# SPEC® CFP2006 Result

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## Lenovo Group Limited

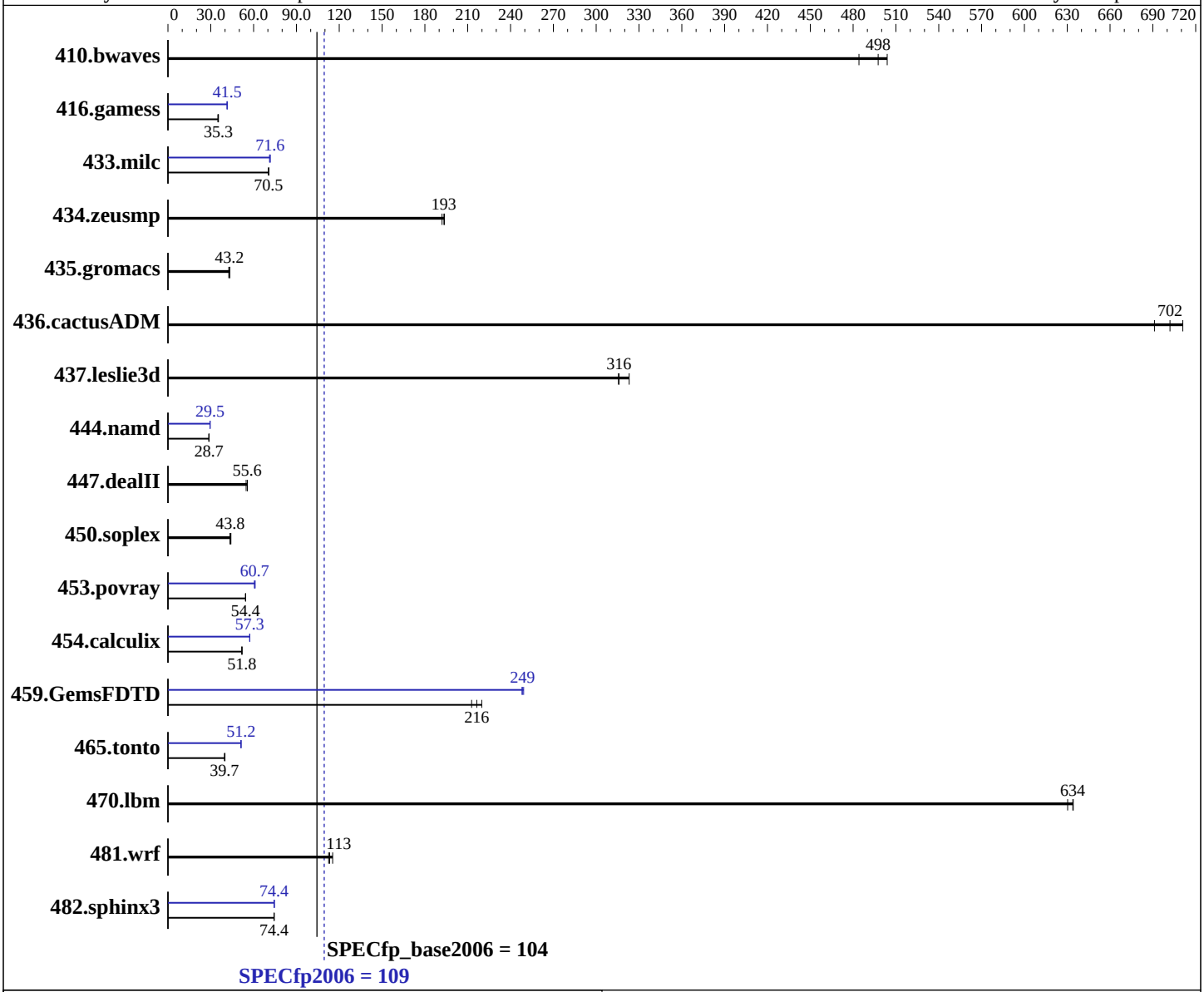
Lenovo ThinkServer RD450 (Intel Xeon E5-2640 v3, 2.60 GHz)

