SPEC® CFP2006 Result

Lenovo Group Limited

$SPECfp^{®}2006 =$ 128

Lenovo Flex System x240 M5
(2.20 GHz, Intel Xeon E5-2699R v4)

$SPECfp\_base2006 =$ 121

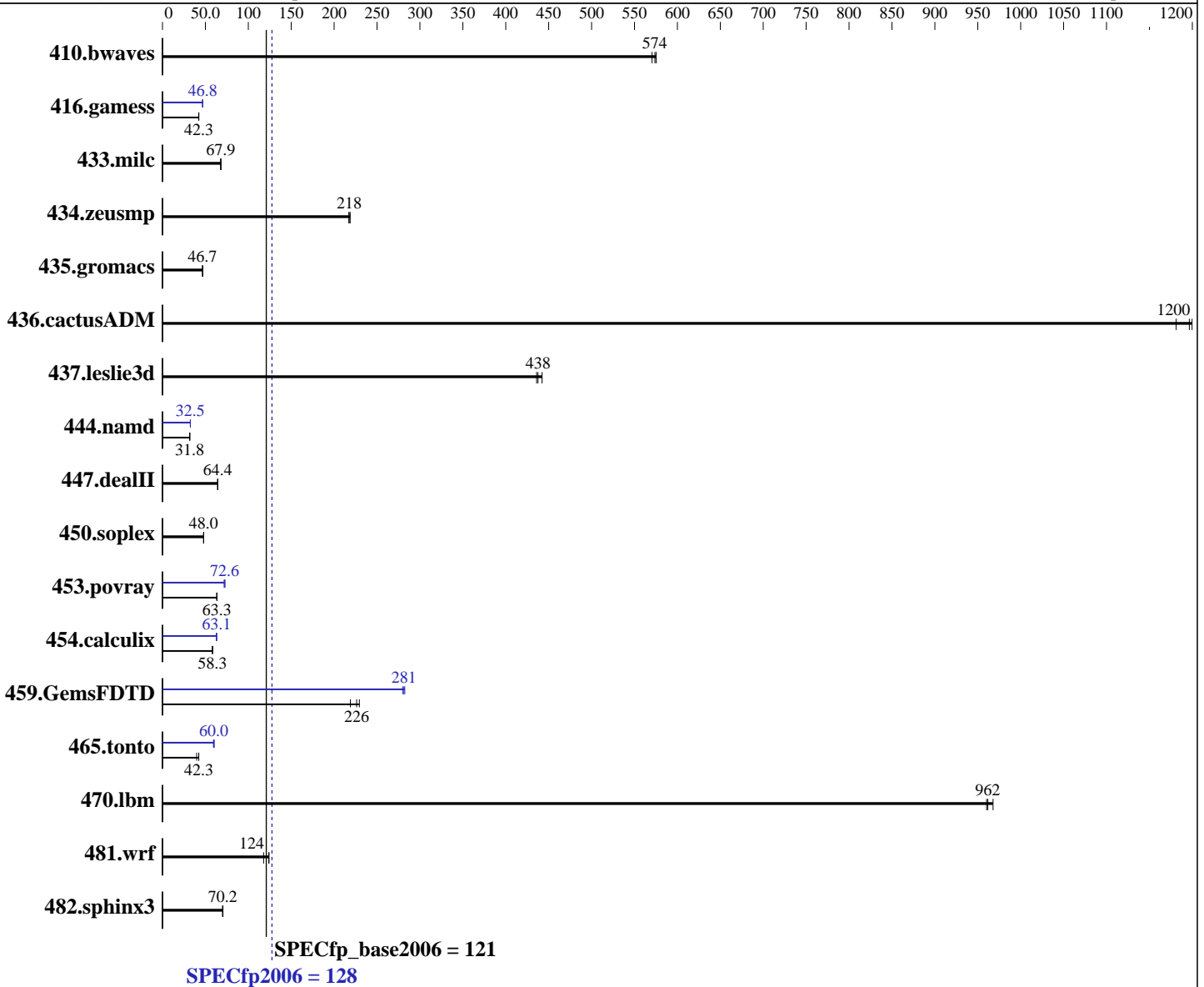|			
CPU2006 license: 9017		**Test date:**	Dec-2016
Test sponsor: Lenovo Group Limited		**Hardware Availability:**	Jan-2017
Tested by: Lenovo Group Limited		**Software Availability:**	Sep-2016

