SPEC® CFP2006 Result
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Dell Inc.

PowerEdge R940
(Intel Xeon Platinum 8176, 2.10 GHz)

$SPECfp^{®}\_rate2006 =$ 3360
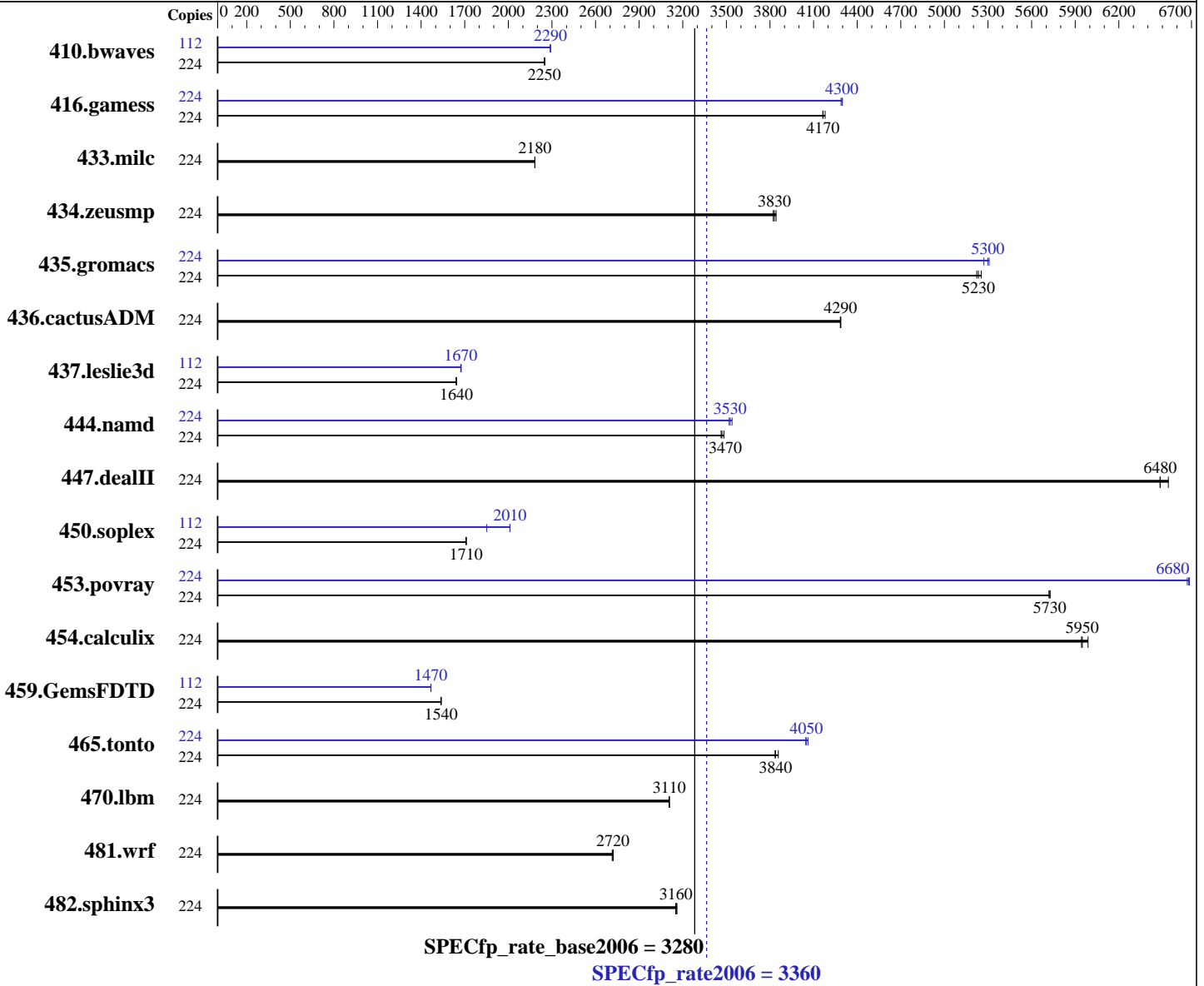
SPECfp_rate_base2006 = 3280

CPU2006 license: 55	**Test date:** Oct-2017
Test sponsor: Dell Inc.	**Hardware Availability:** Jul-2017
Tested by: Dell Inc.	**Software Availability:** Apr-2017

SPECfp_rate_base2006 = 3280

SPECfp_rate2006 = 3360

Benchmark	Copies	Result
410.bwaves	112	2290
410.bwaves	224	2250
416.gamess	224	4300
416.gamess	224	4170
433.milc	224	2180
434.zeusmp	224	3830
435.gromacs	224	5300
435.gromacs	224	5230
436.cactusADM	224	4290
437.leslie3d	112	1670
437.leslie3d	224	1640
444.namd	224	3530
444.namd	224	3470
447.dealII	224	6480
450.soplex	112	2010
450.soplex	224	1710
453.povray	224	6680
453.povray	224	5730
454.calculix	224	5950
459.GemsFDTD	112	1470
459.GemsFDTD	224	1540
465.tonto	224	4050
465.tonto	224	3840
470.lbm	224	3110
481.wrf	224	2720
482.sphinx3	224	3160

