## Lenovo Global Technology

**ThinkSystem SR850**
*(2.00 GHz, Intel Xeon Platinum 8164)*

### SPECfp®2006 Result

<table>
<thead>
<tr>
<th>SPECfp®2006</th>
<th>141</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECfp_base2006</td>
<td>133</td>
</tr>
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### Hardware

<table>
<thead>
<tr>
<th>Hardware</th>
<th>Operating System</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU Name:</td>
<td>SUSE Linux Enterprise Server 12 SP2 (x86_64)</td>
</tr>
<tr>
<td>CPU Characteristics:</td>
<td>Kernel 4.4.21-69-default</td>
</tr>
<tr>
<td>CPU MHz:</td>
<td>Intel Turbo Boost Technology up to 3.70 GHz</td>
</tr>
<tr>
<td>FPU:</td>
<td>Integrated</td>
</tr>
<tr>
<td>CPU(s) enabled:</td>
<td>104 cores, 4 chips, 26 cores/chip</td>
</tr>
<tr>
<td>CPU(s) orderable:</td>
<td>2.4 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>1 MB I+D on chip per core</td>
</tr>
</tbody>
</table>

### Software

<table>
<thead>
<tr>
<th>Software</th>
<th>Compiler</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating System:</td>
<td>C/C++: Version 17.0.3.191 of Intel C/C++ Compiler for Linux, Fortran: Version 17.0.3.191 of Intel Fortran Compiler for Linux</td>
</tr>
<tr>
<td>Auto Parallel:</td>
<td>Yes</td>
</tr>
<tr>
<td>File System:</td>
<td>xfs</td>
</tr>
<tr>
<td>System State:</td>
<td>Run level 3 (multi-user)</td>
</tr>
</tbody>
</table>

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**Test date:** Aug-2017  
**Hardware Availability:** Aug-2017  
**Software Availability:** Apr-2017
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SPECfp_base2006 = 133

CPU2006 license: 9017
Test sponsor: Lenovo Global Technology
Tested by: Lenovo Global Technology

Test date: Aug-2017
Hardware Availability: Aug-2017
Software Availability: Apr-2017

L3 Cache: 35.75 MB I+D on chip per chip
Other Cache: None
Memory: 1536 GB (48 x 32 GB 2Rx4 PC4-2666V-R)
Disk Subsystem: 1 x 800 GB SATA SSD
Other Hardware: None

Base Pointers: 64-bit
Peak Pointers: 32/64-bit
Other Software: None

Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Base Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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</thead>
<tbody>
<tr>
<td>410.bwaves</td>
<td>8.79</td>
<td>1550</td>
<td>8.73</td>
<td>1560</td>
<td>8.84</td>
<td>1540</td>
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<tr>
<td>416.gamess</td>
<td>409</td>
<td>47.9</td>
<td>409</td>
<td>47.9</td>
<td>409</td>
<td>47.8</td>
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<tr>
<td>433.milc</td>
<td>128</td>
<td>71.5</td>
<td>128</td>
<td>71.6</td>
<td>127</td>
<td>72.1</td>
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<td>434.zeusmp</td>
<td>59.7</td>
<td>152</td>
<td>59.5</td>
<td>163</td>
<td>58.8</td>
<td>155</td>
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<tr>
<td>435.gromacs</td>
<td>173</td>
<td>41.4</td>
<td>174</td>
<td>41.1</td>
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<td>41.2</td>
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<tr>
<td>436.cactusADM</td>
<td>9.17</td>
<td>1300</td>
<td>9.09</td>
<td>1310</td>
<td>9.19</td>
<td>1300</td>
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<tr>
<td>437.leslie3d</td>
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<td>315</td>
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<td>320</td>
<td>29.4</td>
<td>320</td>
</tr>
<tr>
<td>444.namd</td>
<td>226</td>
<td>35.5</td>
<td>226</td>
<td>35.5</td>
<td>226</td>
<td>35.5</td>
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<tr>
<td>447.dealII</td>
<td>160</td>
<td>71.6</td>
<td>160</td>
<td>71.6</td>
<td>159</td>
<td>71.9</td>
</tr>
<tr>
<td>450.soplex</td>
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<td>51.6</td>
<td>161</td>
<td>51.9</td>
<td>162</td>
<td>51.5</td>
</tr>
<tr>
<td>454.povray</td>
<td>76.0</td>
<td>76.1</td>
<td>76.9</td>
<td>69.9</td>
<td>76.3</td>
<td>69.7</td>
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<td>455.calculix</td>
<td>118</td>
<td>69.8</td>
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<td>69.6</td>
<td>119</td>
<td>69.5</td>
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<tr>
<td>459.GemsFDTD</td>
<td>89.2</td>
<td>119</td>
<td>90.4</td>
<td>117</td>
<td>89.0</td>
<td>119</td>
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<tr>
<td>465.tonto</td>
<td>248</td>
<td>39.7</td>
<td>259</td>
<td>38.0</td>
<td>253</td>
<td>38.8</td>
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<tr>
<td>470.lbm</td>
<td>3.52</td>
<td>3910</td>
<td>3.52</td>
<td>3900</td>
<td>3.51</td>
<td>3920</td>
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<tr>
<td>481.wrf</td>
<td>87.0</td>
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<td>90.1</td>
<td>124</td>
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<td>126</td>
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<tr>
<td>482.sphinx3</td>
<td>321</td>
<td>60.6</td>
<td>323</td>
<td>60.3</td>
<td>322</td>
<td>60.6</td>
</tr>
</tbody>
</table>

