## Lenovo Group Limited

### Lenovo ThinkServer RD650
(2.20 GHz, Intel Xeon E5-2650 v4)

<table>
<thead>
<tr>
<th>SPECfp®2006</th>
<th>111</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECfp_base2006</td>
<td>107</td>
</tr>
</tbody>
</table>

**CPU2006 license:** 9017  
**Test date:** May-2016

**Test sponsor:** Lenovo Group Limited  
**Hardware Availability:** Mar-2016

**Tested by:** Lenovo Group Limited  
**Software Availability:** Dec-2015

### Hardware

- **CPU Name:** Intel Xeon E5-2650 v4  
- **CPU Characteristics:** Intel Turbo Boost Technology up to 2.90 GHz  
- **CPU MHz:** 2200  
- **FPU:** Integrated  
- **CPU(s) enabled:** 24 cores, 2 chips, 12 cores/chip  
- **CPU(s) orderable:** 1,2 chips  
- **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)

---

**410.bwaves**  
**416.gamess**  
**433.milc**  
**434.zeusmp**  
**435.gromacs**  
**436.cactusADM**  
**437.leslie3d**  
**444.namd**  
**447.dealII**  
**450.soplex**  
**453.povray**  
**454.calculix**  
**459.GemsFDTD**  
**465.tonto**  
**470.lbm**  
**481.wrf**  
**482.sphinx3**

**SPECfp_base2006 = 107**

**SPECfp2006 = 111**

---

**Benchmark Results**

- **bwaves**  
- **gamess**  
- **milc**  
- **zeusmp**  
- **gromacs**  
- **cactusADM**  
- **leslie3d**  
- **namd**  
- **dealII**  
- **soplex**  
- **povray**  
- **calculix**  
- **GemsFDTD**  
- **tonto**  
- **lbm**  
- **wrf**  
- **sphinx3**

---

**Notes**

- Continued on next page
Lenovo Group Limited
Lenovo ThinkServer RD650
(2.20 GHz, Intel Xeon E5-2650 v4)

SPECfp2006 = 111
SPECfp_base2006 = 107

CPU2006 license: 9017
Test sponsor: Lenovo Group Limited
Tested by: Lenovo Group Limited
L3 Cache: 30 MB I+D on chip per chip
Other Cache: None
Memory: 256 GB (16 x 16 GB 2Rx4 PC4-2400T-R)
Disk Subsystem: 1 x 800 GB SATA SSD
Other Hardware: None
Base Pointers: 64-bit
Peak Pointers: 32/64-bit
Other Software: None

Operating System Notes
Stack size set to unlimited using "ulimit -s unlimited"

Platform Notes
BIOS Configuration:
Hyper-Thread 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
Memory Power Savings set to Disabled

Continued on next page
Lenovo Group Limited
Lenovo ThinkServer RD650
(2.20 GHz, Intel Xeon E5-2650 v4)

SPECfp2006 = 111
SPECfp_base2006 = 107

CPU2006 license: 9017
Test date: May-2016
Test sponsor: Lenovo Group Limited
Hardware Availability: Mar-2016
Tested by: Lenovo Group Limited
Software Availability: Dec-2015

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 E5-2650 v4@ 2.20GHz
  2 "physical id"s (chips)
24 "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 : 12
siblings : 12
  physical 0: cores 0 1 2 3 4 5 8 9 10 11 12 13
  physical 1: cores 0 1 2 3 4 5 8 9 10 11 12 13
cache size : 30720 KB

From /proc/meminfo
MemTotal: 264393560 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 rd650-mlk-rackA01 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 May 27 22:10

SPEC is set to: /home/cpu2006-1.2-ic16.0
Filesystem Type Size Used Avail Use% Mounted on
/dev/sda3 xfs 100G 11G 90G 11% /home

Continued on next page
Lenovo Group Limited
Lenovo ThinkServer RD650
(2.20 GHz, Intel Xeon E5-2650 v4)

SPECfp2006 = 111
SPECfp_base2006 = 107

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
database, firmware, and the "DMTF SMBIOS" standard.

