### Lenovo Group Limited

**Lenovo System x3950 X6**  
(2.10 GHz, Intel Xeon E7-8870 v4)

<table>
<thead>
<tr>
<th>SPECfp®2006</th>
<th>117</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECfp_base2006</td>
<td>109</td>
</tr>
</tbody>
</table>

**Hardware**

<table>
<thead>
<tr>
<th>Component</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU Name</td>
<td>Intel Xeon E7-8870 v4</td>
</tr>
<tr>
<td>CPU Characteristics</td>
<td>Intel Turbo Boost Technology up to 3.00 GHz</td>
</tr>
<tr>
<td>CPU MHz</td>
<td>2100</td>
</tr>
<tr>
<td>FPU</td>
<td>Integrated</td>
</tr>
<tr>
<td>CPU(s) enabled</td>
<td>160 cores, 8 chips, 20 cores/chip</td>
</tr>
<tr>
<td>CPU(s) orderable</td>
<td>4,8 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**

<table>
<thead>
<tr>
<th>Component</th>
<th>Value</th>
</tr>
</thead>
</table>
| 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 | Yes |
| File System | xfs |
| System State | Run level 3 (multi-user) |

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**Test Sponsor:** Lenovo Group Limited  
**Test Date:** Jul-2016  
**Hardware Availability:** Jun-2016  
**Software Availability:** Dec-2015
Lenovo Group Limited

Lenovo System x3950 X6 (2.10 GHz, Intel Xeon E7-8870 v4)

SPEC CFP2006 Result

CPU2006 license: 9017
Test sponsor: Lenovo Group Limited
Tested by: Lenovo Group Limited
L3 Cache: 50 MB I+D on chip per chip
Other Cache: None
Memory: 1 TB (64 x 16 GB 2Rx4 PC4-2133P-R, running at 1600 MHz)
Disk Subsystem: 2 x 600 GB 15000 RPM SAS, RAID 1
Other Hardware: None
Base Pointers: 64-bit
Peak Pointers: 32/64-bit
Base Pointers: 64-bit
Peak Pointers: 32/64-bit
Other Software: None

Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Seconds Base</th>
<th>Ratio</th>
<th>Seconds Peak</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>410.bwaves</td>
<td>11.7</td>
<td>1170</td>
<td>11.6</td>
<td>1170</td>
</tr>
<tr>
<td>416.gamess</td>
<td>601</td>
<td>32.6</td>
<td>601</td>
<td>32.6</td>
</tr>
<tr>
<td>433.milc</td>
<td>147</td>
<td>62.3</td>
<td>147</td>
<td>62.2</td>
</tr>
<tr>
<td>434.zesmp</td>
<td>65.3</td>
<td>139</td>
<td>64.5</td>
<td>141</td>
</tr>
<tr>
<td>435.gromacs</td>
<td>194</td>
<td>36.7</td>
<td>195</td>
<td>36.6</td>
</tr>
<tr>
<td>436.cactusADM</td>
<td>12.5</td>
<td>957</td>
<td>11.5</td>
<td>1040</td>
</tr>
<tr>
<td>437.leslie3d</td>
<td>41.2</td>
<td>228</td>
<td>41.1</td>
<td>229</td>
</tr>
<tr>
<td>444.namd</td>
<td>338</td>
<td>23.7</td>
<td>304</td>
<td>26.4</td>
</tr>
<tr>
<td>447.dealII</td>
<td>201</td>
<td>56.9</td>
<td>202</td>
<td>56.6</td>
</tr>
<tr>
<td>450.soplex</td>
<td>196</td>
<td>42.5</td>
<td>197</td>
<td>42.3</td>
</tr>
<tr>
<td>453.povray</td>
<td>99.7</td>
<td>53.3</td>
<td>99.9</td>
<td>53.3</td>
</tr>
<tr>
<td>454.caculix</td>
<td>174</td>
<td>47.4</td>
<td>175</td>
<td>47.2</td>
</tr>
<tr>
<td>459.GemsFDTD</td>
<td>86.2</td>
<td>123</td>
<td>84.1</td>
<td>126</td>
</tr>
<tr>
<td>465.tonto</td>
<td>338</td>
<td>29.1</td>
<td>310</td>
<td>31.7</td>
</tr>
<tr>
<td>470.lbm</td>
<td>2.89</td>
<td>4760</td>
<td>3.20</td>
<td>4300</td>
</tr>
<tr>
<td>481.wrf</td>
<td>107</td>
<td>104</td>
<td>106</td>
<td>106</td>
</tr>
<tr>
<td>482.sphinx3</td>
<td>350</td>
<td>55.7</td>
<td>355</td>
<td>54.8</td>
</tr>
</tbody>
</table>

