SPEC® CFP2006 Result
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ASUSTeK Computer Inc.
(Test Sponsor: Advanced Micro Devices)

Asus RS700A-E9,
AMD EPYC 7451

$SPECfp^®\_rate2006 =$ 1710
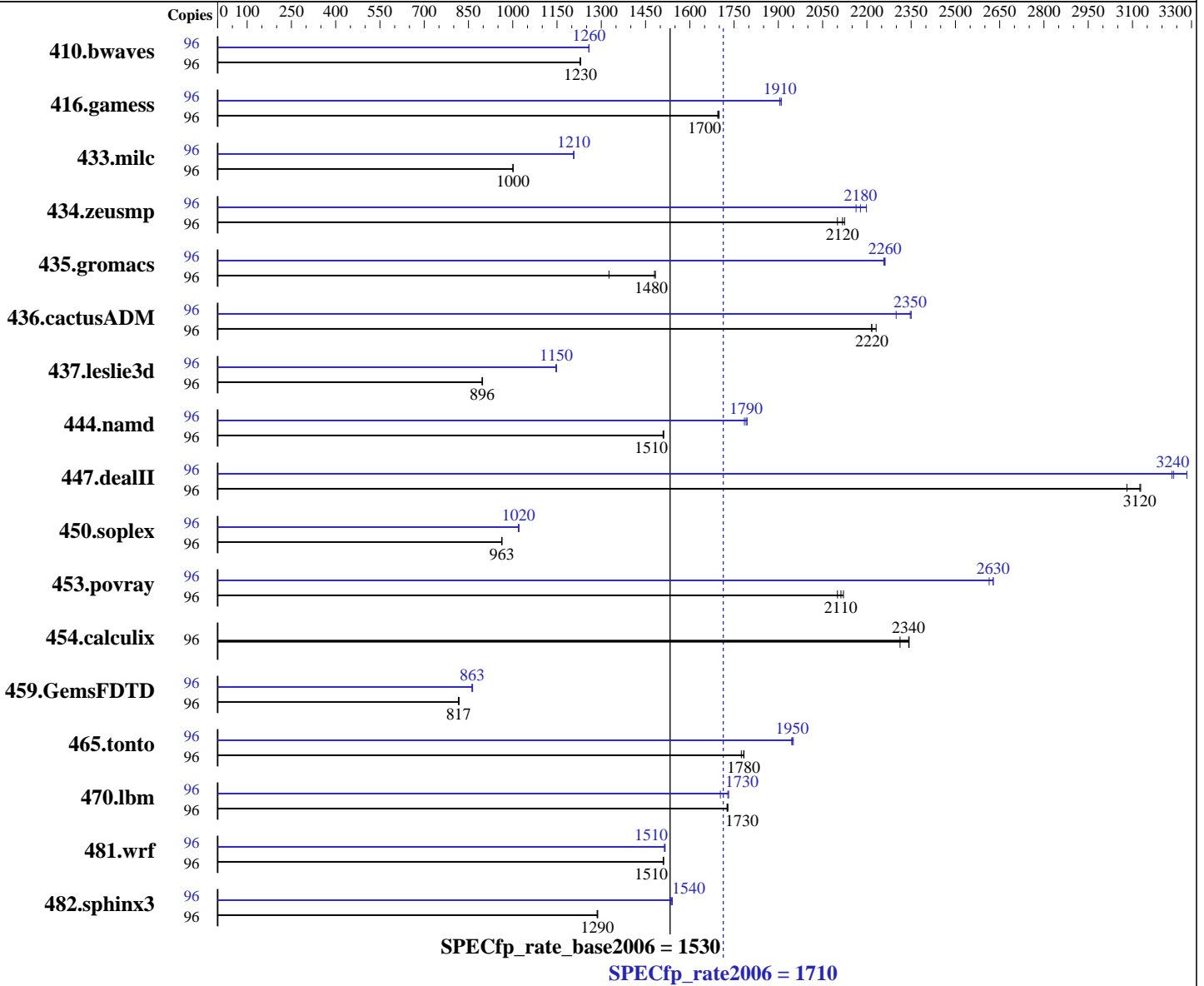
$SPECfp\_rate\_base2006 =$ 1530

