## Lenovo Group Limited

Lenovo System x3650 M4 HD  
(Intel Xeon E5-2637 v2, 3.50 GHz)

<table>
<thead>
<tr>
<th>SPECfp&lt;sup&gt;®&lt;/sup&gt;2006</th>
<th>96.9</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECfp&lt;sub&gt;base&lt;/sub&gt;2006</td>
<td>93.6</td>
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</tbody>
</table>

**CPU2006 license:** 9017  
**Test date:** Mar-2015  
**Test sponsor:** Lenovo Group Limited  
**Hardware Availability:** Dec-2013  
**Tested by:** Lenovo Group Limited  
**Software Availability:** Sep-2013

### Hardware

<table>
<thead>
<tr>
<th>Component</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU Name</td>
<td>Intel Xeon E5-2637 v2</td>
</tr>
<tr>
<td>CPU Characteristics</td>
<td>Intel Turbo Boost Technology up to 3.80 GHz</td>
</tr>
<tr>
<td>CPU MHz</td>
<td>3500</td>
</tr>
<tr>
<td>FPU</td>
<td>Integrated</td>
</tr>
<tr>
<td>CPU(s) enabled</td>
<td>8 cores, 2 chips, 4 cores/chip, 2 threads/core</td>
</tr>
<tr>
<td>CPU(s) orderable</td>
<td>1.2 chips</td>
</tr>
<tr>
<td>Primary Cache</td>
<td>32 KB I + 32 KB D on chip per core</td>
</tr>
<tr>
<td>Secondary Cache</td>
<td>256 KB I+D on chip per core</td>
</tr>
</tbody>
</table>

### Software

| Operating System     | Red Hat Enterprise Linux Server release 6.4                         |
|                      | (Santiago)                                                          |
|                      | 2.6.32-358.el6.x86_64                                              |
| Compiler             | C/C++: Version 14.0.0.080 of Intel C++ Studio XE for Linux;          |
|                      | Fortran: Version 14.0.0.080 of Intel Fortran Studio XE for Linux    |
| Auto Parallel        | Yes                                                                 |
| File System          | ext4                                                                |

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L3 Cache: 15 MB I+D on chip per chip
Other Cache: None
Memory: 256 GB (16 x 16 GB 2Rx4 PC3-14900R-13, ECC)
Disk Subsystem: 1 x 400 GB SSD, RAID 0
Other Hardware: None

System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: 32/64-bit
Other Software: None