Scale: 0 50.0 100 150 200 250 300 350 400 450 500 550 600 650 700 750 800 850 900 950 1000 1050 1100 1200

- **410.bwaves** 574
- **416.gamess** 46.8 / 42.3
- **433.milc** 67.9
- **434.zeusmp** 218
- **435.gromacs** 46.7
- **436.cactusADM** 1200
- **437.leslie3d** 438
- **444.namd** 32.5 / 31.8
- **447.dealII** 64.4
- **450.soplex** 48.0
- **453.povray** 72.6 / 63.3
- **454.calculix** 63.1 / 58.3
- **459.GemsFDTD** 281 / 226
- **465.tonto** 60.0 / 42.3
- **470.lbm** 962
- **481.wrf** 124
- **482.sphinx3** 70.2

SPECfp_base2006 = 121
SPECfp2006 = 128

Hardware

CPU Name:	Intel Xeon E5-2699R v4
CPU Characteristics:	Intel Turbo Boost Technology up to 3.60 GHz
CPU MHz:	2200
FPU:	Integrated
CPU(s) enabled:	44 cores, 2 chips, 22 cores/chip
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:	Yes
File System:	btrfs
System State:	Run level 3 (multi-user)

Continued on next page

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L3 Cache:	55 MB I+D on chip per chip	Base Pointers:	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						Peak					
	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
410.bwaves	23.8	570	**23.7**	**574**	23.6	575	23.8	570	**23.7**	**574**	23.6	575
416.gamess	465	42.1	**463**	**42.3**	462	42.4	**418**	**46.8**	418	46.8	418	46.8
433.milc	135	68.1	**135**	**67.9**	135	67.8	135	68.1	**135**	**67.9**	135	67.8
434.zeusmp	41.9	217	41.6	219	**41.8**	**218**	41.9	217	41.6	219	**41.8**	**218**
435.gromacs	**153**	**46.7**	152	47.0	153	46.6	**153**	**46.7**	152	47.0	153	46.6
436.cactusADM	**9.99**	**1200**	10.1	1180	9.96	1200	**9.99**	**1200**	10.1	1180	9.96	1200
437.leslie3d	**21.5**	**438**	21.3	442	21.6	436	**21.5**	**438**	21.3	442	21.6	436
444.namd	252	31.8	**252**	**31.8**	253	31.7	247	32.5	247	32.5	**247**	**32.5**
447.dealII	178	64.4	178	64.3	**178**	**64.4**	178	64.4	178	64.3	**178**	**64.4**
450.soplex	174	48.0	174	47.9	**174**	**48.0**	174	48.0	174	47.9	**174**	**48.0**
453.povray	83.8	63.5	84.0	63.3	**84.0**	**63.3**	74.1	71.8	73.1	72.7	**73.3**	**72.6**
454.calculix	141	58.4	**142**	**58.3**	142	58.3	**131**	**63.1**	131	63.2	131	62.7
459.GemsFDTD	46.2	229	48.5	219	**46.9**	**226**	37.6	282	37.9	280	**37.7**	**281**
465.tonto	233	42.3	247	39.8	**233**	**42.3**	166	59.4	**164**	**60.0**	163	60.3
470.lbm	14.3	960	**14.3**	**962**	14.2	968	14.3	960	**14.3**	**962**	14.2	968
481.wrf	**90.2**	**124**	90.0	124	94.8	118	**90.2**	**124**	90.0	124	94.8	118
482.sphinx3	277	70.5	**278**	**70.2**	278	70.1	277	70.5	**278**	**70.2**	278	70.1

Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

Operating System Notes

```
Stack size set to unlimited using "ulimit -s unlimited"
Transparent Huge Pages disabled with:
echo never > /sys/kernel/mm/transparent_hugepage/enabled
```

