SPEC® CFP2006 Result

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Lenovo Group Limited

Lenovo ThinkServer SD350
(2.20 GHz, Intel Xeon E5-2630 v4)

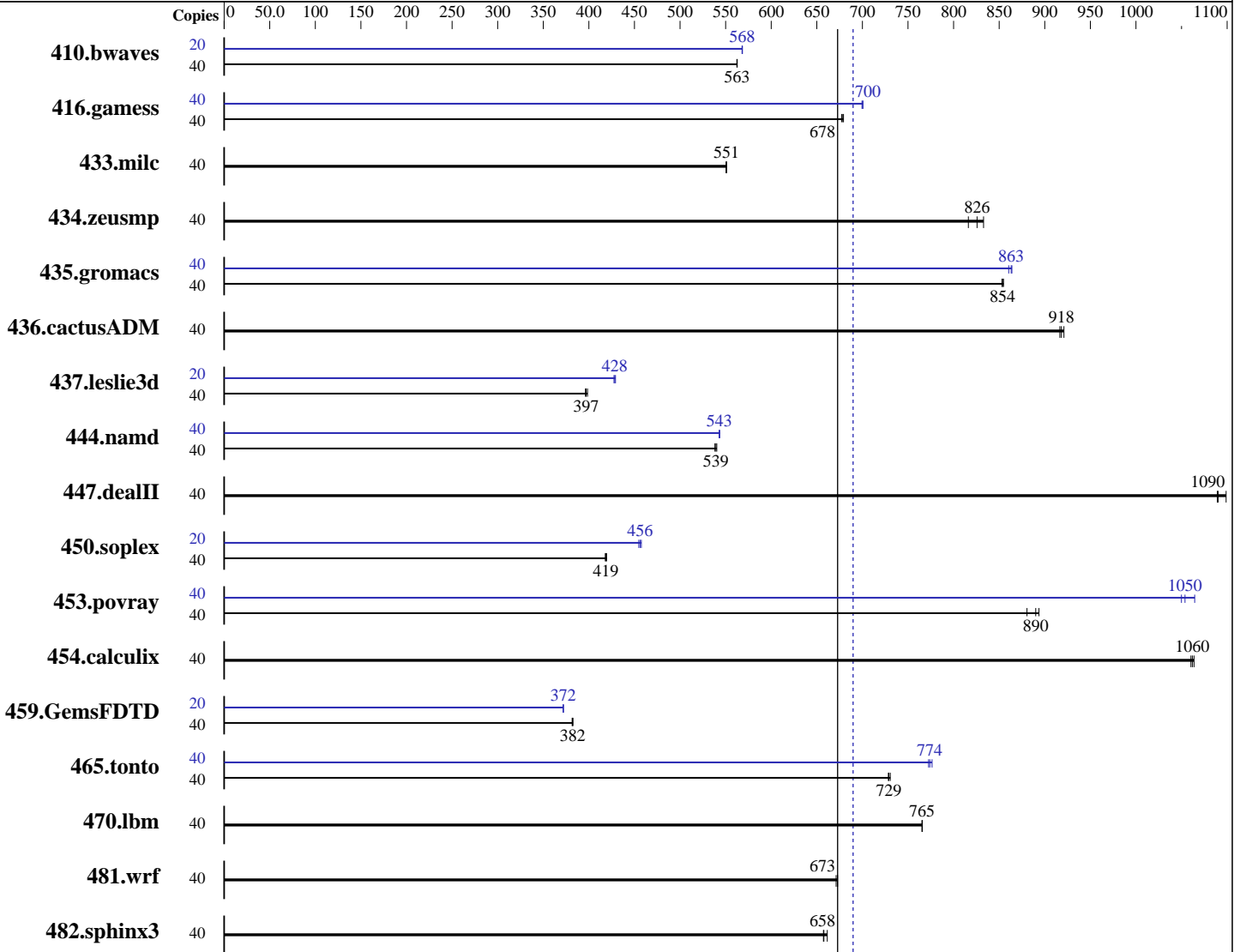$SPECfp®\_rate2006 =$ 690

$SPECfp\_rate\_base2006 =$ 673

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

Results chart (Copies):

- **410.bwaves** — 20: 568; 40: 563
- **416.gamess** — 40: 700; 40: 678
- **433.milc** — 40: 551
- **434.zeusmp** — 40: 826
- **435.gromacs** — 40: 863; 40: 854
- **436.cactusADM** — 40: 918
- **437.leslie3d** — 20: 428; 40: 397
- **444.namd** — 40: 543; 40: 539
- **447.dealII** — 40: 1090
- **450.soplex** — 20: 456; 40: 419
- **453.povray** — 40: 1050; 40: 890
- **454.calculix** — 40: 1060
- **459.GemsFDTD** — 20: 372; 40: 382
- **465.tonto** — 40: 774; 40: 729
- **470.lbm** — 40: 765
- **481.wrf** — 40: 673
- **482.sphinx3** — 40: 658

SPECfp_rate_base2006 = 673

SPECfp_rate2006 = 690

Hardware

CPU Name:	Intel Xeon E5-2630 v4
CPU Characteristics:	Intel Turbo Boost Technology up to 3.10 GHz
CPU MHz:	2200
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 480 GB SATA SSD		
Other Hardware:	None		

Results Table

	Base						Peak					
Benchmark	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
410.bwaves	40	**966**	**563**	967	562	966	563	20	478	568	479	568	**478**	**568**
416.gamess	40	1157	677	**1154**	**678**	1153	679	40	1120	700	1118	701	**1118**	**700**
433.milc	40	667	551	**667**	**551**	667	551	40	667	551	**667**	**551**	667	551
434.zeusmp	40	446	816	437	833	**441**	**826**	40	446	816	437	833	**441**	**826**
435.gromacs	40	**334**	**854**	335	853	334	855	40	331	864	332	860	**331**	**863**
436.cactusADM	40	**521**	**918**	519	921	522	917	40	**521**	**918**	519	921	522	917
437.leslie3d	40	944	399	**947**	**397**	949	396	20	440	428	438	429	**439**	**428**
444.namd	40	596	538	594	540	**595**	**539**	40	591	543	**591**	**543**	590	543
447.dealII	40	**420**	**1090**	420	1090	416	1100	40	**420**	**1090**	420	1090	416	1100
450.soplex	40	795	419	798	418	**797**	**419**	20	365	458	**366**	**456**	367	455
453.povray	40	**239**	**890**	242	880	238	894	40	203	1050	**202**	**1050**	200	1060
454.calculix	40	310	1060	311	1060	**311**	**1060**	40	310	1060	311	1060	**311**	**1060**
459.GemsFDTD	40	1109	383	1112	382	**1111**	**382**	20	570	372	**571**	**372**	571	372
465.tonto	40	540	728	539	731	**540**	**729**	40	**509**	**774**	509	773	507	776
470.lbm	40	718	765	**718**	**765**	718	766	40	718	765	**718**	**765**	718	766
481.wrf	40	**664**	**673**	666	671	664	673	40	**664**	**673**	666	671	664	673
482.sphinx3	40	**1185**	**658**	1186	657	1179	661	40	**1185**	**658**	1186	657	1179	661

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_rate2006 =   690

SPECfp_rate_base2006 =   673

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-SUT2 Fri Jan  8 08:23:38 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 E5-2630 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 : 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:       264569224 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-SUT2 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 7 20:39

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

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

Platform Notes (Continued)

```
    Filesystem      Type   Size  Used Avail Use% Mounted on
    /dev/sda2       btrfs 447G  6.1G  441G   2% /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
```

Continued on next page

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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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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:

Continued on next page

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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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