socket: 24
Socket(s): 1
NUMA node(s): 1
Vendor ID: AuthenticAMD
CPU family: 25
Model: 1
Model name: AMD EPYC 74F3 24-Core Processor
Stepping: 1
CPU MHz: 3065.988
CPU max MHz: 3200.0000
CPU min MHz: 1500.0000
BogoMIPS: 6387.86
Virtualization: AMD-V
L1d cache: 32K
L1i cache: 32K
L2 cache: 512K
L3 cache: 32768K
NUMA node0 CPU(s): 0-23
Flags: fpu vmx 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

(Continued on next page)
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Platform Notes (Continued)

constant_tsc rep_good nonstop_tsc cpuid extd_apicid aperfmpreff pni pclmulqdq
monitor ssse3 fma cx16 pcid sse4_1 sse4_2 movbe popcnt aes xsave avx f16c rdrrand
lahf_lm cmp_legacy svm extapic cr8_legacy abm sse4a misalignsse 3dnowprefetch osvw
ibs skinit wdt tce topoext perfctr_core perfctr_nb bpeext perfctr_l1c mwaitx cpb
cat_l3 cdp_l3 invpcid_single hw_pstate ssbd mba ibrs ibpb stibp vmmcall fsqmbase
bm1 avx2 smep bmi2 erms invpcid cqm rdt_a rdseed adx smap clflushopt clwb sha_ni
xsaveopt xsavec xsaves cqm_llc cqm_occupll1c cqm_mbm_total cqm_mbm_local
clobber xsaveerptr wboinvd arat npt lbrv svm_lock nrip_save tsc_scale
vmcb_clean flushbyasis decodeassists pausefilter pfthreshold v_vmsave_vmload vgif
umip pku ospke vaes vpclmulqdq rdpid overflow_recov succor smca

/cache data
cache size : 512 KB

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
node 0 size: 257607 MB
node 0 free: 257081 MB
node distances:
node 0
0: 10

From /proc/meminfo
MemTotal: 263790184 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) x86_64
x86_64 x86_64 GNU/Linux

(Continued on next page)
**Lenovo Global Technology**

**ThinkSystem SR635**

3.20 GHz, AMD EPYC 74F3

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---

**Platform Notes (Continued)**

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 sanitation

**CVE-2017-5715 (Spectre variant 2):**

- Mitigation: Full AMD retropine, IBPB: conditional, IBRS_FW, STIBP: disabled, RSB filling

**CVE-2020-0543 (Special Register Buffer Data Sampling):** Not affected

**CVE-2019-11135 (TSX Asynchronous Abort):** Not affected

**run-level 3 Jul 5 21:00**

**SPEC is set to:** /home/cpu2017-1.1.8-amd-aocc300-milan-B1

**Filesystem** | **Type** | **Size** | **Used** | **Avail** | **Use%** | **Mounted on**
--- | --- | --- | --- | --- | --- | ---
/dev/sda3 | xfs | 892G | 49G | 843G | 6% | /

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

**Vendor:** Lenovo

**Product:** ThinkSystem SR635 -[7Y98XXXXXXXX]-

**Product Family:** ThinkSystem

**Serial:** 0123456789

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 Samsung M393A4K40DB3-CWE 32 GB 2 rank 3200
- 8x Unknown Unknown

**BIOS:**

- **BIOS Vendor:** Lenovo
- **BIOS Version:** CFE125U
- **BIOS Date:** 05/28/2021
- **BIOS Revision:** 6.0

(End of data from sysinfo program)
## Lenovo Global Technology

**ThinkSystem SR635**  
3.20 GHz, AMD EPYC 74F3

**SPEC CPU®2017 Floating Point Speed Result**

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### Compiler Version Notes

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<td>619.lbm_s(base, peak) 638.imagick_s(base, peak) 644.nab_s(base, peak)</td>
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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)  
- Target: x86_64-unknown-linux-gnu  
- Thread model: posix  
- InstalledDir: /opt/AMD/aocc-compiler-3.0.0/bin

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**Lenovo Global Technology**

