# SPEC® CINT2006 Result

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## Lenovo Group Limited

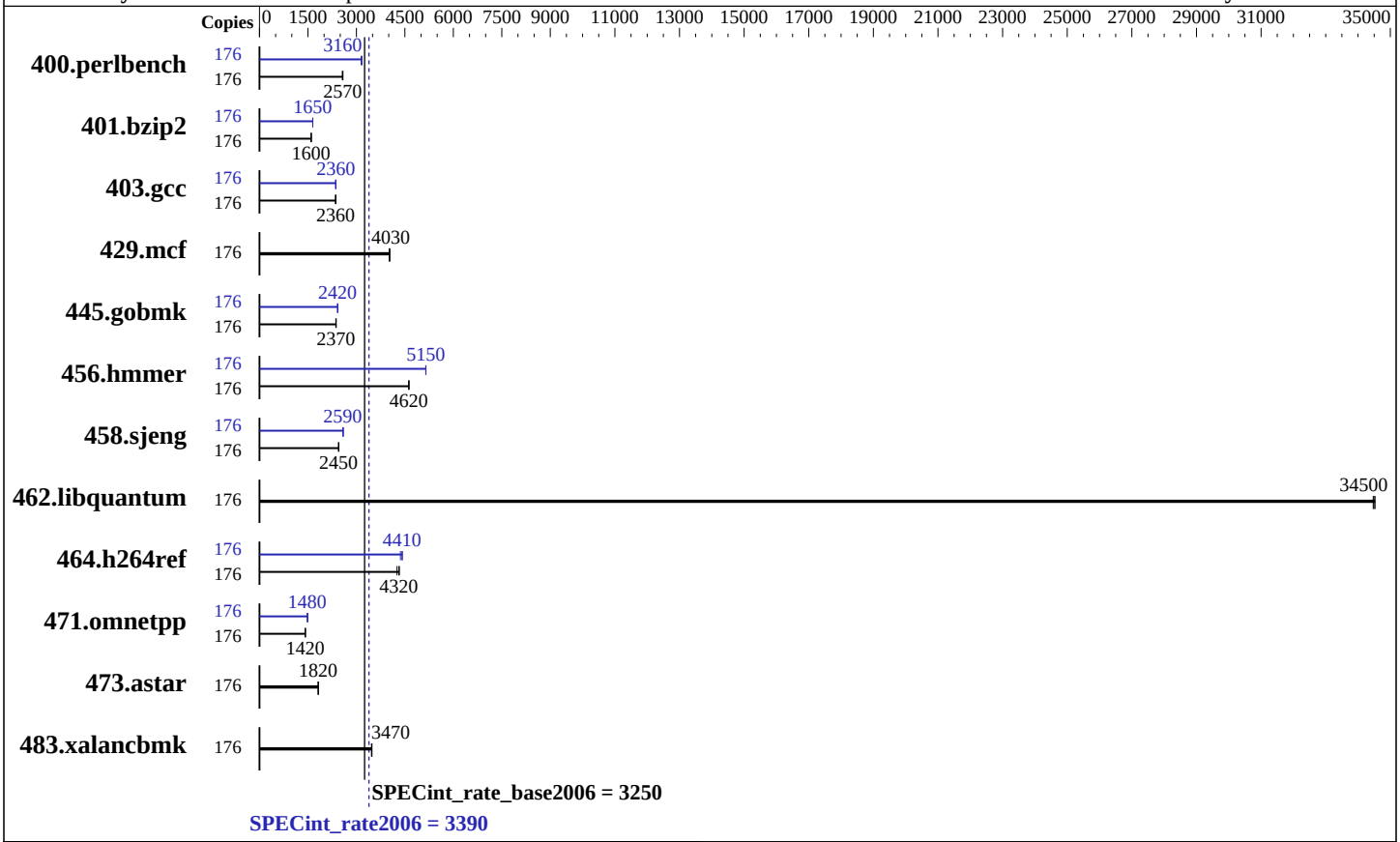
Lenovo System x3850 X6
(Intel Xeon E7-8880 v4, 2.20 GHz)

SPECint®_rate2006 = 3390

SPECint_rate_base2006 = 3250

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

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




## Hardware

| | |
|---|---|
| CPU Name: | Intel Xeon E7-8880 v4 |
| CPU Characteristics: | Intel Turbo Boost Technology up to 3.30 GHz |
| CPU MHz: | 2200 |
| FPU: | Integrated |
| CPU(s) enabled: | 88 cores, 4 chips, 22 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 |
| L3 Cache: | 55 MB I+D on chip per chip |
| Other Cache: | None |
| Memory: | 512 GB (32 x 16 GB 2Rx4 PC4-2133P-R, running at 1600 MHz) |
| Disk Subsystem: | 1 x 800 GB SATA SSD |
| Other Hardware: | None |