CPU2006 license: 49

Test sponsor: Advanced Micro Devices

Tested by: Advanced Micro Devices

Test date: Jul-2017

Hardware Availability: Sep-2017

Software Availability: Apr-2016

SPECfp_rate_base2006 = 1530

SPECfp_rate2006 = 1710

Hardware
CPU Name: AMD EPYC 7451
CPU Characteristics: AMD Turbo CORE technology up to 3.20 GHz
CPU MHz: 2300
FPU: Integrated
CPU(s) enabled: 48 cores, 2 chips, 24 cores/chip, 2 threads/core
CPU(s) orderable: 1,2 chips
Primary Cache: 64 KB I + 32 KB D on chip per core
Secondary Cache: 512 KB I+D on chip per core

Continued on next page

Software
Operating System: Ubuntu 16.04.2 LTS,
Kernel 4.4.0-87-generic
Compiler: C/C++/Fortran: Version 4.5.2.1 of x86 Open64
Compiler Suite (from AMD)
Auto Parallel: No
File System: ext4
System State: Run level 3 (Full multiuser with network)
Base Pointers: 64-bit
Peak Pointers: 32/64-bit

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L3 Cache:	64 MB I+D on chip per chip, 8 MB shared / 3 cores
Other Cache:	None
Memory:	512 GB (16 x 32 GB 2Rx4 PC4-2667V-R, running at 2400)
Disk Subsystem:	1 x 1 TB SSD
Other Hardware:	None

Other Software: None

Results Table

Benchmark	Base Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Peak Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
410.bwaves	96	1061	1230	**1061**	**1230**	1062	1230	96	**1037**	**1260**	1037	1260	1037	1260
416.gamess	96	1109	1690	1106	1700	**1108**	**1700**	96	**987**	**1910**	984	1910	987	1910
433.milc	96	880	1000	881	1000	**880**	**1000**	96	**730**	**1210**	731	1210	730	1210
434.zeusmp	96	**413**	**2120**	416	2100	411	2120	96	404	2160	**401**	**2180**	397	2200
435.gromacs	96	517	1330	**463**	**1480**	462	1480	96	304	2260	303	2260	**303**	**2260**
436.cactusADM	96	514	2230	**518**	**2220**	518	2220	96	488	2350	**489**	**2350**	499	2300
437.leslie3d	96	1005	898	1007	896	**1007**	**896**	96	787	1150	**786**	**1150**	786	1150
444.namd	96	509	1510	510	1510	**510**	**1510**	96	**430**	**1790**	429	1790	431	1780
447.dealII	96	356	3080	351	3130	**351**	**3120**	96	340	3230	**339**	**3240**	334	3280
450.soplex	96	832	963	831	963	**831**	**963**	96	785	1020	784	1020	**785**	**1020**
453.povray	96	243	2100	241	2120	**242**	**2110**	96	**194**	**2630**	194	2630	195	2610
454.calculix	96	338	2340	343	2310	**338**	**2340**	96	338	2340	343	2310	**338**	**2340**
459.GemsFDTD	96	**1247**	**817**	1245	818	1249	816	96	1179	864	**1181**	**863**	1182	862
465.tonto	96	**530**	**1780**	532	1770	530	1780	96	**485**	**1950**	484	1950	486	1950
470.lbm	96	764	1730	**764**	**1730**	763	1730	96	774	1700	**763**	**1730**	762	1730
481.wrf	96	**710**	**1510**	709	1510	710	1510	96	707	1520	708	1510	**708**	**1510**
482.sphinx3	96	1455	1290	1453	1290	**1453**	**1290**	96	1218	1540	**1218**	**1540**	1214	1540

Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

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

    runspec command invoked through numactl i.e.:
    numactl --interleave=all runspec <etc>