SPECfp®2006 = 109

SPECfp_base2006 = 104

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

**Test date:** Nov-2014
**Hardware Availability:** Dec-2014
**Software Availability:** Sep-2014




### Hardware

| | |
|---|---|
| CPU Name: | Intel Xeon E5-2640 v3 |
| CPU Characteristics: | Intel Turbo Boost Technology up to 3.40 GHz |
| CPU MHz: | 2600 |
| FPU: | Integrated |
| CPU(s) enabled: | 16 cores, 2 chips, 8 cores/chip, 2 threads/core |
| CPU(s) orderable: | 1,2 chip |
| Primary Cache: | 32 KB I + 32 KB D on chip per core |
| Secondary Cache: | 256 KB I+D on chip per core |

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### Software

| | |
|---|---|
| Operating System: | Red Hat Enterprise Linux Server release 7.0 (Maipo)<br>3.10.0-123.el7.x86_64 |
| Compiler: | C/C++: Version 15.0.0.090 of Intel C++ Studio XE for Linux;<br>Fortran: Version 15.0.0.090 of Intel Fortran Studio XE for Linux |
| Auto Parallel: | Yes |
| File System: | xfs |

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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 PC4-2133P-R, running at 1866 MHz)
Disk Subsystem: 1 x 800 GB SATA SSD
Other Hardware: None

System State: Run level 3 (multi-user)
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 | 28.1 | 484 | **27.3** | **498** | 27.0 | 504 | 28.1 | 484 | **27.3** | **498** | 27.0 | 504 |
| 416.gamess | **554** | **35.3** | 560 | 34.9 | 554 | 35.3 | 472 | 41.4 | **472** | **41.5** | 472 | 41.5 |
| 433.milc | 130 | 70.4 | **130** | **70.5** | 130 | 70.7 | 129 | 71.1 | **128** | **71.6** | 128 | 71.7 |
| 434.zeusmp | **47.1** | **193** | 47.0 | 194 | 47.4 | 192 | **47.1** | **193** | 47.0 | 194 | 47.4 | 192 |
| 435.gromacs | 168 | 42.6 | 165 | 43.3 | **165** | **43.2** | 168 | 42.6 | 165 | 43.3 | **165** | **43.2** |
| 436.cactusADM | 17.3 | 691 | **17.0** | **702** | 16.8 | 711 | 17.3 | 691 | **17.0** | **702** | 16.8 | 711 |
| 437.leslie3d | 29.1 | 323 | 29.8 | 316 | **29.7** | **316** | 29.1 | 323 | 29.8 | 316 | **29.7** | **316** |
| 444.namd | 279 | 28.7 | **279** | **28.7** | 279 | 28.7 | **272** | **29.5** | 272 | 29.5 | 272 | 29.5 |
| 447.dealII | **206** | **55.6** | 209 | 54.8 | 206 | 55.6 | **206** | **55.6** | 209 | 54.8 | 206 | 55.6 |
| 450.soplex | 189 | 44.1 | 192 | 43.5 | **191** | **43.8** | 189 | 44.1 | 192 | 43.5 | **191** | **43.8** |
| 453.povray | 97.7 | 54.5 | 97.9 | 54.3 | **97.9** | **54.4** | **87.6** | **60.7** | 87.1 | 61.1 | 87.8 | 60.6 |
| 454.calculix | 159 | 51.9 | 159 | 51.7 | **159** | **51.8** | 144 | 57.3 | 144 | 57.3 | **144** | **57.3** |
| 459.GemsFDTD | **49.0** | **216** | 48.3 | 220 | 49.9 | 213 | 42.8 | 248 | 42.6 | 249 | **42.7** | **249** |
| 465.tonto | 246 | 40.0 | **248** | **39.7** | 248 | 39.7 | **192** | **51.2** | 192 | 51.2 | 193 | 51.1 |
| 470.lbm | **21.7** | **634** | 21.7 | 634 | 21.8 | 630 | **21.7** | **634** | 21.7 | 634 | 21.8 | 630 |
| 481.wrf | 99.2 | 113 | 96.8 | 115 | **98.6** | **113** | 99.2 | 113 | 96.8 | 115 | **98.6** | **113** |
| 482.sphinx3 | 262 | 74.4 | **262** | **74.4** | 262 | 74.3 | **262** | **74.4** | 261 | 74.5 | 262 | 74.4 |

