# SPECint® Result

**Lenovo Group Limited**

**Lenovo ThinkServer RD650**
(2.00 GHz, Intel Xeon E5-2660 v4)

<table>
<thead>
<tr>
<th>SPECint®_rate2006</th>
<th>1150</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECint_rate_base2006</td>
<td>1100</td>
</tr>
</tbody>
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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

<table>
<thead>
<tr>
<th>SPECint®_rate2006 = 1150</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECint_rate_base2006 = 1100</td>
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</tbody>
</table>

### Hardware

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU Name</td>
<td>Intel Xeon E5-2660 v4</td>
</tr>
<tr>
<td>CPU Characteristics</td>
<td>Intel Turbo Boost Technology up to 3.20 GHz</td>
</tr>
<tr>
<td>CPU Frequency MHz</td>
<td>2000</td>
</tr>
<tr>
<td>FPU</td>
<td>Integrated</td>
</tr>
<tr>
<td>CPU(s) enabled</td>
<td>28 cores, 2 chips, 14 cores/chip, 2 threads/core</td>
</tr>
<tr>
<td>CPU(s) orderable</td>
<td>1.2 chips</td>
</tr>
<tr>
<td>Primary Cache</td>
<td>32 KB L1 + 32 KB D on chip per core</td>
</tr>
<tr>
<td>Secondary Cache</td>
<td>256 KB L2+D on chip per core</td>
</tr>
<tr>
<td>L3 Cache</td>
<td>35 MB L+D on chip per chip</td>
</tr>
<tr>
<td>Other Cache</td>
<td>None</td>
</tr>
<tr>
<td>Memory</td>
<td>256 GB (16 x 16 GB 2Rx4 PC4-2400T-R)</td>
</tr>
<tr>
<td>Disk Subsystem</td>
<td>1 x 800 GB SATA SSD</td>
</tr>
<tr>
<td>Other Hardware</td>
<td>None</td>
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</table>

### Software

<table>
<thead>
<tr>
<th>Description</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating System</td>
<td>SUSE Linux Enterprise Server 12 SP1 (x86_64) Kernel 3.12.49-11-default</td>
</tr>
<tr>
<td>Compiler</td>
<td>C++: Version 16.0.0.101 of Intel C++ Studio XE for Linux</td>
</tr>
<tr>
<td>Auto Parallel</td>
<td>No</td>
</tr>
<tr>
<td>File System</td>
<td>xfs</td>
</tr>
<tr>
<td>System State</td>
<td>Run level 3 (multi-user)</td>
</tr>
<tr>
<td>Base Pointers</td>
<td>32-bit</td>
</tr>
<tr>
<td>Peak Pointers</td>
<td>32/64-bit</td>
</tr>
<tr>
<td>Other Software</td>
<td>Microquill SmartHeap V10.2</td>
</tr>
</tbody>
</table>
Lenovo Group Limited

Lenovo ThinkServer RD650
(2.00 GHz, Intel Xeon E5-2660 v4)

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

SPECint_rate2006 = 1150
SPECint_rate_base2006 = 1100

Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Base</th>
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<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Peak</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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<td>400.perlbench</td>
<td>56</td>
<td>687</td>
<td>796</td>
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<td>404.bzip2</td>
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<td>473.astar</td>
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</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

Platform Notes

BIOS Configuration:
Cluster On Die set to Enabled
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 Fri May  6 16:03:55 2016

Continued on next page
Lenovo Group Limited

Lenovo ThinkServer RD650
(2.00 GHz, Intel Xeon E5-2660 v4)

SPECint_rate2006 = 1150
SPECint_rate_base2006 = 1100

CPU2006 license: 9017
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Tested by: Lenovo Group Limited

Test date: May-2016
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Platform Notes (Continued)

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)
56 "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 : 14
siblings : 28
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 : 17920 KB

From /proc/meminfo
MemTotal: 264552876 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 6 16:03

SPEC is set to: /home/cpu2006-1.2-ic16.0
Filesystem Type Size Used Avail Use% Mounted on
/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
Lenovo Group Limited

SPECint_rate2006 = 1150
SPECint_rate_base2006 = 1100

CPU2006 license: 9017
Test sponsor: Lenovo Group Limited
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Platform Notes (Continued)

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

(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 -m32 -L/opt/intel/compilers_and_libraries_2016/linux/compiler/lib/ia32_lin

C++ benchmarks:
icpc -m32 -L/opt/intel/compilers_and_libraries_2016/linux/compiler/lib/ia32_lin

Base Portability Flags

400.perlbench: -D_FILE_OFFSET_BITS=64 -DSPEC_CPU_LINUX_IA32
401.bzip2: -D_FILE_OFFSET_BITS=64
403.gcc: -D_FILE_OFFSET_BITS=64
429.mcf: -D_FILE_OFFSET_BITS=64
445.gobmk: -D_FILE_OFFSET_BITS=64
456.hmmer: -D_FILE_OFFSET_BITS=64
458.sjeng: -D_FILE_OFFSET_BITS=64
462.libquantum: -D_FILE_OFFSET_BITS=64 -DSPEC_CPU_LINUX
464.h264ref: -D_FILE_OFFSET_BITS=64
471.omnetpp: -D_FILE_OFFSET_BITS=64
473.astar: -D_FILE_OFFSET_BITS=64
483.xalancbmk: -D_FILE_OFFSET_BITS=64 -DSPEC_CPU_LINUX
Lenovo Group Limited

