Dell Inc.

PowerEdge R730 (Intel Xeon E5-2698 v4, 2.20 GHz)

**SPECint®2006 = 73.5**

**SPECint_base2006 = 71.0**

**Hardware**

- CPU Name: Intel Xeon E5-2698 v4
- CPU Characteristics: Intel Turbo Boost Technology up to 3.60 GHz
- CPU MHz: 2200
- FPU: Integrated
- CPU(s) enabled: 40 cores, 2 chips, 20 cores/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: 50 MB I+D on chip per chip
- Other Cache: None
- Memory: 256 GB (16 x 16 GB 2Rx8 PC4-2400T-R)
- Disk Subsystem: 2 x 2000 GB 7200 RPM SAS RAID 0
- Other Hardware: None

**Software**

- Operating System: SUSE Linux Enterprise Server 12 3.12.28-4-default
- Compiler: C/C++: Version 17.0.0.098 of Intel C/C++ Compiler for Linux
- Auto Parallel: Yes
- File System: ext4
- System State: Run level 3 (multi-user)
- Base Pointers: 32/64-bit
- Peak Pointers: 32/64-bit
- Other Software: Microquill SmartHeap V10.2
## Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Base</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Peak</th>
<th>Seconds</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>400.perlbench</td>
<td>237</td>
<td>41.2</td>
<td>238</td>
<td>41.1</td>
<td></td>
<td></td>
<td>206</td>
<td>47.3</td>
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<td>401.bzip2</td>
<td>378</td>
<td>25.5</td>
<td>378</td>
<td>25.5</td>
<td>375</td>
<td>25.8</td>
<td>376</td>
<td>25.7</td>
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<tr>
<td>403.gcc</td>
<td>210</td>
<td>38.3</td>
<td>210</td>
<td>38.3</td>
<td>210</td>
<td>38.2</td>
<td>209</td>
<td>39.1</td>
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<td>429.mcf</td>
<td>136</td>
<td>66.9</td>
<td>134</td>
<td>68.0</td>
<td>139</td>
<td>65.7</td>
<td>137</td>
<td>66.4</td>
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<tr>
<td>445.gobmk</td>
<td>337</td>
<td>31.2</td>
<td>335</td>
<td>31.3</td>
<td>336</td>
<td>31.2</td>
<td>332</td>
<td>31.6</td>
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<tr>
<td>456.hmmer</td>
<td>106</td>
<td>88.3</td>
<td>106</td>
<td>88.1</td>
<td>106</td>
<td>88.2</td>
<td>106</td>
<td>88.1</td>
</tr>
<tr>
<td>458.sjeng</td>
<td>339</td>
<td>35.7</td>
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<td>35.7</td>
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<td>35.7</td>
<td>331</td>
<td>36.5</td>
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<tr>
<td>462.libquantum</td>
<td>2.77</td>
<td>7480</td>
<td>2.72</td>
<td>7610</td>
<td>2.71</td>
<td>7650</td>
<td>2.77</td>
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<tr>
<td>464.h264ref</td>
<td>376</td>
<td>58.8</td>
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<td>58.5</td>
<td>376</td>
<td>58.8</td>
<td>376</td>
<td>58.5</td>
</tr>
<tr>
<td>471.omnetpp</td>
<td>124</td>
<td>50.3</td>
<td>128</td>
<td>48.9</td>
<td>127</td>
<td>49.0</td>
<td>111</td>
<td>56.5</td>
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<tr>
<td>473.astar</td>
<td>195</td>
<td>36.0</td>
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<td>35.8</td>
<td>195</td>
<td>36.0</td>
<td>199</td>
<td>35.3</td>
</tr>
<tr>
<td>483.xalancbmk</td>
<td>87.6</td>
<td>78.8</td>
<td>88.3</td>
<td>78.2</td>
<td>87.5</td>
<td>78.8</td>
<td>80.0</td>
<td>86.2</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 settings:
- Snoop Mode set to Opportunistic Snoop Broadcast
- Virtualization Technology disabled
- System Profile set to Custom
- CPU Performance set to Maximum Performance
- C States set to Autonomous
- C1E disabled
- Energy Efficient Turbo disabled
- Uncore Frequency set to Dynamic
- Energy Efficiency Policy set to Performance
- Memory Patrol Scrub disabled
- Logical Processor disabled
- Sysinfo program /root/previous-cpu2006-1.2/config/sysinfo.rev6993