    Set dirty_ratio=8 to limit dirty cache to 8% of memory
```

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Operating System Notes (Continued)

```
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

Transparent huge pages were enabled for this run (OS default)

Set vm/nr_hugepages=86016 in /etc/sysctl.conf
mount -t hugetlbfs nodev /mnt/hugepages
```

Platform Notes

```
The Linux run level was 3; sysinfo run-level is incorrect.
The dmidecode memory speed information is incorrect.
```

General Notes

```
Environment variables set by runspec before the start of the run:
HUGETLB_LIMIT = "896"
LD_LIBRARY_PATH = "/root/work/cpu2006/amd1603-rate-libs-revA/32:/root/work/cpu2006/amd1603-rate-libs-revA/64"

The binaries were built with the AMD supported x86 Open64 Compiler Suite,
which is only available from AMD at
http://developer.amd.com/tools-and-sdks/cpu-development/x86-open64-compiler-suite/
Binaries were compiled on a system with 2x AMD Opteron 6378 chips + 128GB Memory using RHEL 6.3

Submitted_by: "Smith, Van" <Van.Smith@amd.com>
Submitted: Mon Aug  7 23:19:38 EDT 2017
Submission: cpu2006-20170807-48148.sub
```

Base Compiler Invocation

C benchmarks:
```
opencc
```

C++ benchmarks:
```
openCC
```

Fortran benchmarks:
```
openf95
```

Benchmarks using both Fortran and C:
```
opencc openf95
```

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Base Portability Flags

```
   410.bwaves: -DSPEC_CPU_LP64
   416.gamess: -DSPEC_CPU_LP64
     433.milc: -DSPEC_CPU_LP64
   434.zeusmp: -DSPEC_CPU_LP64
  435.gromacs: -DSPEC_CPU_LP64
 436.cactusADM: -DSPEC_CPU_LP64 -fno-second-underscore
  437.leslie3d: -DSPEC_CPU_LP64
    444.namd: -DSPEC_CPU_LP64
   447.dealII: -DSPEC_CPU_LP64
   450.soplex: -DSPEC_CPU_LP64
   453.povray: -DSPEC_CPU_LP64
  454.calculix: -DSPEC_CPU_LP64
 459.GemsFDTD: -DSPEC_CPU_LP64
    465.tonto: -DSPEC_CPU_LP64
     470.lbm: -DSPEC_CPU_LP64
     481.wrf: -DSPEC_CPU_LINUX -DSPEC_CPU_CASE_FLAG -DSPEC_CPU_LP64
              -fno-second-underscore
  482.sphinx3: -DSPEC_CPU_LP64
```

Base Optimization Flags

C benchmarks:

```
    -Ofast -OPT:malloc_alg=1 -HP:bd=2m:heap=2m -IPA:plimit=8000
    -IPA:small_pu=100 -mso -march=bdver1 -mno-fma4 -mno-xop -mno-tbm
    -WB, -Wl, -z,muldefs
```

C++ benchmarks:

```
    -Ofast -static -CG:load_exe=0 -OPT:malloc_alg=1 -INLINE:aggressive=on
    -HP:bd=2m:heap=2m -D__OPEN64_FAST_SET -march=bdver2 -mno-fma4
    -mno-xop -mno-tbm -WB, -Wl, -z,muldefs
```

Fortran benchmarks:

```
    -Ofast -LNO:blocking=off -LNO:simd_peel_align=on -OPT:rsqrt=2
    -OPT:unroll_size=256 -HP:bd=2m:heap=2m -mso -march=bdver1 -mno-fma4
    -mno-xop -mno-tbm -WB, -Wl, -z,muldefs
```

Benchmarks using both Fortran and C:

