SPEC® CFP2006 Result
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Lenovo Group Limited

$SPECfp^®\_rate2006 =$ 1030

Lenovo NeXtScale nx360 M5
(2.60 GHz, Intel Xeon E5-2697A v4)

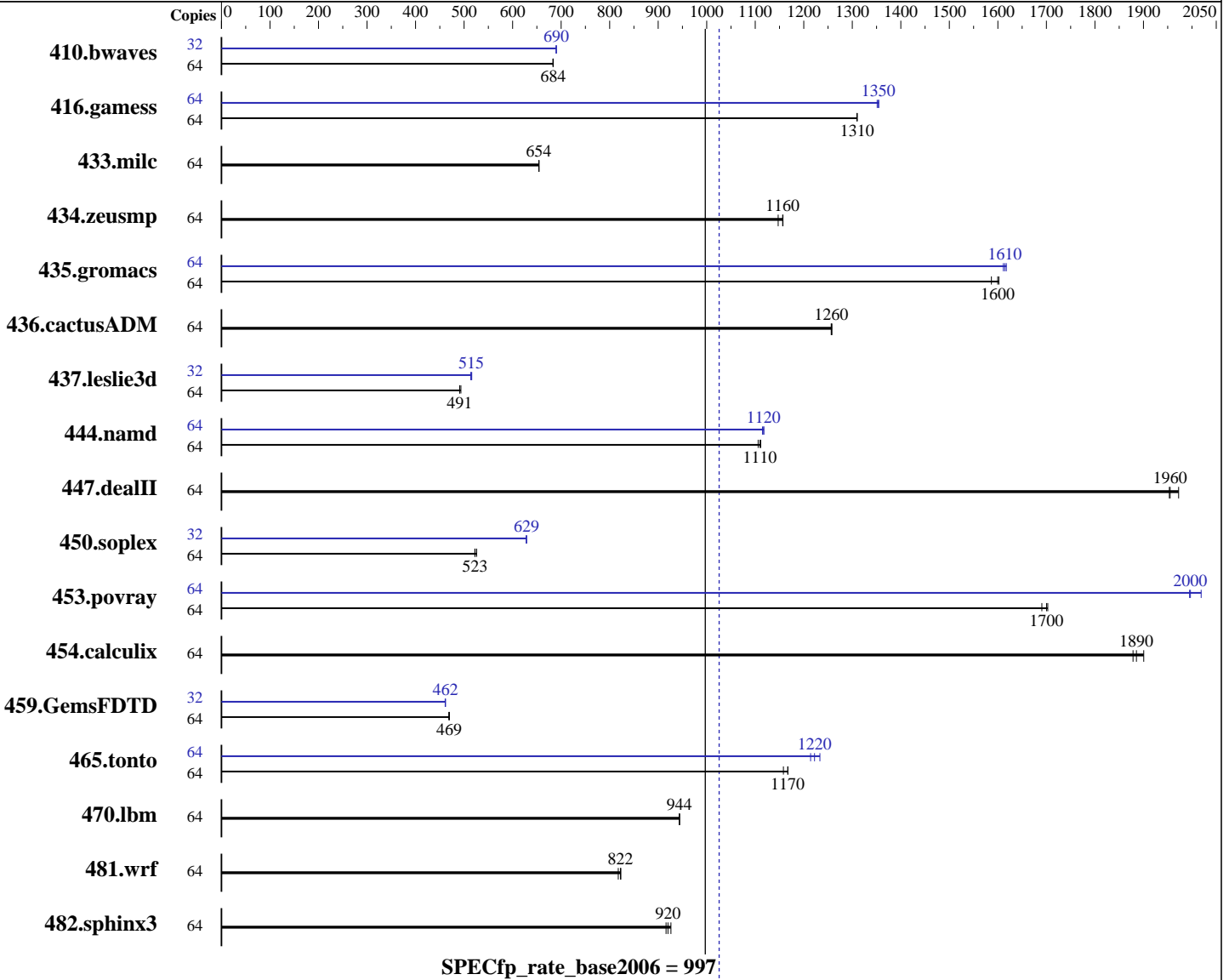$SPECfp\_rate\_base2006 =$ 997

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

Copies	
410.bwaves	32: 690 / 64: 684
416.gamess	64: 1350 / 64: 1310
433.milc	64: 654
434.zeusmp	64: 1160
435.gromacs	64: 1610 / 64: 1600
436.cactusADM	64: 1260
437.leslie3d	32: 515 / 64: 491
444.namd	64: 1120 / 64: 1110
447.dealII	64: 1960
450.soplex	32: 629 / 64: 523
453.povray	64: 2000 / 64: 1700
454.calculix	64: 1890
459.GemsFDTD	32: 462 / 64: 469
465.tonto	64: 1220 / 64: 1170
470.lbm	64: 944
481.wrf	64: 822
482.sphinx3	64: 920

