SPEC® CFP2006 Result
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Lenovo Group Limited

Lenovo ThinkServer RD650 (Intel Xeon E5-2637 v3, 3.50 GHz)

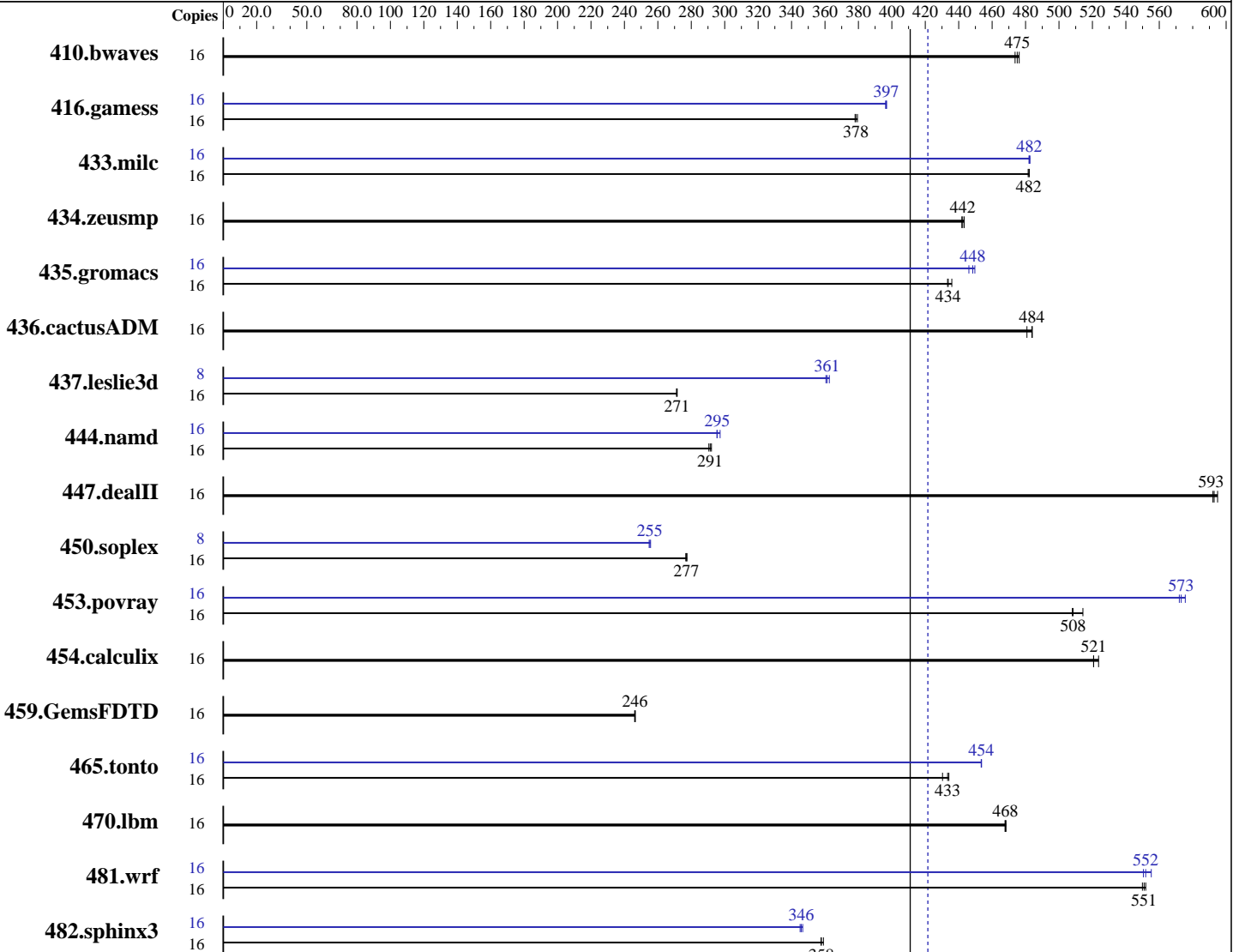$SPECfp®\_rate2006 = \quad 422$

$SPECfp\_rate\_base2006 = \quad 411$

Benchmark	Copies	Result
410.bwaves	16	475
416.gamess	16	397
416.gamess	16	378
433.milc	16	482
433.milc	16	482
434.zeusmp	16	442
435.gromacs	16	448
435.gromacs	16	434
436.cactusADM	16	484
437.leslie3d	8	361
437.leslie3d	16	271
444.namd	16	295
444.namd	16	291
447.dealII	16	593
450.soplex	8	255
450.soplex	16	277
453.povray	16	573
453.povray	16	508
454.calculix	16	521
459.GemsFDTD	16	246
465.tonto	16	454
465.tonto	16	433
470.lbm	16	468
481.wrf	16	552
481.wrf	16	551
482.sphinx3	16	346
482.sphinx3	16	358

