# Lenovo Group Limited

**Lenovo ThinkServer RD450**  
(2.20 GHz, Intel Xeon E5-2660 v4)

## SPEC® CFP2006 Result

<table>
<thead>
<tr>
<th>SPECfp®2006</th>
<th>117</th>
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</thead>
<tbody>
<tr>
<td>SPECfp_base2006</td>
<td>110</td>
</tr>
</tbody>
</table>

### CPU2006 license: 9017  
Test sponsor: Lenovo Group Limited  
Tested by: Lenovo Group Limited

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Time (seconds)</th>
</tr>
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<tbody>
<tr>
<td>410.bwaves</td>
<td>4.15</td>
</tr>
<tr>
<td>416.gamess</td>
<td>32.5</td>
</tr>
<tr>
<td>433.milc</td>
<td>68.4</td>
</tr>
<tr>
<td>434.zeusmp</td>
<td>198</td>
</tr>
<tr>
<td>435.gromacs</td>
<td>43.1</td>
</tr>
<tr>
<td>436.cactusADM</td>
<td>974</td>
</tr>
<tr>
<td>437.leslie3d</td>
<td>348</td>
</tr>
<tr>
<td>444.namd</td>
<td>29.0</td>
</tr>
<tr>
<td>447.dealII</td>
<td>61.2</td>
</tr>
<tr>
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<tr>
<td>459.GemsFDTD</td>
<td>51.8</td>
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<td>465.tonto</td>
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<td>470.lbm</td>
<td>58.9</td>
</tr>
<tr>
<td>481.wrf</td>
<td>109</td>
</tr>
<tr>
<td>482.sphinx3</td>
<td>66.1</td>
</tr>
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</table>

### Hardware

- **CPU Name:** Intel Xeon E5-2660 v4  
- **CPU Characteristics:** Intel Turbo Boost Technology up to 3.20 GHz  
- **CPU MHz:** 2000  
- **FPU:** Integrated  
- **CPU(s) enabled:** 28 cores, 2 chips, 14 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)
Lenovo Group Limited  SPEC CFP2006 Result

Lenovo ThinkServer RD450 (2.20 GHz, Intel Xeon E5-2660 v4)

CPU2006 license: 9017  SPECfp2006 = 117
Test date: May-2016
Test sponsor: Lenovo Group Limited  SPECfp_base2006 = 110
Tested by: Lenovo Group Limited  Hardware Availability: Mar-2016
L3 Cache: 35 MB I+D on chip per chip  Software Availability: Dec-2015
Other Cache: None  Base Pointers: 64-bit
Memory: 256 GB (16 x 16 GB 2Rx4 PC4-2400T-R)  Peak Pointers: 32/64-bit
Disk Subsystem: 1 x 800 GB SATA SSD  Other Software: None
Other Hardware: None

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

Results Table

<table>
<thead>
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</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
Memory Power Savings set to Disabled

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Lenovo Group Limited

Lenovo ThinkServer RD450
(2.20 GHz, Intel Xeon E5-2660 v4)

SPECfp2006 = 117
SPECfp_base2006 = 110

CPU2006 license: 9017
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Platform Notes (Continued)

Sysinfo program /home/cpu2006-1.2-ic16.0/config/sysinfo.rev6914
$Rev: 6914 $ $Date:: 2014-06-25 #$ e3fbb8667b5a285932ceab81e28219e1
running on RD450-MLK Thu May 12 13:52:43 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 E5-2660 v4@ 2.00GHz
  2 "physical id"s (chips)
  28 "processors"
cores, siblings (Caution: counting these is hw and system dependent. The
following excerpts from /proc/cpuinfo might not be reliable. Use with
cautions.)
cpu cores : 14
siblings : 14
physical 0: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14
physical 1: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14
cache size : 35840 KB

From /proc/meminfo
MemTotal: 264557752 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 12 08:38

SPEC is set to: /home/cpu2006-1.2-ic16.0
Filesystem Type Size Used Avail Use% Mounted on
/dev/sda3 xfs 693G 4.0G 689G 1% /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 LENOVO VB3TS332 12/28/2015
Memory: 16x Hynix Semiconductor HMA42GR7AFR4N-UH 16 GB 2 rank 2400 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 = "28"

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
  435.gromacs: -DSPEC_CPU_LP64 -nofor_main

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Hardware Availability: Mar-2016
Software Availability: Dec-2015

Base Portability Flags (Continued)

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
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

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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

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# Lenovo Group Limited

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Software Availability: Dec-2015

## 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:


You can also download the XML flags sources by saving the following links:

[http://www.spec.org/cpu2006/flags/Lenovo-Platform-Settings-V1.2-BDW-revC.xml](http://www.spec.org/cpu2006/flags/Lenovo-Platform-Settings-V1.2-BDW-revC.xml)

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

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