## Dell Inc.

PowerEdge R630 (Intel Xeon E5-2650 v4, 2.20 GHz)

### SPECfp®2006 = 109

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>410.bwaves</td>
<td>532</td>
</tr>
<tr>
<td>416.gamess</td>
<td>194</td>
</tr>
<tr>
<td>433.milc</td>
<td>66.9</td>
</tr>
<tr>
<td>434.zeusmp</td>
<td>194</td>
</tr>
<tr>
<td>435.gromacs</td>
<td>44.6</td>
</tr>
<tr>
<td>436.cactusADM</td>
<td>350</td>
</tr>
<tr>
<td>437.leslie3d</td>
<td>26.3</td>
</tr>
<tr>
<td>444.namd</td>
<td>25.4</td>
</tr>
<tr>
<td>447.dealII</td>
<td>54.3</td>
</tr>
<tr>
<td>450.soplex</td>
<td>42.9</td>
</tr>
<tr>
<td>453.povray</td>
<td>56.6</td>
</tr>
<tr>
<td>454.calculix</td>
<td>50.0</td>
</tr>
<tr>
<td>459.GemsFDFTD</td>
<td>50.5</td>
</tr>
<tr>
<td>465.tonto</td>
<td>233</td>
</tr>
<tr>
<td>470.lbm</td>
<td>38.6</td>
</tr>
<tr>
<td>481.wrf</td>
<td>110</td>
</tr>
<tr>
<td>482.sphinx3</td>
<td>67.9</td>
</tr>
</tbody>
</table>

### SPECfp_base2006 = 104

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>410.bwaves</td>
<td>532</td>
</tr>
<tr>
<td>416.gamess</td>
<td>194</td>
</tr>
<tr>
<td>433.milc</td>
<td>66.9</td>
</tr>
<tr>
<td>434.zeusmp</td>
<td>194</td>
</tr>
<tr>
<td>435.gromacs</td>
<td>44.6</td>
</tr>
<tr>
<td>436.cactusADM</td>
<td>350</td>
</tr>
<tr>
<td>437.leslie3d</td>
<td>26.3</td>
</tr>
<tr>
<td>444.namd</td>
<td>25.4</td>
</tr>
<tr>
<td>447.dealII</td>
<td>54.3</td>
</tr>
<tr>
<td>450.soplex</td>
<td>42.9</td>
</tr>
<tr>
<td>453.povray</td>
<td>56.6</td>
</tr>
<tr>
<td>454.calculix</td>
<td>50.0</td>
</tr>
<tr>
<td>459.GemsFDFTD</td>
<td>50.5</td>
</tr>
<tr>
<td>465.tonto</td>
<td>233</td>
</tr>
<tr>
<td>470.lbm</td>
<td>38.6</td>
</tr>
<tr>
<td>481.wrf</td>
<td>110</td>
</tr>
<tr>
<td>482.sphinx3</td>
<td>67.9</td>
</tr>
</tbody>
</table>

### Hardware

- **CPU Name:** Intel Xeon E5-2650 v4
- **CPU Characteristics:** Intel Turbo Boost Technology up to 2.90 GHz
- **CPU MHz:** 2200
- **FPU:** Integrated
- **CPU(s) enabled:** 24 cores, 2 chips, 12 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

### Software

- **Operating System:** Red Hat Enterprise Linux Server release 7.2 (Maipo) 3.10.0-327.el7.x86_64
- **Compiler:** 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
- **Auto Parallel:** Yes
- **File System:** xfs

---

Continued on next page
Dell Inc.

