# SPEC® CFP2006 Result

## Lenovo Group Limited

$SPECfp^{®}\_rate2006 =$    1780

Lenovo System x3850 X6
(2.10 GHz, Intel Xeon E7-4850 v4)

$SPECfp\_rate\_base2006 =$   1740

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

**Test date:** Jul-2016
**Hardware Availability:** Jun-2016
**Software Availability:** Mar-2016

| Benchmark | Copies | Result |
|---|---|---|
| 410.bwaves | 128 | 1420 |
| 416.gamess | 128 | 2210 |
| 416.gamess | 128 | 2150 |
| 433.milc | 128 | 1320 |
| 434.zeusmp | 128 | 1950 |
| 435.gromacs | 128 | 2680 |
| 435.gromacs | 128 | 2550 |
| 436.cactusADM | 128 | 2100 |
| 437.leslie3d | 128 | 916 |
| 444.namd | 128 | 1740 |
| 444.namd | 128 | 1720 |
| 447.dealII | 128 | 3270 |
| 450.soplex | 64 | 1050 |
| 450.soplex | 128 | 974 |
| 453.povray | 128 | 3320 |
| 453.povray | 128 | 2770 |
| 454.calculix | 128 | 2850 |
| 459.GemsFDTD | 128 | 834 |
| 465.tonto | 128 | 2060 |
| 465.tonto | 128 | 1950 |
| 470.lbm | 128 | 1660 |
| 481.wrf | 128 | 1620 |
| 482.sphinx3 | 128 | 1630 |

**SPECfp_rate_base2006 = 1740**

**SPECfp_rate2006 = 1780**

## Hardware

CPU Name:   Intel Xeon E7-4850 v4
CPU Characteristics:   Intel Turbo Boost Technology up to 2.80 GHz
CPU MHz:   2100
FPU:   Integrated
CPU(s) enabled:   64 cores, 4 chips, 16 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:   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 16.0.2.181 of Intel C++ Studio XE for Linux;
Fortran: Version 16.0.2.181 of Intel Fortran Studio XE for Linux
Auto Parallel:   No
File System:   xfs
System State:   Run level 3 (multi-user)

**Continued on next page**

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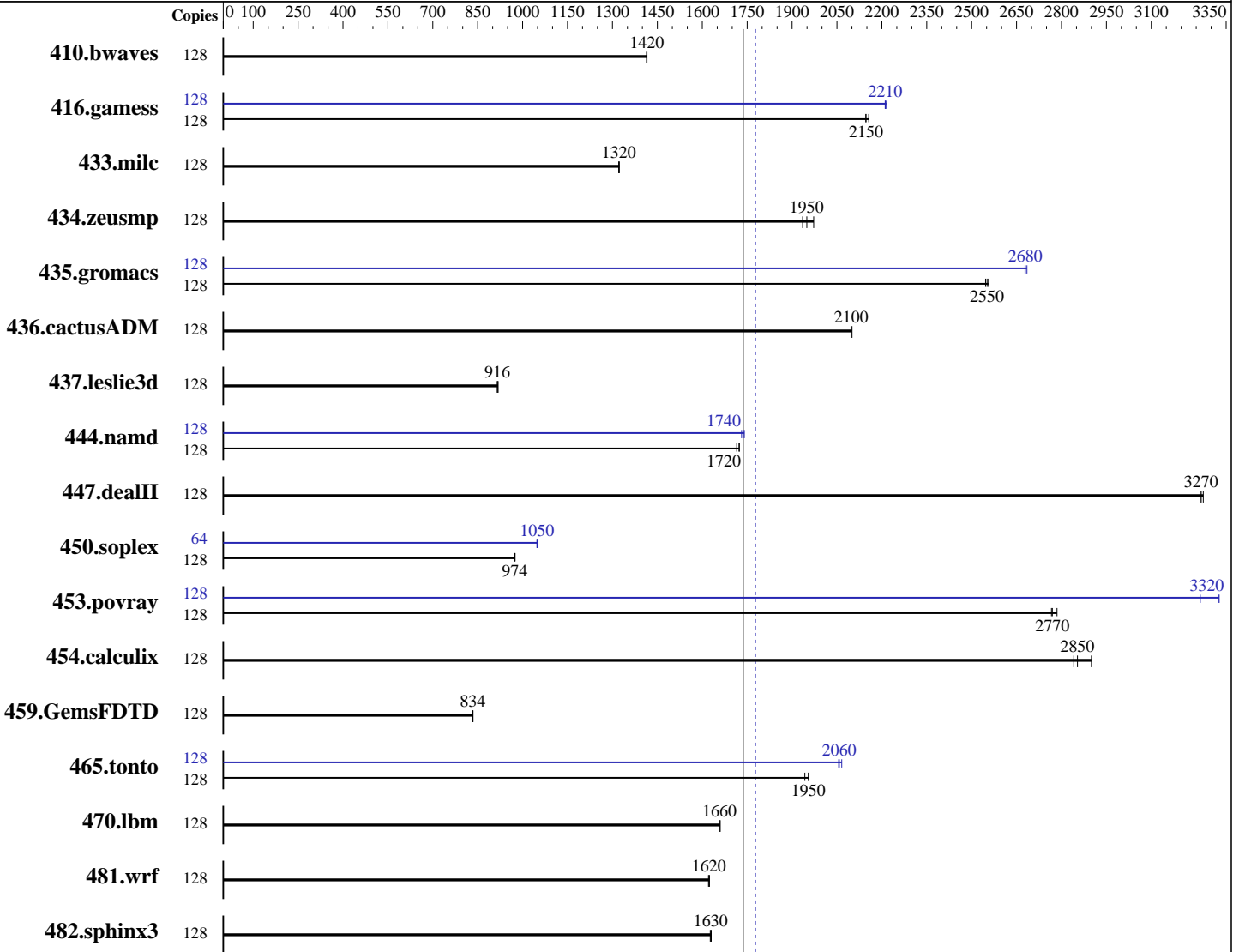$SPECfp\_rate2006 =$ 1780

