SPEC® CFP2006 Result
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Dell Inc.

PowerEdge R640 (Intel Xeon Silver 4110, 2.10 GHz)

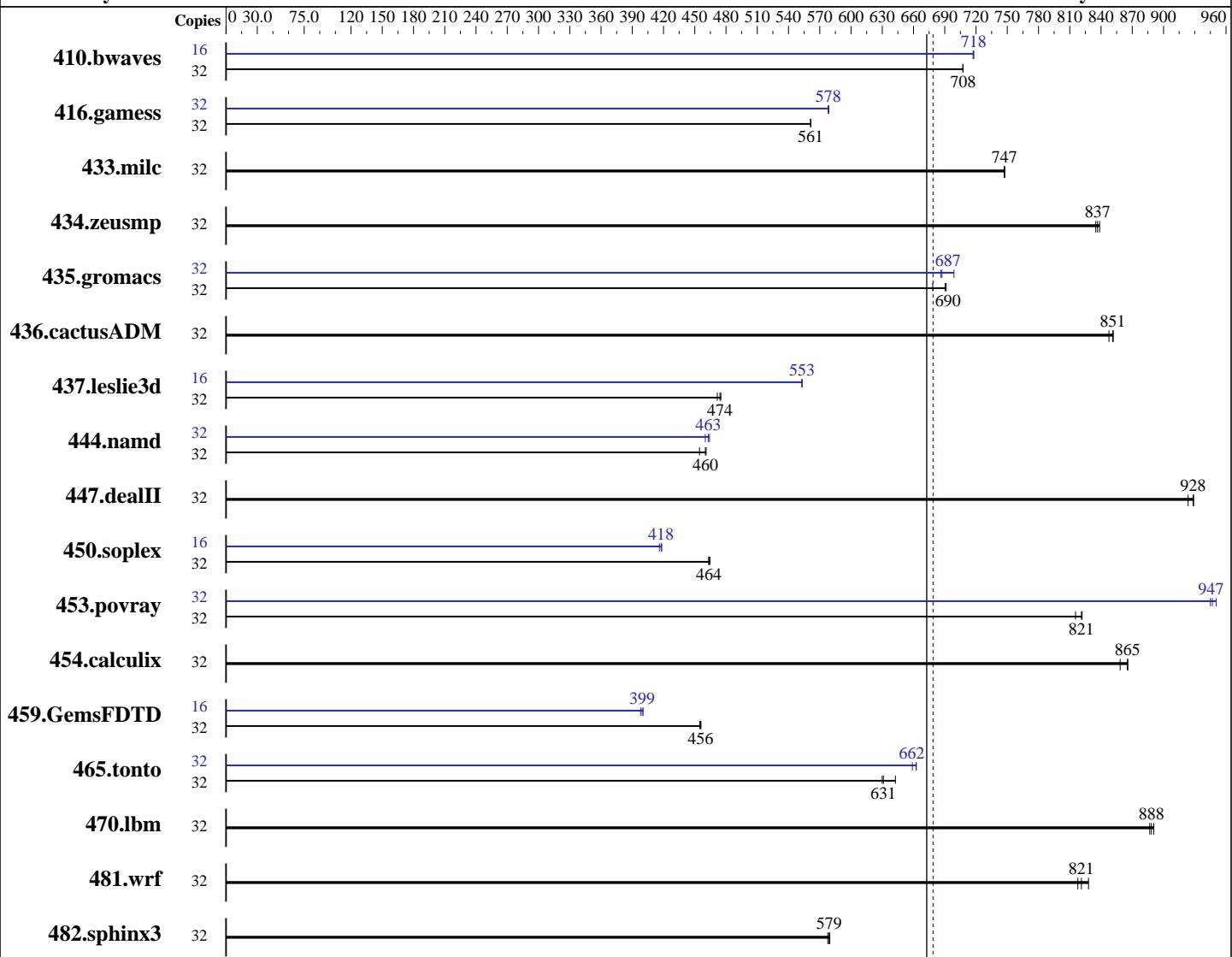$SPECfp^{®}\_rate2006 = 679$

$SPECfp\_rate\_base2006 = 673$

CPU2006 license: 55	**Test date:** Jul-2017
Test sponsor: Dell Inc.	**Hardware Availability:** Jul-2017
Tested by: Dell Inc.	**Software Availability:** Nov-2016

Copies — scale 0 30.0 75.0 120 150 180 210 240 270 300 330 360 390 420 450 480 510 540 570 600 630 660 690 720 750 780 810 840 870 900 960

Benchmark	Copies	Value
410.bwaves	16	718
410.bwaves	32	708
416.gamess	32	578
416.gamess	32	561
433.milc	32	747
434.zeusmp	32	837
435.gromacs	32	687
435.gromacs	32	690
436.cactusADM	32	851
437.leslie3d	16	553
437.leslie3d	32	474
444.namd	32	463
444.namd	32	460
447.dealII	32	928
450.soplex	16	418
450.soplex	32	464
453.povray	32	947
453.povray	32	821
454.calculix	32	865
459.GemsFDTD	16	399
459.GemsFDTD	32	456
465.tonto	32	662
465.tonto	32	631
470.lbm	32	888
481.wrf	32	821
482.sphinx3	32	579

