SPEC® CFP2006 Result

Lenovo Group Limited

Lenovo ThinkServer SD350
(2.40 GHz, Intel Xeon E5-2640 v4)

$SPECfp®\_rate2006 = 713$

$SPECfp\_rate\_base2006 = 695$

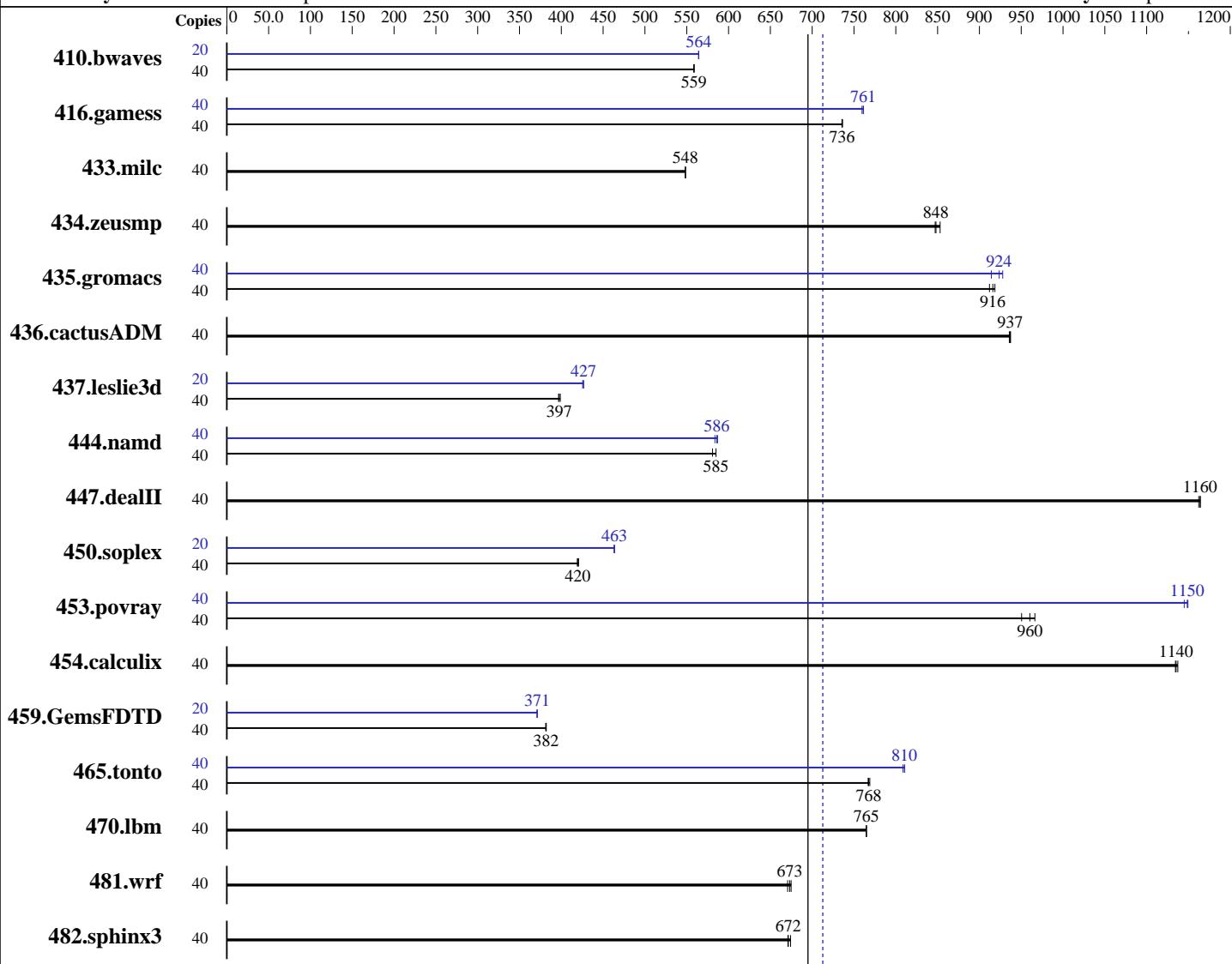|			
CPU2006 license: 9017		**Test date:**	Jan-2017
Test sponsor: Lenovo Group Limited		**Hardware Availability:**	Sep-2016
Tested by: Lenovo Group Limited		**Software Availability:**	Sep-2016

Copies

- 410.bwaves — 20: 564 / 40: 559
- 416.gamess — 40: 761 / 40: 736
- 433.milc — 40: 548
- 434.zeusmp — 40: 848
- 435.gromacs — 40: 924 / 40: 916
- 436.cactusADM — 40: 937
- 437.leslie3d — 20: 427 / 40: 397
- 444.namd — 40: 586 / 40: 585
- 447.dealII — 40: 1160
- 450.soplex — 20: 463 / 40: 420
- 453.povray — 40: 1150 / 40: 960
- 454.calculix — 40: 1140
- 459.GemsFDTD — 20: 371 / 40: 382
- 465.tonto — 40: 810 / 40: 768
- 470.lbm — 40: 765
- 481.wrf — 40: 673
- 482.sphinx3 — 40: 672

SPECfp_rate_base2006 = 695

SPECfp_rate2006 = 713

Hardware

CPU Name:	Intel Xeon E5-2640 v4
CPU Characteristics:	Intel Turbo Boost Technology up to 3.40 GHz
CPU MHz:	2400
FPU:	Integrated
CPU(s) enabled:	20 cores, 2 chips, 10 cores/chip, 2 threads/core
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

Continued on next page

Software

Operating System:	SUSE Linux Enterprise Server 12 SP1 (x86_64) Kernel 3.12.49-11-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:	No
File System:	btrfs
System State:	Run level 3 (multi-user)

