# SPEC® CFP2006 Result

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## Lenovo Group Limited

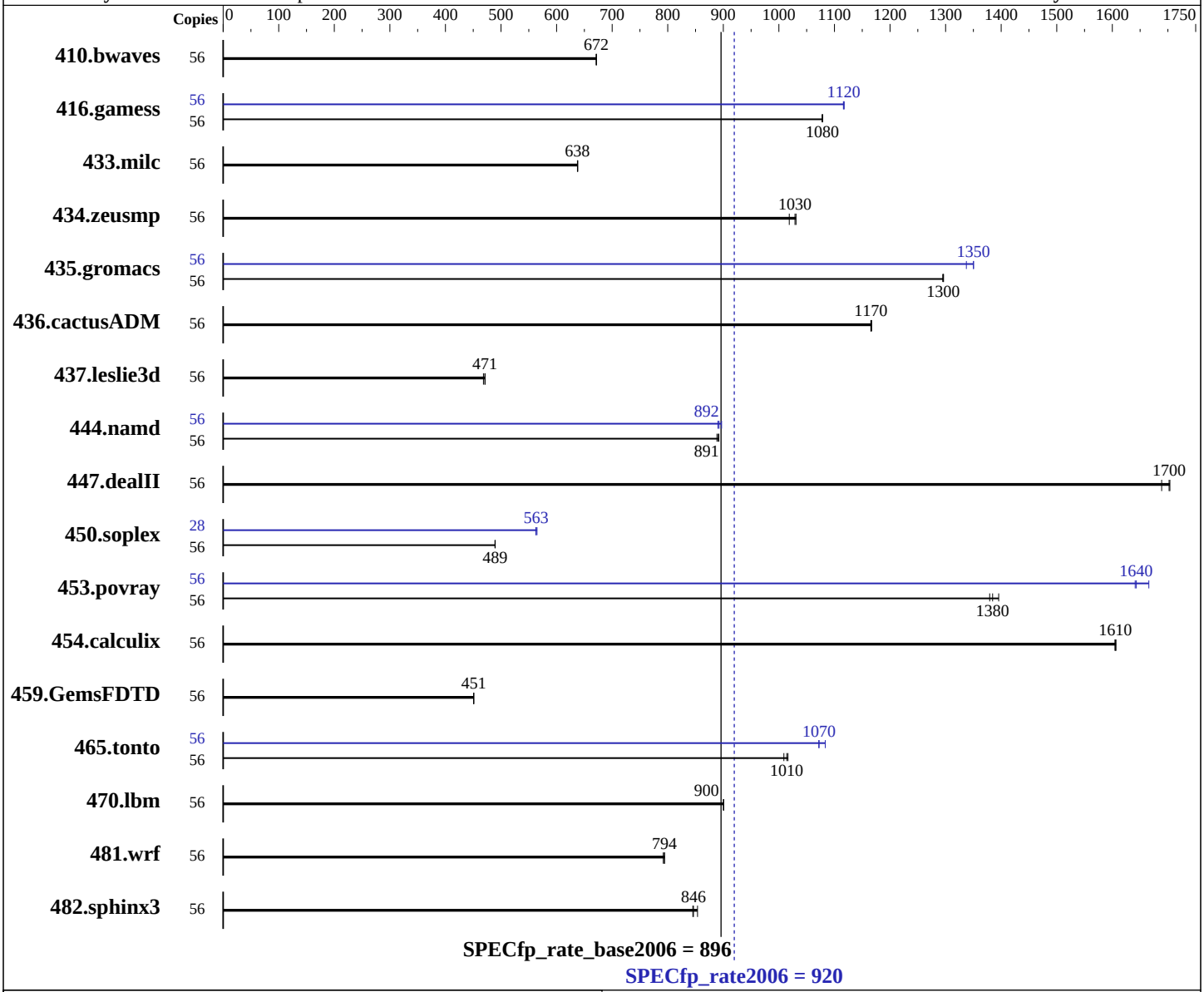
Lenovo Flex System x240 M5
(2.40 GHz, Intel Xeon E5-2680 v4)

