Lenovo Group Limited

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

SPECfp®2006 = 128
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

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

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)
**Lenovo Group Limited**

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

**SPECfp2006 = 128**  
**SPECfp_base2006 = 121**

<table>
<thead>
<tr>
<th>CPU2006 license: 9017</th>
<th>Test date: Dec-2016</th>
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<tbody>
<tr>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>L3 Cache:</th>
<th>55 MB I+D on chip per chip</th>
<th>Base Pointers:</th>
<th>64-bit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other Cache:</td>
<td>None</td>
<td>Peak Pointers:</td>
<td>32/64-bit</td>
</tr>
<tr>
<td>Memory:</td>
<td>256 GB (16 x 16 GB 2Rx4 PC4-2400T-R)</td>
<td>Other Software:</td>
<td>None</td>
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<tr>
<td>Disk Subsystem:</td>
<td>1 x 800 GB SATA SSD</td>
<td>Other Hardware:</td>
<td>None</td>
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</table>

### Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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<tbody>
<tr>
<td>410.bwaves</td>
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<td>570</td>
<td>23.7</td>
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<td>23.6</td>
<td>575</td>
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<td>416.gamess</td>
<td>465</td>
<td>42.1</td>
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<td>42.3</td>
<td>462</td>
<td>42.4</td>
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<td>46.8</td>
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<td>433.milc</td>
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<td>135</td>
<td>67.9</td>
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<td>67.8</td>
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<td>434.zeusmp</td>
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<td>41.6</td>
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<td>435.gromacs</td>
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<td><strong>46.7</strong></td>
<td>152</td>
<td>47.0</td>
<td>153</td>
<td>46.6</td>
<td><strong>153</strong></td>
<td><strong>46.7</strong></td>
<td><strong>152</strong></td>
<td><strong>47.0</strong></td>
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<td>436.cactusADM</td>
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<td>10.1</td>
<td>1180</td>
<td>9.96</td>
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<td><strong>9.99</strong></td>
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<td>437.leslie3d</td>
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<td>21.3</td>
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<td>447.dealII</td>
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<td>453.povray</td>
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<tr>
<td>459.GemsFDTD</td>
<td>46.2</td>
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<td>48.5</td>
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<td><strong>46.9</strong></td>
<td><strong>226</strong></td>
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<tr>
<td>465.tonto</td>
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<td>42.3</td>
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<td>39.8</td>
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<td><strong>42.3</strong></td>
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<td><strong>164</strong></td>
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<tr>
<td>470.lbm</td>
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<td><strong>963</strong></td>
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<td><strong>962</strong></td>
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<td>481.wrf</td>
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<td>482.sphinx3</td>
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<td><strong>70.2</strong></td>
<td>278</td>
<td>70.1</td>
<td><strong>278</strong></td>
<td><strong>70.5</strong></td>
<td><strong>278</strong></td>
<td><strong>70.2</strong></td>
</tr>
</tbody>
</table>

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

Continued on next page
### 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 sponsor:** Lenovo Group Limited  
**Tested by:** Lenovo Group Limited  

**Test date:** Dec-2016  
**Hardware Availability:** Jan-2017  
**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

**Filesysten** | **Type** | **Size** | **Used** | **Avail** | **Use%** | **Mounted on**
--- | --- | --- | --- | --- | --- | ---
/dev/sda2 | btrfs | 746G | 28G | 717G | 4% | /home

**Additional information from dmidecode:**

Continued on next page
# SPEC CFP2006 Result

## Lenovo Group Limited

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

| SPECfp2006 = | 128 |
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| CPU2006 license: | 9017 |
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| 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-ic17.0/1ibs/32:/home/cpu2006-1.2-ic17.0/1ibs/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 -nofor_main
- 435.gromacs: -DSPEC_CPU_LP64 -nofor_main
- 436.cactusADM: -DSPEC_CPU_LP64 -nofor_main
- 437.leslic3d: -DSPEC_CPU_LP64
- 444.namd: -DSPEC_CPU_LP64

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Lenovo Group Limited

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

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CPU2006 license: 9017
Test sponsor: Lenovo Group Limited
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Test date: Dec-2016
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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
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 sponsor: Lenovo Group Limited
Tested by: Lenovo Group Limited

Test date: Dec-2016
Hardware Availability: Jan-2017
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-l1p32
- 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
Lenovo Group Limited
Lenovo Flex System x240 M5
(2.20 GHz, Intel Xeon E5-2699R v4)

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CPU2006 license: 9017
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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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For other inquiries, please contact webmaster@spec.org.

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