



# SPEC® CFP2006 Result

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## Lenovo Group Limited

**SPECfp®2006 = 126**

Lenovo ThinkServer RD650  
(2.40 GHz, Intel Xeon E5-2699A v4)

**SPECfp\_base2006 = 120**

CPU2006 license: 9017

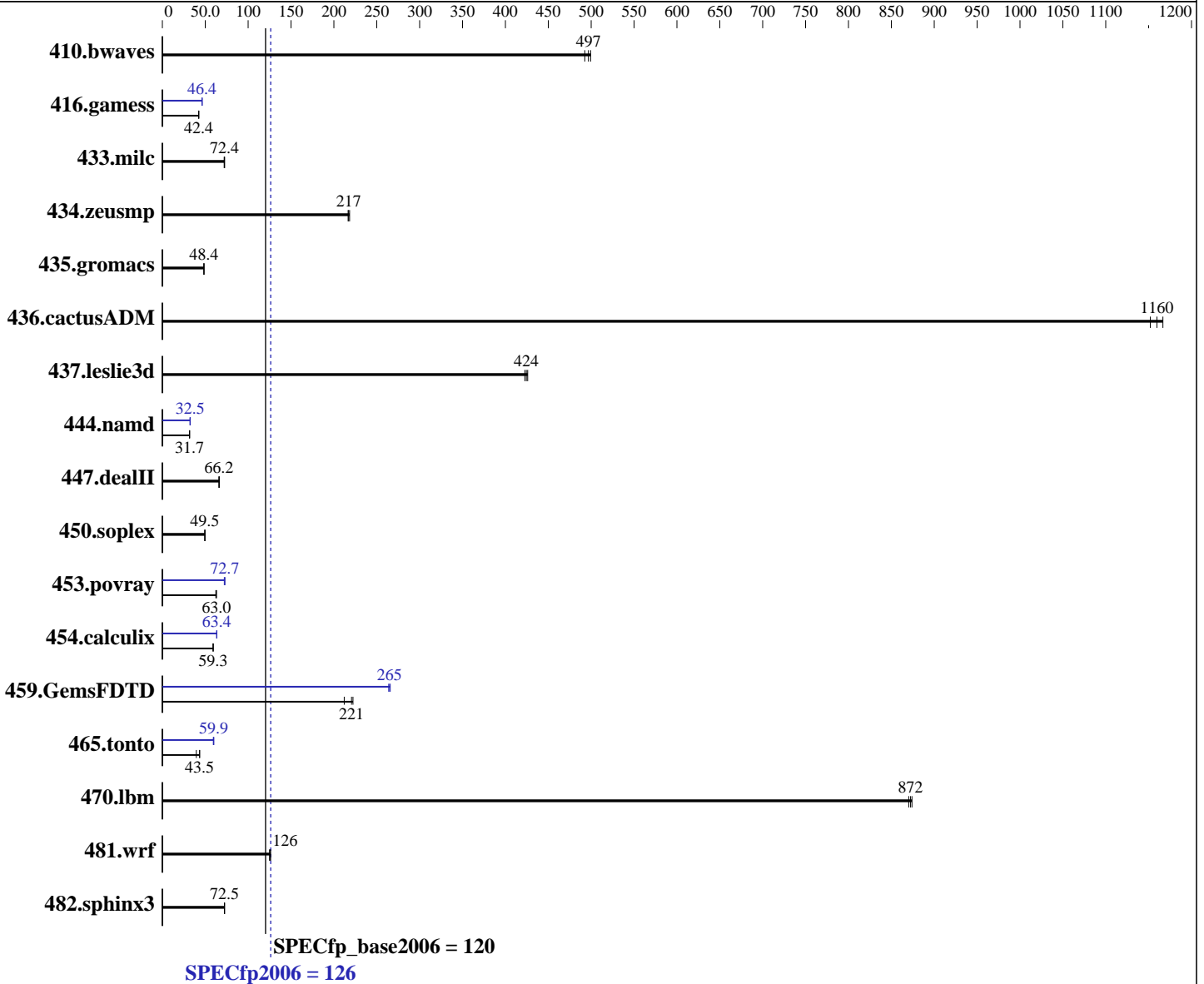
Test date: Nov-2016

Test sponsor: Lenovo Group Limited

Hardware Availability: Mar-2016

Tested by: Lenovo Group Limited

Software Availability: Sep-2016



### Hardware

CPU Name: Intel Xeon E5-2699A v4  
 CPU Characteristics: Intel Turbo Boost Technology up to 3.60 GHz  
 CPU MHz: 2400  
 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: xfs  
 System State: Run level 3 (multi-user)

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L3 Cache: 55 MB I+D on chip per chip  
Other Cache: None  
Memory: 256 GB (16 x 16 GB 2Rx4 PC4-2400T-R)  
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

