## Lenovo Group Limited

**Lenovo ThinkServer RD650 (1.70 GHz, Intel Xeon E5-2609 v4)**

<table>
<thead>
<tr>
<th>SPECfp®_rate2006 = 440</th>
<th>SPECfp_rate_base2006 = 431</th>
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</thead>
<tbody>
<tr>
<td><strong>CPU2006 license:</strong> 9017</td>
<td><strong>Test date:</strong> Aug-2016</td>
</tr>
<tr>
<td><strong>Test sponsor:</strong> Lenovo Group Limited</td>
<td><strong>Hardware Availability:</strong> Mar-2016</td>
</tr>
<tr>
<td><strong>Tested by:</strong> Lenovo Group Limited</td>
<td><strong>Software Availability:</strong> Dec-2015</td>
</tr>
</tbody>
</table>

### Hardware

<table>
<thead>
<tr>
<th>Software</th>
<th>CPU Name:</th>
<th>Intel Xeon E5-2609 v4</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CPU Characteristics:</td>
<td>Integrated</td>
</tr>
<tr>
<td></td>
<td>CPU MHz:</td>
<td>1700</td>
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<tr>
<td></td>
<td>FPU:</td>
<td>Integrated</td>
</tr>
<tr>
<td></td>
<td>CPU(s) enabled:</td>
<td>16 cores, 2 chips, 8 cores/chip</td>
</tr>
<tr>
<td></td>
<td>CPU(s) orderable:</td>
<td>1.2 chip</td>
</tr>
<tr>
<td></td>
<td>Primary Cache:</td>
<td>32 KB I + 32 KB D on chip per core</td>
</tr>
<tr>
<td></td>
<td>Secondary Cache:</td>
<td>256 KB I+D on chip per core</td>
</tr>
</tbody>
</table>

### Software

<table>
<thead>
<tr>
<th>Operating System:</th>
<th>SUSE Linux Enterprise Server 12 SP1 (x86_64)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Kernel 3.12.49-11-default</td>
</tr>
<tr>
<td>Compiler:</td>
<td>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</td>
</tr>
<tr>
<td>Auto Parallel:</td>
<td>No</td>
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<tr>
<td>File System:</td>
<td>xfs</td>
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<tr>
<td>System State:</td>
<td>Run level 3 (multi-user)</td>
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### Results

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>410.bwaves</td>
<td>363</td>
</tr>
<tr>
<td>416.gamess</td>
<td>352</td>
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<tr>
<td>433.milc</td>
<td>422</td>
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<tr>
<td>434.zeusmp</td>
<td>400</td>
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<tr>
<td>435.gromacs</td>
<td>484</td>
</tr>
<tr>
<td>436.cactusADM</td>
<td>697</td>
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<tr>
<td>437.leslie3d</td>
<td>370</td>
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<tr>
<td>444.namd</td>
<td>247</td>
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<td>447.dealII</td>
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<tr>
<td>450.soplex</td>
<td>314</td>
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<td>453.povray</td>
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<td>454.calculix</td>
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<tr>
<td>459.GemsFD</td>
<td>305</td>
</tr>
<tr>
<td>465.tonto</td>
<td>444</td>
</tr>
<tr>
<td>470.lbm</td>
<td>625</td>
</tr>
<tr>
<td>481.wrf</td>
<td>508</td>
</tr>
<tr>
<td>482.sphinx3</td>
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</table>

**COPYS**

SPECfp_rate_base2006 = 431
SPECfp_rate2006 = 440
Lenovo Group Limited

Lenovo ThinkServer RD650
(1.70 GHz, Intel Xeon E5-2609 v4)

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

L3 Cache: 20 MB I+D on chip per chip
Other Cache: None
Memory: 256 GB (16 x 16 GB 2Rx4 PC4-2400T-R, running at 1866 MHz)
Disk Subsystem: 1 x 800 GB SATA SSD
Other Hardware: None

SPECfp_rate2006 = 440
SPECfp_rate_base2006 = 431

Test date: Aug-2016
Hardware Availability: Mar-2016
Software Availability: Dec-2015

Results Table

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<thead>
<tr>
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<td><strong>782</strong></td>
<td><strong>399</strong></td>
</tr>
</tbody>
</table>

Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

Submit Notes

The numactl mechanism was used to bind copies to processors. The config file option 'submit' was used to generate numactl commands to bind each copy to a specific processor. For details, please see the config file.

Operating System Notes

Stack size set to unlimited using "ulimit -s unlimited"
Transparent Huge Pages enabled with:
echo always > /sys/kernel/mm/transparent_hugepage/enabled
Filesystem page cache cleared with:
echo 1 > /proc/sys/vm/drop_caches
**Lenovo Group Limited**

**Lenovo ThinkServer RD650**
(1.70 GHz, Intel Xeon E5-2609 v4)

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>SPECfp_rate_base2006</td>
<td>= 431</td>
</tr>
</tbody>
</table>

**Platform Notes**

BIOS Configuration:
Cluster On Die set to Disabled
Early Snoop set to Disabled
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

