SPEC® CFP2006 Result
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Lenovo Global Technology

ThinkSystem SR950
(2.10 GHz, Intel Xeon Platinum 8170)

$SPECfp®\_rate2006 =$ 3310

$SPECfp\_rate\_base2006 =$ 3230

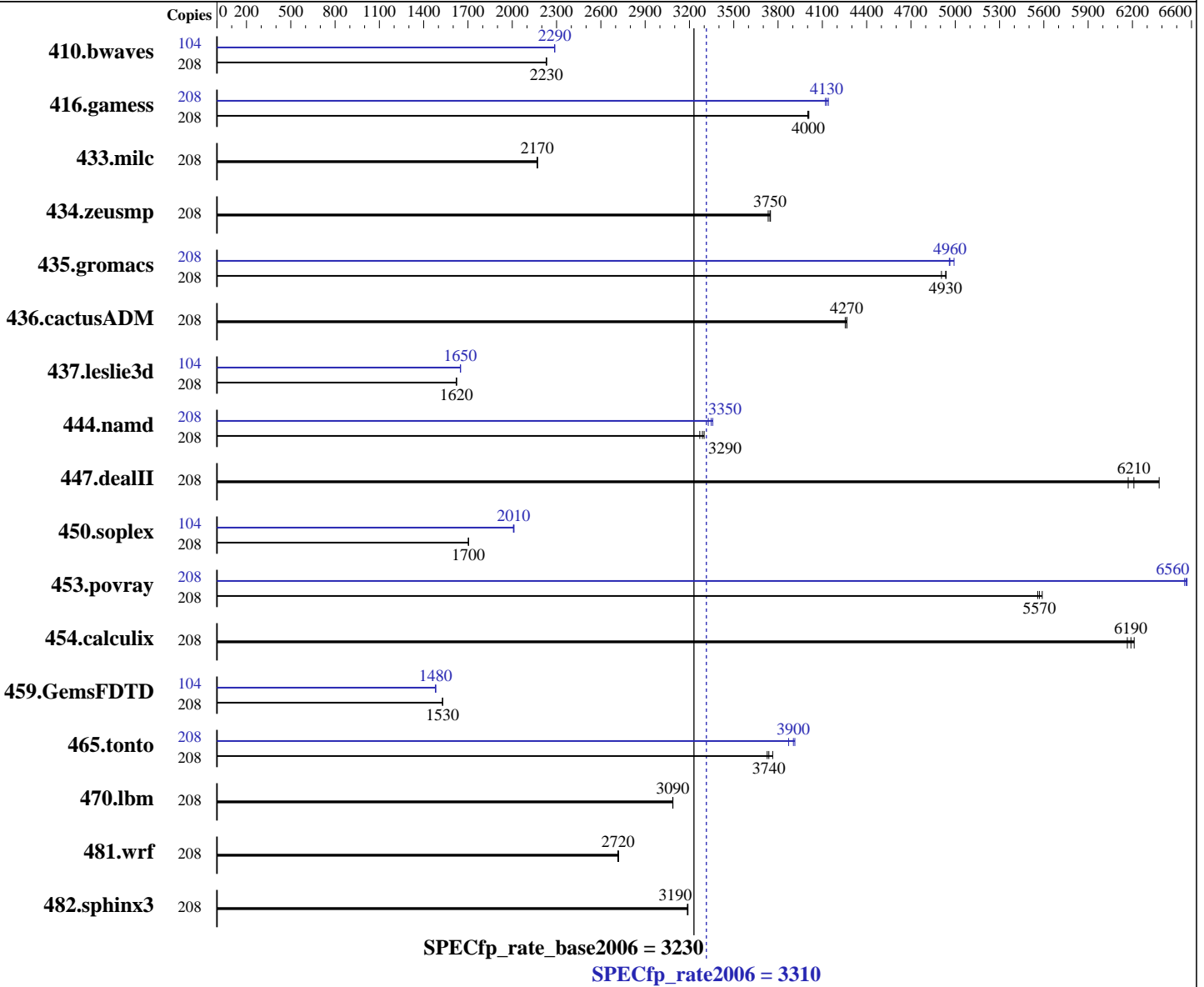|	
CPU2006 license: 9017	**Test date:** Oct-2017
Test sponsor: Lenovo Global Technology	**Hardware Availability:** Sep-2017
Tested by: Lenovo Global Technology	**Software Availability:** Apr-2017

Copies — graph scale: 0 200 500 800 1100 1400 1700 2000 2300 2600 2900 3200 3500 3800 4100 4400 4700 5000 5300 5600 5900 6200 6600

Benchmark	Copies	Result
410.bwaves	104	2290
	208	2230
416.gamess	208	4130
	208	4000
433.milc	208	2170
434.zeusmp	208	3750
435.gromacs	208	4960
	208	4930
436.cactusADM	208	4270
437.leslie3d	104	1650
	208	1620
444.namd	208	3350
	208	3290
447.dealII	208	6210
450.soplex	104	2010
	208	1700
453.povray	208	6560
	208	5570
454.calculix	208	6190
459.GemsFDTD	104	1480
	208	1530
465.tonto	208	3900
	208	3740
470.lbm	208	3090
481.wrf	208	2720
482.sphinx3	208	3190

SPECfp_rate_base2006 = 3230

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Hardware

CPU Name:	Intel Xeon Platinum 8170
CPU Characteristics:	Intel Turbo Boost Technology up to 3.70 GHz
CPU MHz:	2100
FPU:	Integrated
CPU(s) enabled:	104 cores, 4 chips, 26 cores/chip, 2 threads/core
CPU(s) orderable:	2,4 chips
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 (x86_64) Kernel 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:	tmpfs
System State:	Run level 3 (multi-user)

