SPEC® CFP2006 Result
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Lenovo Global Technology

$SPECfp^®\_rate2006 =$ 6230

ThinkSystem SR950
(2.10 GHz, Intel Xeon Platinum 8160T)

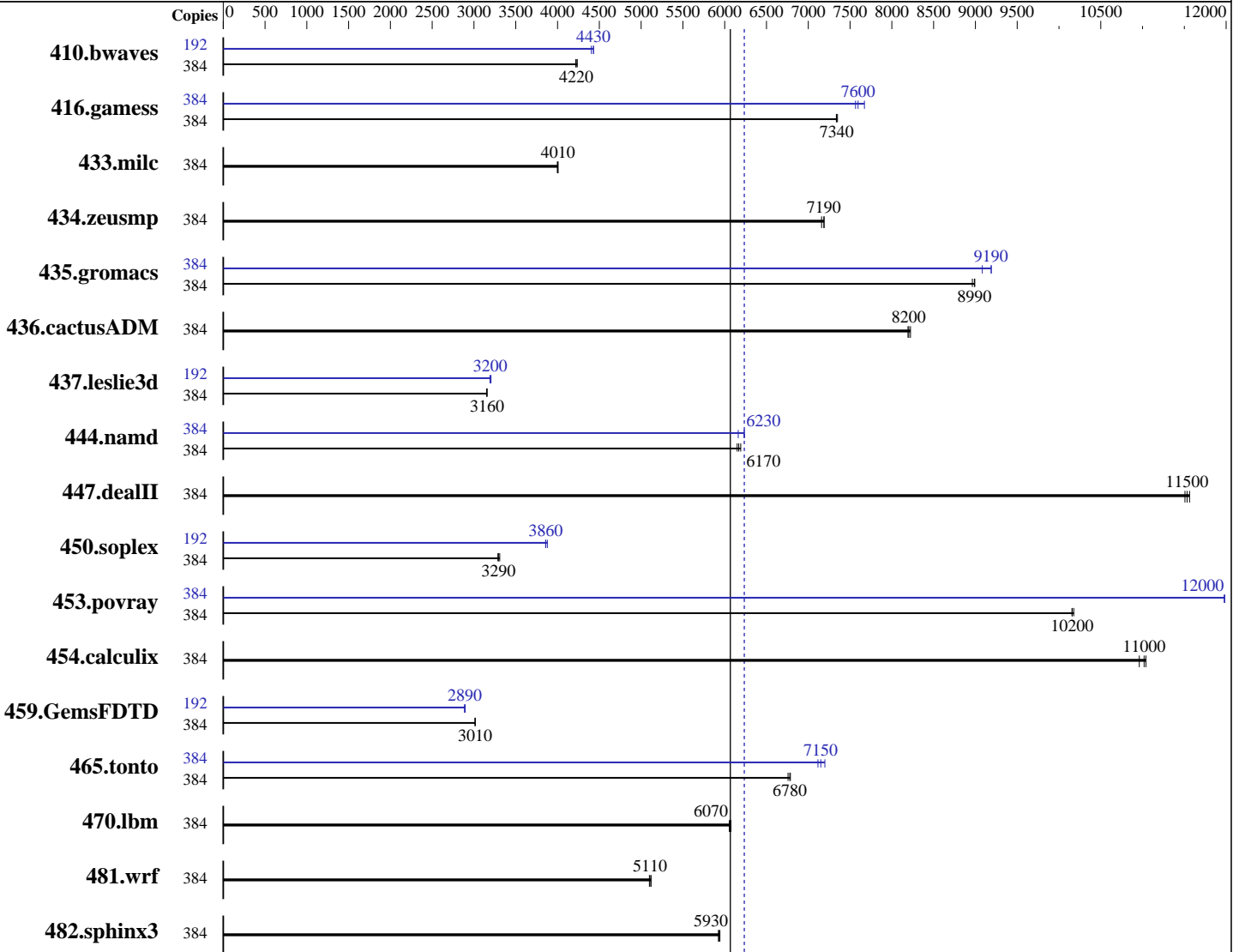$SPECfp\_rate\_base2006 =$ 6070

CPU2006 license: 9017
Test sponsor: Lenovo Global Technology
Tested by: Lenovo Global Technology

Test date: Aug-2017
Hardware Availability: Sep-2017
Software Availability: Apr-2017

