SPEC® CFP2006 Result

Dell Inc.

PowerEdge R630 (Intel Xeon E5-2667 v4, 3.20 GHz)

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

SPECfp®2006 = 127
SPECfp_base2006 = 123

Hardware

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU Name</td>
<td>Intel Xeon E5-2667 v4</td>
</tr>
<tr>
<td>CPU Characteristics</td>
<td>Intel Turbo Boost Technology up to 3.60 GHz</td>
</tr>
<tr>
<td>CPU MHZ</td>
<td>3200</td>
</tr>
<tr>
<td>FPU</td>
<td>Integrated</td>
</tr>
<tr>
<td>CPU(s) enabled</td>
<td>16 cores, 2 chips, 8 cores/chip, 2 threads/core</td>
</tr>
<tr>
<td>CPU(s) orderable</td>
<td>1.2 chip</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>
</tbody>
</table>

Software

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating System</td>
<td>SUSE Linux Enterprise Server 12 SP1 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>Yes</td>
</tr>
<tr>
<td>File System</td>
<td>xfs</td>
</tr>
<tr>
<td>System State</td>
<td>Run level 3 (multi-user)</td>
</tr>
</tbody>
</table>

Test date: Mar-2016
Hardware Availability: Mar-2016
Software Availability: Mar-2016
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L3 Cache: 25 MB I+D on chip per chip
Other Cache: None
Memory: 512 GB (16 x 32 GB 2Rx4 PC4-2400T-R)
Disk Subsystem: 1 x 480 GB SATA SSD
Other Hardware: None

Base Pointers: 64-bit
Peak Pointers: 32/64-bit
Other Software: None

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>
</tr>
</thead>
<tbody>
<tr>
<td>410.bwaves</td>
<td>22.6</td>
<td>602</td>
<td>23.0</td>
<td>591</td>
<td>22.9</td>
<td>593</td>
</tr>
<tr>
<td>416.gamess</td>
<td>445</td>
<td>44.0</td>
<td>444</td>
<td>44.1</td>
<td>444</td>
<td>44.1</td>
</tr>
<tr>
<td>433.milc</td>
<td>120</td>
<td>76.4</td>
<td>120</td>
<td>76.7</td>
<td>119</td>
<td>77.1</td>
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<tr>
<td>434.zeusmp</td>
<td>43.2</td>
<td>211</td>
<td>43.3</td>
<td>210</td>
<td>43.1</td>
<td>211</td>
</tr>
<tr>
<td>435.gromacs</td>
<td>113</td>
<td>63.4</td>
<td>115</td>
<td>62.3</td>
<td>113</td>
<td>63.4</td>
</tr>
<tr>
<td>436.cactusADM</td>
<td>15.8</td>
<td>758</td>
<td>15.9</td>
<td>753</td>
<td>15.8</td>
<td>755</td>
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<tr>
<td>437.leslie3d</td>
<td>27.3</td>
<td>345</td>
<td>25.1</td>
<td>374</td>
<td>25.5</td>
<td>368</td>
</tr>
<tr>
<td>444.namd</td>
<td>253</td>
<td>31.7</td>
<td>253</td>
<td>31.7</td>
<td>253</td>
<td>31.7</td>
</tr>
<tr>
<td>447.dealII</td>
<td>165</td>
<td>69.5</td>
<td>164</td>
<td>69.6</td>
<td>165</td>
<td>69.4</td>
</tr>
<tr>
<td>450.soplex</td>
<td>162</td>
<td>51.4</td>
<td>163</td>
<td>51.2</td>
<td>165</td>
<td>50.6</td>
</tr>
<tr>
<td>453.povray</td>
<td>84.9</td>
<td>62.6</td>
<td>86.1</td>
<td>61.8</td>
<td>84.8</td>
<td>62.7</td>
</tr>
<tr>
<td>454.calculix</td>
<td>138</td>
<td>59.7</td>
<td>138</td>
<td>59.8</td>
<td>138</td>
<td>59.8</td>
</tr>
<tr>
<td>459.GemsFDTD</td>
<td>45.4</td>
<td>234</td>
<td>45.5</td>
<td>233</td>
<td>46.4</td>
<td>229</td>
</tr>
<tr>
<td>465.tonto</td>
<td>191</td>
<td>51.6</td>
<td>191</td>
<td>51.6</td>
<td>190</td>
<td>51.7</td>
</tr>
<tr>
<td>470.lbm</td>
<td>19.0</td>
<td>724</td>
<td>19.0</td>
<td>722</td>
<td>18.8</td>
<td>733</td>
</tr>
<tr>
<td>481.wrf</td>
<td>85.7</td>
<td>130</td>
<td>86.0</td>
<td>130</td>
<td>86.0</td>
<td>130</td>
</tr>
<tr>
<td>482.sphinx3</td>
<td>211</td>
<td>92.4</td>
<td>211</td>
<td>92.2</td>
<td>211</td>
<td>92.2</td>
</tr>
</tbody>
</table>