## 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 |
| Auto Parallel: | No |
| File System: | xfs |
| System State: | Run level 3 (multi-user) |
| Base Pointers: | 32-bit |
| Peak Pointers: | 32/64-bit |
| Other Software: | Microquill SmartHeap V10.2 |

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## Results Table

| Benchmark | Base | | | | | | | Peak | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Copies | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio | Copies | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio |
| 400.perlbench | 176 | **668** | **2570** | 666 | 2580 | 670 | 2570 | 176 | **544** | **3160** | 547 | 3150 | 543 | 3170 |
| 401.bzip2 | 176 | **1061** | **1600** | 1062 | 1600 | 1060 | 1600 | 176 | **1030** | **1650** | 1030 | 1650 | 1029 | 1650 |
| 403.gcc | 176 | 599 | 2360 | **600** | **2360** | 603 | 2350 | 176 | 602 | 2350 | **599** | **2360** | 599 | 2370 |
| 429.mcf | 176 | 398 | 4030 | **399** | **4030** | 400 | 4020 | 176 | 398 | 4030 | **399** | **4030** | 400 | 4020 |
| 445.gobmk | 176 | 781 | 2360 | 777 | 2380 | **779** | **2370** | 176 | **763** | **2420** | 762 | 2420 | 764 | 2420 |
| 456.hmmer | 176 | **355** | **4620** | 355 | 4630 | 355 | 4620 | 176 | 319 | 5150 | **319** | **5150** | 319 | 5150 |
| 458.sjeng | 176 | 871 | 2450 | 866 | 2460 | **869** | **2450** | 176 | **823** | **2590** | 821 | 2590 | 825 | 2580 |
| 462.libquantum | 176 | 106 | 34500 | 106 | 34500 | **106** | **34500** | 176 | 106 | 34500 | 106 | 34500 | **106** | **34500** |
| 464.h264ref | 176 | **902** | **4320** | 900 | 4330 | 915 | 4260 | 176 | **883** | **4410** | 893 | 4360 | 881 | 4420 |
| 471.omnetpp | 176 | 775 | 1420 | 776 | 1420 | **775** | **1420** | 176 | **741** | **1480** | 738 | 1490 | 744 | 1480 |
| 473.astar | 176 | 678 | 1820 | 680 | 1820 | **679** | **1820** | 176 | 678 | 1820 | 680 | 1820 | **679** | **1820** |
| 483.xalancbmk | 176 | **350** | **3470** | 349 | 3480 | 350 | 3470 | 176 | **350** | **3470** | 349 | 3480 | 350 | 3470 |

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 Draco-02 Wed Aug 10 15:00:35 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 E7-8880 v4 @ 2.20GHz
```

Continued on next page

## Platform Notes (Continued)

```
        4 "physical id"s (chips)
        176 "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 : 22
        siblings  : 44
        physical 0: cores 0 1 2 3 4 5 8 9 10 11 12 16 17 18 19 20 21 24 25 26 27
        28
        physical 1: cores 0 1 2 3 4 5 8 9 10 11 12 16 17 18 19 20 21 24 25 26 27
        28
        physical 2: cores 0 1 2 3 4 5 8 9 10 11 12 16 17 18 19 20 21 24 25 26 27
        28
        physical 3: cores 0 1 2 3 4 5 8 9 10 11 12 16 17 18 19 20 21 24 25 26 27
        28
     cache size : 28160 KB

  From /proc/meminfo
     MemTotal:       529150660 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-02 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 Aug 10 14:49

  SPEC is set to: /home/cpu2006-1.2-ic16.0
     Filesystem     Type  Size  Used Avail Use% Mounted on
     /dev/sda4      xfs   688G  5.1G  683G   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
```

Continued on next page

## Platform Notes (Continued)

```
     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:
    64x NO DIMM Unknown
    32x Samsung M393A2G40DB0-CPB 16 GB 2 rank 2133 MHz, configured at 1600 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-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 -m32 -L/opt/intel/compilers_and_libraries_2016/linux/compiler/lib/ia32_lin
```

C++ benchmarks:

```
icpc -m32 -L/opt/intel/compilers_and_libraries_2016/linux/compiler/lib/ia32_lin
```

## Base Portability Flags