Revision 6993 of 2015-11-06 (b5e8d4b4eb51ed28d7f98696cbe290c1)
running on linux-0171 Mon Feb  6 15:51:01 2017

This section contains SUT (System Under Test) info as seen by
Dell Inc.

PowerEdge R730 (Intel Xeon E5-2698 v4, 2.20 GHz)

**SPEC CINT2006 Result**

<table>
<thead>
<tr>
<th>CPU2006 license</th>
<th>Test date</th>
</tr>
</thead>
<tbody>
<tr>
<td>55</td>
<td>Feb-2017</td>
</tr>
</tbody>
</table>

**Test sponsor:** Dell Inc.

**Tested by:** Dell Inc.

<table>
<thead>
<tr>
<th>Hardware Availability</th>
<th>Software Availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mar-2016</td>
<td>Nov-2016</td>
</tr>
</tbody>
</table>

**SPECint2006 = 73.5**

**SPECint_base2006 = 71.0**

### Platform Notes (Continued)

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 E5-2698 v4 @ 2.20GHz
- 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: 20
  - siblings: 20
  - physical 0: cores 0 1 2 3 4 8 9 10 11 12 16 17 18 19 20 24 25 26 27 28
  - physical 1: cores 0 1 2 3 4 8 9 10 11 12 16 17 18 19 20 24 25 26 27 28
- cache size: 51200 KB

From /proc/meminfo

- MemTotal: 264567484 kB
- HugePages_Total: 0
- Hugepagesize: 2048 kB

/usr/bin/lsb_release -d

SUSE Linux Enterprise Server 12

From /etc/*release* /etc/*version*

SuSE-release:

- NAME="SLES"
- VERSION="12"
- VERSION_ID="12"
- PRETTY_NAME="SUSE Linux Enterprise Server 12"
- ID="sles"
- ANSI_COLOR="0;32"
- CPE_NAME="cpe:/o:suse:sles:12"

uname -a:

Linux linux-0171 3.12.28-4-default #1 SMP Thu Sep 25 17:02:34 UTC 2014
(9879bd4) x86_64 x86_64 x86_64 GNU/Linux

run-level 3 Feb 6 15:25

SPEC is set to: /root/previous-cpu2006-1.2

Filesystem Type Size Used Avail Use% Mounted on
/dev/sda2 ext4 246G 19G 226G 8% /

Additional information from dmidecode:

Continued on next page
SPEC CINT2006 Result

Dell Inc.

PowerEdge R730 (Intel Xeon E5-2698 v4, 2.20 GHz)

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SPECint_base2006 = 71.0

CPU2006 license: 55
Test sponsor: Dell Inc.
Tested by: Dell Inc.

Platform Notes (Continued)

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 Dell Inc. 2.3.4 11/08/2016
Memory:
7x 0OAD63200AD HMA82GR7MF8N-UH 16 GB 2 rank 2400 MHz
9x 00CE00B300CE M393A2K43BB1-CRC 16 GB 2 rank 2400 MHz
8x Not Specified Not Specified

(End of data from sysinfo program)

General Notes

Environment variables set by runspec before the start of the run:
KMP_AFFINITY = "granularity=fine,scatter"
LD_LIBRARY_PATH = "/root/previous-cpu2006-1.2/libs/32:/root/previous-cpu2006-1.2/libs/64:/root/previous-cpu2006-1.2/sh10.2"
OMP_NUM_THREADS = "20"
The Dell PowerEdge R730 and the PowerEdge R730xd models are electronically equivalent. The results have been measured on a Dell PowerEdge R730xd model.
Binaries compiled on a system with 1x Intel Core i7-4790K CPU + 32GB RAM memory using Redhat Enterprise Linux 7.2
Transparent Huge Pages enabled with:
echo always > /sys/kernel/mm/transparent_hugepage/enabled