Lenovo ThinkServer RD650
(2.00 GHz, Intel Xeon E5-2660 v4)

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CPU2006 license: 9017
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Tested by: Lenovo Group Limited

Test date: May-2016
Hardware Availability: Mar-2016
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Base Optimization Flags

\[
\begin{align*}
C \text{ benchmarks:} & & -xCORE-AVX2 & -ipo & -O3 & -no-prec-div & -opt-prefetch \\
& & -opt-mem-layout-trans=3
\end{align*}
\]

\[
\begin{align*}
C++ \text{ benchmarks:} & & -xCORE-AVX2 & -ipo & -O3 & -no-prec-div & -opt-prefetch \\
& & -opt-mem-layout-trans=3 & -Wl,-z,muldefs & -L/sh & -lsmartheap
\end{align*}
\]

Base Other Flags

\[
\begin{align*}
C \text{ benchmarks:} & & 403.\text{gcc: } & -Dalloca=_alloca
\end{align*}
\]

Peak Compiler Invocation

\[
\begin{align*}
C \text{ benchmarks (except as noted below):} & & \text{icc } & -m32 & -L/opt/intel/compilers_and_libraries_2016/linux/compiler/lib/ia32_lin \\
& & 400.\text{perlbench: } & \text{icc } & -m64 \\
& & 401.\text{bzip2: } & \text{icc } & -m64 \\
& & 456.\text{hmmer: } & \text{icc } & -m64 \\
& & 458.\text{sjeng: } & \text{icc } & -m64
\end{align*}
\]

\[
\begin{align*}
C++ \text{ benchmarks:} & & \text{icpc } & -m32 & -L/opt/intel/compilers_and_libraries_2016/linux/compiler/lib/ia32_lin
\end{align*}
\]

Peak Portability Flags

\[
\begin{align*}
400.\text{perlbench: } & -D\text{ FILE_OFFSET_BITS}=64 & -D\text{SPEC_CPU_LP64} & -D\text{SPEC_CPU_LINUX_X64} \\
401.\text{bzip2: } & -D\text{ FILE_OFFSET_BITS}=64 & -D\text{SPEC_CPU_LP64} \\
403.\text{gcc: } & -D\text{ FILE_OFFSET_BITS}=64 \\
429.\text{mcf: } & -D\text{ FILE_OFFSET_BITS}=64 \\
445.\text{gobmk: } & -D\text{ FILE_OFFSET_BITS}=64 \\
456.\text{hmmer: } & -D\text{ FILE_OFFSET_BITS}=64 & -D\text{SPEC_CPU_LP64} \\
458.\text{sjeng: } & -D\text{ FILE_OFFSET_BITS}=64 & -D\text{SPEC_CPU_LP64} \\
462.\text{libquantum: } & -D\text{ FILE_OFFSET_BITS}=64 & -D\text{SPEC_CPU_LINUX} \\
464.\text{h264ref: } & -D\text{ FILE_OFFSET_BITS}=64 \\
471.\text{omnetpp: } & -D\text{ FILE_OFFSET_BITS}=64 \\
473.\text{astar: } & -D\text{ FILE_OFFSET_BITS}=64
\end{align*}
\]
Lenovo Group Limited
Lenovo ThinkServer RD650
(2.00 GHz, Intel Xeon E5-2660 v4)

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SPECint_rate_base2006 = 1100

CPU2006 license: 9017
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Peak Portability Flags (Continued)

483.xalancbmk: -D_FILE_OFFSET_BITS=64 -DSPEC_CPU_LINUX

Peak Optimization Flags

C benchmarks:

400.perlbench: -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) -auto-ilp32

401.bzip2: -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) -opt-prefetch
    -auto-ilp32 -ansi-alias

403.gcc: -xCORE-AVX2 -ipo -O3 -no-prec-div

429.mcf: basepeak = yes

445.gobmk: -xCORE-AVX2(pass 2) -prof-gen:threadsafe(pass 1)
    -prof-use(pass 2) -par-num-threads=1(pass 1) -ansi-alias
    -opt-mem-layout-trans=3

456.hmmer: -xCORE-AVX2 -ipo -O3 -no-prec-div -unroll2 -auto-ilp32

458.sjeng: -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) -unroll14
    -auto-ilp32

462.libquantum: basepeak = yes

464.h264ref: -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) -unroll12
    -ansi-alias

C++ benchmarks:

471.omnetpp: -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) -ansi-alias
    -opt-ra-region-strategy=block -Wl,-z,muldefs
    -L/sh -lsmartheap

473.astar: basepeak = yes

Continued on next page
## Lenovo Group Limited

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<thead>
<tr>
<th>SPECint_rate2006</th>
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<tr>
<td>SPECint_rate_base2006</td>
<td>1100</td>
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**CPU2006 license:** 9017  
**Test sponsor:** Lenovo Group Limited  
**Tested by:** Lenovo Group Limited

<table>
<thead>
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<th>Test date:</th>
<th>May-2016</th>
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<tbody>
<tr>
<td>Hardware Availability:</td>
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<tr>
<td>Software Availability:</td>
<td>Dec-2015</td>
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### Peak Optimization Flags (Continued)

<table>
<thead>
<tr>
<th>Flag</th>
<th>Value</th>
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<tbody>
<tr>
<td>483.xalancbmk:basepeak</td>
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### Peak Other Flags

**C benchmarks:**

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Flags</th>
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<tbody>
<tr>
<td>403.gcc</td>
<td>-Dalloca=_alloca</td>
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The flags files that were used to format this result can be browsed at:

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