Lenovo Group Limited

**Lenovo ThinkServer RD650**
(2.10 GHz, Intel Xeon E5-2695 v4)

**SPECint®2006 = 67.3**
**SPECint_base2006 = 65.6**

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

---

**Hardware**

<table>
<thead>
<tr>
<th>Component</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU Name</td>
<td>Intel Xeon E5-2695 v4</td>
</tr>
<tr>
<td>CPU Characteristics</td>
<td>Intel Turbo Boost Technology up to 3.30 GHz</td>
</tr>
<tr>
<td>CPU MHz</td>
<td>2100</td>
</tr>
<tr>
<td>FPU</td>
<td>Integrated</td>
</tr>
<tr>
<td>CPU(s) enabled</td>
<td>36 cores, 2 chips, 18 cores/chip</td>
</tr>
<tr>
<td>CPU(s) orderable</td>
<td>1.2 chips</td>
</tr>
<tr>
<td>Primary Cache</td>
<td>32 KB I + 32 KB D on chip per core</td>
</tr>
<tr>
<td>Secondary Cache</td>
<td>256 KB I+D on chip per core</td>
</tr>
<tr>
<td>L3 Cache</td>
<td>45 MB I+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>
</tr>
</tbody>
</table>

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**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
- **Auto Parallel:** Yes
- **File System:** xfs
- **System State:** Run level 3 (multi-user)
- **Base Pointers:** 32/64-bit
- **Peak Pointers:** 32/64-bit
- **Other Software:** Microquill SmartHeap V10.2
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Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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<tbody>
<tr>
<td>400.perlbench</td>
<td>253</td>
<td>38.7</td>
<td>252</td>
<td>38.7</td>
<td>256</td>
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<td>42.0</td>
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<tr>
<td>401.bzip2</td>
<td>414</td>
<td>23.3</td>
<td>414</td>
<td>23.3</td>
<td>415</td>
<td>23.3</td>
<td>413</td>
<td>23.3</td>
<td>413</td>
<td>23.4</td>
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<tr>
<td>403.mcc</td>
<td>230</td>
<td>35.0</td>
<td>230</td>
<td>35.1</td>
<td>230</td>
<td>35.1</td>
<td>227</td>
<td>35.5</td>
<td>228</td>
<td>35.3</td>
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<td>429.mcf</td>
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<td>57.9</td>
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<td>56.3</td>
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<td>59.0</td>
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<td>56.6</td>
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<tr>
<td>445.gobmk</td>
<td>373</td>
<td>28.1</td>
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<td>28.1</td>
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<td>28.1</td>
<td>378</td>
<td>27.8</td>
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<td>27.7</td>
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<td>456.hmmer</td>
<td>115</td>
<td>81.0</td>
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<td>81.1</td>
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<td>81.0</td>
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<td>458.sjeng</td>
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<td>8120</td>
<td>2.56</td>
<td>8090</td>
<td>2.56</td>
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<td>2.55</td>
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<td>464.h264ref</td>
<td>431</td>
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<td>51.5</td>
<td>432</td>
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<td>431</td>
<td>51.4</td>
<td>430</td>
<td>51.5</td>
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<td>471.omnetpp</td>
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<td>46.4</td>
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<td>46.6</td>
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<td>52.3</td>
<td>120</td>
<td>52.3</td>
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<tr>
<td>473.astar</td>
<td>205</td>
<td>34.2</td>
<td>204</td>
<td>34.4</td>
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<td>34.2</td>
<td>207</td>
<td>34.0</td>
<td>207</td>
<td>33.8</td>
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<td>483.xalancbmk</td>
<td>97.4</td>
<td>70.8</td>
<td>97.4</td>
<td>70.9</td>
<td>97.4</td>
<td>70.8</td>
<td>86.7</td>
<td>79.5</td>
<td>86.8</td>
<td>79.5</td>
</tr>
</tbody>
</table>

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

Submit Notes

The config file option 'submit' was used.

