Lenovo Group Limited
Lenovo ThinkServer RD550 (Intel Xeon E5-2650 v3, 2.30 GHz)

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

SPECint\textsubscript{rate2006} = 839
SPECint\textsubscript{rate_base2006} = 810

CPU Name: Intel Xeon E5-2650 v3
CPU Characteristics: Intel Turbo Boost Technology up to 3.00 GHz
CPU MHz: 2300
FPU: Integrated
CPU(s) enabled: 20 cores, 2 chips, 10 cores/chip, 2 threads/core
CPU(s) orderable: 1,2 chip
Primary Cache: 32 KB I + 32 KB D on chip per core
Secondary Cache: 256 KB I+D on chip per core
L3 Cache: 25 MB I+D on chip per chip
Other Cache: None
Memory: 256 GB (16 x 16 GB 2Rx4 PC4-2133P-R)
Disk Subsystem: 1 x 800 GB SATA SSD
Other Hardware: None

Operating System: Red Hat Enterprise Linux Server release 6.5 (Santiago)
Compiler: C/C++: Version 14.0.0.080 of Intel C++ Studio XE for Linux
Auto Parallel: No
File System: ext4
System State: Run level 3 (multi-user)
Base Pointers: 32-bit
Peak Pointers: 32/64-bit
Other Software: Microquill SmartHeap V10.0
<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>Base Seconds</th>
<th>Base Ratio</th>
<th>Peak Seconds</th>
<th>Peak Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>400.perlbench</td>
<td>40</td>
<td>640</td>
<td>611</td>
<td>638</td>
<td>612</td>
</tr>
<tr>
<td>401.bzip2</td>
<td>40</td>
<td>981</td>
<td>393</td>
<td>980</td>
<td>394</td>
</tr>
<tr>
<td>403.mcf</td>
<td>40</td>
<td>332</td>
<td>1100</td>
<td>329</td>
<td>1110</td>
</tr>
<tr>
<td>445.gobmk</td>
<td>40</td>
<td>780</td>
<td>538</td>
<td>778</td>
<td>539</td>
</tr>
<tr>
<td>456.hmmer</td>
<td>40</td>
<td>323</td>
<td>1160</td>
<td>318</td>
<td>1170</td>
</tr>
<tr>
<td>458.sjeng</td>
<td>40</td>
<td>846</td>
<td>572</td>
<td>846</td>
<td>572</td>
</tr>
<tr>
<td>462.libquantum</td>
<td>40</td>
<td>104</td>
<td>7990</td>
<td>103</td>
<td>8040</td>
</tr>
<tr>
<td>464.h264ref</td>
<td>40</td>
<td>950</td>
<td>932</td>
<td>943</td>
<td>939</td>
</tr>
<tr>
<td>471.onetpp</td>
<td>40</td>
<td>555</td>
<td>450</td>
<td>554</td>
<td>451</td>
</tr>
<tr>
<td>473.astar</td>
<td>40</td>
<td>630</td>
<td>446</td>
<td>626</td>
<td>448</td>
</tr>
<tr>
<td>483.xalancbmk</td>
<td>40</td>
<td>304</td>
<td>908</td>
<td>305</td>
<td>904</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"

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

The sysinfo program /usr/cpu2006/config/sysinfo.rev6818
$Rev: 6818 $ $Date:: 2012-07-17 #$ e86d102572650a6e4d596a3cee98f191
running on RD550 Thu Oct 30 02:11:08 2014

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

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**Test date:** Oct-2014
**Hardware Availability:** Sep-2014
**Software Availability:** Jan-2014

### Platform Notes (Continued)

From /proc/cpuinfo
- *model name:* Intel(R) Xeon(R) CPU E5-2650 v3 @ 2.30GHz
- 2 "physical id"s (chips)
- 40 "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 : 10
  - siblings : 20
  - physical 0: cores 0 1 2 3 4 8 9 10 11 12
  - physical 1: cores 0 1 2 3 4 8 9 10 11 12
- cache size : 12800 KB

From /proc/meminfo
- *MemTotal:* 264412060 kB
- *HugePages_Total:* 0
- *Hugepagesize:* 2048 kB

/usr/bin/lsb_release -d
- Red Hat Enterprise Linux Server release 6.5 (Santiago)

From /etc/*release* /etc/*version*
- *redhat-release:* Red Hat Enterprise Linux Server release 6.5 (Santiago)
- *system-release:* Red Hat Enterprise Linux Server release 6.5 (Santiago)

uname -a:
- Linux RD550 2.6.32-431.el6.x86_64 #1 SMP Sun Nov 10 22:19:54 EST 2013 x86_64 x86_64 GNU/Linux

run-level 3 Oct 30 02:10

SPEC is set to: /usr/cpu2006
- *Filesystem*     *Type*  *Size*  *Used*  *Avail*  *Use%*  *Mounted on*
- /dev/sda2     ext4     730G     13G    680G     2%  /