Platform Notes

```
BIOS configuration:
Operating Mode set to Maximum Performance
Hyper-Threading set to Disabled
Snoop Preference set to Home Snoop
Sysinfo program /home/cpu2006-1.2-ic17.0/config/sysinfo.rev6993
Revision 6993 of 2015-11-06 (b5e8d4b4eb51ed28d7f98696cbe290c1)
running on x240 Mon Dec 12 23:02:43 2016
```

Lenovo Group Limited

Lenovo Flex System x240 M5
(2.20 GHz, Intel Xeon E5-2699R v4)

$SPECfp2006 =$ 128

$SPECfp\_base2006 =$ 121

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

Platform Notes (Continued)

```
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 E5-2699R v4 @ 2.20GHz
      2 "physical id"s (chips)
      44 "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 : 22
      siblings  : 22
      physical 0: cores 0 1 2 3 4 5 8 9 10 11 12 16 17 18 19 20 21 24 25 26 27
      28
      physical 1: cores 0 1 2 3 4 5 8 9 10 11 12 16 17 18 19 20 21 24 25 26 27
      28
   cache size : 56320 KB

From /proc/meminfo
   MemTotal:       263826960 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 x240 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 Dec 12 18:18

SPEC is set to: /home/cpu2006-1.2-ic17.0
   Filesystem      Type    Size   Used Avail Use% Mounted on
   /dev/sda2       btrfs   746G    28G  717G   4% /home
Additional information from dmidecode:
```

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SPECfp_base2006 = 121

CPU2006 license: 9017
Test sponsor: Lenovo Group Limited
Tested by: Lenovo Group Limited

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

Platform Notes (Continued)

```
    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 -[C4E126N-2.20]- 09/07/2016
    Memory:
    16x Hynix HMA42GR7AFR4N-UH 16 GB 2 rank 2400 MHz
    8x NO DIMM Unknown

 (End of data from sysinfo program)
```

General Notes

```
Environment variables set by runspec before the start of the run:
KMP_AFFINITY = "granularity=fine,compact"
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"
OMP_NUM_THREADS = "44"

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

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
      444.namd: -DSPEC_CPU_LP64
```

Lenovo Group Limited

Lenovo Flex System x240 M5
(2.20 GHz, Intel Xeon E5-2699R v4)

$\text{SPECfp2006} = \qquad 128$

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CPU2006 license: 9017

Test sponsor: Lenovo Group Limited

Tested by: Lenovo Group Limited

Test date: Dec-2016

Hardware Availability: Jan-2017

Software Availability: Sep-2016

Base Portability Flags (Continued)

```
   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 -parallel -qopt-prefetch
```

C++ benchmarks:
```
     -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch
```

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

Benchmarks using both Fortran and C:
```
     -xCORE-AVX2 -ipo -O3 -no-prec-div -parallel -qopt-prefetch
```

Peak Compiler Invocation

C benchmarks:
```
     icc -m64
```

C++ benchmarks:
```
     icpc -m64
```

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

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

Peak Portability Flags

```
Same as Base Portability Flags
```

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Lenovo Group Limited

Lenovo Flex System x240 M5
(2.20 GHz, Intel Xeon E5-2699R v4)

SPECfp2006 = 128

SPECfp_base2006 = 121

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

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`

    447.dealII: `basepeak = yes`

    450.soplex: `basepeak = yes`

    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 -ansi-alias`

Fortran benchmarks:

    410.bwaves: `basepeak = yes`

    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: `basepeak = yes`

  459.GemsFDTD: `-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`
           `-qopt-prefetch -parallel`

    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) -inline-calloc -qopt-malloc-options=3`
           `-auto -unroll4`

Benchmarks using both Fortran and C:

    435.gromacs: `basepeak = yes`

  436.cactusADM: `basepeak = yes`

Continued on next page

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Peak Optimization Flags (Continued)

454.calculix: `-xCORE-AVX2 -ipo -O3 -no-prec-div -auto-ilp32`

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-C.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-C.xml

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