SPECfp®_rate2006 = 920

SPECfp_rate_base2006 = 896

**CPU2006 license:** 9017
**Test sponsor:** Lenovo Group Limited
**Tested by:** Lenovo Group Limited

**Test date:** Apr-2016
**Hardware Availability:** Mar-2016
**Software Availability:** Dec-2015




## Hardware

| | |
|---|---|
| CPU Name: | Intel Xeon E5-2680 v4 |
| CPU Characteristics: | Intel Turbo Boost Technology up to 3.30 GHz |
| CPU MHz: | 2400 |
| FPU: | Integrated |
| CPU(s) enabled: | 28 cores, 2 chips, 14 cores/chip, 2 threads/core |
| CPU(s) orderable: | 1,2 chips |
| Primary Cache: | 32 KB I + 32 KB D on chip per core |
| Secondary Cache: | 256 KB I+D on chip per core |

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## Software

| | |
|---|---|
| Operating System: | SUSE Linux Enterprise Server 12 SP1 (x86_64)<br>Kernel 3.12.49-11-default |
| Compiler: | C/C++: Version 16.0.0.101 of Intel C++ Studio XE for Linux;<br>Fortran: Version 16.0.0.101 of Intel Fortran Studio XE for Linux |
| Auto Parallel: | No |
| File System: | xfs |
| System State: | Run level 3 (multi-user) |

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L3 Cache: 35 MB I+D on chip per chip
Other Cache: None
Memory: 256 GB (16 x 16 GB 2Rx4 PC4-2400T-R)
Disk Subsystem: 2 x 300 GB 10000 RPM SAS, RAID 0
Other Hardware: None

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

## Results Table

| Benchmark | Base | | | | | | | Peak | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Copies | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio | Copies | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio |
| 410.bwaves | 56 | 1133 | 672 | 1134 | 671 | **1133** | **672** | 56 | 1133 | 672 | 1134 | 671 | **1133** | **672** |
| 416.gamess | 56 | 1016 | 1080 | 1017 | 1080 | **1017** | **1080** | 56 | 981 | 1120 | **982** | **1120** | 982 | 1120 |
| 433.milc | 56 | 806 | 637 | **806** | **638** | 806 | 638 | 56 | 806 | 637 | **806** | **638** | 806 | 638 |
| 434.zeusmp | 56 | **495** | **1030** | 494 | 1030 | 500 | 1020 | 56 | **495** | **1030** | 494 | 1030 | 500 | 1020 |
| 435.gromacs | 56 | **309** | **1300** | 308 | 1300 | 309 | 1290 | 56 | 299 | 1340 | **296** | **1350** | 296 | 1350 |
| 436.cactusADM | 56 | 573 | 1170 | 574 | 1170 | **574** | **1170** | 56 | 573 | 1170 | 574 | 1170 | **574** | **1170** |
| 437.leslie3d | 56 | 1124 | 468 | **1117** | **471** | 1117 | 471 | 56 | 1124 | 468 | **1117** | **471** | 1117 | 471 |
| 444.namd | 56 | 503 | 892 | **504** | **891** | 505 | 888 | 56 | 504 | 890 | 501 | 897 | **503** | **892** |
| 447.dealII | 56 | 379 | 1690 | 376 | 1700 | **376** | **1700** | 56 | 379 | 1690 | 376 | 1700 | **376** | **1700** |
| 450.soplex | 56 | **955** | **489** | 954 | 490 | 955 | 489 | 28 | 413 | 565 | **415** | **563** | 415 | 563 |
| 453.povray | 56 | **215** | **1380** | 216 | 1380 | 213 | 1400 | 56 | **181** | **1640** | 179 | 1670 | 182 | 1640 |
| 454.calculix | 56 | **288** | **1610** | 288 | 1610 | 288 | 1600 | 56 | **288** | **1610** | 288 | 1610 | 288 | 1600 |
| 459.GemsFDTD | 56 | **1317** | **451** | 1319 | 451 | 1317 | 451 | 56 | **1317** | **451** | 1319 | 451 | 1317 | 451 |
| 465.tonto | 56 | 542 | 1020 | **543** | **1010** | 546 | 1010 | 56 | **514** | **1070** | 509 | 1080 | 514 | 1070 |
| 470.lbm | 56 | **855** | **900** | 855 | 900 | 854 | 901 | 56 | **855** | **900** | 855 | 900 | 854 | 901 |
| 481.wrf | 56 | **788** | **794** | 790 | 792 | 788 | 794 | 56 | **788** | **794** | 790 | 792 | 788 | 794 |
| 482.sphinx3 | 56 | 1279 | 854 | 1291 | 845 | **1290** | **846** | 56 | 1279 | 854 | 1291 | 845 | **1290** | **846** |