Additional information from dmidecode:
- BIOS LENOVO PB1TS110 10/06/2014
- Memory:
  - 16x 16 GB
  - 1x Hynix Semiconductor HMA42GR7MFR4N-TF 16 GB 2133 MHz 2 rank
  - 15x Hynix Semiconductor HMA42GR7MFR4N-TFTD 16 GB 2133 MHz 2 rank
  - 8x NO DIMM NO DIMM

(End of data from sysinfo program)
RD550 support 4 channels and 12 DIMMs per processor, total 8 channels and 24 DIMMs. 16 DIMM slots installed with 16 GB DIMM for this run.
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**General Notes**

Environment variables set by runspec before the start of the run:
LD_LIBRARY_PATH = "/usr/cpu2006/libs/32:/usr/cpu2006/libs/64:/usr/cpu2006/sh"

Binaries compiled on a system with 1x Core i7-860 CPU + 8GB memory using RedHat EL 6.4
Transparent Huge Pages enabled with:
echo always > /sys/kernel/mm/redhat_transparent_hugepage/enabled
Filesystem page cache cleared with:
echo 1 > /proc/sys/vm/drop_caches
runspec command invoked through numactl i.e.:
umactl --interleave=all runspec <etc>

**Base Compiler Invocation**

C benchmarks:
```plaintext
icc  -m32
```

C++ benchmarks:
```plaintext
icpc -m32
```

**Base Portability Flags**

400.perlbench: -DSPEC_CPU_LINUX_IA32
462.libquantum: -DSPEC_CPU_LINUX
483.xalancbmk: -DSPEC_CPU_LINUX

**Base Optimization Flags**

C benchmarks:
```plaintext
-xCORE-AVX2 -ipo -O3 -no-prec-div -opt-prefetch
-opt-mem-layout-trans=3
```

C++ benchmarks:
```plaintext
-xCORE-AVX2 -ipo -O3 -no-prec-div -opt-prefetch
-opt-mem-layout-trans=3 -Wl,-z,muldefs -L/sh -lsmartheap
```

**Base Other Flags**

C benchmarks:
```plaintext
403.gcc: -Dalloca=_alloca
```
Lenovo Group Limited
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SPEC CINT2006 Result

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Peak Compiler Invocation

C benchmarks (except as noted below):

```plaintext
  icc  -m32
  400.perlbench : icc  -m64
  401.bzip2 : icc  -m64
  456.hmmer : icc  -m64
  458.sjeng : icc  -m64
```

C++ benchmarks:

```plaintext
  icpc  -m32
```

Peak Portability Flags

```plaintext
400.perlbench: -DSPEC_CPU_LP64  -DSPEC_CPU_LINUX_X64
401.bzip2: -DSPEC_CPU_LP64
456.hmmer: -DSPEC_CPU_LP64
458.sjeng: -DSPEC_CPU_LP64
462.libquantum: -DSPEC_CPU_LINUX
483.xalancbmk: -DSPEC_CPU_LINUX
```

Peak Optimization Flags

C benchmarks:

```plaintext
400.perlbench: -xCORE-AVX2(pass 2)  -prof-gen(pass 1)  -ipo(pass 2)
   -O3(pass 2)  -no-prec-div(pass 2)  -prof-use(pass 2)
   -auto-ilp32

401.bzip2: -xCORE-AVX2(pass 2)  -prof-gen(pass 1)  -ipo(pass 2)
   -O3(pass 2)  -no-prec-div(pass 2)  -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(pass 1)  -prof-use(pass 2)
   -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(pass 1)  -ipo(pass 2)
   -O3(pass 2)  -no-prec-div(pass 2)  -prof-use(pass 2)
   -unroll4  -auto-ilp32
```

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Peak Optimization Flags (Continued)

462.libquantum: basepeak = yes

464.h264ref:
-xCORE-AVX2(pass 2) -prof-gen(pass 1) -ipo(pass 2)
-O3(pass 2) -no-prec-div(pass 2) -prof-use(pass 2)
-unroll2 -ansi-alias

C++ benchmarks:

471.omnetpp:
-xCORE-AVX2(pass 2) -prof-gen(pass 1) -ipo(pass 2)
-O3(pass 2) -no-prec-div(pass 2) -prof-use(pass 2)
-ansi-alias -opt-ra-region-strategy=block -Wl,-z,muldefs
-L/sh -lsmartheap

473.astar: basepeak = yes
483.xalancbmk: basepeak = yes

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-ic14.0-official-linux64.20140128.html
http://www.spec.org/cpu2006/flags/Lenovo-Platform-Settings-V1.2-RD550-revA.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2006/flags/Intel-ic14.0-official-linux64.20140128.xml
http://www.spec.org/cpu2006/flags/Lenovo-Platform-Settings-V1.2-RD550-revA.xml

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For other inquiries, please contact webmaster@spec.org.

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