# SPEC® CFP2006 Result

**Lenovo Group Limited**

Lenovo ThinkServer RD650
(2.10 GHz, Intel Xeon E5-2620 v4)

**SPECfp®2006 = 108**

**SPECfp_base2006 = 102**

<table>
<thead>
<tr>
<th>Software</th>
<th>Hardware</th>
</tr>
</thead>
</table>
| **Operating System:** SUSE Linux Enterprise Server 12 SP1 (x86_64)  
Kernel 3.12.49-11-default | **CPU Name:** Intel Xeon E5-2620 v4  
**CPU Characteristics:** Intel Turbo Boost Technology up to 3.00 GHz  
**CPU MHz:** 2100  
**FPU:** Integrated  
**CPU(s) enabled:** 16 cores, 2 chips, 8 cores/chip  
**CPU(s) orderable:** 1.2 chips  
**Primary Cache:** 32 KB L1 + 32 KB D on chip per core  
**Secondary Cache:** 256 KB I+D on chip per core |
| **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) |

**Test date:** May-2016  
**Hardware Availability:** Mar-2016  
**Software Availability:** Dec-2015
## Lenovo Group Limited

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<table>
<thead>
<tr>
<th>CPU2006 license: 9017</th>
<th>Test date: May-2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lenovo Group Limited</td>
<td>Lenovo Group Limited</td>
</tr>
<tr>
<td>Tested by: Lenovo Group Limited</td>
<td>Test sponsor: Lenovo Group Limited</td>
</tr>
<tr>
<td>L3 Cache: 20 MB I+D on chip per chip</td>
<td>Hardware Availability: Mar-2016</td>
</tr>
<tr>
<td>Other Cache: None</td>
<td>Software Availability: Dec-2015</td>
</tr>
<tr>
<td>Memory: 256 GB (16 x 16 GB 2Rx4 PC4-2400T-R, running at 2133 MHz)</td>
<td><strong>SPECfp2006</strong> = 108</td>
</tr>
<tr>
<td>Disk Subsystem: 1 x 800 GB SATA SSD</td>
<td><strong>SPECfp_base2006</strong> = 102</td>
</tr>
</tbody>
</table>

## Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Seconds</th>
<th>Base Pointers: 64-bit</th>
<th>Peak Pointers: 32/64-bit</th>
</tr>
</thead>
<tbody>
<tr>
<td>410.bwaves</td>
<td>27.0</td>
<td>26.9</td>
<td>26.9</td>
</tr>
<tr>
<td>416.gamess</td>
<td>598</td>
<td>155</td>
<td>45.0</td>
</tr>
<tr>
<td>433.milc</td>
<td>137</td>
<td>137</td>
<td>137</td>
</tr>
<tr>
<td>434.zeusmp</td>
<td>58.7</td>
<td>58.7</td>
<td>58.7</td>
</tr>
<tr>
<td>435.gromacs</td>
<td>155</td>
<td>155</td>
<td>155</td>
</tr>
<tr>
<td>436.cactusADM</td>
<td>17.2</td>
<td>17.2</td>
<td>17.2</td>
</tr>
<tr>
<td>437.leslie3d</td>
<td>32.1</td>
<td>32.1</td>
<td>32.1</td>
</tr>
<tr>
<td>444.namd</td>
<td>286</td>
<td>285</td>
<td>285</td>
</tr>
<tr>
<td>447.dealII</td>
<td>187</td>
<td>187</td>
<td>187</td>
</tr>
<tr>
<td>450.soplex</td>
<td>194</td>
<td>194</td>
<td>194</td>
</tr>
<tr>
<td>453.povray</td>
<td>93.1</td>
<td>93.1</td>
<td>93.1</td>
</tr>
<tr>
<td>454.calculix</td>
<td>156</td>
<td>156</td>
<td>156</td>
</tr>
<tr>
<td>459.GemsFDTD</td>
<td>57.8</td>
<td>57.8</td>
<td>57.8</td>
</tr>
<tr>
<td>465.tonto</td>
<td>245</td>
<td>245</td>
<td>245</td>
</tr>
<tr>
<td>470.lbm</td>
<td>19.2</td>
<td>19.2</td>
<td>19.2</td>
</tr>
<tr>
<td>481.wrf</td>
<td>105</td>
<td>105</td>
<td>105</td>
</tr>
<tr>
<td>482.sphinx3</td>
<td>281</td>
<td>281</td>
<td>281</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"

### Platform Notes

BIOS Configuration:
- Hyper-Threading set to Disabled
- Cluster On Die set to Disabled
- Early Snoop set to Enabled
- Performance Profile set to Custom
- C1E Support set to Disabled
- Core C3 set to Disabled
- Core C6 set to Disabled
- Thermal Profile set to High Fan Speed
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Platform Notes (Continued)

Memory Power Savings set to Disabled
Sysinfo program /home/cpu2006-1.2-ic16.0/config/sysinfo.rev6914
$Rev: 6914 $ $Date:: 2014-06-25 #$ e3fbb8667b5a285932ceab81e28219e1

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 E5-2620 v4 @ 2.10GHz
  2 "physical id"s (chips)
  16 "processors"
core, siblings (Caution: counting these is hw and system dependent. The following excerpts from /proc/cpuinfo might not be reliable. Use with caution.)
cpu cores : 8
siblings : 8
physical 0: cores 0 1 2 3 4 5 6 7
physical 1: cores 0 1 2 3 4 5 6 7
cache size : 20480 KB

From /proc/meminfo
MemTotal: 264558048 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=cpede:o:suse:sles:12:sp1"

uname -a:
  (8d714a0) x86_64 x86_64 x86_64 GNU/Linux

run-level 3 May 25 13:10

SPEC is set to: /home/cpu2006-1.2-ic16.0
Filesystem Type Size Used Avail Use% Mounted on
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Platform Notes (Continued)

/dev/sda3      xfs  691G  7.8G  684G  2% /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 PB2TS335 01/09/2016
Memory:
  8x NO DIMM NO DIMM
  16x Samsung M393A2G40DB1-CRC 16 GB 2 rank 2400 MHz, configured at 2133 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 = "16"

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
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Base Portability Flags (Continued)

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
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
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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 l)
           -ipo(pass 2) -O3(pass 2) -no-prec-div(pass 2)
           -par-num-threads=1(pass l) -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 l)
            -ipo(pass 2) -O3(pass 2) -no-prec-div(pass 2)
            -par-num-threads=1(pass l) -prof-use(pass 2) -unroll4
            -ansi-alias

Fortran benchmarks:

410.bwaves: basepeak = yes
416.gamess: -xCORE-AVX2(pass 2) -prof-gen:threadsafe(pass l)
            -ipo(pass 2) -O3(pass 2) -no-prec-div(pass 2)
            -par-num-threads=1(pass l) -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 l)
              -ipo(pass 2) -O3(pass 2) -no-prec-div(pass 2)
              -par-num-threads=1(pass l) -prof-use(pass 2) -unroll2
              -inline-level=0 -opt-prefetch -parallel

465.tonto: -xCORE-AVX2(pass 2) -prof-gen:threadsafe(pass l)
          -ipo(pass 2) -O3(pass 2) -no-prec-div(pass 2)
          -par-num-threads=1(pass l) -prof-use(pass 2) -inline-callc

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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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