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

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
CPU Power Management set to Maximum Performance
Memory Patrol Scrub disabled
C states set to Autonomus
Energy Efficient Policy set to Performance
Energy Efficient Turbo disabled
C1E disabled
Uncore Frequency set to Dynamic

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Platform Notes (Continued)

Logical Processor enabled
Sysinfo program /root/cpu2006-1.2/config/sysinfo.rev6914
$Rev: 6914 $ $Date:: 2014-06-25 #$ e3fbb8667b5a285932ceab81e28219e1
running on linux-m662 Thu Mar 17 20:51:33 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 E5-2667 v4@ 3.20GHz
  2 "physical id"s (chips)
  32 "processors"
cores, siblings (Caution: counting these is hw and system dependent. The
following excerpts from /proc/cpuinfo might not be reliable. Use with
cautions.)
  cpu cores : 8
  siblings : 16
  physical 0: cores 0 2 3 4 8 10 11 12
  physical 1: cores 0 2 3 4 8 10 11 12
  cache size : 25600 KB

From /proc/meminfo
  MemTotal: 529333472 kB
  HugePages_Total: 0
  Hugepagesize: 2048 kB

/usr/bin/lsb_release -d
  SUSE Linux Enterprise Server 12 SP1

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:
    Linux linux-m662 3.12.49-11-default #1 SMP Wed Nov 11 20:52:43 UTC 2015
    (8d714a0) x86_64 x86_64 x86_64 GNU/Linux

  run-level 3 Mar 17 16:04
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Platform Notes (Continued)

SPEC is set to: /root/cpu2006-1.2  
Filesystem Type Size Used Avail Use% Mounted on  
/dev/sda2 xfs 439G 9.1G 430G 3% /

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 Dell Inc. 2.0.1 02/12/2016  
Memory:  
16x 00AD063200AD HMA84GR7MFR4N-UH 32 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,compact,1,0"  
LD_LIBRARY_PATH = "/root/cpu2006-1.2/libs/32:/root/cpu2006-1.2/libs/64:/root/cpu2006-1.2/sh"  
OMP_NUM_THREADS = "16"

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

Base Compiler Invocation

C benchmarks:  
icc -m64

C++ benchmarks:  
icpc -m64

Fortran benchmarks:  
ifort -m64

Benchmarks using both Fortran and C:  
icc -m64 ifort -m64
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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
  -DSPEC_CPU_CASE_FLAG
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  -parallel  -opt-prefetch
  -ansi-alias

C++ benchmarks:
-xCORE-AVX2  -ipo  -O3  -no-prec-div  -opt-prefetch  -ansi-alias

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

Benchmarks using both Fortran and C:
-xCORE-AVX2  -ipo  -O3  -no-prec-div  -parallel  -opt-prefetch
  -ansi-alias

Peak Compiler Invocation

C benchmarks:
  icc  -m64

C++ benchmarks:
icpc  -m64

Fortran benchmarks:
ifort  -m64

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Peak Compiler Invocation (Continued)

Benchmarks using both Fortran and C:

```
icc  -m64 ifort -m64
```

Peak Portability Flags

Same as Base Portability Flags

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) -prof-use(pass 2) -fno-alias
         -auto-ilp32
447.dealII: basepeak = yes
450.soplex: basepeak = yes
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) -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
```

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Peak Optimization Flags (Continued)

459.GemsFDTD: -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 -opt-prefetch -parallel

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

Benchmarks using both Fortran and C:

435.gromacs: basepeak = yes
436.cactusADM: basepeak = yes
454.calculix: -xCORE-AVX2 -ipo -O3 -no-prec-div -auto-ilp32 -ansi-alias
481.wrf: basepeak = yes

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

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/Dell-Platform-Settings-V1.2-revD.20151006.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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