Hardware

CPU Name:	Intel Xeon Platinum 8176
CPU Characteristics:	Intel Turbo Boost Technology up to 3.80 GHz
CPU MHz:	2100
FPU:	Integrated
CPU(s) enabled:	112 cores, 4 chips, 28 cores/chip, 2 threads/core
CPU(s) orderable:	2,4 chip
Primary Cache:	32 KB I + 32 KB D on chip per core
Secondary Cache:	1 MB I+D on chip per core

Continued on next page

Software

Operating System:	SUSE Linux Enterprise Server 12 (x86_64) SP2 4.4.21-69-default
Compiler:	C/C++: Version 17.0.3.191 of Intel C/C++ Compiler for Linux; Fortran: Version 17.0.3.191 of Intel Fortran Compiler for Linux
Auto Parallel:	Yes
File System:	xfs
System State:	Run level 3 (multi-user)

Continued on next page

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L3 Cache:	38.5 MB I+D on chip per chip	Base Pointers:	32/64-bit
Other Cache:	None	Peak Pointers:	32/64-bit
Memory:	768 GB (48 x 16 GB 2Rx8 PC4-2666V-R)	Other Software:	None
Disk Subsystem:	1 x 900 GB 15K RPM SAS12		
Other Hardware:	None		

Results Table

Benchmark	Base Copies	Base Seconds	Base Ratio	Base Seconds	Base Ratio	Base Seconds	Base Ratio	Peak Copies	Peak Seconds	Peak Ratio	Peak Seconds	Peak Ratio	Peak Seconds	Peak Ratio
410.bwaves	224	1354	2250	**1354**	**2250**	1353	2250	112	665	2290	**665**	**2290**	665	2290
416.gamess	224	1049	4180	1053	4160	**1053**	**4170**	224	1020	4300	1023	4290	**1021**	**4300**
433.milc	224	942	2180	**942**	**2180**	942	2180	224	942	2180	**942**	**2180**	942	2180
434.zeusmp	224	533	3820	531	3840	**532**	**3830**	224	533	3820	531	3840	**532**	**3830**
435.gromacs	224	**306**	**5230**	306	5220	304	5250	224	301	5310	303	5270	**302**	**5300**
436.cactusADM	224	624	4290	**625**	**4290**	625	4280	224	624	4290	**625**	**4290**	625	4280
437.leslie3d	224	**1282**	**1640**	1282	1640	1283	1640	112	629	1670	628	1680	**629**	**1670**
444.namd	224	516	3480	**518**	**3470**	519	3460	224	**509**	**3530**	508	3540	510	3520
447.dealII	224	395	6480	**395**	**6480**	392	6540	224	395	6480	**395**	**6480**	392	6540
450.soplex	224	1092	1710	1094	1710	**1092**	**1710**	112	504	1850	**465**	**2010**	464	2010
453.povray	224	208	5730	**208**	**5730**	208	5720	224	**178**	**6680**	179	6670	178	6690
454.calculix	224	309	5990	**311**	**5950**	311	5940	224	309	5990	**311**	**5950**	311	5940
459.GemsFDTD	224	1546	1540	1546	1540	**1546**	**1540**	112	**810**	**1470**	810	1470	810	1470
465.tonto	224	571	3860	**574**	**3840**	575	3840	224	543	4060	**544**	**4050**	545	4050
470.lbm	224	990	3110	**990**	**3110**	991	3110	224	990	3110	**990**	**3110**	991	3110
481.wrf	224	**920**	**2720**	922	2710	919	2720	224	**920**	**2720**	922	2710	919	2720
482.sphinx3	224	1382	3160	1385	3150	**1384**	**3160**	224	1382	3160	1385	3150	**1384**	**3160**

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

Kernel boot parameter: nohz_full=1-223
Stack size set to unlimited using "ulimit -s unlimited"

