SPEC® CFP2006 Result
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Lenovo Global Technology

$SPECfp^{®}\_rate2006 = \qquad 3220$

ThinkSystem SN850
(2.10 GHz, Intel Xeon Platinum 8170)

$SPECfp\_rate\_base2006 = 3130$

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

Test date: Aug-2017
Hardware Availability: Aug-2017
Software Availability: Nov-2016

Benchmark results chart:

Benchmark	Copies	Result
410.bwaves	104	2260
410.bwaves	208	2200
416.gamess	208	3920
416.gamess	208	3800
433.milc	208	2160
434.zeusmp	208	3720
435.gromacs	208	4850
435.gromacs	208	4780
436.cactusADM	208	4180
437.leslie3d	104	1640
437.leslie3d	208	1620
444.namd	208	3190
444.namd	208	3140
447.dealII	208	5700
450.soplex	104	2000
450.soplex	208	1690
453.povray	208	6120
453.povray	208	5110
454.calculix	208	5720
459.GemsFDTD	104	1470
459.GemsFDTD	208	1530
465.tonto	208	3800
465.tonto	208	3580
470.lbm	208	3060
481.wrf	208	2680
482.sphinx3	208	3070

SPECfp_rate_base2006 = 3130
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Hardware

CPU Name: Intel Xeon Platinum 8170
CPU Characteristics: Intel Turbo Boost Technology up to 3.70 GHz
CPU MHz: 2100
FPU: Integrated
CPU(s) enabled: 104 cores, 4 chips, 26 cores/chip, 2 threads/core
CPU(s) orderable: 2,4 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 17.0.0.098 of Intel C/C++ Compiler for Linux; Fortran: Version 17.0.0.098 of Intel Fortran Compiler for Linux
Auto Parallel: No
File System: tmpfs
System State: Run level 3 (multi-user)
Continued on next page

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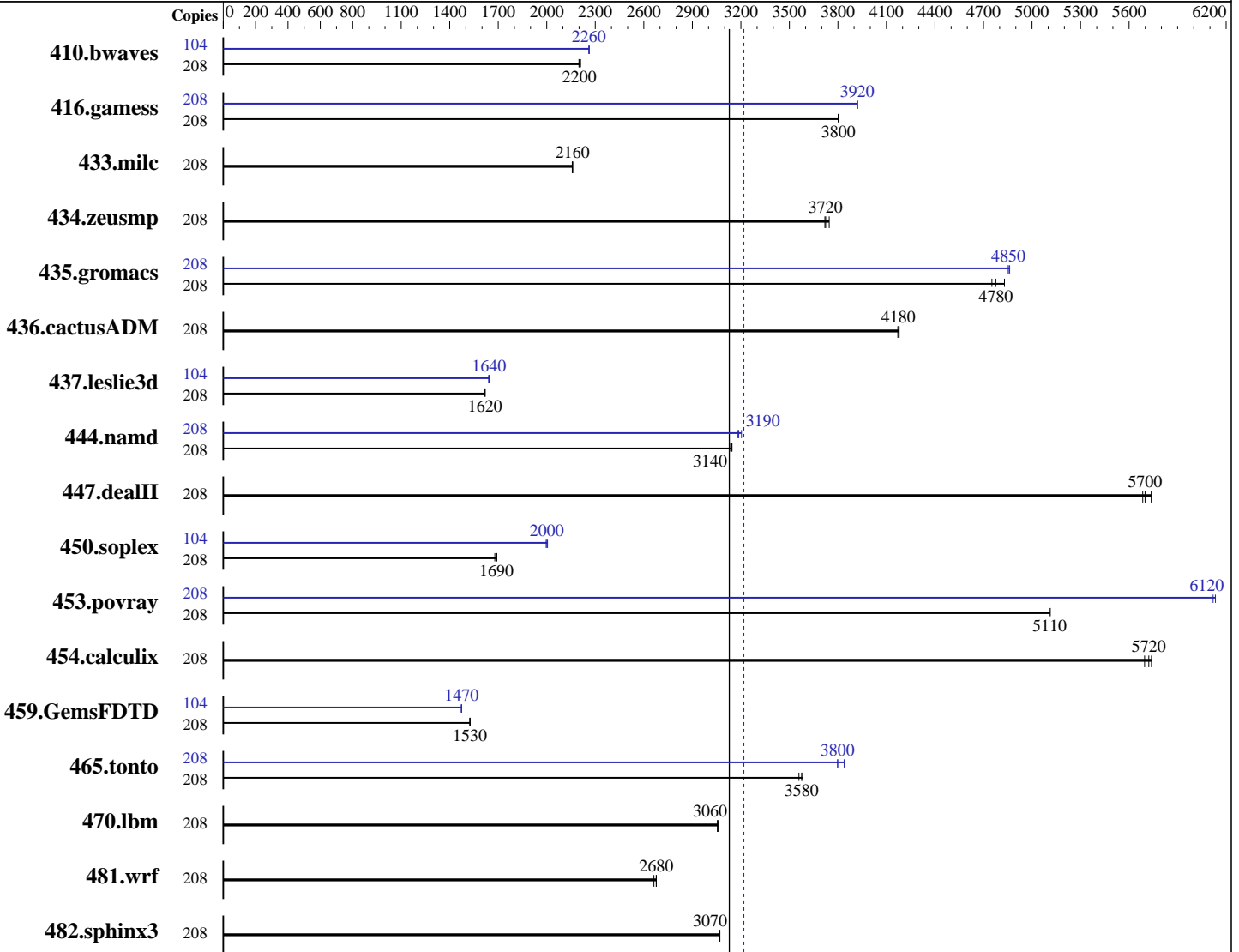
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L3 Cache:	35.75 MB I+D on chip per chip	Base Pointers:	32/64-bit
Other Cache:	None	Peak Pointers:	32/64-bit
Memory:	1536 GB (48 x 32 GB 2Rx4 PC4-2666V-R)	Other Software:	None
Disk Subsystem:	1 x 960 GB SATA SSD		
Other Hardware:	None		

Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
410.bwaves	208	1280	2210	**1284**	**2200**	1285	2200	104	625	2260	**625**	**2260**	625	2260
416.gamess	208	1071	3800	1071	3800	**1071**	**3800**	208	**1039**	**3920**	1038	3920	1039	3920
433.milc	208	**884**	**2160**	884	2160	885	2160	208	**884**	**2160**	884	2160	885	2160
434.zeusmp	208	509	3720	**508**	**3720**	505	3750	208	509	3720	**508**	**3720**	505	3750
435.gromacs	208	**311**	**4780**	313	4750	307	4830	208	306	4850	305	4860	**306**	**4850**
436.cactusADM	208	**595**	**4180**	596	4170	595	4180	208	**595**	**4180**	596	4170	595	4180
437.leslie3d	208	**1208**	**1620**	1211	1610	1208	1620	104	595	1640	596	1640	**595**	**1640**
444.namd	208	530	3150	532	3140	**531**	**3140**	208	**523**	**3190**	521	3200	524	3180
447.dealII	208	**418**	**5700**	415	5740	419	5680	208	**418**	**5700**	415	5740	419	5680
450.soplex	208	1033	1680	**1027**	**1690**	1026	1690	104	435	2000	**433**	**2000**	433	2000
453.povray	208	217	5110	216	5110	**217**	**5110**	208	181	6110	180	6130	**181**	**6120**
454.calculix	208	299	5740	**300**	**5720**	301	5700	208	299	5740	**300**	**5720**	301	5700
459.GemsFDTD	208	1447	1530	**1447**	**1530**	1447	1530	104	**749**	**1470**	750	1470	749	1470
465.tonto	208	575	3560	**572**	**3580**	572	3580	208	539	3800	**539**	**3800**	533	3840
470.lbm	208	**935**	**3060**	935	3060	934	3060	208	**935**	**3060**	935	3060	934	3060
481.wrf	208	873	2660	**868**	**2680**	868	2680	208	873	2660	**868**	**2680**	868	2680
482.sphinx3	208	1322	3070	1320	3070	**1321**	**3070**	208	1322	3070	1320	3070	**1321**	**3070**

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

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Platform Notes

```
    BIOS configuration:
     Choose Operating Mode set to Maximum Performance
     Adjacent Cache Prefetch set to Disable
     DCU Streamer Prefetcher set to Disable
     SNC set to Enable
     Stale Atos set to Disable
     LLC dead line alloc set to Disable
    Sysinfo program /home/cpu2006-1.2-ic17.0/config/sysinfo.rev6993
    Revision 6993 of 2015-11-06 (b5e8d4b4eb51ed28d7f98696cbe290c1)
    running on SN850-01 Tue Aug 22 19:59:06 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 8170 CPU @ 2.10GHz
          4 "physical id"s (chips)
          208 "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 : 26
          siblings  : 52
          physical 0: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 16 17 18 19 20 21 22 24 25
          26 27 28 29
          physical 1: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 16 17 18 19 20 21 22 24 25
          26 27 28 29
          physical 2: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 16 17 18 19 20 21 22 24 25
          26 27 28 29
          physical 3: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 16 17 18 19 20 21 22 24 25
          26 27 28 29
       cache size : 36608 KB

    From /proc/meminfo
       MemTotal:       1584965048 kB
       HugePages_Total:        0
       Hugepagesize:        2048 kB

    From /etc/*release* /etc/*version*
       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"
```
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Platform Notes (Continued)

```
      ID="sles"
      ANSI_COLOR="0;32"
      CPE_NAME="cpe:/o:suse:sles:12:sp2"

  uname -a:
     Linux SN850-01 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 22 19:55

  SPEC is set to: /home/cpu2006-1.2-ic17.0
     Filesystem      Type    Size   Used Avail Use% Mounted on
     tmpfs           tmpfs   800G   4.5G  796G   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 -[IVE109A-1.00]- 04/27/2017
  Memory:
  48x 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-ic17.0/libs/32:/home/cpu2006-1.2-ic17.0/libs/64:/home/cpu2006-1.2-ic17.0/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:
 echo 1>         /proc/sys/vm/drop_caches
 runspec command invoked through numactl i.e.:
 numactl --interleave=all runspec <etc>
```

Base Compiler Invocation

C benchmarks:
      icc -m64

C++ benchmarks:
      icpc -m64

Fortran benchmarks:
      ifort -m64

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Base Compiler Invocation (Continued)

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
```

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
```

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Peak Compiler Invocation (Continued)

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:

```
        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
```

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Peak Optimization Flags (Continued)

```
     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

   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.html
http://www.spec.org/cpu2006/flags/Lenovo-Platform-Flags-V1.2-SKL-C.html

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You can also download the XML flags sources by saving the following links:

`http://www.spec.org/cpu2006/flags/Intel-ic17.0-official-linux64.xml`
`http://www.spec.org/cpu2006/flags/Lenovo-Platform-Flags-V1.2-SKL-C.xml`

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