# SPEC® CFP2006 Result

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## Dell Inc.

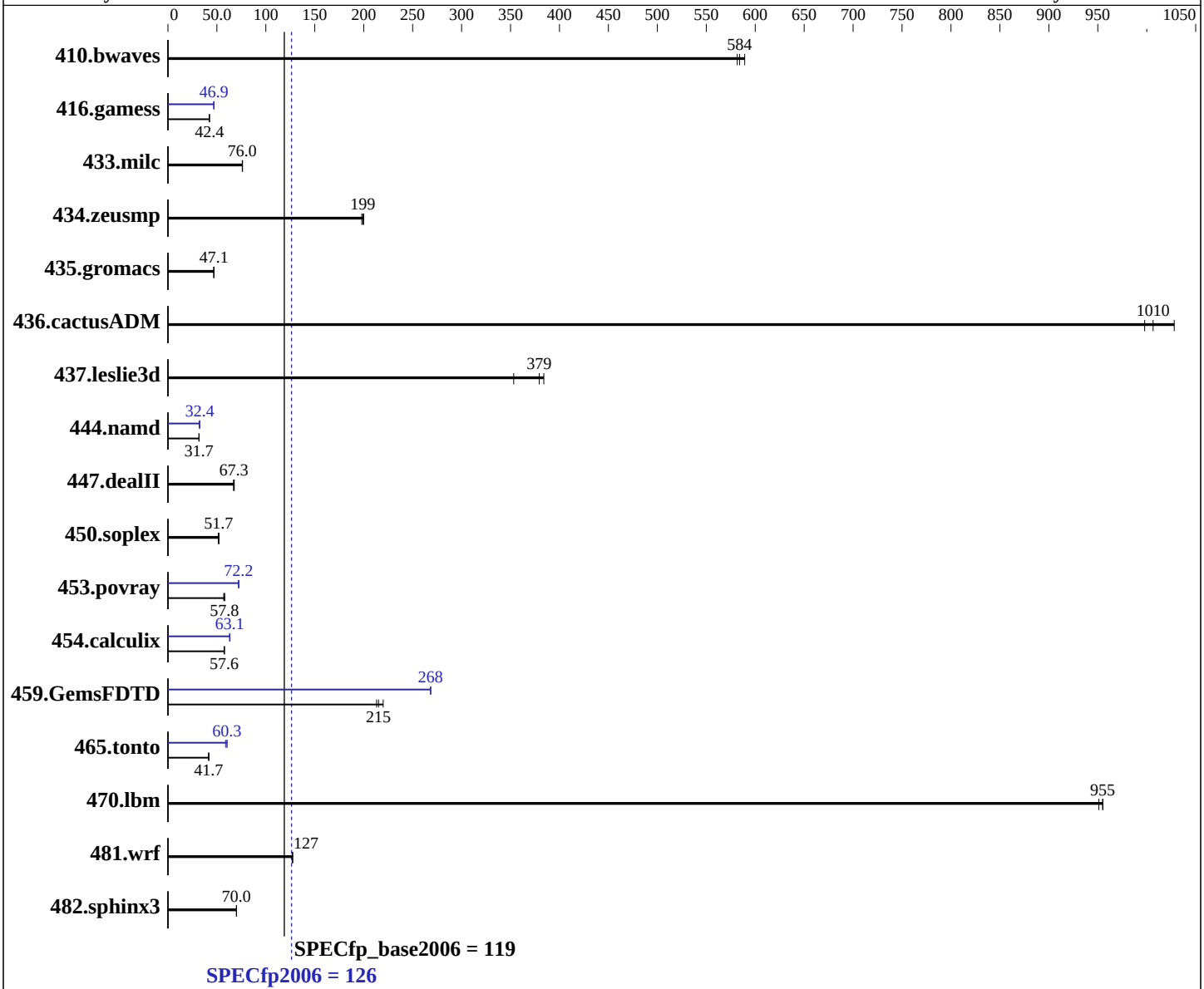
PowerEdge R730xd (Intel Xeon E5-2698 v4, 2.20 GHz)

SPECfp®2006 = 126

SPECfp_base2006 = 119

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

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




## 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 |
| CPU(s) orderable: | 1,2 chips |
| Primary Cache: | 32 KB I + 32 KB D on chip per core |
| Secondary Cache: | 256 KB I+D on chip per core |

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## 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; Fortran: Version 17.0.0.098 of Intel Fortran Compiler for Linux |
| Auto Parallel: | Yes |
| File System: | ext4 |
| System State: | Run level 3 (multi-user) |

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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