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Test date: Oct-2017

Hardware Availability: Jul-2017

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Platform Notes

```
        BIOS settings:
        Logical Processor Enabled
        Virtualization Technology Disabled
        Sub NUMA Cluster Enabled
        System Profile set to Custom
        CPU Performance set to Maximum Performance
        C1E Disabled
        C States set to Autonomous
        Uncore Frequency set to Dynamic
        Memory Patrol Scrub Disabled
        Energy Efficiency Policy set to Performance
        CPU Interconnect Bus Link Power Management Disabled
        PCI ASPM L1 Link Power Management Disabled
        Sysinfo program /home/cpu2006/config/sysinfo.rev6993
        Revision 6993 of 2015-11-06 (b5e8d4b4eb51ed28d7f98696cbe290c1)
        running on linux-apb2 Wed Oct 11 16:34:29 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) Platinum 8176 CPU @ 2.10GHz
              4 "physical id"s (chips)
              224 "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 : 28
              siblings  : 56
              physical 0: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24
              25 26 27 28 29 30
              physical 1: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24
              25 26 27 28 29 30
              physical 2: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24
              25 26 27 28 29 30
              physical 3: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14 16 17 18 19 20 21 22 24
              25 26 27 28 29 30
           cache size : 39424 KB

        From /proc/meminfo
           MemTotal:       791224272 kB
           HugePages_Total:        0
           Hugepagesize:        2048 kB

        /usr/bin/lsb_release -d
           SUSE Linux Enterprise Server 12 SP2

        From /etc/*release* /etc/*version*
           SuSE-release:
              SUSE Linux Enterprise Server 12 (x86_64)
              VERSION = 12
```

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Platform Notes (Continued)

```
        PATCHLEVEL = 2
        # 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-SP2"
        VERSION_ID="12.2"
        PRETTY_NAME="SUSE Linux Enterprise Server 12 SP2"
        ID="sles"
        ANSI_COLOR="0;32"
        CPE_NAME="cpe:/o:suse:sles:12:sp2"

 uname -a:
    Linux linux-apb2 4.4.21-69-default #1 SMP Tue Oct 25 10:58:20 UTC 2016
    (9464f67) x86_64 x86_64 x86_64 GNU/Linux

 run-level 3 Oct 11 04:39

 SPEC is set to: /home/cpu2006
    Filesystem      Type  Size  Used Avail Use% Mounted on
    /dev/sda4       xfs   796G   17G  779G   3% /home
 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. 1.1.7 08/10/2017
  Memory:
   17x 002C00B3002C 18ASF2G72PDZ-2G6D1 16 GB 2 rank 2666 MHz
   7x 00AD00B300AD HMA82GR7AFR8N-VK 16 GB 2 rank 2666 MHz
   24x 00CE063200CE M393A2K43BB1-CTD 16 GB 2 rank 2666 MHz

 (End of data from sysinfo program)
```

General Notes

```
 Environment variables set by runspec before the start of the run:
 LD_LIBRARY_PATH = "/home/cpu2006/lib/ia32:/home/cpu2006/lib/intel64:/home/cpu2006/sh10.2"

  Binaries compiled on a system with 1x Intel Core i7-4790 CPU + 32GB RAM
  memory using Redhat Enterprise Linux 7.2
  Transparent Huge Pages enabled by default
  Filesystem page cache cleared with:
  shell invocation of 'sync; echo 3 > /proc/sys/vm/drop_caches' prior to run
  runspec command invoked through numactl i.e.:
  numactl --interleave=all runspec <etc>
```

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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 -qopt-prefetch -auto-p32
-qopt-mem-layout-trans=3
```

C++ benchmarks:
```
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -auto-p32
-qopt-mem-layout-trans=3
```

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

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Base Optimization Flags (Continued)

Benchmarks using both Fortran and C:
```
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -auto-p32
-qopt-mem-layout-trans=3
```

Peak Compiler Invocation

C benchmarks:
```
icc -m64
```

C++ benchmarks (except as noted below):
```
icpc -m64

  450.soplex: icpc -m32 -L/opt/intel/compilers_and_libraries_2017/linux/lib/ia32
```

Fortran benchmarks:
```
ifort -m64
```

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

Peak 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: -D_FILE_OFFSET_BITS=64
    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
```

Peak Optimization Flags

C benchmarks:

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Peak Optimization Flags (Continued)

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
-qopt-mem-layout-trans=3

447.dealII: basepeak = yes

450.soplex: -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-malloc-options=3
-qopt-mem-layout-trans=3

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 -qopt-mem-layout-trans=3

Fortran benchmarks:

410.bwaves: -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch

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: Same as 410.bwaves

459.GemsFDTD: Same as 410.bwaves

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

Benchmarks using both Fortran and C:

435.gromacs: -prof-gen(pass 1) -prof-use(pass 2) -xCORE-AVX2(pass 2)
-par-num-threads=1(pass 1) -qopt-prefetch -auto-ilp32
-qopt-mem-layout-trans=3

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Peak Optimization Flags (Continued)

436.cactusADM: basepeak = yes

454.calculix: basepeak = yes

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-revF.html
http://www.spec.org/cpu2006/flags/Dell-Platform-Flags-PowerEdge14G-revC.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-revF.xml
http://www.spec.org/cpu2006/flags/Dell-Platform-Flags-PowerEdge14G-revC.xml

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

Tested with SPEC CPU2006 v1.2.
Report generated on Wed Nov 15 10:58:45 2017 by SPEC CPU2006 PS/PDF formatter v6932.
Originally published on 14 November 2017.