```
    400.perlbench: -D_FILE_OFFSET_BITS=64 -DSPEC_CPU_LINUX_IA32
      401.bzip2: -D_FILE_OFFSET_BITS=64
        403.gcc: -D_FILE_OFFSET_BITS=64
        429.mcf: -D_FILE_OFFSET_BITS=64
      445.gobmk: -D_FILE_OFFSET_BITS=64
      456.hmmer: -D_FILE_OFFSET_BITS=64
      458.sjeng: -D_FILE_OFFSET_BITS=64
  462.libquantum: -D_FILE_OFFSET_BITS=64 -DSPEC_CPU_LINUX
    464.h264ref: -D_FILE_OFFSET_BITS=64
    471.omnetpp: -D_FILE_OFFSET_BITS=64
      473.astar: -D_FILE_OFFSET_BITS=64
  483.xalancbmk: -D_FILE_OFFSET_BITS=64 -DSPEC_CPU_LINUX
```

## Base Optimization Flags

C benchmarks:
```
-xCORE-AVX2 -ipo -O3 -no-prec-div -opt-prefetch
-opt-mem-layout-trans=3
```

C++ benchmarks:
```
-xCORE-AVX2 -ipo -O3 -no-prec-div -opt-prefetch
-opt-mem-layout-trans=3 -Wl,-z,muldefs -L/sh -lsmartheap
```

## Base Other Flags

C benchmarks:

403.gcc: `-Dalloca=_alloca`

## Peak Compiler Invocation

C benchmarks (except as noted below):
```
icc -m32 -L/opt/intel/compilers_and_libraries_2016/linux/compiler/lib/ia32_lin
```

400.perlbench: `icc -m64`

401.bzip2: `icc -m64`

456.hmmer: `icc -m64`

458.sjeng: `icc -m64`

C++ benchmarks:
```
icpc -m32 -L/opt/intel/compilers_and_libraries_2016/linux/compiler/lib/ia32_lin
```

## Peak Portability Flags

400.perlbench: `-D_FILE_OFFSET_BITS=64 -DSPEC_CPU_LP64 -DSPEC_CPU_LINUX_X64`
401.bzip2: `-D_FILE_OFFSET_BITS=64 -DSPEC_CPU_LP64`
403.gcc: `-D_FILE_OFFSET_BITS=64`
429.mcf: `-D_FILE_OFFSET_BITS=64`
445.gobmk: `-D_FILE_OFFSET_BITS=64`
456.hmmer: `-D_FILE_OFFSET_BITS=64 -DSPEC_CPU_LP64`
458.sjeng: `-D_FILE_OFFSET_BITS=64 -DSPEC_CPU_LP64`
462.libquantum: `-D_FILE_OFFSET_BITS=64 -DSPEC_CPU_LINUX`
464.h264ref: `-D_FILE_OFFSET_BITS=64`
471.omnetpp: `-D_FILE_OFFSET_BITS=64`
473.astar: `-D_FILE_OFFSET_BITS=64`

Continued on next page

## Peak Portability Flags (Continued)

483.xalancbmk: -D_FILE_OFFSET_BITS=64 -DSPEC_CPU_LINUX

## Peak Optimization Flags

C benchmarks:

400.perlbench: -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) -auto-ilp32

401.bzip2: -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) -opt-prefetch
-auto-ilp32 -ansi-alias

403.gcc: -xCORE-AVX2 -ipo -O3 -no-prec-div

429.mcf: basepeak = yes

445.gobmk: -xCORE-AVX2(pass 2) -prof-gen:threadsafe(pass 1)
-prof-use(pass 2) -par-num-threads=1(pass 1) -ansi-alias
-opt-mem-layout-trans=3

456.hmmer: -xCORE-AVX2 -ipo -O3 -no-prec-div -unroll2 -auto-ilp32

458.sjeng: -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-ilp32

462.libquantum: basepeak = yes

464.h264ref: -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
-ansi-alias

C++ benchmarks:

471.omnetpp: -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) -ansi-alias
-opt-ra-region-strategy=block -Wl,-z,muldefs
-L/sh -lsmartheap

473.astar: basepeak = yes

Continued on next page

## Peak Optimization Flags (Continued)

483.xalancbmk: basepeak = yes

## Peak Other Flags

C benchmarks:

403.gcc: -Dalloca=_alloca

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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Tested with SPEC CPU2006 v1.2.
Report generated on Tue Sep 6 16:58:04 2016 by SPEC CPU2006 PS/PDF formatter v6932.
Originally published on 6 September 2016.