# SPEC® CFP2006 Result

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## Lenovo Global Technology

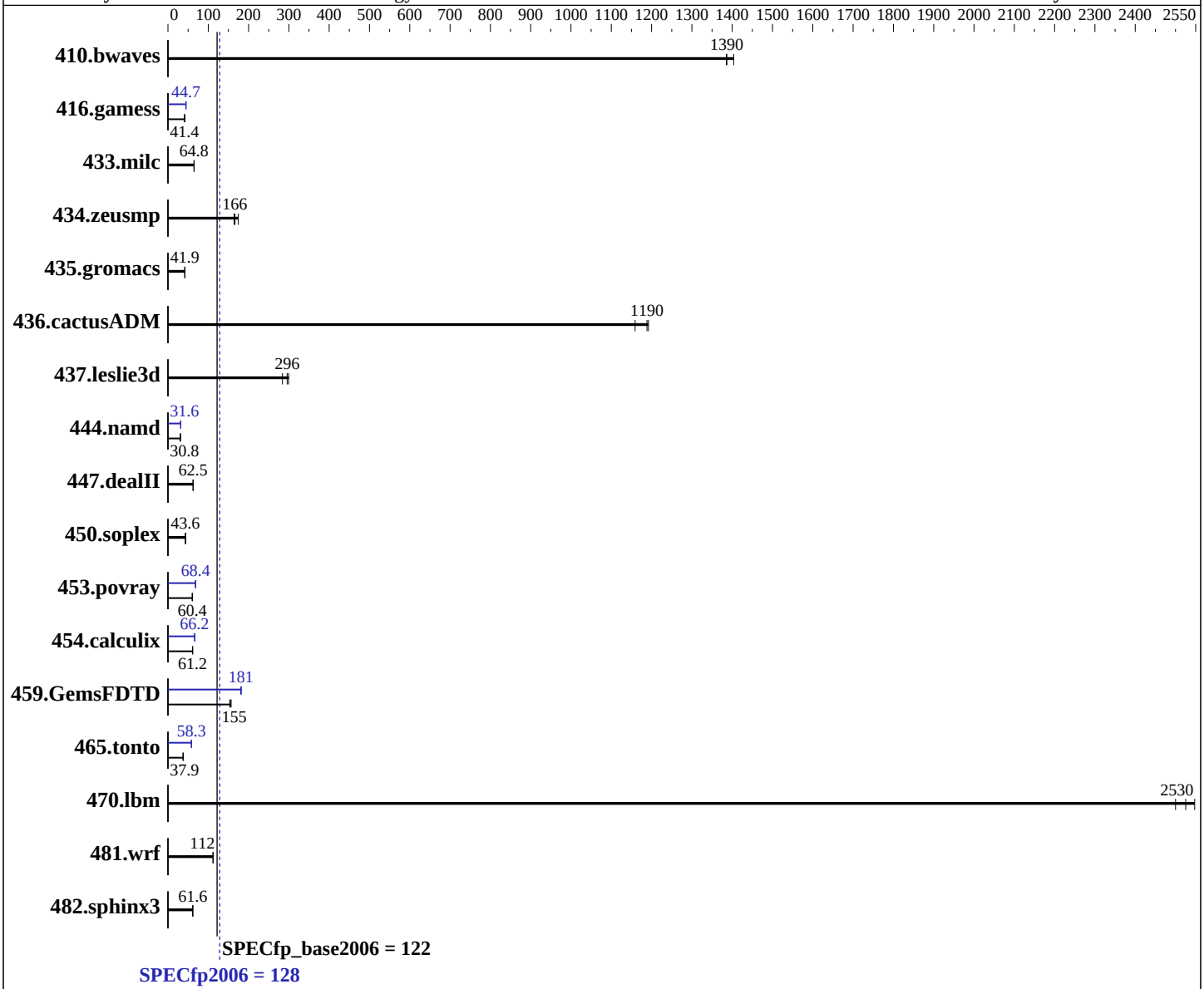
ThinkSystem SN850
(2.20 GHz, Intel Xeon Gold 5120)

SPECfp®2006 = 128

SPECfp_base2006 = 122

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

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




### Hardware

| | |
|---|---|
| CPU Name: | Intel Xeon Gold 5120 |
| CPU Characteristics: | Intel Turbo Boost Technology up to 3.20 GHz |
| CPU MHz: | 2200 |
| FPU: | Integrated |
| CPU(s) enabled: | 56 cores, 4 chips, 14 cores/chip |
| 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 |

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### Software

| | |
|---|---|
| Operating System: | SUSE Linux Enterprise Server 12 SP2 (x86_64)<br>Kernel 4.4.21-69-default |
| Compiler: | C/C++: Version 17.0.0.098 of Intel C/C++ Compiler for Linux;<br>Fortran: Version 17.0.0.098 of Intel Fortran Compiler for Linux |
| Auto Parallel: | Yes |
| File System: | xfs |
| System State: | Run level 3 (multi-user) |

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L3 Cache: 19.25 MB I+D on chip per chip
Other Cache: None
Memory: 1536 GB (48 x 32 GB 2Rx4 PC4-2666V-R, running at 2400 MHz)
Disk Subsystem: 1 x 960 GB SATA SSD
Other Hardware: None