**ThinkSystem SR635**

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**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
```

---

**Base 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`

---

**Base Portability Flags**

- 603.bwaves_s: -DSPEC_LP64
- 607.cactuBSSN_s: -DSPEC_LP64
- 619.lbm_s: -DSPEC_LP64
- 621.wrf_s: -DSPEC_CASE_FLAG -Mbyteswapiop -DSPEC_LP64
- 627.cam4_s: -DSPEC_CASE_FLAG -DSPEC_LP64
- 628.pop2_s: -DSPEC_CASE_FLAG -Mbyteswapiop -DSPEC_LP64
- 638.imagick_s: -DSPEC_LP64
- 644.nab_s: -DSPEC_LP64
- 649.fotonik3d_s: -DSPEC_LP64
- 654.roms_s: -DSPEC_LP64
Base Optimization Flags

C benchmarks:
- `-m64` -mn-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`
- `-fvecclib=AMDLIBM -ffast-math -flto -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`
- `-DSPEC_OPENMP -fopenmp -fopenmp=libomp -lomp -lamdlibm -ljemalloc`
- `-flang -lflangrti`

Fortran benchmarks:
- `-m64` -mn-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 -fvecclib=AMDLIBM -ffast-math -Mrecursive`
- `-mllvm -fuse-tile-inner-loop -funroll-loops`
- `-mllvm -extra-vectorizer-passes -mllvm -lsr-in-nested-loop`
- `-mllvm -enable-licm-vrp -mllvm -reduce-array-computations=3`
- `-mllvm -global-vectorize-slp=true -z muldefs -DSPEC_OPENMP -fopenmp -fopenmp=libomp -lomp -lamdlibm -ljemalloc -lflang -lflangrti`

Benchmarks using both Fortran and C:
- `-m64` -mn-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 -O3 -march=znver3`
- `-fvecclib=AMDLIBM -ffast-math -flto -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 -Hz,1,0x1`
- `-Mrecursive -mllvm -fuse-tile-inner-loop -funroll-loops`
- `-mllvm -extra-vectorizer-passes -mllvm -lsr-in-nested-loop -z muldefs`
- `-DSPEC_OPENMP -fopenmp -fopenmp=libomp -lomp -lamdlibm -ljemalloc -lflang -lflangrti`

Benchmarks using Fortran, C, and C++:
- `-m64` -mn-adx -mno-sse4a -std=c++98
- `-Wl,-mllvm -Wl,-x86-use-vzeroupper=false`
- `-Wl,-mllvm -Wl,-region-vectorize -Wl,-mllvm -Wl,-function-specialize`

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**Lenovo Global Technology**

**ThinkSystem SR635**

3.20 GHz, AMD EPYC 74F3

**SPECspeed®2017_fp_base = 137**

**SPECspeed®2017_fp_peak = 138**

**CPU2017 License:** 9017

**Test Sponsor:** Lenovo Global Technology

**Test Date:** Jul-2021

**Hardware Availability:** Jun-2021

**Tested by:** Lenovo Global Technology

**Software Availability:** Mar-2021

### Base Optimization Flags (Continued)

Benchmarks using Fortran, C, and C++ (continued):

- `-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`
- `-fremap-arrays -mllvm -function-specialize -flv-function-specialization`
- `-mllvm -enable-gvn-hoist -mllvm -global-vectorize-slп=true`
- `-mllvm -enable-lcm-vrp -mllvm -reduce-array-computations=3`
- `-mllvm -enable-partial-unswitch -mllvm -unroll-threshold=100`
- `-finline-aggressive -mllvm -loop-unswitch-threshold=200000`
- `-mllvm -reroll-loops -mllvm -aggressive-loop-unswitch`
- `-mllvm -extra-vectorizer-passes -mllvm -convert-pow-exp-to-int=false`
- `-Hz,1,0x1 -Mrecursive -mllvm -fuse-tile-inner-loop -funroll-loops`
- `-mllvm -lsr-in-nested-loop -z muldefs -DSPEC_OPENMP -fopenmp`
- `-fopenmp=libomp -lomp -lamlibm -ljemalloc -lflang -lflangrti`

### 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`
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ThinkSystem SR635
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Peak Compiler Invocation (Continued)

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

Fortran benchmarks:
603.bwaves_s: basepeak = yes
649.fotonik3d_s: basepeak = yes
654.roms_s: -m64 -mno-adx -mno-sse4a
-W1,-mllvm -W1,-enable-X86-prefetching
-W1,-mllvm -W1,-enable-licm-vrp
-W1,-mllvm -W1,-function-specialize
-W1,-mllvm -W1,-align-all-nofallthru-blocks=6
-W1,-mllvm -W1,-reduce-array-computations=3 -Ofast
-march=znver3 -fveclib=AMDLIBM -ffast-math -Mrecursive
-mllvm -reduce-array-computations=3
-mllvm -global-vectorize-slp=true -mllvm -enable-licm-vrp
-DSPEC_OPENMP -fopenmp -fopenmp=libomp -lomp -lamdlibm
-ljemalloc -lflang

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

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

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
http://www.spec.org/cpu2017/flags/Lenovo-Platform-SPECcpu2017-Flags-V1.2-Milan1P-G.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-Milan1P-G.xml

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