SPECfp_rate_base2006 = 411

SPECfp_rate2006 = 422

Hardware

CPU Name:	Intel Xeon E5-2637 v3
CPU Characteristics:	Intel Turbo Boost Technology up to 3.70 GHz
CPU MHz:	3500
FPU:	Integrated
CPU(s) enabled:	8 cores, 2 chips, 4 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:	256 KB I+D on chip per core

Continued on next page

Software

Operating System:	Red Hat Enterprise Linux Server release 6.5 (Santiago) 2.6.32-431.el6.x86_64
Compiler:	C/C++: Version 14.0.0.080 of Intel C++ Studio XE for Linux; Fortran: Version 14.0.0.080 of Intel Fortran Studio XE for Linux
Auto Parallel:	No
File System:	ext4

Continued on next page

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Test sponsor: Lenovo Group Limited		**Hardware Availability:**	Sep-2014
Tested by: Lenovo Group Limited		**Software Availability:**	Jan-2014

L3 Cache:	15 MB I+D on chip per chip	System State:	Run level 3 (multi-user)
Other Cache:	None	Base Pointers:	32/64-bit
Memory:	256 GB (16 x 16 GB 2Rx4 PC4-2133P-R)	Peak Pointers:	32/64-bit
Disk Subsystem:	1 x 240 GB SATA SSD	Other Software:	None
Other Hardware:	None		

Results Table

Benchmark	Base						Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
410.bwaves	16	457	476	**458**	**475**	459	474	16	457	476	**458**	**475**	459	474
416.gamess	16	826	379	829	378	**828**	**378**	16	791	396	789	397	**790**	**397**
433.milc	16	305	482	305	482	**305**	**482**	16	**305**	**482**	305	482	304	483
434.zeusmp	16	328	443	330	442	**329**	**442**	16	328	443	330	442	**329**	**442**
435.gromacs	16	264	433	**263**	**434**	262	436	16	254	450	256	446	**255**	**448**
436.cactusADM	16	398	481	**395**	**484**	395	484	16	398	481	**395**	**484**	395	484
437.leslie3d	16	**554**	**271**	554	272	555	271	8	207	363	**208**	**361**	209	361
444.namd	16	**440**	**291**	439	292	442	291	16	434	295	432	297	**434**	**295**
447.dealII	16	308	595	309	592	**309**	**593**	16	308	595	309	592	**309**	**593**
450.soplex	16	482	277	481	277	**481**	**277**	8	261	256	262	255	**261**	**255**
453.povray	16	168	508	**167**	**508**	166	514	16	149	572	**149**	**573**	148	576
454.calculix	16	252	524	**253**	**521**	254	521	16	252	524	**253**	**521**	254	521
459.GemsFDTD	16	**689**	**246**	690	246	689	247	16	**689**	**246**	690	246	689	247
465.tonto	16	**363**	**433**	366	430	363	434	16	347	454	**347**	**454**	347	453
470.lbm	16	469	468	**470**	**468**	470	468	16	469	468	**470**	**468**	470	468
481.wrf	16	325	550	**324**	**551**	324	552	16	325	550	322	555	**324**	**552**
482.sphinx3	16	868	359	**871**	**358**	872	358	16	904	345	**902**	**346**	900	347

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 configuration:
Cluster On Die set to Auto
Early Snoop set to Auto

Continued on next page

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Platform Notes (Continued)

```
Performance Profile set to Custom
C1E Support set to Disabled
Core C3 set to Disabled
Core C6 set to Disabled
Thermal Profile set to High Fan Speed
Memory Power Savings set to Disabled
 Sysinfo program /usr/cpu2006/config/sysinfo.rev6818
 $Rev: 6818 $ $Date:: 2012-07-17 #$ e86d102572650a6e4d596a3cee98f191
 running on RD550 Thu Dec 25 04:29:13 2014

 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 E5-2637 v3 @ 3.50GHz
       2 "physical id"s (chips)
       16 "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 : 4
       siblings  : 8
       physical 0: cores 0 1 4 5
       physical 1: cores 0 1 4 5
    cache size : 15360 KB

 From /proc/meminfo
    MemTotal:      264415612 kB
    HugePages_Total:       0
    Hugepagesize:       2048 kB

 /usr/bin/lsb_release -d
    Red Hat Enterprise Linux Server release 6.5 (Santiago)

 From /etc/*release* /etc/*version*
    redhat-release: Red Hat Enterprise Linux Server release 6.5 (Santiago)
    system-release: Red Hat Enterprise Linux Server release 6.5 (Santiago)
    system-release-cpe: cpe:/o:redhat:enterprise_linux:6server:ga:server

 uname -a:
    Linux RD550 2.6.32-431.el6.x86_64 #1 SMP Sun Nov 10 22:19:54 EST 2013 x86_64
    x86_64 x86_64 GNU/Linux

 run-level 3 Dec 24 19:53

 SPEC is set to: /usr/cpu2006
    Filesystem     Type  Size  Used Avail Use% Mounted on
    /dev/sda2      ext4  217G   54G  152G  27% /

 Additional information from dmidecode:
   BIOS LENOVO PB2TS110 10/06/2014
```
Continued on next page