Operating System Notes

Stack size set to unlimited using "ulimit -s unlimited"

Platform Notes

BIOS Configuration:
Operating Mode set to "Maximum Performance"
Hyper-Threading set to Disable
Sysinfo program /home/cpu2006-1.2-ic16.0/config/sysinfo.rev6914
$Rev: 6914 $ $Date:: 2014-06-25 #$ e3fbb8667b5a285932ceab81e28219e1
running on X3950-01-SLES12SP1 Thu Jul 21 23:25:52 2016

This section contains SUT (System Under Test) info as seen by some common utilities. To remove or add to this section, see:

Continued on next page
Lenovo Group Limited

Lenovo System x3950 X6
(2.10 GHz, Intel Xeon E7-8870 v4)

**SPECfp2006** = 117
**SPECfp_base2006** = 109

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

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**Platform Notes (Continued)**

http://www.spec.org/cpu2006/Docs/config.html#sysinfo

From /proc/cpuinfo
- model name: Intel(R) Xeon(R) CPU E7-8870 v4 @ 2.10GHz
- 160 "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: 20
  - siblings: 20
  - physical 0: cores 0 1 2 3 4 8 9 10 11 12 16 17 18 19 20 24 25 26 27 28
  - physical 1: cores 0 1 2 3 4 8 9 10 11 12 16 17 18 19 20 24 25 26 27 28
  - physical 2: cores 0 1 2 3 4 8 9 10 11 12 16 17 18 19 20 24 25 26 27 28
  - physical 3: cores 0 1 2 3 4 8 9 10 11 12 16 17 18 19 20 24 25 26 27 28
  - physical 4: cores 0 1 2 3 4 8 9 10 11 12 16 17 18 19 20 24 25 26 27 28
  - physical 5: cores 0 1 2 3 4 8 9 10 11 12 16 17 18 19 20 24 25 26 27 28
  - physical 6: cores 0 1 2 3 4 8 9 10 11 12 16 17 18 19 20 24 25 26 27 28
  - physical 7: cores 0 1 2 3 4 8 9 10 11 12 16 17 18 19 20 24 25 26 27 28
- cache size: 51200 KB

From /proc/meminfo
- MemTotal: 1058553356 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 X3950-01-SLES12SP1 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 Jul 21 17:54

**SPEC is set to:** /home/cpu2006-1.2-ic16.0

Filesystem Type Size Used Avail Use% Mounted on
/dev/sda4 xfs 512G 6.8G 505G 2% /home

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**Platform Notes (Continued)**

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 -[A9E135CUS-3.10]- 06/16/2016

Memory:
128x NO DIMM Unknown
64x 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:

KMP_AFFINITY = "granularity=fine,compact"

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"

OMP_NUM_THREADS = "160"

Binaries compiled on a system with 1x Intel Core i5-4670K CPU + 32GB memory using RedHat EL 7.1
Transparent Huge Pages disabled with:
echo never > /sys/kernel/mm/transparent_hugepage/enabled

---

**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
```

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Base Portability Flags (Continued)

435.gromacs: -DSPEC_CPU_LP64 -nofor_main
436.cactusADM: -DSPEC_CPU_LP64 -nofor_main
437.leslie3d: -DSPEC_CPU_LP64
444.namd: -DSPEC_CPU_LP64 -nofor_main
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
463.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 -parallel -opt-prefetch
-ansi-alias

C++ benchmarks:
-xCORE-AVX2 -ipo -O3 -no-prec-div -opt-prefetch -ansi-alias

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

Benchmarks using both Fortran and C:
-xCORE-AVX2 -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
Lenovo Group Limited

Lenovo System x3950 X6
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Tested by: Lenovo Group Limited
Software Availability: Dec-2015

Peak Portability Flags

Same as Base Portability Flags

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) -prof-use(pass 2) -fno-alias
  -auto-ilp32
- 447.dealII: basepeak = yes
- 450.soplex: basepeak = yes
- 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) -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: -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 -opt-prefetch -parallel
- 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) -inline-calloc

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Peak Optimization Flags (Continued)

465.tonto (continued):
- opt-malloc-options=3 -auto -unroll4

Benchmarks using both Fortran and C:

435.gromacs: basepeak = yes

436.cactusADM: basepeak = yes

454.calculix: -xCORE-AVX2 -ipo -O3 -no-prec-div -auto-ilp32 -ansi-alias

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 other inquiries, please contact webmaster@spec.org.

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