Continued on next page

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L3 Cache:	35.75 MB I+D on chip per chip	Base Pointers:	32/64-bit
Other Cache:	None	Peak Pointers:	32/64-bit
Memory:	1536 GB (48 x 32 GB 2Rx4 PC4-2666V-R)	Other Software:	None
Disk Subsystem:	800 GB tmpfs		
Other Hardware:	None		

Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
410.bwaves	208	1267	2230	1266	2230	**1267**	**2230**	104	618	2290	**618**	**2290**	618	2290
416.gamess	208	1016	4010	1018	4000	**1017**	**4000**	208	**986**	**4130**	984	4140	988	4120
433.milc	208	881	2170	879	2170	**880**	**2170**	208	881	2170	879	2170	**880**	**2170**
434.zeusmp	208	505	3750	**505**	**3750**	507	3730	208	505	3750	**505**	**3750**	507	3730
435.gromacs	208	301	4940	303	4910	**301**	**4930**	208	298	4990	299	4960	**299**	**4960**
436.cactusADM	208	**583**	**4270**	584	4260	583	4270	208	**583**	**4270**	584	4260	583	4270
437.leslie3d	208	1206	1620	1205	1620	**1205**	**1620**	104	593	1650	593	1650	**593**	**1650**
444.namd	208	**507**	**3290**	506	3300	510	3270	208	501	3330	**498**	**3350**	497	3360
447.dealII	208	**383**	**6210**	386	6170	373	6380	208	**383**	**6210**	386	6170	373	6380
450.soplex	208	1019	1700	1018	1700	**1018**	**1700**	104	**431**	**2010**	432	2010	431	2010
453.povray	208	**199**	**5570**	199	5560	198	5590	208	168	6570	**169**	**6560**	169	6550
454.calculix	208	**277**	**6190**	278	6170	276	6210	208	**277**	**6190**	278	6170	276	6210
459.GemsFDTD	208	**1444**	**1530**	1444	1530	1445	1530	104	**745**	**1480**	745	1480	746	1480
465.tonto	208	544	3760	549	3730	**548**	**3740**	208	523	3910	**524**	**3900**	529	3870
470.lbm	208	**926**	**3090**	926	3090	926	3090	208	**926**	**3090**	926	3090	926	3090
481.wrf	208	**855**	**2720**	854	2720	856	2720	208	**855**	**2720**	854	2720	856	2720
482.sphinx3	208	**1271**	**3190**	1271	3190	1273	3190	208	**1271**	**3190**	1271	3190	1273	3190

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"
Tmpfs filesystem can be set with:
 mount -t tmpfs -o size=800g tmpfs /home
Process tuning setting:
 echo 50000   > /proc/sys/kernel/sched_cfs_bandwidth_slice_us
 echo 240000000 > /proc/sys/kernel/sched_latency_ns
 echo 5000000   > /proc/sys/kernel/sched_migration_cost_ns
 echo 100000000 > /proc/sys/kernel/sched_min_granularity_ns

Continued on next page

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Hardware Availability: Sep-2017
Software Availability: Apr-2017

Operating System Notes (Continued)

```
echo 150000000 > /proc/sys/kernel/sched_wakeup_granularity_ns
```

Platform Notes

```
    BIOS configuration:
    Choose Operating Mode set to Maximum Performance
    SNC set to Enable
    DCU Streamer Prefetcher set to Disable
    Stale AtoS set to Enable
    LLC dead line alloc set to Disable
     Sysinfo program /home/cpu2006-1.2-ic17.0u3/config/sysinfo.rev6993
     Revision 6993 of 2015-11-06 (b5e8d4b4eb51ed28d7f98696cbe290c1)
     running on Proton4S-SUSE12SP2 Mon Oct 23 15:59:57 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 8170 CPU @ 2.10GHz
           4 "physical id"s (chips)
           208 "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 : 26
           siblings  : 52
           physical 0: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 16 17 18 19 20 21 22 24 25
           26 27 28 29
           physical 1: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 16 17 18 19 20 21 22 24 25
           26 27 28 29
           physical 2: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 16 17 18 19 20 21 22 24 25
           26 27 28 29
           physical 3: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 16 17 18 19 20 21 22 24 25
           26 27 28 29
        cache size : 36608 KB

     From /proc/meminfo
        MemTotal:        1584765780 kB
        HugePages_Total:        0
        Hugepagesize:        2048 kB

     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:
```

Continued on next page

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Platform Notes (Continued)

```
        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 Proton4S-SUSE12SP2 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 23 04:36

    SPEC is set to: /home/cpu2006-1.2-ic17.0u3
        Filesystem      Type    Size  Used Avail Use% Mounted on
        tmpfs           tmpfs   800G  5.0G  796G   1% /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 Lenovo -[PSE105X-1.00]- 08/17/2017
      Memory:
      48x NO DIMM NO DIMM
      48x Samsung M393A4K40BB2-CTD 32 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/cpu2006-1.2-ic17.0u3/lib/ia32:/home/cpu2006-1.2-ic17.0u3/lib/intel64:/home/cpu2006-1.2-ic17.0u3/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
```

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Base Compiler Invocation (Continued)

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
```

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

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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:

        433.milc: basepeak = yes

        470.lbm: basepeak = yes

      482.sphinx3: basepeak = yes

C++ benchmarks:

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Peak Optimization Flags (Continued)

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`

436.cactusADM: `basepeak = yes`

454.calculix: `basepeak = yes`

481.wrf: `basepeak = yes`

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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/Lenovo-Platform-Flags-V1.2-SKL-E.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/Lenovo-Platform-Flags-V1.2-SKL-E.xml

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

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