Base Compiler Invocation

C benchmarks:
icc -m64

C++ benchmarks:
icpc -m64

Base Portability Flags

400.perlbench: -DSPEC_CPU_LP64 -DSPEC_CPU_LINUX_X64
401.bzip2: -DSPEC_CPU_LP64
403.gcc: -DSPEC_CPU_LP64
429.mcf: -DSPEC_CPU_LP64
445.gobmk: -DSPEC_CPU_LP64
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: -DSPEC_CPU_LP64
SPEC CINT2006 Result

Dell Inc.

PowerEdge R730 (Intel Xeon E5-2698 v4, 2.20 GHz)

\[
\text{SPECint2006} = 73.5 \\
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\]

CPU2006 license: 55
Test sponsor: Dell Inc.
Tested by: Dell Inc.

Test date: Feb-2017
Hardware Availability: Mar-2016
Software Availability: Nov-2016

Base Portability Flags (Continued)

- 473.astar: -DSPEC\_CPU\_LP64
- 483.xalanbmk: -DSPEC\_CPU\_LP64 -DSPEC\_CPU\_LINUX

Base Optimization Flags

C benchmarks:
- -xCORE-AVX2 -ipo -O3 -no-prec-div -parallel -qopt-prefetch
- -auto-p32

C++ benchmarks:
- -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -auto-p32
- -Wl,-z,muldefs -L/sh10.2 -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_2017/linux/lib/ia32
  - 445.gobmk: icc -m32 -L/opt/intel/compilers_and_libraries_2017/linux/lib/ia32

C++ benchmarks (except as noted below):
- icc -m32 -L/opt/intel/compilers_and_libraries_2017/linux/lib/ia32
  - 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

Continued on next page
SPEC CINT2006 Result

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CPU2006 license: 55
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Tested by: Dell Inc.

Test date: Feb-2017
Hardware Availability: Mar-2016
Software Availability: Nov-2016

Peak Portability Flags (Continued)

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

Peak Optimization Flags

C benchmarks:

400.perlbench: -prof-gen(pass 1) -prof-use(pass 2) -xCORE-AVX2(pass 2)
   -par-num-threads=1(pass 1) -ipo(pass 2) -O3(pass 2)
   -no-prec-div(pass 2) -qopt-prefetch

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

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

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

445.gobmk: -prof-gen(pass 1) -prof-use(pass 2) -xCORE-AVX2(pass 2)
   -par-num-threads=1(pass 1) -ipo(pass 2) -O3(pass 2)
   -no-prec-div(pass 2)

456.hmmer: basepeak = yes

458.sjeng: -prof-gen(pass 1) -prof-use(pass 2) -xCORE-AVX2(pass 2)
   -par-num-threads=1(pass 1) -ipo(pass 2) -O3(pass 2)
   -no-prec-div(pass 2) -unroll4

462.libquantum: basepeak = yes

464.h264ref: basepeak = yes

C++ benchmarks:

471.omnetpp: -prof-gen(pass 1) -prof-use(pass 2) -xCORE-AVX2(pass 2)
   -par-num-threads=1(pass 1) -ipo(pass 2) -O3(pass 2)
   -no-prec-div(pass 2) -qopt-ra-region-strategy=block
   -Wl,-z,muldefs -L/sh10.2 -lsmartheap

473.astar: -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
   -auto-p32 -Wl,-z,muldefs -L/sh10.2 -lsmartheap64

Continued on next page
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Test date: Feb-2017
Hardware Availability: Mar-2016
Software Availability: Nov-2016

Peak Optimization Flags (Continued)
483.xalancbmk: -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
-Wl,-z,muldefs -L/sh10.2 -lsmartheap

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-ic17.0-official-linux64.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2006/flags/Intel-ic17.0-official-linux64.xml

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

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