```
    -Ofast -OPT:malloc_alg=1 -HP:bd=2m:heap=2m -IPA:plimit=8000
    -IPA:small_pu=100 -mso -march=bdver1 -mno-fma4 -mno-xop -mno-tbm
    -WB, -Wl, -z,muldefs -LNO:blocking=off -LNO:simd_peel_align=on
    -OPT:rsqrt=2 -OPT:unroll_size=256
```

Peak Compiler Invocation

C benchmarks:
```
    opencc
```

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Peak Compiler Invocation (Continued)

C++ benchmarks:
    openCC

Fortran benchmarks:
    openf95

Benchmarks using both Fortran and C:
    opencc openf95

Peak Portability Flags

        410.bwaves: -DSPEC_CPU_LP64
        416.gamess: -DSPEC_CPU_LP64
         433.milc: -DSPEC_CPU_LP64
        434.zeusmp: -DSPEC_CPU_LP64
       435.gromacs: -DSPEC_CPU_LP64
     436.cactusADM: -DSPEC_CPU_LP64 -fno-second-underscore
       437.leslie3d: -DSPEC_CPU_LP64
         444.namd: -DSPEC_CPU_LP64
        453.povray: -DSPEC_CPU_LP64
       454.calculix: -DSPEC_CPU_LP64
      459.GemsFDTD: -DSPEC_CPU_LP64
         465.tonto: -DSPEC_CPU_LP64
          470.lbm: -DSPEC_CPU_LP64
          481.wrf: -DSPEC_CPU_LINUX -DSPEC_CPU_CASE_FLAG -DSPEC_CPU_LP64
                   -fno-second-underscore

Peak Optimization Flags

C benchmarks:

        433.milc: -Ofast -CG:movnti=1 -CG:locs_best=on -HP:bdt=2m:heap=2m
                  -IPA:plimit=7000 -IPA:callee_limit=1200
                  -OPT:struct_array_copy=2 -OPT:alias=field_sensitive -mso
                  -march=bdver1 -mno-fma4

         470.lbm: -Ofast -CG:cmp_peep=on -OPT:keep_ext=on -HP:bdt=2m:heap=2m
                  -IPA:plimit=8000 -IPA:small_pu=100 -march=bdver1 -mno-fma4
                  -mso

      482.sphinx3: -Ofast -m32 -IPA:plimit=1000 -OPT:malloc_alg=2
                   -CG:cmp_peep=on -CG:p2align=0 -CG:load_exe=1 -CG:dsched=on
                   -INLINE:aggressive=on -LNO:prefetch=2 -LNO:prefetch_ahead=4
                   -mso -march=bdver2 -WB, -mno-fma4 -mno-tbm -mno-xop

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Peak Optimization Flags (Continued)

C++ benchmarks:

```
444.namd: -Ofast -IPA:plimit=3000 -LNO:ignore_feedback=off
          -CG:local_sched_alg=0 -CG:load_exe=0 -OPT:unroll_size=256
          -fno-exceptions -HP:bdt=2m:heap=2m -LNO:if_select_conv=1
          -OPT:alias=disjoint -LNO:psimd_iso_unroll=ON -march=bdver2
          -mno-fma4 -WB, -mno-xop -mno-tbm

447.dealII: -Ofast -D__OPEN64_FAST_SET -static -INLINE:aggressive=on
            -LNO:opt=1 -LNO:simd=2 -fno-emit-exceptions -m32
            -OPT:unroll_times_max=8 -OPT:unroll_size=256
            -OPT:unroll_level=2 -HP:bdt=2m:heap=2m -GRA:unspill=on
            -CG:cmp_peep=on -CG:movext_icmp=off -TENV:frame_pointer=off
            -march=bdver1 -mno-fma4

450.soplex: -fb_create fbdata(pass 1) -fb_opt fbdata(pass 2) -O3
            -LNO:ignore_feedback=off -INLINE:aggressive=on -OPT:RO=1
            -OPT:IEEE_arith=3 -OPT:IEEE_NaN_Inf=off
            -OPT:fold_unsigned_relops=on -fno-exceptions -CG:p2align=0
            -m32 -mno-fma4 -HP:bdt=2m:heap=2m -WOPT:sib=on
            -march=bdver1