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
Sysinfo program `/home/cpu2006-1.2-ic16.0/config/sysinfo.rev6914
$Rev: 6914 $ $Date:: 2014-06-25 $$ e3fbb8667b5a285932ceab81e28219e1

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

Continued on next page
Lenovo Group Limited

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CPU2006 license: 9017
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Platform Notes (Continued)

model name : Intel(R) Xeon(R) CPU E5-2695 v4 @ 2.10GHz
  2 "physical id"s (chips)
  36 "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 : 18
  siblings : 18
physical 0: cores 0 1 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27
physical 1: cores 0 1 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27
  cache size : 46080 KB

From /proc/meminfo
  MemTotal: 264555976 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 Apr 21 14:36

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
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:
Lenovo Group Limited

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**Platform Notes (Continued)**

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:  
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 = "36"

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
```
**SPEC CINT2006 Result**

**Lenovo Group Limited**

Lenovo ThinkServer RD650  
(2.10 GHz, Intel Xeon E5-2695 v4)

**SPECint2006 = 67.3**  
**SPECint_base2006 = 65.6**

**Base Optimization Flags (Continued)**

C++ benchmarks:
- xCORE-AVX2  -ipo  -O3  -no-prec-div  -opt-prefetch  -auto-p32  
- Wl,-z,muldefs -L/sh -lsmartheap64

**Base Other Flags**

C benchmarks:
- 403.gcc: -Dalloca=_alloca

**Peak Compiler Invocation**

C benchmarks (except as noted below):
- icc  -m64

- 400.perlbench: icc -m32 -L/opt/intel/compilers_and_libraries_2016/linux/compiler/lib/ia32_lin


C++ benchmarks (except as noted below):
- icpc  -m32 -L/opt/intel/compilers_and_libraries_2016/linux/compiler/lib/ia32_lin

- 473.astar: icpc  -m64

**Peak Portability Flags**

- 400.perlbench: -D_FILE_OFFSET_BITS=64  -DSPEC_CPU_LINUX_IA32
- 401.bzip2: -DSPEC_CPU_LP64
- 403.gcc: -DSPEC_CPU_LP64
- 429.mcf: -DSPEC_CPU_LP64
- 445.gobmk: -D_FILE_OFFSET_BITS=64
- 456.hmmer: -DSPEC_CPU_LP64
- 458.sjeng: -DSPEC_CPU_LP64
- 462.libquantum: -DSPEC_CPU_LP64  -DSPEC_CPU_LINUX
- 464.h264ref: -DSPEC_CPU_LP64
- 471.omnetpp: -D_FILE_OFFSET_BITS=64
- 473.astar: -DSPEC_CPU_LP64
- 483.xalancbmk: -D_FILE_OFFSET_BITS=64  -DSPEC_CPU_LINUX
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**SPEC CINT2006 Result**

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**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) -opt-prefetch
-ansi-alias

401.bzip2: -xCORE-AVX2(pass 2) -prof-gen:threadsafe(pass 1)
-ipo(pass 2) -O3(pass 2) -no-prec-div
-par-num-threads=1(pass 1) -prof-use(pass 2) -auto-ilp32
-opt-prefetch -ansi-alias

403.gcc: -xCORE-AVX2 -ipo -O3 -no-prec-div -inline-calloc
-opt-malloc-options=3 -auto-ilp32

429.mcf: -xCORE-AVX2 -ipo -O3 -no-prec-div -parallel
-opt-prefetch -auto-p32

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

456.hmmer: basepeak = yes

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) -unroll4

462.libquantum: basepeak = yes

464.h264ref: basepeak = yes

**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)
-opt-ra-region-strategy=block -ansi-alias
-Wl,-z,muldefs -L/sh -lsmartheap

473.aistar: -xCORE-AVX2 -ipo -O3 -no-prec-div -opt-prefetch
-auto-p32 -Wl,-z,muldefs -L/sh -lsmartheap64

483.xalancbmk: -xCORE-AVX2 -ipo -O3 -no-prec-div -opt-prefetch
-ansi-alias -Wl,-z,muldefs -L/sh -lsmartheap
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Peak Other Flags

C benchmarks:

403.gcc -Dalloca=_alloca

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-Settings-V1.2-BDW-revC.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-Settings-V1.2-BDW-revC.xml

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