PowerEdge R630 (Intel Xeon E5-2650 v4, 2.20 GHz)

SPECfp2006 = 109
SPECfp_base2006 = 104

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

L3 Cache: 30 MB I+D on chip per chip
Other Cache: None
Memory: 256 GB (16 x 16 GB 2Rx4 PC4-2400T-R)
Disk Subsystem: 1 x 500 GB 7200 RPM SATA
Other Hardware: None

System State: Run level 3 (multi-user)
Base Pointers: 64-bit
Peak Pointers: 32/64-bit
Other Software: None

Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Base Seconds</th>
<th>Base Ratio</th>
<th>Base Seconds</th>
<th>Base Ratio</th>
<th>Base Seconds</th>
<th>Base Ratio</th>
<th>Peak Seconds</th>
<th>Peak Ratio</th>
<th>Peak Seconds</th>
<th>Peak Ratio</th>
<th>Peak Seconds</th>
<th>Peak Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>410.bwaves</td>
<td>26.4</td>
<td>514</td>
<td>25.5</td>
<td>532</td>
<td>24.0</td>
<td>566</td>
<td>26.4</td>
<td>514</td>
<td>25.5</td>
<td>532</td>
<td>24.0</td>
<td>566</td>
</tr>
<tr>
<td>416.gamess</td>
<td>605</td>
<td>32.4</td>
<td>604</td>
<td>32.4</td>
<td>603</td>
<td>32.4</td>
<td>524</td>
<td>37.4</td>
<td>525</td>
<td>37.3</td>
<td>525</td>
<td>37.3</td>
</tr>
<tr>
<td>433.milc</td>
<td>137</td>
<td>66.9</td>
<td>133</td>
<td>68.9</td>
<td>139</td>
<td>65.9</td>
<td>137</td>
<td>66.9</td>
<td>133</td>
<td>68.9</td>
<td>139</td>
<td>65.9</td>
</tr>
<tr>
<td>434.zeusmp</td>
<td>47.0</td>
<td>194</td>
<td>46.8</td>
<td>194</td>
<td>47.0</td>
<td>194</td>
<td>47.0</td>
<td>194</td>
<td>46.8</td>
<td>194</td>
<td>47.0</td>
<td>194</td>
</tr>
<tr>
<td>435.gromacs</td>
<td>160</td>
<td>44.6</td>
<td>160</td>
<td>44.5</td>
<td>157</td>
<td>45.6</td>
<td>160</td>
<td>44.4</td>
<td>160</td>
<td>44.5</td>
<td>157</td>
<td>45.6</td>
</tr>
<tr>
<td>436.cactusADM</td>
<td>14.5</td>
<td>826</td>
<td>14.4</td>
<td>831</td>
<td>14.5</td>
<td>822</td>
<td>14.5</td>
<td>826</td>
<td>14.4</td>
<td>831</td>
<td>14.5</td>
<td>822</td>
</tr>
<tr>
<td>437.leslie3d</td>
<td>27.6</td>
<td>340</td>
<td>26.8</td>
<td>350</td>
<td>26.3</td>
<td>357</td>
<td>27.6</td>
<td>340</td>
<td>26.8</td>
<td>350</td>
<td>26.3</td>
<td>357</td>
</tr>
<tr>
<td>444.namd</td>
<td>315</td>
<td>25.4</td>
<td>315</td>
<td>25.4</td>
<td>316</td>
<td>25.4</td>
<td>305</td>
<td>26.3</td>
<td>305</td>
<td>26.3</td>
<td>305</td>
<td>26.3</td>
</tr>
<tr>
<td>447.dealII</td>
<td>211</td>
<td>54.2</td>
<td>211</td>
<td>54.3</td>
<td>210</td>
<td>54.4</td>
<td>211</td>
<td>54.2</td>
<td>211</td>
<td>54.3</td>
<td>210</td>
<td>54.4</td>
</tr>
<tr>
<td>450.soplex</td>
<td>192</td>
<td>43.4</td>
<td>194</td>
<td>42.9</td>
<td>196</td>
<td>42.5</td>
<td>192</td>
<td>43.4</td>
<td>194</td>
<td>42.9</td>
<td>196</td>
<td>42.5</td>
</tr>
<tr>
<td>453.povray</td>
<td>106</td>
<td>50.2</td>
<td>107</td>
<td>49.9</td>
<td>106</td>
<td>50.0</td>
<td>94.6</td>
<td>56.2</td>
<td>94.0</td>
<td>56.6</td>
<td>93.5</td>
<td>56.9</td>
</tr>
<tr>
<td>454.calculix</td>
<td>178</td>
<td>46.3</td>
<td>179</td>
<td>46.2</td>
<td>179</td>
<td>46.2</td>
<td>163</td>
<td>50.6</td>
<td>163</td>
<td>50.5</td>
<td>164</td>
<td>50.2</td>
</tr>
<tr>
<td>459.GemsFDTD</td>
<td>45.3</td>
<td>234</td>
<td>45.6</td>
<td>233</td>
<td>47.5</td>
<td>224</td>
<td>38.2</td>
<td>278</td>
<td>38.7</td>
<td>274</td>
<td>38.7</td>
<td>274</td>
</tr>
<tr>
<td>465.tonto</td>
<td>255</td>
<td>38.6</td>
<td>255</td>
<td>38.6</td>
<td>255</td>
<td>38.6</td>
<td>208</td>
<td>47.4</td>
<td>208</td>
<td>47.4</td>
<td>207</td>
<td>47.5</td>
</tr>
<tr>
<td>470.lbm</td>
<td>18.4</td>
<td>745</td>
<td>19.0</td>
<td>722</td>
<td>18.8</td>
<td>731</td>
<td>18.4</td>
<td>745</td>
<td>19.0</td>
<td>722</td>
<td>18.8</td>
<td>731</td>
</tr>
<tr>
<td>481.wrf</td>
<td>102</td>
<td>109</td>
<td>102</td>
<td>110</td>
<td>101</td>
<td>111</td>
<td>102</td>
<td>109</td>
<td>102</td>
<td>110</td>
<td>101</td>
<td>111</td>
</tr>
<tr>
<td>482.sphinx3</td>
<td>284</td>
<td>68.5</td>
<td>287</td>
<td>67.9</td>
<td>287</td>
<td>67.8</td>
<td>284</td>
<td>68.5</td>
<td>287</td>
<td>67.9</td>
<td>287</td>
<td>67.8</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
System Profile set to Custom
CPU Power Management set to Maximum Performance
Energy Efficient Turbo disabled
Memory Patrol Scrub disabled
Cstates autonomous/C1E enabled
Energy Efficient Policy set to Performance
Sysinfo program /root/cpu2006-1.2/config/sysinfo.rev6914
Continued on next page