Operating System Notes

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

Platform Notes

BIOS Configuration:
Choose Operating Mode set to Maximum Performance
LLC dead line alloc set to Disable
Patrol Scrub set to Disable
DCU Streamer Prefetcher set to Disable
Hyper-Threading set to Disable
Sysinfo program /home/cpu2006-1.2-ic17.0u3/config/sysinfo.rev6993
Revision 6993 of 2015-11-06 (b5e84d4b4eb51ed28d7f98696cbe290c1)
runtime on Electron-node-02 Tue Aug 8 18:08:30 2017

Continued on next page
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) Platinum 8164 CPU @ 2.00GHz
4 "physical id"s (chips)
104 "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 : 26
siblings : 26
physical 0: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 16 17 18 19 20 21 22 24 25 26 27 28 29
physical 1: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 16 17 18 19 20 21 22 24 25 26 27 28 29
physical 2: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 16 17 18 19 20 21 22 24 25 26 27 28 29
physical 3: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 16 17 18 19 20 21 22 24 25 26 27 28 29
cache size : 36608 KB

From /proc/meminfo
MemTotal:       1584975180 kB
HugePages_Total:       0
Hugepagesize:       2048 kB

From /etc/*release* /etc/*version*
SuSE-release:
SUSE Linux Enterprise Server 12 (x86_64)
VERSION = 12
PATCHLEVEL = 2
# 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-SP2"
VERSION_ID="12.2"
PRETTY_NAME="SUSE Linux Enterprise Server 12 SP2"
ID="sles"
ANSI_COLOR="0;32"
CPE_NAME="cpe:/o:suse:sles:12:sp2"

uname -a:
(9464f67) x86_64 x86_64 x86_64 GNU/Linux

run-level 3 Aug 8 18:07

SPEC is set to: /home/cpu2006-1.2-ic17.0u3
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Platform Notes (Continued)

<table>
<thead>
<tr>
<th>Filesystem</th>
<th>Type</th>
<th>Size</th>
<th>Used</th>
<th>Avail</th>
<th>Use%</th>
<th>Mounted on</th>
</tr>
</thead>
<tbody>
<tr>
<td>/dev/sda4</td>
<td>xfs</td>
<td>688G</td>
<td>263G</td>
<td>425G</td>
<td>39%</td>
<td>/home</td>
</tr>
</tbody>
</table>

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 -[TEE113J-1.00]- 06/03/2017
Memory:
48x Samsung M393A4K40BB2-CTD 32 GB 2 rank 2666 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-ic17.0u3/lib/ia32:/home/cpu2006-1.2-ic17.0u3/lib/intel64:/home/cpu2006-1.2-ic17.0u3/sh10.2"
OMP_NUM_THREADS = "104"