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| | |
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| | | | |
|---|---|---|---|
| L3 Cache: | 40 MB I+D on chip per chip | Base Pointers: | 32/64-bit |
| Other Cache: | None | Peak Pointers: | 32/64-bit |
| Memory: | 512 GB (32 x 16 GB 2Rx4 PC4-2133P-R, running at 1333 MHz) | Other Software: | None |
| Disk Subsystem: | 1 x 800 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 | 128 | 1231 | 1410 | **1229** | **1420** | 1229 | 1420 | 128 | 1231 | 1410 | **1229** | **1420** | 1229 | 1420 |
| 416.gamess | 128 | 1168 | 2150 | **1167** | **2150** | 1162 | 2160 | 128 | 1131 | 2220 | **1133** | **2210** | 1133 | 2210 |
| 433.milc | 128 | 888 | 1320 | 889 | 1320 | **889** | **1320** | 128 | 888 | 1320 | 889 | 1320 | **889** | **1320** |
| 434.zeusmp | 128 | 602 | 1940 | **598** | **1950** | 591 | 1970 | 128 | 602 | 1940 | **598** | **1950** | 591 | 1970 |
| 435.gromacs | 128 | 359 | 2550 | **358** | **2550** | 358 | 2560 | 128 | 340 | 2680 | 341 | 2680 | **341** | **2680** |
| 436.cactusADM | 128 | 729 | 2100 | 728 | 2100 | **729** | **2100** | 128 | 729 | 2100 | 728 | 2100 | **729** | **2100** |
| 437.leslie3d | 128 | 1314 | 915 | **1313** | **916** | 1310 | 918 | 128 | 1314 | 915 | **1313** | **916** | 1310 | 918 |
| 444.namd | 128 | 599 | 1720 | 595 | 1720 | **596** | **1720** | 128 | 593 | 1730 | **591** | **1740** | 590 | 1740 |
| 447.dealII | 128 | 447 | 3270 | **448** | **3270** | 449 | 3260 | 128 | 447 | 3270 | **448** | **3270** | 449 | 3260 |
| 450.soplex | 128 | 1095 | 975 | 1097 | 973 | **1096** | **974** | 64 | **509** | **1050** | 508 | 1050 | 509 | 1050 |
| 453.povray | 128 | 245 | 2790 | **246** | **2770** | 246 | 2770 | 128 | **205** | **3320** | 209 | 3260 | 205 | 3330 |
| 454.calculix | 128 | 364 | 2900 | **370** | **2850** | 372 | 2840 | 128 | 364 | 2900 | **370** | **2850** | 372 | 2840 |
| 459.GemsFDTD | 128 | 1627 | 834 | 1631 | 833 | **1629** | **834** | 128 | 1627 | 834 | 1631 | 833 | **1629** | **834** |
| 465.tonto | 128 | **644** | **1950** | 648 | 1940 | 644 | 1960 | 128 | **612** | **2060** | 610 | 2070 | 613 | 2060 |
| 470.lbm | 128 | **1061** | **1660** | 1059 | 1660 | 1061 | 1660 | 128 | **1061** | **1660** | 1059 | 1660 | 1061 | 1660 |
| 481.wrf | 128 | 882 | 1620 | 880 | 1620 | **881** | **1620** | 128 | 882 | 1620 | 880 | 1620 | **881** | **1620** |
| 482.sphinx3 | 128 | **1532** | **1630** | 1530 | 1630 | 1534 | 1630 | 128 | **1532** | **1630** | 1530 | 1630 | 1534 | 1630 |

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

## Lenovo Group Limited

Lenovo System x3850 X6
(2.10 GHz, Intel Xeon E7-4850 v4)

$SPECfp\_rate2006 = $ 1780

$SPECfp\_rate\_base2006 = $ 1740

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

**Test date:** Jul-2016
**Hardware Availability:** Jun-2016
**Software Availability:** Mar-2016

### 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 Draco-01 Fri Jul 22 21:06:48 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 E7-4850 v4 @ 2.10GHz
      4 "physical id"s (chips)
      128 "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 : 16
      siblings  : 32
      physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
      physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
      physical 2: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
      physical 3: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
   cache size : 20480 KB

From /proc/meminfo
   MemTotal:       529155136 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 Draco-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
```

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## Platform Notes (Continued)

```
  run-level 3 Jul 22 07:52

  SPEC is set to: /home/cpu2006-1.2-ic16.0
     Filesystem     Type  Size  Used Avail Use% Mounted on
     /dev/sda4      xfs   688G  4.5G  684G   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 -[A9E135CUS-3.10]- 06/16/2016
   Memory:
   32x Hynix HMA42GR7AFR4N-UH 16 GB 2 rank 2400 MHz, configured at 1333 MHz
   64x 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 i7-4790K CPU + 32GB
 memory using RedHat EL 7.2 glibc 2.17
 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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For questions about this result, please contact the tester.
For other inquiries, please contact webmaster@spec.org.

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