Standard Performance Evaluation Corporation
info@spec.org
http://www.spec.org/
Dell Inc.

PowerEdge R630 (Intel Xeon E5-2650 v4, 2.20 GHz)

SPECfp2006 = 109
SPECfp_base2006 = 104

CPU2006 license: 55
Test sponsor: Dell Inc.
Tested by: Dell Inc.
Test date: Mar-2016
Hardware Availability: Mar-2016
Software Availability: Mar-2016

Platform Notes (Continued)

$Rev: 6914 $ $Date:: 2014-06-25 #$ e3fbb8667bSa285932ceab81e28219e1
running on localhost.localdomain Wed Mar 16 09:05:10 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 E5-2650 v4@ 2.20GHz
  2 "physical id"s (chips)
  48 "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: 12
  siblings: 24
  physical 0: cores 0 1 2 3 4 5 8 9 10 11 12 13
  physical 1: cores 0 1 2 3 4 5 8 9 10 11 12 13
  cache size: 30720 KB

From /proc/meminfo
  MemTotal: 264040556 kB
  HugePages_Total: 0
  Hugepagesize: 2048 kB

From /etc/*release*/etc/*version*
os-release:
  NAME="Red Hat Enterprise Linux Server"
  VERSION="7.2 (Maipo)"
  ID="rhel"
  ID_LIKE="fedora"
  VERSION_ID="7.2"
  PRETTY_NAME="Red Hat Enterprise Linux Server 7.2 (Maipo)"
  ANSI_COLOR="0;31"
  CPE_NAME="cpe:/o:redhat:enterprise_linux:7.2:GA:server"
  redhat-release: Red Hat Enterprise Linux Server release 7.2 (Maipo)
  system-release: Red Hat Enterprise Linux Server release 7.2 (Maipo)

uname -a:
  Linux localhost.localdomain 3.10.0-327.el7.x86_64 #1 SMP Thu Oct 29 17:29:29
  EDT 2015 x86_64 x86_64 x86_64 GNU/Linux
run-level 3 Mar 16 03:21