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"
Transparent Huge Pages enabled with:
 echo always > /sys/kernel/mm/transparent_hugepage/enabled
Filesystem page cache cleared with:
 echo 1 > /proc/sys/vm/drop_caches
```

## Platform Notes

```
BIOS Configuration:
 Operating Mode set to "Maximum Performance"
 COD Preference set to Enable
Sysinfo program /home/cpu2006-1.2-ic16.0/config/sysinfo.rev6914
$Rev: 6914 $ $Date:: 2014-06-25 #$ e3fbb8667b5a285932ceab81e28219e1
running on x240m5-cpu2006 Thu Apr 14 17:04:02 2016

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) CPU E5-2680 v4@ 2.40GHz
      2 "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  : 28
      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
   cache size : 17920 KB

From /proc/meminfo
   MemTotal:       263824888 kB
   HugePages_Total:       0
   Hugepagesize:       2048 kB

From /etc/*release* /etc/*version*
   SuSE-release:
      SUSE Linux Enterprise Server 12 (x86_64)
      VERSION = 12
      PATCHLEVEL = 1
      # 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-SP1"
      VERSION_ID="12.1"
      PRETTY_NAME="SUSE Linux Enterprise Server 12 SP1"
      ID="sles"
      ANSI_COLOR="0;32"
      CPE_NAME="cpe:/o:suse:sles:12:sp1"

uname -a:
   Linux x240m5-cpu2006 3.12.49-11-default #1 SMP Wed Nov 11 20:52:43 UTC 2015
   (8d714a0) x86_64 x86_64 x86_64 GNU/Linux

run-level 3 Apr 14 06:07
```

Continued on next page

## Platform Notes (Continued)

```
SPEC is set to: /home/cpu2006-1.2-ic16.0
   Filesystem     Type  Size  Used Avail Use% Mounted on
   /dev/sda4      xfs   515G  7.1G  508G   2% /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 -[C4E123H-2.10]- 03/25/2016
  Memory:
   16x Hynix HMA42GR7AFR4N-UH 16 GB 2 rank 2400 MHz
   8x NO DIMM Unknown

(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-ic16.0/libs/32:/home/cpu2006-1.2-ic16.0/libs/64:/home/cpu2006-1.2-ic16.0/sh"

 Binaries compiled on a system with 1x Intel Core i5-4670K CPU + 32GB
 memory using RedHat EL 7.1
 Transparent Huge Pages enabled with:
 echo always > /sys/kernel/mm/transparent_hugepage/enabled
 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
```

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 -opt-prefetch -auto-p32
-ansi-alias -opt-mem-layout-trans=3

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

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

Benchmarks using both Fortran and C:
-xCORE-AVX2 -ipo -O3 -no-prec-div -opt-prefetch -auto-p32
-ansi-alias -opt-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_2016/linux/compiler/lib/ia32_lin

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## Peak Compiler Invocation (Continued)

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

447.dealII: basepeak = yes

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# Peak Optimization Flags (Continued)

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

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

Fortran benchmarks:

410.bwaves: basepeak = yes

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

434.zeusmp: basepeak = yes

437.leslie3d: basepeak = yes

459.GemsFDTD: basepeak = yes

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

Benchmarks using both Fortran and C:

435.gromacs: -xCORE-AVX2(pass 2) -prof-gen:threadsafe(pass 1) -ipo(pass 2) -O3(pass 2) -no-prec-div(pass 2) -par-num-threads=1(pass 1) -opt-mem-layout-trans=3(pass 2) -prof-use(pass 2) -opt-prefetch -auto-ilp32

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-ic16.0-official-linux64.html
http://www.spec.org/cpu2006/flags/Lenovo-Platform-Flags-V1.2-BDW-B.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2006/flags/Intel-ic16.0-official-linux64.xml
http://www.spec.org/cpu2006/flags/Lenovo-Platform-Flags-V1.2-BDW-B.xml

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