Base Pointers: 64-bit
Peak Pointers: 32/64-bit
Other Software: None

## Results Table

| Benchmark | Base | | | | | | Peak | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio |
| 410.bwaves | 9.68 | 1400 | **9.80** | **1390** | 9.81 | 1390 | 9.68 | 1400 | **9.80** | **1390** | 9.81 | 1390 |
| 416.gamess | 474 | 41.3 | **473** | **41.4** | 473 | 41.4 | 438 | 44.7 | **438** | **44.7** | 438 | 44.7 |
| 433.milc | **142** | **64.8** | 142 | 64.6 | 141 | 65.1 | **142** | **64.8** | 142 | 64.6 | 141 | 65.1 |
| 434.zeusmp | 55.4 | 164 | **54.7** | **166** | 52.1 | 175 | 55.4 | 164 | **54.7** | **166** | 52.1 | 175 |
| 435.gromacs | 170 | 41.9 | 170 | 41.9 | **170** | **41.9** | 170 | 41.9 | 170 | 41.9 | **170** | **41.9** |
| 436.cactusADM | **10.1** | **1190** | 10.0 | 1190 | 10.3 | 1160 | **10.1** | **1190** | 10.0 | 1190 | 10.3 | 1160 |
| 437.leslie3d | 33.1 | 284 | 31.4 | 299 | **31.8** | **296** | 33.1 | 284 | 31.4 | 299 | **31.8** | **296** |
| 444.namd | 260 | 30.8 | **260** | **30.8** | 260 | 30.8 | **254** | **31.6** | 254 | 31.6 | 254 | 31.5 |
| 447.dealII | **183** | **62.5** | 183 | 62.5 | 183 | 62.4 | **183** | **62.5** | 183 | 62.5 | 183 | 62.4 |
| 450.soplex | **191** | **43.6** | 191 | 43.6 | 192 | 43.4 | **191** | **43.6** | 191 | 43.6 | 192 | 43.4 |
| 453.povray | 88.3 | 60.3 | 87.8 | 60.6 | **88.0** | **60.4** | 77.6 | 68.5 | **77.7** | **68.4** | 77.9 | 68.3 |
| 454.calculix | 135 | 61.2 | 135 | 61.1 | **135** | **61.2** | 125 | 66.2 | 124 | 66.3 | **125** | **66.2** |
| 459.GemsFDTD | 69.2 | 153 | 67.7 | 157 | **68.4** | **155** | 58.8 | 180 | **58.5** | **181** | 58.3 | 182 |
| 465.tonto | **259** | **37.9** | 266 | 37.0 | 256 | 38.4 | 169 | 58.4 | 169 | 58.1 | **169** | **58.3** |
| 470.lbm | 5.39 | 2550 | 5.50 | 2500 | **5.44** | **2530** | 5.39 | 2550 | 5.50 | 2500 | **5.44** | **2530** |
| 481.wrf | 99.7 | 112 | **99.8** | **112** | 99.8 | 112 | 99.7 | 112 | **99.8** | **112** | 99.8 | 112 |
| 482.sphinx3 | 319 | 61.2 | **316** | **61.6** | 316 | 61.7 | 319 | 61.2 | **316** | **61.6** | 316 | 61.7 |

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

## Operating System Notes

```
Stack size set to unlimited using "ulimit -s unlimited"
```

## Platform Notes

```
BIOS configuration:
 Choose Operating Mode set to Maximum Performance
 Hyper-Threading set to Disable
 Per Core P-state set to Disable
 DCA set to Disable
 Patrol Scrub 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)
```

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## Platform Notes (Continued)

```
running on SN850-01 Wed Sep 13 10:15:21 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) Gold 5120 CPU @ 2.20GHz
      4 "physical id"s (chips)
      56 "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 : 14
      siblings  : 14
      physical 0: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14
      physical 1: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14
      physical 2: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14
      physical 3: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14
   cache size : 19712 KB

From /proc/meminfo
   MemTotal:       1584968300 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"
      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 Sep 13 10:14

SPEC is set to: /home/cpu2006-1.2-ic17.0
   Filesystem     Type  Size  Used Avail Use% Mounted on
   /dev/sda4      xfs   836G  294G  543G  36% /home
```

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## Platform Notes (Continued)

```
 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, configured at 2400 MHz

 (End of data from sysinfo program)
```

## General Notes

```
Environment variables set by runspec before the start of the run:
KMP_AFFINITY = "granularity=fine,compact"
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"
OMP_NUM_THREADS = "56"

 Binaries compiled on a system with 1x Intel Core i7-4790 CPU + 32GB RAM
 memory using Redhat Enterprise Linux 7.2
 Transparent Huge Pages disabled with:
 echo never > /sys/kernel/mm/transparent_hugepage/enabled
```

## 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

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## Base Portability Flags (Continued)

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 -parallel -qopt-prefetch

C++ benchmarks:
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch

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

Benchmarks using both Fortran and C:
-xCORE-AVX2 -ipo -O3 -no-prec-div -parallel -qopt-prefetch

## Peak Compiler Invocation

C benchmarks:
icc -m64

C++ benchmarks:
icpc -m64

Fortran benchmarks:
ifort -m64

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

## Peak Portability Flags

Same as Base Portability Flags

## 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

447.dealII: basepeak = yes

450.soplex: basepeak = yes

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 -ansi-alias

Fortran benchmarks:

410.bwaves: basepeak = yes

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: basepeak = yes

459.GemsFDTD: -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 -qopt-prefetch -parallel

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) -inline-calloc -qopt-malloc-options=3 -auto -unroll4

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# Peak Optimization Flags (Continued)

Benchmarks using both Fortran and C:

435.gromacs: `basepeak = yes`

436.cactusADM: `basepeak = yes`

454.calculix: `-xCORE-AVX2 -ipo -O3 -no-prec-div -auto-ilp32`

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.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.xml`
`http://www.spec.org/cpu2006/flags/Lenovo-Platform-Flags-V1.2-SKL-C.20171004.xml`


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