453.povray: -fb_create fbdata(pass 1) -fb_opt fbdata(pass 2) -Ofast
            -CG:pre_local_sched=off -CG:p2align=0 -CG:p2align_split=on
            -CG:dsched=on -INLINE:aggressive=on -HP:bd=2m:heap=2m
            -OPT:transform=2 -OPT:alias=disjoint -WOPT:aggcm=0
            -march=bdver2 -mno-fma4 -WB, -mno-xop -mno-tbm -Wl,
            -z,muldefs
```

Fortran benchmarks:

```
410.bwaves: -fb_create fbdata(pass 1) -fb_opt fbdata(pass 2) -Ofast
            -OPT:Ofast -OPT:treeheight=on -LNO:blocking=off
            -LNO:ignore_feedback=off -LNO:fu=4 -LNO:loop_model_simd=on
            -LNO:simd_rm_unity_remainder=on -WOPT:aggstr=0
            -HP:bdt=2m:heap=2m -CG:cmp_peep=on -march=bdver2 -mno-fma4

416.gamess: -fb_create fbdata(pass 1) -fb_opt fbdata(pass 2) -Ofast
            -LNO:fu=6 -LNO:blocking=0 -LNO:simd=2 -OPT:ro=3
            -OPT:recip=on -CG:local_sched_alg=1 -HP:bdt=2m:heap=2m
            -WOPT:sib=on -march=bdver1 -mno-fma4

434.zeusmp: -fb_create fbdata(pass 1) -fb_opt fbdata(pass 2) -Ofast
            -LNO:blocking=off -LNO:interchange=off -IPA:plimit=1500
            -HP:bdt=2m:heap=2m -march=bdver2 -mno-fma4

437.leslie3d: -Ofast -CG:pre_minreg_level=2 -LNO:simd=0 -LNO:fusion=2
              -HP:bdt=2m:heap=2m -mso -march=bdver1 -mno-fma4
```

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Peak Optimization Flags (Continued)

459.GemsFDTD: `-Ofast -IPA:plimit=1500 -OPT:unroll_size=1024`
`-OPT:unroll_times_max=16 -LNO:fission=2`
`-CG:local_sched_alg=2 -HP -march=bdver1 -mno-fma4`

465.tonto: `-Ofast -OPT:alias=no_f90_pointer_alias -LNO:blocking=off`
`-CG:load_exe=1 -CG:local_sched_alg=3 -IPA:plimit=525`
`-HP:bdt=2m:heap=2m -march=bdver2 -WB, -mno-fma4 -mno-tbm`
`-mno-xop`

Benchmarks using both Fortran and C:

435.gromacs: `-Ofast -OPT:rsqrt=2 -HP:bdt=2m:heap=2m`
`-CG:local_sched_alg=2 -CG:load_exe=3 -GRA:unspill=on`
`-march=bdver2 -mno-fma4 -LNO:simd=3`

436.cactusADM: `-fb_create fbdata(pass 1) -fb_opt fbdata(pass 2) -Ofast`
`-LNO:blocking=off -LNO:prefetch=2 -LNO:pf2=0`
`-LNO:prefetch_ahead=4 -HP -CG:locs_shallow_depth=1`
`-CG:load_exe=0 -CG:dsched=on -WOPT:sib=on -march=bdver2`
`-mno-fma4`

454.calculix: `basepeak = yes`

481.wrf: `-Ofast -LNO:blocking=off -LANG:copyinout=off`
`-IPA:callee_limit=5000 -GRA:prioritize_by_density=on -HP`
`-WOPT:sib=on -march=bdver1 -mno-fma4`

The flags file that was used to format this result can be browsed at
http://www.spec.org/cpu2006/flags/x86-openflags-rate-revA-I.html

You can also download the XML flags source by saving the following link:
http://www.spec.org/cpu2006/flags/x86-openflags-rate-revA-I.xml

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

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