Binaries compiled on a system with 1x Intel Core i7-4790 CPU + 32GB RAM memory using Redhat Enterprise Linux 7.2
Transparent Huge Pages disabled with:
echo never > /sys/kernel/mm/transparent_hugepage/enable
Filesystem page cache cleared with:
shell invocation of 'sync; echo 3 > /proc/sys/vm/drop_caches' prior to run

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

Continued on next page
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**Base Portability Flags (Continued)**

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<tr>
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</tr>
<tr>
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<td>-DSPEC_CPU_LP64 -nofor_main</td>
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<td>-DSPEC_CPU_LP64 -nofor_main</td>
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</tr>
<tr>
<td>465.tonto</td>
<td>-DSPEC_CPU_LP64</td>
</tr>
<tr>
<td>470.lbm</td>
<td>-DSPEC_CPU_LP64</td>
</tr>
<tr>
<td>481.wrf</td>
<td>-DSPEC_CPU_LP64 -DSPEC_CPU_CASE_FLAG -DSPEC_CPU_LINUX</td>
</tr>
<tr>
<td>482.sphinx3</td>
<td>-DSPEC_CPU_LP64</td>
</tr>
</tbody>
</table>

**Base Optimization Flags**

C benchmarks:
-xCORE-AVX2 -ipo -O3 -no-prec-div -parallel -qopt-prefetch

C++ benchmarks:
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch

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

Benchmarks using both Fortran and C:
-xCORE-AVX2 -ipo -O3 -no-prec-div -parallel -qopt-prefetch

**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
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### Peak Portability Flags

Same as Base Portability Flags

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### Peak Optimization Flags

**C benchmarks:**

- 433.milc: basepeak = yes
- 470.lbm: basepeak = yes
- 482.sphinx3: basepeak = yes

**C++ benchmarks:**

- 444.namd: -prof-gen(pass 1) -prof-use(pass 2) -xCORE-AVX2(pass 2) -par-num-threads=1(pass 1) -ipo(pass 2) -O3(pass 2) -no-prec-div(pass 2) -fno-alias -auto-iipt32
- 447.dealII: basepeak = yes
- 450.soplex: basepeak = yes
- 453.povray: -prof-gen(pass 1) -prof-use(pass 2) -xCORE-AVX2(pass 2) -par-num-threads=1(pass 1) -ipo(pass 2) -O3(pass 2) -no-prec-div(pass 2) -unroll4 -ansi-alias

**Fortran benchmarks:**

- 410.bwaves: basepeak = yes
- 416.gamess: -prof-gen(pass 1) -prof-use(pass 2) -xCORE-AVX2(pass 2) -par-num-threads=1(pass 1) -ipo(pass 2) -O3(pass 2) -no-prec-div(pass 2) -unroll2 -inline-level=0 -scalar-rep-
- 434.zeusmp: basepeak = yes
- 437.leslie3d: basepeak = yes

**C++ benchmarks:**

- 459.GemsFDX: -prof-gen(pass 1) -prof-use(pass 2) -xCORE-AVX2(pass 2) -par-num-threads=1(pass 1) -ipo(pass 2) -O3(pass 2) -no-prec-div(pass 2) -unroll2 -inline-level=0 -qopt-prefetch -parallel
- 465.tonto: -prof-gen(pass 1) -prof-use(pass 2) -xCORE-AVX2(pass 2) -par-num-threads=1(pass 1) -ipo(pass 2) -O3(pass 2) -no-prec-div(pass 2) -inline-calloc -qopt-malloc-options=3 -auto -unroll4

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Continued on next page
Lenovo Global Technology
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SPECfp2006 = 141
SPECfp_base2006 = 133

Peak Optimization Flags (Continued)

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
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-ic17.0-official-linux64-revF.html
http://www.spec.org/cpu2006/flags/Lenovo-Platform-Flags-V1.2-SKL-C.20171004.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2006/flags/Intel-ic17.0-official-linux64-revF.xml
http://www.spec.org/cpu2006/flags/Lenovo-Platform-Flags-V1.2-SKL-C.20171004.xml

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