SPECfp2006 = 96.9
SPECfp_base2006 = 93.6

Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
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<tbody>
<tr>
<td>410.bwaves</td>
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<td>417</td>
<td>32.8</td>
<td>414</td>
<td>32.8</td>
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<td>416.gamess</td>
<td>530</td>
<td>36.9</td>
<td>529</td>
<td>37.0</td>
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<td>36.9</td>
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<td>41.3</td>
<td>471</td>
<td>41.6</td>
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<tr>
<td>433.milc</td>
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<td>69.7</td>
<td>132</td>
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<td>69.3</td>
<td>130</td>
<td>70.5</td>
<td>131</td>
<td>70.0</td>
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<tr>
<td>434.zeusmp</td>
<td>61.0</td>
<td>149</td>
<td>61.0</td>
<td>149</td>
<td>61.4</td>
<td>148</td>
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<td>149</td>
<td>61.0</td>
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<tr>
<td>435.gromacs</td>
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<td>48.4</td>
<td>147</td>
<td>48.7</td>
<td>147</td>
<td>48.7</td>
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<td>48.4</td>
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<td>48.7</td>
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<tr>
<td>436.cactusADM</td>
<td>27.5</td>
<td>435</td>
<td>26.6</td>
<td>448</td>
<td>26.8</td>
<td>445</td>
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<td>437.leslie3d</td>
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<td>225</td>
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<td>230</td>
<td>41.0</td>
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<tr>
<td>444.namd</td>
<td>305</td>
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<td>26.3</td>
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<td>447.dealII</td>
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<td>450.soplex</td>
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<td>45.9</td>
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<td>454.calculix</td>
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<td>52.0</td>
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<td>459.GemsFDTD</td>
<td>64.6</td>
<td>164</td>
<td>65.0</td>
<td>163</td>
<td>66.0</td>
<td>161</td>
<td>60.5</td>
<td>175</td>
<td>60.7</td>
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<tr>
<td>465.tonto</td>
<td>221</td>
<td>44.5</td>
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<td>44.4</td>
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<td>44.5</td>
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<td>51.6</td>
<td>190</td>
<td>51.9</td>
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<tr>
<td>470.lbm</td>
<td>36.6</td>
<td>375</td>
<td>35.6</td>
<td>386</td>
<td>35.6</td>
<td>386</td>
<td>36.6</td>
<td>375</td>
<td>35.6</td>
<td>386</td>
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<tr>
<td>481.wrf</td>
<td>123</td>
<td>90.9</td>
<td>123</td>
<td>91.1</td>
<td>121</td>
<td>92.6</td>
<td>123</td>
<td>90.9</td>
<td>123</td>
<td>91.1</td>
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<tr>
<td>482.sphinx3</td>
<td>231</td>
<td>84.5</td>
<td>229</td>
<td>85.1</td>
<td>226</td>
<td>86.1</td>
<td>231</td>
<td>84.5</td>
<td>229</td>
<td>85.1</td>
</tr>
</tbody>
</table>

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"
Zone reclaim mode enabled with:
echo 1 > /proc/sys/vm/zone_reclaim_mode
Intel Idle Driver disabled with the following Linux kernel parameter in /etc/grub.conf:
intel_idle.max_cstate=0

Platform Notes

BIOS setting:
Operating Mode set to Maximum Performance
Sysinfo program /home/SPECcpu-20140116-ic14.0/config/sysinfo.rev6874
$Rev: 6874 $ $Date:: 2013-11-20 #S 654bd3fcf53b06faef0efe54ed011998
running on x3650M4HD Wed Mar 18 09:02:45 2015

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Lenovo Group Limited

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SPECfp2006 = 96.9
SPECfp_base2006 = 93.6

CPU2006 license: 9017
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Platform Notes (Continued)

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 E5-2637 v2 @ 3.50GHz
 2 "physical id"s (chips)
 16 "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 : 4
siblings : 8
physical 0: cores 1 2 3 4
physical 1: cores 1 2 3 4
cache size : 15360 KB

From /proc/meminfo
MemTotal: 264654784 kB
HugePages_Total: 0
Hugepagesize: 2048 kB

/usr/bin/lsb_release -d
Red Hat Enterprise Linux Server release 6.4 (Santiago)

From /etc/*release* /etc/*version*
redhat-release: Red Hat Enterprise Linux Server release 6.4 (Santiago)
system-release: Red Hat Enterprise Linux Server release 6.4 (Santiago)

uname -a:
Linux x3650M4HD 2.6.32-358.el6.x86_64 #1 SMP Tue Jan 29 11:47:41 EST 2013
x86_64 x86_64 x86_64 GNU/Linux

run-level 3 Mar 18 08:56

SPEC is set to: /home/SPECcpu-20140116-ic14.0
Filesystem Type  Size  Used  Avail  Use% Mounted on
/dev/mapper/vg_x3650m4plus-lv_home ext4 309G 223G  77G /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 IBM -[VVE141DUS-1.73]- 07/31/2014
Memory:
8x Not Specified Not Specified
16x Samsung M393B2G70QH0-CMA 16 GB 2 rank 1866 MHz, configured at 1867 MHz

Continued on next page
## Platform Notes (Continued)

(End of data from sysinfo program)