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Platform Notes (Continued)

```
     Memory:
      16x   16 GB
      16x Hynix Semiconductor HMA42GR7MFR4N-TFTD 16 GB 2133 MHz 2 rank
       8x NO DIMM NO DIMM

   (End of data from sysinfo program)
   RD650 support 4 channels and 12 DIMMs per processor, total 8 channels and
   24 DIMMs. 16 DIMM slots installed with 16 GB DIMM for this run.
```

General Notes

```
Environment variables set by runspec before the start of the run:
LD_LIBRARY_PATH = "/usr/cpu2006/libs/32:/usr/cpu2006/libs/64:/usr/cpu2006/sh"

 Binaries compiled on a system with 1x Core i7-860 CPU + 8GB
 memory using RedHat EL 6.4
 Transparent Huge Pages enabled with:
 echo always > /sys/kernel/mm/redhat_transparent_hugepage/enabled
 Filesystem page cache cleared with:
 echo 1>        /proc/sys/vm/drop_caches
 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
 436.cactusADM: -DSPEC_CPU_LP64 -nofor_main
   437.leslie3d: -DSPEC_CPU_LP64
```

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Base Portability Flags (Continued)

```
    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 -opt-prefetch -auto-p32
    -ansi-alias -opt-mem-layout-trans=3
```

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

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

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

Peak Compiler Invocation

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

```
    482.sphinx3: icc -m32
```

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

```
    450.soplex: icpc -m32
```

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

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

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Hardware Availability: Sep-2014
Software Availability: Jan-2014

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
      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
```

Peak Optimization Flags

C benchmarks:

```
        433.milc: -xCORE-AVX2(pass 2) -prof-gen(pass 1) -ipo(pass 2)
            -O3(pass 2) -no-prec-div(pass 2)
            -opt-mem-layout-trans=3(pass 2) -prof-use(pass 2)
            -auto-ilp32

        470.lbm: basepeak = yes

     482.sphinx3: -xCORE-AVX2 -ipo -O3 -no-prec-div -opt-mem-layout-trans=3
            -unroll2
```

C++ benchmarks:

```
       444.namd: -xCORE-AVX2(pass 2) -prof-gen(pass 1) -ipo(pass 2)
            -O3(pass 2) -no-prec-div(pass 2)
            -opt-mem-layout-trans=3(pass 2) -prof-use(pass 2) -fno-alias
            -auto-ilp32

        447.dealII: basepeak = yes

       450.soplex: -xCORE-AVX2(pass 2) -prof-gen(pass 1) -ipo(pass 2)
            -O3(pass 2) -no-prec-div(pass 2)
            -opt-mem-layout-trans=3(pass 2) -prof-use(pass 2)
            -opt-malloc-options=3

      453.povray: -xCORE-AVX2(pass 2) -prof-gen(pass 1) -ipo(pass 2)
            -O3(pass 2) -no-prec-div(pass 2)
            -opt-mem-layout-trans=3(pass 2) -prof-use(pass 2) -unroll4
            -ansi-alias
```

Continued on next page

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Peak Optimization Flags (Continued)

Fortran benchmarks:

    410.bwaves: basepeak = yes

    416.gamess: -xCORE-AVX2(pass 2) -prof-gen(pass 1) -ipo(pass 2)
                -O3(pass 2) -no-prec-div(pass 2) -prof-use(pass 2) -unroll2
                -inline-level=0 -scalar-rep-

    434.zeusmp: basepeak = yes

    437.leslie3d: -xCORE-AVX2 -ipo -O3 -no-prec-div -opt-prefetch

  459.GemsFDTD: basepeak = yes

      465.tonto: -xCORE-AVX2(pass 2) -prof-gen(pass 1) -ipo(pass 2)
                 -O3(pass 2) -no-prec-div(pass 2) -prof-use(pass 2) -unroll4
                 -auto -inline-calloc -opt-malloc-options=3

Benchmarks using both Fortran and C:

    435.gromacs: -xCORE-AVX2(pass 2) -prof-gen(pass 1) -ipo(pass 2)
                 -O3(pass 2) -no-prec-div(pass 2)
                 -opt-mem-layout-trans=3(pass 2) -prof-use(pass 2)
                 -opt-prefetch -auto-ilp32

  436.cactusADM: basepeak = yes

    454.calculix: basepeak = yes

        481.wrf: -xCORE-AVX2 -ipo -O3 -no-prec-div -auto-ilp32

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2006/flags/Intel-ic14.0-official-linux64.20140128.html
http://www.spec.org/cpu2006/flags/Lenovo-Platform-Settings-V1.2-HSW-revA.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2006/flags/Intel-ic14.0-official-linux64.20140128.xml
http://www.spec.org/cpu2006/flags/Lenovo-Platform-Settings-V1.2-HSW-revA.xml

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