# Lenovo Group Limited

**Lenovo ThinkServer RD650**  
(2.20 GHz, Intel Xeon E5-2630 v4)

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<table>
<thead>
<tr>
<th>Software</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECfp®2006</td>
<td>108</td>
<td>SPECfp_base2006</td>
<td>102</td>
</tr>
</tbody>
</table>

## Hardware

- **CPU Name:** Intel Xeon E5-2630 v4  
- **CPU Characteristics:** Intel Turbo Boost Technology up to 3.10 GHz  
- **CPU MHz:** 2200  
- **FPU:** Integrated  
- **CPU(s) enabled:** 20 cores, 2 chips, 10 cores/chip  
- **CPU(s) orderable:** 1.2 chips

## Secondary Cache

- **Primary Cache:** 32 KB I + 32 KB D on chip per core  
- **Secondary Cache:** 256 KB I+D on chip per core

---

## Software

- **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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Continued on next page
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**SPEC CFP2006 Result**

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Base Seconds</th>
<th>Base Ratio</th>
<th>Peak Seconds</th>
<th>Peak Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>410.bwaves</td>
<td>28.2</td>
<td>482</td>
<td>28.2</td>
<td>482</td>
</tr>
<tr>
<td>416.gamess</td>
<td>621</td>
<td>31.5</td>
<td>621</td>
<td>31.5</td>
</tr>
<tr>
<td>433.milc</td>
<td>138</td>
<td>138</td>
<td>138</td>
<td>138</td>
</tr>
<tr>
<td>434.zeusmp</td>
<td>54.8</td>
<td>166</td>
<td>30.8</td>
<td>30.8</td>
</tr>
<tr>
<td>435.gromacs</td>
<td>162</td>
<td>44.0</td>
<td>162</td>
<td>44.0</td>
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<tr>
<td>436.cactusADM</td>
<td>14.7</td>
<td>14.7</td>
<td>14.7</td>
<td>14.7</td>
</tr>
<tr>
<td>437.leslie3d</td>
<td>29.8</td>
<td>315</td>
<td>29.8</td>
<td>315</td>
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<tr>
<td>444.namd</td>
<td>294</td>
<td>27.3</td>
<td>294</td>
<td>27.3</td>
</tr>
<tr>
<td>447.dealII</td>
<td>191</td>
<td>59.9</td>
<td>191</td>
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</tr>
<tr>
<td>450.soplex</td>
<td>191</td>
<td>43.7</td>
<td>191</td>
<td>43.7</td>
</tr>
<tr>
<td>453.povray</td>
<td>97.1</td>
<td>54.8</td>
<td>96.8</td>
<td>55.0</td>
</tr>
<tr>
<td>454.calculix</td>
<td>159</td>
<td>52.0</td>
<td>159</td>
<td>51.8</td>
</tr>
<tr>
<td>459.GemsFDTD</td>
<td>55.1</td>
<td>192</td>
<td>63.5</td>
<td>167</td>
</tr>
<tr>
<td>465.tonto</td>
<td>259</td>
<td>38.0</td>
<td>259</td>
<td>38.9</td>
</tr>
<tr>
<td>470.lbm</td>
<td>18.5</td>
<td>743</td>
<td>18.5</td>
<td>743</td>
</tr>
<tr>
<td>481.wrf</td>
<td>108</td>
<td>103</td>
<td>108</td>
<td>103</td>
</tr>
<tr>
<td>482.sphinx3</td>
<td>290</td>
<td>67.2</td>
<td>290</td>
<td>67.2</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

Continued on next page

Standard Performance Evaluation Corporation
info@spec.org
http://www.spec.org/
Lenovo Group Limited

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**CPU2006 license:** 9017

**Test sponsor:** Lenovo Group Limited

**Tested by:** Lenovo Group Limited

**Test date:** May-2016

**Hardware Availability:** Mar-2016

**Software Availability:** Dec-2015

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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

running on RD650-MLK Thu May 19 19:56:08 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 E5-2630 v4 @ 2.20GHz

  2 "physical id"s (chips)
  20 "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 : 10
siblings : 10
physical 0: cores 0 1 2 3 4 8 9 10 11 12
physical 1: cores 0 1 2 3 4 8 9 10 11 12

cache size : 25600 KB

From /proc/meminfo

MemTotal:       264557632 kB

HugePages_Total:       0

Hugepagesize:       2048 kB

From /proc/meminfo

MemTotal:       264557632 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:


(8d714a0) x86_64 x86_64 x86_64 GNU/Linux

run-level 3 May 19 14:31

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

Filesystem Type Size Used Avail Use% Mounted on

Continued on next page
## Lenovo Group Limited

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### Platform Notes (Continued)

```
/dev/sda3   xfs   691G  7.7G  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 = "20"

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/enable

### 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

Continued on next page
**SPEC CFP2006 Result**

**Lenovo Group Limited**

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**SPECfp2006 = 108**

**SPECfp_base2006 = 102**

**CPU2006 license:** 9017

**Test sponsor:** Lenovo Group Limited

**Tested by:** Lenovo Group Limited

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<tr>
<td>434.zeusmp: -DSPEC_CPU_LP64</td>
</tr>
<tr>
<td>435.gromacs: -DSPEC_CPU_LP64 -nofor_main</td>
</tr>
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<td>436.cactusADM: -DSPEC_CPU_LP64 -nofor_main</td>
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<td>459.GemsFDTD: -DSPEC_CPU_LP64</td>
</tr>
<tr>
<td>465.tonto: -DSPEC_CPU_LP64</td>
</tr>
<tr>
<td>481.wrf: -DSPEC_CPU_LP64 -DSPEC_CPU_CASE_FLAG -DSPEC_CPU_LINUX</td>
</tr>
<tr>
<td>482.sphinx3: -DSPEC_CPU_LP64</td>
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<th>Base Optimization Flags</th>
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<tr>
<td>C benchmarks:</td>
</tr>
<tr>
<td>-xCORE-AVX2 -ipo -O3 -no-prec-div -parallel -opt-prefetch</td>
</tr>
<tr>
<td>-ansi-alias</td>
</tr>
<tr>
<td>C++ benchmarks:</td>
</tr>
<tr>
<td>-xCORE-AVX2 -ipo -O3 -no-prec-div -opt-prefetch -ansi-alias</td>
</tr>
</tbody>
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| 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             |

<table>
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<th>Peak Compiler Invocation</th>
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</thead>
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<tr>
<td>C benchmarks:</td>
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<tr>
<td>icc -m64</td>
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| Benchmarks using both Fortran and C: |
| icc -m64 ifort -m64 |

**Test date:** May-2016

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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 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

Continued on next page
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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.

Tested with SPEC CPU2006 v1.2.
Originally published on 28 June 2016.