SPEC is set to: /root/cpu2006-1.2
  Filesystem Type Size Used Avail Use% Mounted on
  /dev/sda2 xfs 256G 12G 245G 5% /
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
Continued on next page
**Dell Inc.**

PowerEdge R630 (Intel Xeon E5-2650 v4, 2.20 GHz)

SPECfp2006 = 109
SPECfp_base2006 = 104

**CPU2006 license:** 55  
**Test date:** Mar-2016

**Test sponsor:** Dell Inc.  
**Hardware Availability:** Mar-2016

**Tested by:** Dell Inc.  
**Software Availability:** Mar-2016

---

**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** Dell Inc. 2.0.1 02/12/2016  
**Memory:**
- 16x 002C0632002C 18ASF2G72PDZ-2G3B1 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,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 = "24"

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
```

---

**Base Portability Flags**

410.bwaves: -DSPEC_CPU_LP64
416.gamess: -DSPEC_CPU_LP64  
433.milc: -DSPEC_CPU_LP64
434.zeusmp: -DSPEC_CPU_LP64 -nofor_main
435.gromacs: -DSPEC_CPU_LP64 -nofor_main
436.cactusADM: -DSPEC_CPU_LP64 -nofor_main
437.leslie3d: -DSPEC_CPU_LP64
444.namd: -DSPEC_CPU_LP64

Continued on next page
Dell Inc.

PowerEdge R630 (Intel Xeon E5-2650 v4, 2.20 GHz)

SPECfp2006 = 109
SPECfp_base2006 = 104

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

Test date: Mar-2016
Hardware Availability: Mar-2016
Software Availability: Mar-2016

### Base Portability Flags (Continued)

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
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

Benchmarks using both Fortran and C:
icc -m64 ifort -m64

### Peak Portability Flags

Same as Base Portability Flags
Dell Inc.  
PowerEdge R630 (Intel Xeon E5-2650 v4, 2.20 GHz)  

**SPECf2006 = 109**  
**SPECfp_base2006 = 104**

**CPU2006 license:** 55  
**Test date:** Mar-2016  

**Test sponsor:** Dell Inc.  
**Hardware Availability:** Mar-2016

**Tested by:** Dell Inc.  
**Software Availability:** Mar-2016

---

# 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`

**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) -unroll4`
  `-ansi-alias`

- 434.zeusmp: `basepeak = yes`
- 437.leslie3d: `basepeak = yes`
- 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 -scalar-rep-`

- 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) -unroll2`
  `-inline-level=0 -opt-prefetch -parallel`
  `-opt-malloc-options=3 -auto -unroll4`

**Benchmarks using both Fortran and C:**

---

Continued on next page
Dell Inc.
PowerEdge R630 (Intel Xeon E5-2650 v4, 2.20 GHz)

SPECfp2006 = 109
SPECfp_base2006 = 104

CPU2006 license: 55
Test sponsor: Dell Inc.
Tested by: Dell Inc.
Test date: Mar-2016
Hardware Availability: Mar-2016
Software Availability: Mar-2016

Peak Optimization Flags (Continued)

435.gromacs: basepeak = yes
436.cactusADM: basepeak = yes
454.calculix: -xCORE-AVX2 -ipo -O3 -no-prec-div -auto-llp32 -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

SPEC and SPECfp are registered trademarks of the Standard Performance Evaluation Corporation. All other brand and product names appearing in this result are trademarks or registered trademarks of their respective holders.

For questions about this result, please contact the tester.
For other inquiries, please contact webmaster@spec.org.

Tested with SPEC CPU2006 v1.2.
Originally published on 5 April 2016.