Copies		
410.bwaves	192	4430
	384	4220
416.gamess	384	7600
	384	7340
433.milc	384	4010
434.zeusmp	384	7190
435.gromacs	384	9190
	384	8990
436.cactusADM	384	8200
437.leslie3d	192	3200
	384	3160
444.namd	384	6230
	384	6170
447.dealII	384	11500
450.soplex	192	3860
	384	3290
453.povray	384	12000
	384	10200
454.calculix	384	11000
459.GemsFDTD	192	2890
	384	3010
465.tonto	384	7150
	384	6780
470.lbm	384	6070
481.wrf	384	5110
482.sphinx3	384	5930

SPECfp_rate_base2006 = 6070
SPECfp_rate2006 = 6230

Hardware

CPU Name: Intel Xeon Platinum 8160T
CPU Characteristics: Intel Turbo Boost Technology up to 3.70 GHz
CPU MHz: 2100
FPU: Integrated
CPU(s) enabled: 192 cores, 8 chips, 24 cores/chip, 2 threads/core
CPU(s) orderable: 2,4,8 chips
Primary Cache: 32 KB I + 32 KB D on chip per core
Secondary Cache: 1 MB I+D on chip per core

Continued on next page

Software

Operating System: SUSE Linux Enterprise Server 12 SP2 (x86_64)
Kernel 4.4.21-69-default
Compiler: C/C++: Version 17.0.3.191 of Intel C/C++
Compiler for Linux;
Fortran: Version 17.0.3.191 of Intel Fortran
Compiler for Linux
Auto Parallel: Yes
File System: tmpfs
System State: Run level 3 (multi-user)

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L3 Cache:	33 MB I+D on chip per chip	Base Pointers:	32/64-bit
Other Cache:	None	Peak Pointers:	32/64-bit
Memory:	3 TB (96 x 32 GB 2Rx4 PC4-2666V-R)	Other Software:	None
Disk Subsystem:	800 GB tmpfs		
Other Hardware:	None		

Results Table

| Benchmark | Base | | | | | | | Peak | | | | | | |
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
410.bwaves	384	1232	4240	1237	4220	**1235**	**4220**	192	589	4430	**589**	**4430**	592	4400
416.gamess	384	1023	7350	**1024**	**7340**	1025	7340	384	980	7670	994	7570	**990**	**7600**
433.milc	384	882	4000	**880**	**4010**	880	4010	384	882	4000	**880**	**4010**	880	4010
434.zeusmp	384	486	7190	488	7160	**486**	**7190**	384	486	7190	488	7160	**486**	**7190**
435.gromacs	384	306	8960	305	8990	**305**	**8990**	384	302	9080	298	9190	**298**	**9190**
436.cactusADM	384	560	8190	**559**	**8200**	558	8220	384	560	8190	**559**	**8200**	558	8220
437.leslie3d	384	1144	3160	1146	3150	**1144**	**3160**	192	563	3200	565	3190	**565**	**3200**
444.namd	384	**499**	**6170**	501	6150	497	6190	384	500	6160	494	6240	**494**	**6230**
447.dealII	384	382	11500	**381**	**11500**	380	11600	384	382	11500	**381**	**11500**	380	11600
450.soplex	384	974	3290	**973**	**3290**	968	3310	192	**415**	**3860**	415	3860	413	3880
453.povray	384	201	10200	201	10200	**201**	**10200**	384	171	12000	171	12000	**171**	**12000**
454.calculix	384	287	11000	**288**	**11000**	289	11000	384	287	11000	**288**	**11000**	289	11000
459.GemsFDTD	384	**1352**	**3010**	1352	3010	1352	3010	192	706	2890	**705**	**2890**	704	2900
465.tonto	384	559	6760	**557**	**6780**	557	6790	384	531	7120	525	7200	**528**	**7150**
470.lbm	384	869	6070	**869**	**6070**	871	6050	384	869	6070	**869**	**6070**	871	6050
481.wrf	384	**840**	**5110**	841	5100	838	5120	384	**840**	**5110**	841	5100	838	5120
482.sphinx3	384	1263	5920	1259	5940	**1261**	**5930**	384	1263	5920	1259	5940	**1261**	**5930**

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

Submit Notes

    The numactl mechanism was used to bind copies to processors. The config file option 'submit'
was used to generate numactl commands to bind each copy to a specific processor.
For details, please see the config file.

