# SPEC® CFP2006 Result

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## Lenovo Group Limited

$SPECfp^{®}\_rate2006 = 479$

Lenovo Flex System x240 M5
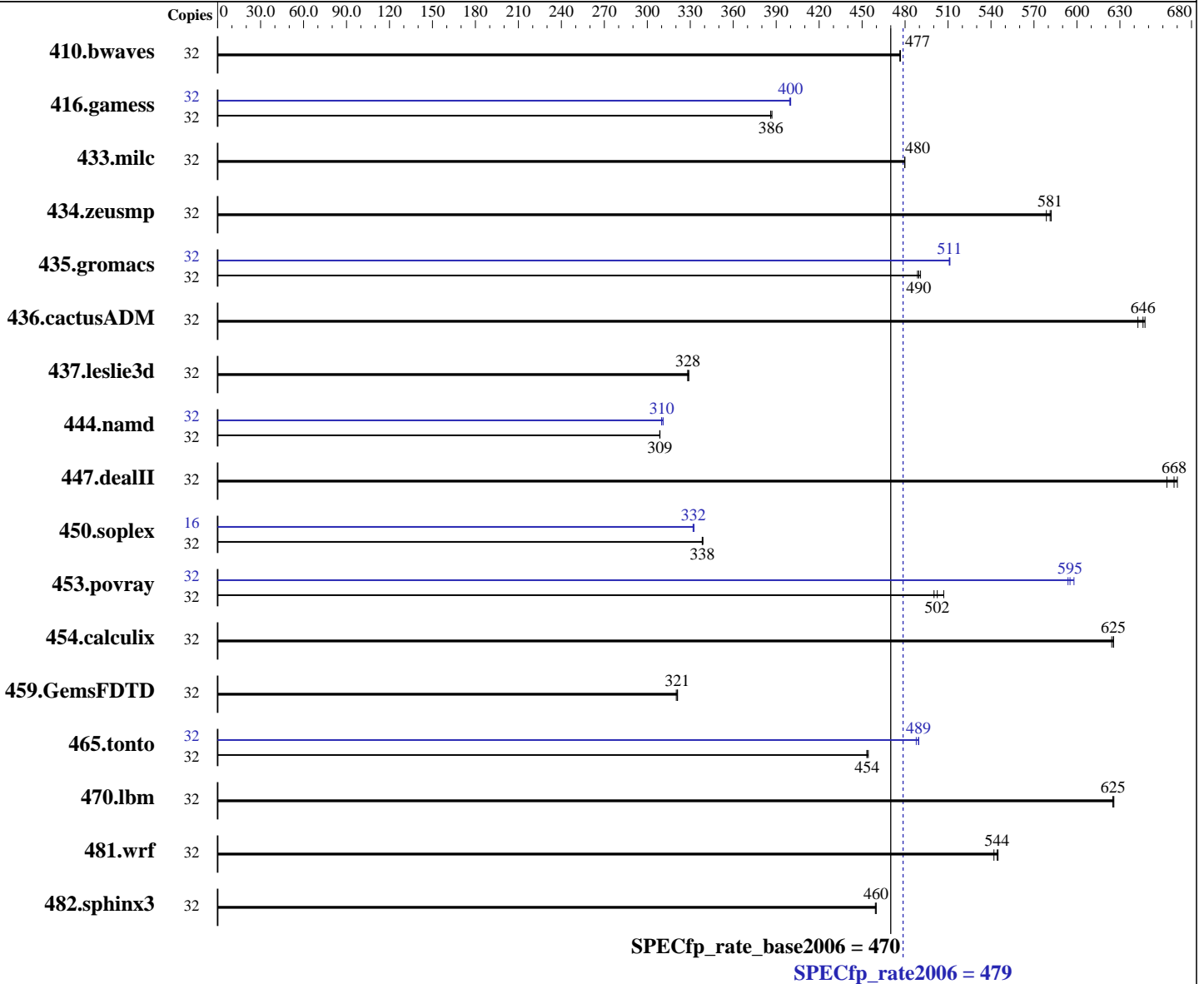(1.60 GHz, Intel Xeon E5-2608L v4)

$SPECfp\_rate\_base2006 = 470$

| | |
|---|---|
| **CPU2006 license:** 9017 | **Test date:** Jun-2016 |
| **Test sponsor:** Lenovo Group Limited | **Hardware Availability:** Mar-2016 |
| **Tested by:** Lenovo Group Limited | **Software Availability:** Dec-2015 |



| Benchmark | Copies | Result |
|---|---|---|
| 410.bwaves | 32 | 477 |
| 416.gamess | 32 | 400 |
| 416.gamess | 32 | 386 |
| 433.milc | 32 | 480 |
| 434.zeusmp | 32 | 581 |
| 435.gromacs | 32 | 511 |
| 435.gromacs | 32 | 490 |
| 436.cactusADM | 32 | 646 |
| 437.leslie3d | 32 | 328 |
| 444.namd | 32 | 310 |
| 444.namd | 32 | 309 |
| 447.dealII | 32 | 668 |
| 450.soplex | 16 | 332 |
| 450.soplex | 32 | 338 |
| 453.povray | 32 | 595 |
| 453.povray | 32 | 502 |
| 454.calculix | 32 | 625 |
| 459.GemsFDTD | 32 | 321 |
| 465.tonto | 32 | 489 |
| 465.tonto | 32 | 454 |
| 470.lbm | 32 | 625 |
| 481.wrf | 32 | 544 |
| 482.sphinx3 | 32 | 460 |