SPECfp_rate_base2006 = 997
SPECfp_rate2006 = 1030

Hardware

CPU Name: Intel Xeon E5-2697A v4
CPU Characteristics: Intel Turbo Boost Technology up to 3.60 GHz
CPU MHz: 2600
FPU: Integrated
CPU(s) enabled: 32 cores, 2 chips, 16 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)

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L3 Cache:	40 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)	Other Software:	None
Disk Subsystem:	1 x 800 GB SATA SSD		
Other Hardware:	None		

Results Table

Benchmark	Base Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Peak Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
410.bwaves	64	**_1272_**	**_684_**	1272	684	1273	683	32	630	690	631	690	**_630_**	**_690_**
416.gamess	64	957	1310	956	1310	**_957_**	**_1310_**	64	925	1350	927	1350	**_926_**	**_1350_**
433.milc	64	**_898_**	**_654_**	898	654	898	654	64	**_898_**	**_654_**	898	654	898	654
434.zeusmp	64	**_504_**	**_1160_**	503	1160	508	1150	64	**_504_**	**_1160_**	503	1160	508	1150
435.gromacs	64	288	1590	285	1600	**_286_**	**_1600_**	64	**_283_**	**_1610_**	284	1610	283	1620
436.cactusADM	64	**_608_**	**_1260_**	608	1260	609	1260	64	**_608_**	**_1260_**	608	1260	609	1260
437.leslie3d	64	1226	491	1219	493	**_1225_**	**_491_**	32	**_584_**	**_515_**	583	516	586	514
444.namd	64	**_462_**	**_1110_**	462	1110	464	1110	64	460	1110	**_459_**	**_1120_**	459	1120
447.dealII	64	375	1950	**_375_**	**_1960_**	371	1970	64	375	1950	**_375_**	**_1960_**	371	1970
450.soplex	64	1022	522	1015	526	**_1021_**	**_523_**	32	**_425_**	**_629_**	425	628	425	629
453.povray	64	201	1690	**_200_**	**_1700_**	200	1700	64	**_171_**	**_2000_**	169	2020	171	2000
454.calculix	64	278	1900	281	1880	**_280_**	**_1890_**	64	278	1900	281	1880	**_280_**	**_1890_**
459.GemsFDTD	64	1446	470	1449	468	**_1446_**	**_469_**	32	736	461	736	462	**_736_**	**_462_**
465.tonto	64	544	1160	**_540_**	**_1170_**	539	1170	64	511	1230	**_515_**	**_1220_**	519	1210
470.lbm	64	932	943	931	944	**_932_**	**_944_**	64	932	943	931	944	**_932_**	**_944_**
481.wrf	64	874	818	**_869_**	**_822_**	869	823	64	874	818	**_869_**	**_822_**	869	823
482.sphinx3	64	**_1356_**	**_920_**	1361	916	1347	926	64	**_1356_**	**_920_**	1361	916	1347	926

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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Test date: Mar-2017
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Platform Notes

```
    BIOS configuration:
    Operating Mode set to Maximum Performance
    COD Preference set to Enable
    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 nx360 Tue Mar  7 10:19:28 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) CPU E5-2697A v4 @ 2.60GHz
           2 "physical id"s (chips)
           64 "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 : 16
           siblings  : 32
           physical 0: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
           physical 1: cores 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
        cache size : 20480 KB

     From /proc/meminfo
        MemTotal:       263960952 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 nx360 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 Mar 7 00:02
```

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Platform Notes (Continued)

```
  SPEC is set to: /home/cpu2006-1.2-ic17.0
    Filesystem      Type    Size   Used Avail Use% Mounted on
    /dev/sda2       btrfs  746G    59G  686G   8% /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 -[THE126N-2.20]- 09/07/2016
    Memory:
    16x Samsung M393A2G40DB1-CRC 16 GB 2 rank 2400 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

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Base Portability Flags (Continued)

```
        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
```

C++ benchmarks (except as noted below):

```
icpc -m64
```

```
  450.soplex: icpc -m64 -L/opt/intel/compilers_and_libraries_2017/linux/lib/ia32
```

Fortran benchmarks:

```
ifort -m64
```

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Peak Compiler Invocation (Continued)

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

 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
```

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Peak Optimization Flags (Continued)

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.html
http://www.spec.org/cpu2006/flags/Lenovo-Platform-Flags-V1.2-BDW-D.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-Flags-V1.2-BDW-D.xml

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

Tested with SPEC CPU2006 v1.2.
Report generated on Tue Apr 4 16:57:12 2017 by SPEC CPU2006 PS/PDF formatter v6932.
Originally published on 4 April 2017.