Operating System Notes

    Stack size set to unlimited using "ulimit -s unlimited"
    Tmpfs filesystem can be set with:
     mount -t tmpfs -o size=800g tmpfs /home
    Process tuning setting:
      echo 50000   > /proc/sys/kernel/sched_cfs_bandwidth_slice_us
      echo 240000000 > /proc/sys/kernel/sched_latency_ns
      echo 5000000   > /proc/sys/kernel/sched_migration_cost_ns
      echo 100000000 > /proc/sys/kernel/sched_min_granularity_ns

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Test date: Aug-2017
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Operating System Notes (Continued)

```
echo 150000000 > /proc/sys/kernel/sched_wakeup_granularity_ns
```

Platform Notes

```
    BIOS configuration:
    Choose Operating Mode set to Maximum Performance
    SNC set to Enable
    DCU Streamer Prefetcher set to Disable
    Stale AtoS set to Enable
    LLC dead line alloc set to Disable
     Sysinfo program /home/cpu2006-1.2-ic17.0u3/config/sysinfo.rev6993
     Revision 6993 of 2015-11-06 (b5e8d4b4eb51ed28d7f98696cbe290c1)
     running on Proton8S-SUSE12SP2 Sun Aug 20 05:05:32 2017

     This section contains SUT (System Under Test) info as seen by
     some common utilities.  To remove or add to this section, see:
       http://www.spec.org/cpu2006/Docs/config.html#sysinfo

     From /proc/cpuinfo
        model name : Intel(R) Xeon(R) Platinum 8160T CPU @ 2.10GHz
           8 "physical id"s (chips)
           384 "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  : 48
           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
           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
           physical 2: 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
           physical 3: 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
           physical 4: 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
           physical 5: 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
           physical 6: 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
           physical 7: 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
        cache size : 33792 KB

     From /proc/meminfo
        MemTotal:       3170207836 kB
        HugePages_Total:        0
        Hugepagesize:        2048 kB

     From /etc/*release* /etc/*version*
```

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Platform Notes (Continued)

```
    SuSE-release:
       SUSE Linux Enterprise Server 12 (x86_64)
       VERSION = 12
       PATCHLEVEL = 2
       # This file is deprecated and will be removed in a future service pack or
       release.
       # Please check /etc/os-release for details about this release.
    os-release:
       NAME="SLES"
       VERSION="12-SP2"
       VERSION_ID="12.2"
       PRETTY_NAME="SUSE Linux Enterprise Server 12 SP2"
       ID="sles"
       ANSI_COLOR="0;32"
       CPE_NAME="cpe:/o:suse:sles:12:sp2"

  uname -a:
     Linux Proton8S-SUSE12SP2 4.4.21-69-default #1 SMP Tue Oct 25 10:58:20 UTC
     2016 (9464f67) x86_64 x86_64 x86_64 GNU/Linux

  run-level 3 Aug 20 05:02

  SPEC is set to: /home/cpu2006-1.2-ic17.0u3
     Filesystem       Type   Size  Used Avail Use% Mounted on
     tmpfs            tmpfs  800G  3.7G  797G   1% /home
  Additional information from dmidecode:

     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.

   BIOS Lenovo -[PSE105L-1.00]- 06/22/2017
   Memory:
    96x Samsung M393A4K40BB2-CTD 32 GB 2 rank 2666 MHz

  (End of data from sysinfo program)
```

General Notes

```
 Environment variables set by runspec before the start of the run:
 LD_LIBRARY_PATH = "/home/cpu2006-1.2-ic17.0u3/lib/ia32:/home/cpu2006-1.2-ic17.0u3/lib/intel64:/home/cpu2006-1.2-ic17.0u3/sh10.2"


  Binaries compiled on a system with 1x Intel Core i7-4790 CPU + 32GB RAM
  memory using Redhat Enterprise Linux 7.2
  Transparent Huge Pages enabled by default
  Filesystem page cache cleared with:
  shell invocation of 'sync; echo 3 > /proc/sys/vm/drop_caches' prior to run
  runspec command invoked through numactl i.e.:
  numactl --interleave=all runspec <etc>
```

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Base Compiler Invocation

C benchmarks:
```
icc -m64
```

C++ benchmarks:
```
icpc -m64
```

Fortran benchmarks:
```
ifort -m64
```

Benchmarks using both Fortran and C:
```
icc -m64 ifort -m64
```

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 -nofor_main
436.cactusADM: -DSPEC_CPU_LP64 -nofor_main
 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 -nofor_main
459.GemsFDTD: -DSPEC_CPU_LP64
   465.tonto: -DSPEC_CPU_LP64
    470.lbm: -DSPEC_CPU_LP64
     481.wrf: -DSPEC_CPU_LP64 -DSPEC_CPU_CASE_FLAG -DSPEC_CPU_LINUX
  482.sphinx3: -DSPEC_CPU_LP64
```

Base Optimization Flags

C benchmarks:
```
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -auto-p32
-qopt-mem-layout-trans=3
```

C++ benchmarks:
```
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -auto-p32
-qopt-mem-layout-trans=3
```

Fortran benchmarks:
```
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
```

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Base Optimization Flags (Continued)

Benchmarks using both Fortran and C:
```
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -auto-p32
-qopt-mem-layout-trans=3
```

Peak Compiler Invocation

C benchmarks:
```
icc -m64
```

C++ benchmarks (except as noted below):
```
icpc -m64
```