SPECfp_rate_base2006 = 470

SPECfp_rate2006 = 479

## Hardware

| | |
|---|---|
| CPU Name: | Intel Xeon E5-2608L v4 |
| CPU Characteristics: | Intel Turbo Boost Technology up to 1.70 GHz |
| CPU MHz: | 1600 |
| FPU: | Integrated |
| CPU(s) enabled: | 16 cores, 2 chips, 8 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 |

*Continued on next page*

## Software

| | |
|---|---|
| Operating System: | SUSE Linux Enterprise Server 12 SP1 (x86_64) Kernel 3.12.49-11-default |
| Compiler: | C/C++: Version 16.0.0.101 of Intel C++ Studio XE for Linux; 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: | 20 MB I+D on chip per chip | Base Pointers: | 32/64-bit |
| Other Cache: | None | Peak Pointers: | 32/64-bit |
| Memory: | 256 GB (16 x 16 GB 2Rx4 PC4-2400T-R, running at 1866 MHz) | Other Software: | None |
| Disk Subsystem: | 2 x 600 GB 15000 RPM SAS, RAID 1 | | |
| Other Hardware: | None | | |

## Results Table

| Benchmark | Base | | | | | | Peak | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Copies | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio | Copies | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio |
| 410.bwaves | 32 | 912 | 477 | **913** | **477** | 913 | 476 | 32 | 912 | 477 | **913** | **477** | 913 | 476 |
| 416.gamess | 32 | **1622** | **386** | 1619 | 387 | 1623 | 386 | 32 | 1566 | 400 | 1569 | 399 | **1566** | **400** |
| 433.milc | 32 | **612** | **480** | 612 | 480 | 612 | 480 | 32 | **612** | **480** | 612 | 480 | 612 | 480 |
| 434.zeusmp | 32 | 503 | 579 | **501** | **581** | 500 | 582 | 32 | 503 | 579 | **501** | **581** | 500 | 582 |
| 435.gromacs | 32 | 468 | 489 | **467** | **490** | 466 | 491 | 32 | 447 | 511 | 447 | 511 | **447** | **511** |
| 436.cactusADM | 32 | **592** | **646** | 595 | 643 | 591 | 648 | 32 | **592** | **646** | 595 | 643 | 591 | 648 |
| 437.leslie3d | 32 | 914 | 329 | **916** | **328** | 916 | 328 | 32 | 914 | 329 | **916** | **328** | 916 | 328 |
| 444.namd | 32 | **831** | **309** | 831 | 309 | 831 | 309 | 32 | **828** | **310** | 825 | 311 | 828 | 310 |
| 447.dealII | 32 | 552 | 663 | **548** | **668** | 546 | 670 | 32 | 552 | 663 | **548** | **668** | 546 | 670 |
| 450.soplex | 32 | 789 | 338 | **789** | **338** | 787 | 339 | 16 | **402** | **332** | 401 | 333 | 402 | 332 |
| 453.povray | 32 | **339** | **502** | 336 | 507 | 340 | 500 | 32 | 285 | 598 | **286** | **595** | 287 | 594 |
| 454.calculix | 32 | 422 | 626 | 423 | 624 | **422** | **625** | 32 | 422 | 626 | 423 | 624 | **422** | **625** |
| 459.GemsFDTD | 32 | **1058** | **321** | 1060 | 320 | 1057 | 321 | 32 | **1058** | **321** | 1060 | 320 | 1057 | 321 |
| 465.tonto | 32 | 695 | 453 | 693 | 454 | **694** | **454** | 32 | **643** | **489** | 646 | 488 | 643 | 490 |
| 470.lbm | 32 | 703 | 626 | **703** | **625** | 703 | 625 | 32 | 703 | 626 | **703** | **625** | 703 | 625 |
| 481.wrf | 32 | 659 | 542 | **657** | **544** | 656 | 545 | 32 | 659 | 542 | **657** | **544** | 656 | 545 |
| 482.sphinx3 | 32 | 1358 | 459 | 1356 | 460 | **1356** | **460** | 32 | 1358 | 459 | 1356 | 460 | **1356** | **460** |

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

# SPEC CFP2006 Result
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## Lenovo Group Limited

Lenovo Flex System x240 M5
(1.60 GHz, Intel Xeon E5-2608L v4)

SPECfp_rate2006 = 479

SPECfp_rate_base2006 = 470

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

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

## Platform Notes

```
BIOS Configuration:
 Operating Mode set to "Maximum Performance"
 COD Preference set to Disabled
Sysinfo program /home/cpu2006-1.2-ic16.0/config/sysinfo.rev6914
$Rev: 6914 $ $Date:: 2014-06-25 #$ e3fbb8667b5a285932ceab81e28219e1
running on Bonnevil-01 Sat Jun 18 00:57:48 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 E5-2608L v4 @ 1.60GHz
      2 "physical id"s (chips)
      32 "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 : 8
      siblings  : 16
      physical 0: cores 0 1 2 3 4 5 6 7
      physical 1: cores 0 1 2 3 4 5 6 7
   cache size : 20480 KB

From /proc/meminfo
   MemTotal:        263829404 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 Bonnevil-01 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 Jun 17 09:25
```

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### Platform Notes (Continued)

```
SPEC is set to: /home/cpu2006-1.2-ic16.0
   Filesystem      Type   Size   Used  Avail  Use% Mounted on
   /dev/sda4        xfs    502G   6.5G   496G    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 -[C4E124J-2.10]- 05/05/2016
   Memory:
   16x Hynix HMA42GR7AFR4N-UH 16 GB 2 rank 2400 MHz, configured at 1867 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

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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 -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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