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

## Results Table

| Benchmark | Base | | | | | | Peak | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio |
| 410.bwaves | **23.3** | **584** | 23.1 | 589 | 23.4 | 582 | **23.3** | **584** | 23.1 | 589 | 23.4 | 582 |
| 416.gamess | 462 | 42.4 | 464 | 42.2 | **462** | **42.4** | 417 | 46.9 | **418** | **46.9** | 418 | 46.8 |
| 433.milc | **121** | **76.0** | 121 | 75.9 | 120 | 76.2 | **121** | **76.0** | 121 | 75.9 | 120 | 76.2 |
| 434.zeusmp | 46.0 | 198 | **45.7** | **199** | 45.5 | 200 | 46.0 | 198 | **45.7** | **199** | 45.5 | 200 |
| 435.gromacs | 153 | 46.6 | 151 | 47.2 | **152** | **47.1** | 153 | 46.6 | 151 | 47.2 | **152** | **47.1** |
| 436.cactusADM | 11.6 | 1030 | 12.0 | 998 | **11.9** | **1010** | 11.6 | 1030 | 12.0 | 998 | **11.9** | **1010** |
| 437.leslie3d | 26.6 | 353 | **24.8** | **379** | 24.5 | 384 | 26.6 | 353 | **24.8** | **379** | 24.5 | 384 |
| 444.namd | 253 | 31.7 | **253** | **31.7** | 252 | 31.8 | 251 | 32.0 | 247 | 32.4 | **247** | **32.4** |
| 447.dealII | **170** | **67.3** | 171 | 67.0 | 169 | 67.7 | **170** | **67.3** | 171 | 67.0 | 169 | 67.7 |
| 450.soplex | **161** | **51.7** | 162 | 51.6 | 160 | 52.1 | **161** | **51.7** | 162 | 51.6 | 160 | 52.1 |
| 453.povray | 91.9 | 57.9 | **92.0** | **57.8** | 93.4 | 57.0 | **73.7** | **72.2** | 73.8 | 72.1 | 73.3 | 72.5 |
| 454.calculix | 143 | 57.7 | **143** | **57.6** | 143 | 57.5 | **131** | **63.1** | 131 | 63.0 | 130 | 63.4 |
| 459.GemsFDTD | 49.8 | 213 | 48.2 | 220 | **49.3** | **215** | 39.6 | 268 | **39.5** | **268** | 39.5 | 268 |
| 465.tonto | **236** | **41.7** | 237 | 41.5 | 236 | 41.8 | 167 | 58.8 | **163** | **60.3** | 163 | 60.4 |
| 470.lbm | 14.4 | 951 | **14.4** | **955** | 14.4 | 955 | 14.4 | 951 | **14.4** | **955** | 14.4 | 955 |
| 481.wrf | **88.0** | **127** | 88.0 | 127 | 87.6 | 128 | **88.0** | **127** | 88.0 | 127 | 87.6 | 128 |
| 482.sphinx3 | 279 | 69.9 | 278 | 70.0 | **278** | **70.0** | 279 | 69.9 | 278 | 70.0 | **278** | **70.0** |

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 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
```

Continued on next page

## Platform Notes (Continued)

```
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 20:31:03 2017

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 E5-2698 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:
      SUSE Linux Enterprise Server 12 (x86_64)
      VERSION = 12
      PATCHLEVEL = 0
      # 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"
      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
```

Continued on next page

## Platform Notes (Continued)

```
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:

   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 00AD063200AD HMA82GR7MFR8N-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 never > /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
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
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 -qopt-prefetch

C++ benchmarks:
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch

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

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

## 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

## Peak Optimization Flags

C benchmarks:

433.milc: basepeak = yes

470.lbm: basepeak = yes

482.sphinx3: basepeak = yes

C++ benchmarks:

444.namd: -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) -fno-alias -auto-ilp32

447.dealII: basepeak = yes

450.soplex: basepeak = yes

453.povray: -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 -ansi-alias

Fortran benchmarks:

410.bwaves: basepeak = yes

416.gamess: -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) -unroll2 -inline-level=0 -scalar-rep-

434.zeusmp: basepeak = yes

437.leslie3d: basepeak = yes

459.GemsFDTD: -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) -unroll2 -inline-level=0 -qopt-prefetch -parallel

465.tonto: -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) -inline-calloc -qopt-malloc-options=3 -auto -unroll4

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## Peak Optimization Flags (Continued)

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`

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-ic17.0-official-linux64.html`
`http://www.spec.org/cpu2006/flags/Dell-Platform-Flags-PowerEdge13G-revE.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`
`http://www.spec.org/cpu2006/flags/Dell-Platform-Flags-PowerEdge13G-revE.xml`


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