Continued on next page

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L3 Cache:	25 MB I+D on chip per chip	Base Pointers:	32/64-bit
Other Cache:	None	Peak Pointers:	32/64-bit
Memory:	256 GB (16 x 16 GB 2Rx4 PC4-2400T-R, running at 2133 MHz)	Other Software:	None
Disk Subsystem:	1 x 800 GB SATA SSD		
Other Hardware:	None		

Results Table

Benchmark	Base						Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
410.bwaves	40	973	558	973	559	**973**	**559**	20	482	564	482	564	**482**	**564**
416.gamess	40	**1065**	**736**	1065	736	1064	736	40	1031	760	1029	761	**1029**	**761**
433.milc	40	670	548	**670**	**548**	670	548	40	670	548	**670**	**548**	670	548
434.zeusmp	40	427	853	**429**	**848**	430	847	40	427	853	**429**	**848**	430	847
435.gromacs	40	313	912	311	919	**312**	**916**	40	308	928	312	914	**309**	**924**
436.cactusADM	40	510	937	**510**	**937**	511	936	40	510	937	**510**	**937**	511	936
437.leslie3d	40	943	399	**946**	**397**	948	397	20	441	427	**441**	**427**	442	426
444.namd	40	**548**	**585**	548	585	552	581	40	547	587	550	584	**548**	**586**
447.dealII	40	**393**	**1160**	394	1160	393	1160	40	**393**	**1160**	394	1160	393	1160
450.soplex	40	**794**	**420**	796	419	793	421	20	360	464	**360**	**463**	360	463
453.povray	40	220	966	224	950	**222**	**960**	40	**185**	**1150**	186	1140	185	1150
454.calculix	40	290	1140	**291**	**1140**	291	1130	40	290	1140	**291**	**1140**	291	1130
459.GemsFDTD	40	1111	382	**1112**	**382**	1113	381	20	572	371	572	371	**572**	**371**
465.tonto	40	512	769	**513**	**768**	513	767	40	487	809	486	811	**486**	**810**
470.lbm	40	719	765	719	764	**719**	**765**	40	719	765	719	764	**719**	**765**
481.wrf	40	662	675	666	671	**664**	**673**	40	662	675	666	671	**664**	**673**
482.sphinx3	40	**1161**	**672**	1162	671	1156	674	40	**1161**	**672**	1162	671	1156	674

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"
Transparent Huge Pages enabled with:
echo always > /sys/kernel/mm/transparent_hugepage/enabled
Filesystem page cache cleared with:
echo 1>   /proc/sys/vm/drop_caches

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SPECfp_rate_base2006 =   695

CPU2006 license: 9017

Test sponsor: Lenovo Group Limited

Tested by: Lenovo Group Limited

Test date: Jan-2017

Hardware Availability: Sep-2016

Software Availability: Sep-2016

Platform Notes

```
    BIOS configuration:
    DCU Streamer Prefetcher set to Disable
     Sysinfo program /home/cpu2006-1.2-ic17.0/config/sysinfo.rev6993
     Revision 6993 of 2015-11-06 (b5e8d4b4eb51ed28d7f98696cbe290c1)
     running on Kent-SUT1 Mon Jan 18 07:09:57 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 E5-2640 v4 @ 2.40GHz
           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 : 10
           siblings  : 20
           physical 0: cores 0 1 2 3 4 8 9 10 11 12
           physical 1: cores 0 1 2 3 4 8 9 10 11 12
        cache size : 25600 KB

     From /proc/meminfo
        MemTotal:       264568980 kB
        HugePages_Total:        0
        Hugepagesize:        2048 kB

     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 Kent-SUT1 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 Jan 17 20:06

    SPEC is set to: /home/cpu2006-1.2-ic17.0
```

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CPU2006 license: 9017
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Test date: Jan-2017
Hardware Availability: Sep-2016
Software Availability: Sep-2016

Platform Notes (Continued)

```
     Filesystem      Type   Size  Used Avail Use% Mounted on
     /dev/md126p2    btrfs  745G   25G  718G   4% /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 American Megatrends Inc. 3.57 08/12/2016
   Memory:
     16x Samsung M393A2G40DB1-CRC 16 GB 2 rank 2400 MHz, configured at 2133 MHz

   (End of data from sysinfo program)
```

General Notes

```
Environment variables set by runspec before the start of the run:
LD_LIBRARY_PATH = "/home/cpu2006-1.2-ic17.0/libs/32:/home/cpu2006-1.2-ic17.0/libs/64:/home/cpu2006-1.2-ic17.0/sh10.2"

 Binaries compiled on a system with 1x Intel Core i7-4790 CPU + 32GB RAM
 memory using Redhat Enterprise Linux 7.2
 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
```

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
```

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Hardware Availability: Sep-2016
Software Availability: Sep-2016

Base Portability Flags (Continued)

```
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
```

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
```

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Test sponsor: Lenovo Group Limited   **Hardware Availability:** Sep-2016
Tested by: Lenovo Group Limited   **Software Availability:** Sep-2016

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

   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:

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Test date: Jan-2017
Hardware Availability: Sep-2016
Software Availability: Sep-2016

Peak Optimization Flags (Continued)

```
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.html
http://www.spec.org/cpu2006/flags/Lenovo-Platform-Settings-V1.2-BDW-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/Lenovo-Platform-Settings-V1.2-BDW-revE.xml

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Tested with SPEC CPU2006 v1.2.
Report generated on Tue Feb 7 17:00:13 2017 by SPEC CPU2006 PS/PDF formatter v6932.
Originally published on 7 February 2017.