SPECfp_rate_base2006 = 673

SPECfp_rate2006 = 679

Hardware

CPU Name:	Intel Xeon Silver 4110
CPU Characteristics:	Intel Turbo Boost Technology up to 3.00 GHz
CPU MHz:	2100
FPU:	Integrated
CPU(s) enabled:	16 cores, 2 chips, 8 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:	1 MB I+D on chip per core

Continued on next page

Software

Operating System:	SUSE Linux Enterprise Server 12 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)

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L3 Cache:	11 MB I+D on chip per chip
Other Cache:	None
Memory:	384 GB (24 x 16 GB 2Rx8 PC4-2666V-R, running at 2400 MT/s)
Disk Subsystem:	1 x 960 GB SATA SSD
Other Hardware:	None

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

Results Table

Benchmark		Base							Peak					
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
410.bwaves	32	615	708	**615**	**708**	615	707	16	303	717	**303**	**718**	303	718
416.gamess	32	1116	562	1116	561	**1116**	**561**	32	**1084**	**578**	1083	579	1084	578
433.milc	32	**393**	**747**	393	747	393	748	32	**393**	**747**	393	747	393	748
434.zeusmp	32	347	839	349	835	**348**	**837**	32	347	839	349	835	**348**	**837**
435.gromacs	32	330	691	337	678	**331**	**690**	32	333	686	327	699	**332**	**687**
436.cactusADM	32	**449**	**851**	449	852	451	848	32	**449**	**851**	449	852	451	848
437.leslie3d	32	638	472	**634**	**474**	633	475	16	**272**	**553**	272	553	272	553
444.namd	32	557	461	565	455	**558**	**460**	32	**554**	**463**	558	460	553	464
447.dealII	32	396	924	394	929	**394**	**928**	32	396	924	394	929	**394**	**928**
450.soplex	32	**576**	**464**	574	465	576	463	16	321	416	**319**	**418**	319	418
453.povray	32	**207**	**821**	207	822	209	816	32	180	945	**180**	**947**	179	951
454.calculix	32	308	858	305	866	**305**	**865**	32	308	858	305	866	**305**	**865**
459.GemsFDTD	32	**745**	**456**	746	455	745	456	16	**425**	**399**	427	398	424	400
465.tonto	32	**499**	**631**	490	643	500	630	32	478	659	475	663	**475**	**662**
470.lbm	32	**495**	**888**	494	891	496	887	32	**495**	**888**	494	891	496	887
481.wrf	32	437	818	432	828	**435**	**821**	32	437	818	432	828	**435**	**821**
482.sphinx3	32	1076	580	1080	578	**1077**	**579**	32	1076	580	1080	578	**1077**	**579**

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:
Virtualization Technology disabled
System Profile set to Custom

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Platform Notes (Continued)

```
CPU Performance set to Maximum Performance
C States set to autonomous
C1E disabled
Uncore Frequency set to Dynamic
Energy Efficiency Policy set to Performance
Memory Patrol Scrub disabled
Logical Processor enabled
CPU Interconnect Bus Link Power Management disabled
PCI ASPM L1 Link Power Management disabled
Sysinfo program /root/cpu2006-1.2_ic17u3/config/sysinfo.rev6993
Revision 6993 of 2015-11-06 (b5e8d4b4eb51ed28d7f98696cbe290c1)
running on linux-bo7a Thu Jul 13 20:50:02 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) Silver 4110 CPU @ 2.10GHz
      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
   caution.)
      cpu cores : 8
      siblings  : 16
      physical 0: cores 0 1 2 3 4 5 6 7
      physical 1: cores 0 1 2 3 4 5 6 7
   cache size : 11264 KB

From /proc/meminfo
   MemTotal:      395511412 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
      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"
```

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Platform Notes (Continued)

```
        ANSI_COLOR="0;32"
        CPE_NAME="cpe:/o:suse:sles:12:sp2"

  uname -a:
     Linux linux-bo7a 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 Jul 13 09:35

  SPEC is set to: /root/cpu2006-1.2_ic17u3
     Filesystem      Type   Size  Used Avail Use% Mounted on
     /dev/sda2       xfs    892G   36G  857G   4% /
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. 1.0.5 06/19/2017
   Memory:
   24x 00AD00B300AD HMA82GR7AFR8N-VK 16 GB 2 rank 2666 MHz, configured at 2400
   MHz

  (End of data from sysinfo program)
```

General Notes

Environment variables set by runspec before the start of the run:
LD_LIBRARY_PATH = "/root/cpu2006-1.2_ic17u3/lib/ia32:/root/cpu2006-1.2_ic17u3/lib/intel64:/root/cpu2006-1.2_ic17u3/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>
```

Base Compiler Invocation

C benchmarks:
    icc -m64

C++ benchmarks:
    icpc -m64

Fortran benchmarks:
    ifort -m64

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Base Compiler Invocation (Continued)

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
```

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
```

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Peak Compiler Invocation (Continued)

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:

        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`

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Peak Optimization Flags (Continued)

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

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

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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.

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