## General Notes

Environment variables set by runspec before the start of the run:

```plaintext
KMP_AFFINITY = "granularity=fine,compact,1,0"
LD_LIBRARY_PATH = "/home/SPECcpu-20140116-ic14.0/libs/32:/home/SPECcpu-20140116-ic14.0/libs/64:/home/SPECcpu-20140116-ic14.0/sh"
OMP_NUM_THREADS = "8"
```

Binaries compiled on a system with 1x Core i7-860 CPU + 8GB memory using RedHat EL 6.4

Transparent Huge Pages enabled with:
```
echo always > /sys/kernel/mm/redhat_transparent_hugepage/enabled
```

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`

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Base Portability Flags (Continued)

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:
- xAVX
- ipo
- O3
- no-prec-div
- parallel
- opt-prefetch
- ansi-alias

C++ benchmarks:
- xAVX
- ipo
- O3
- no-prec-div
- opt-prefetch
- ansi-alias

Fortran benchmarks:
- xAVX
- ipo
- O3
- no-prec-div
- parallel
- opt-prefetch

Benchmarks using both Fortran and C:
- xAVX
- ipo
- O3
- no-prec-div
- parallel
- opt-prefetch
- ansi-alias

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: -xAVX(pass 2) -prof-gen(pass 1) -ipo(pass 2) -O3(pass 2)
- no-prec-div(pass 2) -prof-use(pass 2) -auto-ilp32
- ansi-alias

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Lenovo Group Limited

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SPEC CFP2006 Result

SPECfp2006 = 96.9
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Peak Optimization Flags (Continued)

470.lbm: basepeak = yes
482.sphinx3: basepeak = yes

C++ benchmarks:

444.namd: -xAVX(pass 2) -prof-gen(pass 1) -ipo(pass 2) -O3(pass 2)
           -no-prec-div(pass 2) -prof-use(pass 2) -fno-alias
           -auto-ilp32
447.dealII: basepeak = yes
450.soplex: basepeak = yes
453.povray: -xAVX(pass 2) -prof-gen(pass 1) -ipo(pass 2) -O3(pass 2)
           -no-prec-div(pass 2) -prof-use(pass 2) -unroll4 -ansi-alias

Fortran benchmarks:

410.bwaves: basepeak = yes
416.gamess: -xAVX(pass 2) -prof-gen(pass 1) -ipo(pass 2) -O3(pass 2)
           -no-prec-div(pass 2) -prof-use(pass 2) -unroll2
           -inline-level=0 -scalar-rep-
434.zeusmp: basepeak = yes
437.leslie3d: basepeak = yes
459.GemsFDTD: -xAVX(pass 2) -prof-gen(pass 1) -ipo(pass 2) -O3(pass 2)
           -no-prec-div(pass 2) -prof-use(pass 2) -unroll2
           -inline-level=0 -opt-prefetch -parallel
465.tonto: -xAVX(pass 2) -prof-gen(pass 1) -ipo(pass 2) -O3(pass 2)
           -no-prec-div(pass 2) -prof-use(pass 2) -inline-calloc
           -opt-malloc-options=3 -auto -unroll4

Benchmarks using both Fortran and C:

435.gromacs: basepeak = yes
436.cactusADM: basepeak = yes
454.calculix: -xAVX -ipo -O3 -no-prec-div -auto-ilp32 -ansi-alias
481.wrf: basepeak = yes
**SPEC CFP2006 Result**

**Lenovo Group Limited**

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The flags files that were used to format this result can be browsed at:

- [http://www.spec.org/cpu2006/flags/IBM-Platform-Flags-V1.2-IVB-C.html](http://www.spec.org/cpu2006/flags/IBM-Platform-Flags-V1.2-IVB-C.html)

You can also download the XML flags sources by saving the following links:

- [http://www.spec.org/cpu2006/flags/IBM-Platform-Flags-V1.2-IVB-C.xml](http://www.spec.org/cpu2006/flags/IBM-Platform-Flags-V1.2-IVB-C.xml)

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For other inquiries, please contact webmaster@spec.org.

Tested with SPEC CPU2006 v1.2.
Originally published on  5 May 2015.