| Benchmark     | Base               |                    |                    |                    |                    |                    | Peak               |                    |                    |                    |                    |                    |
|---------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|--------------------|
|               | Seconds            | Ratio              | Seconds            | Ratio              | Seconds            | Ratio              | Seconds            | Ratio              | Seconds            | Ratio              | Seconds            | Ratio              |
| 410.bwaves    | 27.6               | 493                | <b><u>27.4</u></b> | <b><u>497</u></b>  | 27.2               | 499                | 27.6               | 493                | <b><u>27.4</u></b> | <b><u>497</u></b>  | 27.2               | 499                |
| 416.gamess    | 461                | 42.4               | 462                | 42.4               | <b><u>462</u></b>  | <b><u>42.4</u></b> | <b><u>422</u></b>  | <b><u>46.4</u></b> | 424                | 46.2               | 422                | 46.4               |
| 433.milc      | 126                | 72.6               | <b><u>127</u></b>  | <b><u>72.4</u></b> | 127                | 72.1               | 126                | 72.6               | <b><u>127</u></b>  | <b><u>72.4</u></b> | 127                | 72.1               |
| 434.zeusmp    | 41.7               | 218                | <b><u>41.9</u></b> | <b><u>217</u></b>  | 42.0               | 217                | 41.7               | 218                | <b><u>41.9</u></b> | <b><u>217</u></b>  | 42.0               | 217                |
| 435.gromacs   | 147                | 48.6               | 148                | 48.4               | <b><u>147</u></b>  | <b><u>48.4</u></b> | 147                | 48.6               | 148                | 48.4               | <b><u>147</u></b>  | <b><u>48.4</u></b> |
| 436.cactusADM | 10.2               | 1170               | 10.4               | 1150               | <b><u>10.3</u></b> | <b><u>1160</u></b> | 10.2               | 1170               | 10.4               | 1150               | <b><u>10.3</u></b> | <b><u>1160</u></b> |
| 437.leslie3d  | <b><u>22.1</u></b> | <b><u>424</u></b>  | 22.1               | 426                | 22.2               | 423                | <b><u>22.1</u></b> | <b><u>424</u></b>  | 22.1               | 426                | 22.2               | 423                |
| 444.namd      | 253                | 31.7               | <b><u>253</u></b>  | <b><u>31.7</u></b> | 253                | 31.7               | 247                | 32.5               | <b><u>247</u></b>  | <b><u>32.5</u></b> | 249                | 32.2               |
| 447.dealII    | <b><u>173</u></b>  | <b><u>66.2</u></b> | 174                | 65.9               | 172                | 66.4               | <b><u>173</u></b>  | <b><u>66.2</u></b> | 174                | 65.9               | 172                | 66.4               |
| 450.soplex    | 168                | 49.7               | <b><u>168</u></b>  | <b><u>49.5</u></b> | 168                | 49.5               | 168                | 49.7               | <b><u>168</u></b>  | <b><u>49.5</u></b> | 168                | 49.5               |
| 453.povray    | 85.3               | 62.4               | <b><u>84.5</u></b> | <b><u>63.0</u></b> | 84.5               | 63.0               | <b><u>73.1</u></b> | <b><u>72.7</u></b> | 73.7               | 72.2               | 73.0               | 72.9               |
| 454.calculix  | 139                | 59.3               | 139                | 59.2               | <b><u>139</u></b>  | <b><u>59.3</u></b> | 130                | 63.5               | 130                | 63.4               | <b><u>130</u></b>  | <b><u>63.4</u></b> |
| 459.GemsFDTD  | 50.0               | 212                | <b><u>48.1</u></b> | <b><u>221</u></b>  | 47.7               | 222                | 39.9               | 266                | <b><u>40.0</u></b> | <b><u>265</u></b>  | 40.2               | 264                |
| 465.tonto     | <b><u>226</u></b>  | <b><u>43.5</u></b> | 249                | 39.6               | 226                | 43.5               | 166                | 59.4               | 164                | 60.0               | <b><u>164</u></b>  | <b><u>59.9</u></b> |
| 470.lbm       | 15.8               | 870                | <b><u>15.7</u></b> | <b><u>872</u></b>  | 15.7               | 874                | 15.8               | 870                | <b><u>15.7</u></b> | <b><u>872</u></b>  | 15.7               | 874                |
| 481.wrf       | 89.4               | 125                | <b><u>89.0</u></b> | <b><u>126</u></b>  | 88.5               | 126                | 89.4               | 125                | <b><u>89.0</u></b> | <b><u>126</u></b>  | 88.5               | 126                |
| 482.sphinx3   | 269                | 72.4               | <b><u>269</u></b>  | <b><u>72.5</u></b> | 269                | 72.6               | 269                | 72.4               | <b><u>269</u></b>  | <b><u>72.5</u></b> | 269                | 72.6               |

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:  
Hyper-Threading set to Disabled  
Cluster On Die set to Disabled  
Early Snoop set to Enabled  
Performance Profile set to Custom  
C1E Support set to Disabled  
Core C3 set to Disabled  
Core C6 set to Disabled  
CPU Performance and Energy Bias set to Disabled  
Thermal Profile set to High Fan Speed

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Software Availability: Sep-2016

### Platform Notes (Continued)

Memory Power Savings set to Disabled  
Sysinfo program /home/cpu2006-1.2-ic16.0/config/sysinfo.rev6993  
Revision 6993 of 2015-11-06 (b5e8d4b4eb51ed28d7f98696cbe290c1)  
running on RD650-MLK Sun Nov 27 20:46:48 2016

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 E5-2699A v4 @ 2.40GHZ
 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: 264554460 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 RD650-MLK 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 Nov 27 16:02
```

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## Platform Notes (Continued)

SPEC is set to: /home/cpu2006-1.2-ic16.0  
Filesystem Type Size Used Avail Use% Mounted on  
/dev/sda3 xfs 691G 176G 516G 26% /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 PB1TS362 03/24/2016

Memory:

16x Hynix Semiconductor HMA42GR7AFR4N-UH 16 GB 2 rank 2400 MHz  
8x NO DIMM NO DIMM

(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/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  
Transparent Huge Pages enabled by default.

## 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

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## Base Portability Flags (Continued)

```

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: -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



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## 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: -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

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## Peak Optimization Flags (Continued)

Benchmarks using both Fortran and C:

435.gromacs: basepeak = yes

436.cactusADM: basepeak = yes

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-Settings-V1.2-BDW-revD.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-Settings-V1.2-BDW-revD.xml>

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For questions about this result, please contact the tester.  
For other inquiries, please contact [webmaster@spec.org](mailto:webmaster@spec.org).

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