Lenovo Group Limited

Lenovo System x3650 M5
(2.10 GHz, Intel Xeon E5-2620 v4)

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

Lenovo Group Limited

Test date: Apr-2016
Hardware Availability: Mar-2016
Software Availability: Dec-2015

SPECfp®2006 = 112
SPECfp_base2006 = 106

CPU Name: Intel Xeon E5-2620 v4
CPU Characteristics: Intel Turbo Boost Technology up to 3.00 GHz
CPU MHz: 2100
FPU: Integrated
CPU(s) enabled: 16 cores, 2 chips, 8 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

Operating System: SUSE Linux Enterprise Server 12 SP1 (x86_64)
Compiler: C/C++: Version 16.0.0.101 of Intel C++ Studio XE for Linux;
          Fortran: Version 16.0.0.101 of Intel Fortran Studio XE for Linux
Auto Parallel: Yes
File System: xfs
System State: Run level 3 (multi-user)
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L3 Cache: 20 MB I+D on chip per chip
Other Cache: None
Memory: 256 GB (16 x 16 GB 2Rx4 PC4-2400T-R, running at 2133 MHz)
Disk Subsystem: 1 x 800 GB SATA SSD
Other Hardware: None

Base Pointers: 64-bit
Peak Pointers: 32/64-bit
Other Software: None

Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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<td>570</td>
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<tr>
<td>416.gamess</td>
<td>595</td>
<td>32.9</td>
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<td>32.8</td>
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<td>433.milc</td>
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<tr>
<td>444.namd</td>
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<td>459.GemsFDTD</td>
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<td>481.wrf</td>
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<tr>
<td>482.sphinx3</td>
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<td>69.1</td>
<td>284</td>
<td>68.7</td>
<td>281</td>
<td>69.4</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"

Platform Notes:

BIOS Configuration:
Operating Mode set to Maximum Performance
Intel Hyperthreading set to Disabled
COD Preference set to Disable

Sysinfo program /home/cpu2006-1.2-ic16.0/config/sysinfo.rev6914
$Rev: 6914 $ $Date:: 2014-06-25 #$ e3fbb8667b5a285932ceab81e28219e1
running on XinYi-mlk-04 Thu Apr 28 11:20:29 2016

This section contains SUT (System Under Test) info as seen by
Continued on next page

Standard Performance Evaluation Corporation
info@spec.org
http://www.spec.org/
Lenovo Group Limited

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Platform Notes (Continued)

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 E5-2620 v4 @ 2.10GHz
    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 : 8
      siblings : 8
      physical 0: cores 0 1 2 3 4 5 6 7
      physical 1: cores 0 1 2 3 4 5 6 7
    cache size : 20480 KB

From /proc/meminfo
  MemTotal: 263961528 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:
  (8d714a0) x86_64 x86_64 x86_64 GNU/Linux

run-level 3 Apr 28 06:03

SPEC is set to: /home/cpu2006-1.2-ic16.0

Filesystem Type Size Used Avail Use% Mounted on
/dev/sda4 xfs 701G 11G 691G 2% /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
Continued on next page
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Platform Notes (Continued)

hardware, firmware, and the "DMTF SMBIOS" standard.

BIOS LENOVO -[TCE123H-2.10]- 03/25/2016
Memory:
8x NO DIMM Unknown
16x Samsung M395A2G40DB1-CRC 16 GB 2 rank 2400 MHz, configured at 2133 MHz

(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-ic16.0/libs/32:/home/cpu2006-1.2-ic16.0/libs/64:/home/cpu2006-1.2-ic16.0/sh"
OMP_NUM_THREADS = "16"

Binaries compiled on a system with 1x Intel Core i5-4670K CPU + 32GB memory using RedHat EL 7.1
Transparent Huge Pages disabled with:
echo never > /sys/kernel/mm/transparent_hugepage/enabled

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
447.dealII: -DSPEC_CPU_LP64

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Lenovo Group Limited
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**CPU2006 license:** 9017

**Test date:** Apr-2016

**Test sponsor:** Lenovo Group Limited

**Tested by:** Lenovo Group Limited

<table>
<thead>
<tr>
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<th>Mar-2016</th>
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<tbody>
<tr>
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<td>Dec-2015</td>
</tr>
</tbody>
</table>

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### Base Portability Flags (Continued)

- **450.soplex:** `-DSPEC_CPU_LP64`
- **453.povray:** `-DSPEC_CPU_LP64`
- **454.calculix:** `-DSPEC_CPU_LP64 -nofor_main`
- **459.GemsFDTD:** `-DSPEC_CPU_LP64`
- **463.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 -opt-prefetch`
- `-ansi-alias`

**C++ benchmarks:**

- `-xCORE-AVX2 -ipo -O3 -no-prec-div -opt-prefetch -ansi-alias`

**Fortran benchmarks:**

- `-xCORE-AVX2 -ipo -O3 -no-prec-div -parallel -opt-prefetch`

**Benchmarks using both Fortran and C:**

- `-xCORE-AVX2 -ipo -O3 -no-prec-div -parallel -opt-prefetch`
- `-ansi-alias`

---

### 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
Peak Optimization Flags

C benchmarks:

433.milc: basepeak = yes
470.lbm: basepeak = yes
482.sphinx3: basepeak = yes

C++ benchmarks:

444.namd: -xCORE-AVX2(pass 2) -prof-gen:threadsafe(pass 1)
-ipo(pass 2) -O3(pass 2) -no-prec-div(pass 2)
-par-num-threads=1(pass 1) -prof-use(pass 2) -fno-alias
-auto-ilp32
447.dealII: basepeak = yes
450.soplex: basepeak = yes
453.povray: -xCORE-AVX2(pass 2) -prof-gen:threadsafe(pass 1)
-ipo(pass 2) -O3(pass 2) -no-prec-div(pass 2)
-par-num-threads=1(pass 1) -prof-use(pass 2) -unroll4
-ansi-alias

Fortran benchmarks:

410.bwaves: basepeak = yes
416.gamess: -xCORE-AVX2(pass 2) -prof-gen:threadsafe(pass 1)
-ipo(pass 2) -O3(pass 2) -no-prec-div(pass 2)
-par-num-threads=1(pass 1) -prof-use(pass 2) -unroll2
-inline-level=0 -scalar-rep-
434.zeusmp: basepeak = yes
437.leslie3d: basepeak = yes
459.GemsFDTD: -xCORE-AVX2(pass 2) -prof-gen:threadsafe(pass 1)
-ipo(pass 2) -O3(pass 2) -no-prec-div(pass 2)
-par-num-threads=1(pass 1) -prof-use(pass 2) -unroll2
-inline-level=0 -opt-prefetch -parallel
465.tonto: -xCORE-AVX2(pass 2) -prof-gen:threadsafe(pass 1)
-ipo(pass 2) -O3(pass 2) -no-prec-div(pass 2)
-par-num-threads=1(pass 1) -prof-use(pass 2) -inline-calloc
-opt-malloc-options=3 -auto -unroll4

Benchmarks using both Fortran and C:
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Peak Optimization Flags (Continued)

435.gromacs: basepeak = yes
436.cactusADM: basepeak = yes
454.calculix: -xCORE-AVX2 -ipo -O3 -no-prec-div -auto-llp32 -ansi-alias
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-ic16.0-official-linux64.html
http://www.spec.org/cpu2006/flags/Lenovo-Platform-Settings-V1.2-BDW-revC.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2006/flags/Intel-ic16.0-official-linux64.xml
http://www.spec.org/cpu2006/flags/Lenovo-Platform-Settings-V1.2-BDW-revC.xml

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