Sysinfo program /home/cpu2006-1.2-ic16.0/config/sysinfo.rev6914
$Rev: 6914 $ $Date:: 2014-06-25 #$ e3fbb8667b5a285932ceab81e28219e1
running on RD650-MLK Thu Aug 18 03:48:44 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 E5-2609 v4 @ 1.70GHz
  2 "physical id"s (chips)
  16 "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 : 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:       264558736 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"

Continued on next page
Lenovo Group Limited

Lenovo ThinkServer RD650
(1.70 GHz, Intel Xeon E5-2609 v4)

SPECfp_rate2006 = 440
SPECfp_rate_base2006 = 431

CPU2006 license: 9017
Test date: Aug-2016
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Platform Notes (Continued)

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

run-level 3 Aug 17 18:08

SPEC is set to: /home/cpu2006-1.2-ic16.0
   Filesystem     Type  Size  Used Avail Use% Mounted on
   /dev/sda3      xfs   691G  7.9G  683G   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 PB1TS362 03/24/2016
Memory:
   16x Hynix Semiconductor HMA42GR7AFR4N-UH 16 GB 2 rank 2400 MHz, configured at
   1866 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:
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"

Binaries compiled on a system with 1x Intel Core i5-4670K CPU + 32GB
memory using RedHat EL 7.1
Transparent Huge Pages enabled with:
   echo always > /sys/kernel/mm/transparent_hugepage/enabled
Filesystem page cache cleared with:
   echo 1 > /proc/sys/vm/drop_caches
runspec command invoked through numactl i.e.:
   numactl --interleave=all runspec <etc>

Base Compiler Invocation

C benchmarks:
   icc -m64

C++ benchmarks:
   icpc -m64

Fortran benchmarks:
   ifort -m64

Continued on next page
Lenovo Group Limited

SPEC CFP2006 Result

Lenovo ThinkServer RD650
(1.70 GHz, Intel Xeon E5-2609v4)

SPECfp_rate2006 = 440
SPECfp_rate_base2006 = 431

CPU2006 license: 9017
Test sponsor: Lenovo Group Limited
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Test date: Aug-2016
Hardware Availability: Mar-2016
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Base Compiler Invocation (Continued)

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
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
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 -opt-prefetch -auto-p32
-ansi-alias -opt-mem-layout-trans=3

C++ benchmarks:
-xCORE-AVX2 -ipo -O3 -no-prec-div -opt-prefetch -auto-p32
-ansi-alias -opt-mem-layout-trans=3

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

Benchmarks using both Fortran and C:
-xCORE-AVX2 -ipo -O3 -no-prec-div -opt-prefetch -auto-p32
-ansi-alias -opt-mem-layout-trans=3

Peak Compiler Invocation

C benchmarks:
icc  -m64

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Lenovo Group Limited
Lenovo ThinkServer RD650
(1.70 GHz, Intel Xeon E5-2609 v4)

CPU2006 license: 9017
Test sponsor: Lenovo Group Limited
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Peak Compiler Invocation (Continued)

C++ benchmarks (except as noted below):
    icpc  -m64

    450.soplex: icpc -m32 -L/opt/intel/compilers_and_libraries_2016/linux/compiler/lib/ia32_lin

Fortran benchmarks:
    ifort  -m64

Benchmarks using both Fortran and C:
    icc   -m64 ifort  -m64

Peak 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
436.cactusADM: -DSPEC_CPU_LP64 -nofor_main
437.leslie3d: -DSPEC_CPU_LP64
444.namd: -DSPEC_CPU_LP64
447.dealII: -DSPEC_CPU_LP64
450.soplex: -D_FILE_OFFSET_BITS=64
453.povray: -DSPEC_CPU_LP64
454.calculix: -DSPEC_CPU_LP64 -nofor_main
459.GemsFDTD: -DSPEC_CPU_LP64
465.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

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) -opt-mem-layout-trans=3(pass 2)
               -prof-use(pass 2) -fno-alias -auto-ilp32

Continued on next page
### Lenovo Group Limited

**Lenovo ThinkServer RD650**  
(1.70 GHz, Intel Xeon E5-2609 v4)

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<tr>
<th>SPECfp_rate2006</th>
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**CPU2006 license:** 9017  
**Test date:** Aug-2016  
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**Hardware Availability:** Mar-2016  
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**Software Availability:** Dec-2015

---

**Peak Optimization Flags (Continued)**

447.dealII: basepeak = yes

450.soplex:  
-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) -opt-mem-layout-trans=3(pass 2)  
-prof-use(pass 2) -opt-malloc-options=3

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) -opt-mem-layout-trans=3(pass 2)  
-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: basepeak = yes

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) -unroll4 -auto  
-inline-calloc -opt-malloc-options=3

---

**Benchmarks using both Fortran and C:**

435.gromacs:  
-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) -opt-mem-layout-trans=3(pass 2)  
-prof-use(pass 2) -opt-prefetch -auto-ilp32

436.cactusADM: basepeak = yes

454.calculix: basepeak = yes

481.wrf: basepeak = yes
# SPEC CFP2006 Result

## Lenovo Group Limited

**Lenovo ThinkServer RD650**  
(1.70 GHz, Intel Xeon E5-2609 v4)

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**Test date:** Aug-2016  
**Hardware Availability:** Mar-2016  
**Software Availability:** Dec-2015

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.

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