```
450.soplex: icpc -m32 -L/opt/intel/compilers_and_libraries_2017/linux/lib/ia32
```

Fortran benchmarks:
```
ifort -m64
```

Benchmarks using both Fortran and C:
```
icc -m64 ifort -m64
```

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 -nofor_main
    436.cactusADM: -DSPEC_CPU_LP64 -nofor_main
     437.leslie3d: -DSPEC_CPU_LP64
        444.namd: -DSPEC_CPU_LP64
       447.dealII: -DSPEC_CPU_LP64
       450.soplex: -D_FILE_OFFSET_BITS=64
       453.povray: -DSPEC_CPU_LP64
     454.calculix: -DSPEC_CPU_LP64 -nofor_main
    459.GemsFDTD: -DSPEC_CPU_LP64
        465.tonto: -DSPEC_CPU_LP64
         470.lbm: -DSPEC_CPU_LP64
         481.wrf: -DSPEC_CPU_LP64 -DSPEC_CPU_CASE_FLAG -DSPEC_CPU_LINUX
      482.sphinx3: -DSPEC_CPU_LP64
```

Peak Optimization Flags

C benchmarks:

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Peak Optimization Flags (Continued)

433.milc: basepeak = yes

470.lbm: basepeak = yes

482.sphinx3: basepeak = yes

C++ benchmarks:

    444.namd: -prof-gen(pass 1) -prof-use(pass 2) -xCORE-AVX2(pass 2)
        -par-num-threads=1(pass 1) -ipo(pass 2) -O3(pass 2)
        -no-prec-div(pass 2) -fno-alias -auto-ilp32
        -qopt-mem-layout-trans=3

    447.dealII: basepeak = yes

    450.soplex: -prof-gen(pass 1) -prof-use(pass 2) -xCORE-AVX2(pass 2)
        -par-num-threads=1(pass 1) -ipo(pass 2) -O3(pass 2)
        -no-prec-div(pass 2) -qopt-malloc-options=3
        -qopt-mem-layout-trans=3

    453.povray: -prof-gen(pass 1) -prof-use(pass 2) -xCORE-AVX2(pass 2)
        -par-num-threads=1(pass 1) -ipo(pass 2) -O3(pass 2)
        -no-prec-div(pass 2) -unroll4 -qopt-mem-layout-trans=3

Fortran benchmarks:

    410.bwaves: -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch

    416.gamess: -prof-gen(pass 1) -prof-use(pass 2) -xCORE-AVX2(pass 2)
        -par-num-threads=1(pass 1) -ipo(pass 2) -O3(pass 2)
        -no-prec-div(pass 2) -unroll2 -inline-level=0 -scalar-rep-

    434.zeusmp: basepeak = yes

    437.leslie3d: Same as 410.bwaves

  459.GemsFDTD: Same as 410.bwaves

    465.tonto: -prof-gen(pass 1) -prof-use(pass 2) -xCORE-AVX2(pass 2)
        -par-num-threads=1(pass 1) -ipo(pass 2) -O3(pass 2)
        -no-prec-div(pass 2) -unroll4 -auto -inline-calloc
        -qopt-malloc-options=3

Benchmarks using both Fortran and C:

    435.gromacs: -prof-gen(pass 1) -prof-use(pass 2) -xCORE-AVX2(pass 2)
        -par-num-threads=1(pass 1) -qopt-prefetch -auto-ilp32
        -qopt-mem-layout-trans=3

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Peak Optimization Flags (Continued)

436.cactusADM: basepeak = yes

454.calculix: basepeak = yes

481.wrf: basepeak = yes

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2006/flags/Intel-ic17.0-official-linux64-revF.html
http://www.spec.org/cpu2006/flags/Lenovo-Platform-Flags-V1.2-SKL-C.20171004.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2006/flags/Intel-ic17.0-official-linux64-revF.xml
http://www.spec.org/cpu2006/flags/Lenovo-Platform-Flags-V1.2-SKL-C.20171004.xml

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

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