BIOS LENOVO PB2TS335 01/09/2016
Memory:
16x Hynix Semiconductor HMA42GR7AFR4N-UH 16 GB 2 rank 2400 MHz
8x NO DIMM NO DIMM

(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 = "24"

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

Continued on next page
# SPEC CFP2006 Result

**Lenovo Group Limited**

Lenovo ThinkServer RD650
(2.20 GHz, Intel Xeon E5-2650 v4)

| SPECfp2006 = | 111 |
| SPECfp_base2006 = | 107 |

| 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 |

## Base Portability Flags (Continued)

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Portability Flags</th>
</tr>
</thead>
<tbody>
<tr>
<td>435.gromacs</td>
<td>-DSPEC_CPU_LP64 -nofor_main</td>
</tr>
<tr>
<td>436.cactusADM</td>
<td>-DSPEC_CPU_LP64 -nofor_main</td>
</tr>
<tr>
<td>437.leslie3d</td>
<td>-DSPEC_CPU_LP64</td>
</tr>
<tr>
<td>444.namd</td>
<td>-DSPEC_CPU_LP64 -nofor_main</td>
</tr>
<tr>
<td>447.dealII</td>
<td>-DSPEC_CPU_LP64</td>
</tr>
<tr>
<td>450.soplex</td>
<td>-DSPEC_CPU_LP64</td>
</tr>
<tr>
<td>453.povray</td>
<td>-DSPEC_CPU_LP64</td>
</tr>
<tr>
<td>454.calculix</td>
<td>-DSPEC_CPU_LP64 -nofor_main</td>
</tr>
<tr>
<td>459.GemsFDTD</td>
<td>-DSPEC_CPU_LP64</td>
</tr>
<tr>
<td>463.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

<table>
<thead>
<tr>
<th>Optimization Flags for C benchmarks:</th>
</tr>
</thead>
<tbody>
<tr>
<td>-xCORE-AVX2</td>
</tr>
<tr>
<td>-ansi-alias</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Optimization Flags for C++ benchmarks:</th>
</tr>
</thead>
<tbody>
<tr>
<td>-xCORE-AVX2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Optimization Flags for Fortran benchmarks:</th>
</tr>
</thead>
<tbody>
<tr>
<td>-xCORE-AVX2</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Optimization Flags for Benchmarks using both Fortran and C:</th>
</tr>
</thead>
<tbody>
<tr>
<td>-xCORE-AVX2</td>
</tr>
<tr>
<td>-ansi-alias</td>
</tr>
</tbody>
</table>

## Peak Compiler Invocation

<table>
<thead>
<tr>
<th>Compiler Invocation for C benchmarks:</th>
</tr>
</thead>
<tbody>
<tr>
<td>icc</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Compiler Invocation for C++ benchmarks:</th>
</tr>
</thead>
<tbody>
<tr>
<td>icpc</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Compiler Invocation for Fortran benchmarks:</th>
</tr>
</thead>
<tbody>
<tr>
<td>ifort</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Compiler Invocation for Benchmarks using both Fortran and C:</th>
</tr>
</thead>
<tbody>
<tr>
<td>icc ifort</td>
</tr>
</tbody>
</table>

---

Standard Performance Evaluation Corporation
info@spec.org
http://www.spec.org/
## 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) -unroll+ -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
**Lenovo Group Limited**

Lenovo ThinkServer RD650
(2.20 GHz, Intel Xeon E5-2650 v4)

<table>
<thead>
<tr>
<th>CPU2006 license: 9017</th>
<th>Test date: May-2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test sponsor: Lenovo Group Limited</td>
<td>Hardware Availability: Mar-2016</td>
</tr>
<tr>
<td>Tested by: Lenovo Group Limited</td>
<td>Software Availability: Dec-2015</td>
</tr>
</tbody>
</table>

**SPECfp2006 =** 111
**SPECfp_base2006 =** 107

**Peak Optimization Flags (Continued)**

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

Benmarks 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

SPEC and SPECfp are registered trademarks of the Standard Performance Evaluation Corporation. All other brand and product names appearing in this result are trademarks or registered trademarks of their respective holders.

For questions about this result, please contact the tester.
For other inquiries, please contact webmaster@spec.org.

Tested with SPEC CPU2006 v1.2.
Report generated on Tue Jun 28 17:33:00 2016 by SPEC CPU2006 PS/PDF formatter v6932.
Originally published on 28 June 2016.