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:
Cluster On Die set to Disabled
Early Snoop set to Disabled
Performance Profile set to Custom
C1E Support set to Disabled
Core C3 set to Disabled
Core C6 set to Disabled
Thermal Profile set to High Fan Speed
Memory Power Savings set to Disabled
```

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## Platform Notes (Continued)

```
Sysinfo program /usr/cpu2006/config/sysinfo.rev6914
$Rev: 6914 $ $Date:: 2014-06-25 #$ e3fbb8667b5a285932ceab81e28219e1
running on RD450 Mon Nov  3 18:56:15 2014

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 E5-2640 v3 @ 2.60GHz
      2 "physical id"s (chips)
      32 "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  : 16
      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:       263858276 kB
   HugePages_Total:       0
   Hugepagesize:       2048 kB

From /etc/*release* /etc/*version*
   os-release:
      NAME="Red Hat Enterprise Linux Server"
      VERSION="7.0 (Maipo)"
      ID="rhel"
      ID_LIKE="fedora"
      VERSION_ID="7.0"
      PRETTY_NAME="Red Hat Enterprise Linux Server 7.0 (Maipo)"
      ANSI_COLOR="0;31"
      CPE_NAME="cpe:/o:redhat:enterprise_linux:7.0:GA:server"
   redhat-release: Red Hat Enterprise Linux Server release 7.0 (Maipo)
   system-release: Red Hat Enterprise Linux Server release 7.0 (Maipo)
   system-release-cpe: cpe:/o:redhat:enterprise_linux:7.0:ga:server

uname -a:
   Linux RD450 3.10.0-123.el7.x86_64 #1 SMP Mon May 5 11:16:57 EDT 2014 x86_64
   x86_64 x86_64 GNU/Linux

run-level 3 Nov 3 18:55

SPEC is set to: /usr/cpu2006
   Filesystem     Type  Size  Used Avail Use% Mounted on
   /dev/sda2      xfs   741G   84G  658G  12% /
Additional information from dmidecode:

   Warning: Use caution when you interpret this section. The 'dmidecode' program
```

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## Platform Notes (Continued)

```
      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 VB3TS110 10/05/2014
    Memory:
     16x Samsung M393A2G40DB0-CPB 16 GB 2 rank 2133 MHz, configured at 1866 MHz

  (End of data from sysinfo program)
RD450 support 4 channels and 8 DIMMs per processor, total 8 channels and
16 DIMMs. All 16 DIMM slots installed with 16 GB DIMM for this run.
```

## General Notes

```
Environment variables set by runspec before the start of the run:
KMP_AFFINITY = "granularity=fine,compact,1,0"
LD_LIBRARY_PATH = "/usr/cpu2006/libs/32:/usr/cpu2006/libs/64:/usr/cpu2006/sh"
OMP_NUM_THREADS = "16"

 Binaries compiled on a system with 1x Core i5-4670K CPU + 16GB
 memory using RedHat EL 7.0
 Transparent Huge Pages enabled with:
 echo always > /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
```

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## Base Portability Flags (Continued)

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 -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: -xCORE-AVX2(pass 2) -prof-gen(pass 1) -ipo(pass 2) -O3(pass 2) -no-prec-div(pass 2) -prof-use(pass 2) -auto-ilp32 -ansi-alias

470.lbm: basepeak = yes

482.sphinx3: -xCORE-AVX2 -ipo -O3 -no-prec-div -unroll2 -ansi-alias -parallel

C++ benchmarks:

444.namd: -xCORE-AVX2(pass 2) -prof-gen(pass 1) -ipo(pass 2) -O3(pass 2) -no-prec-div(pass 2) -prof-use(pass 2) -fno-alias -auto-ilp32

447.dealII: basepeak = yes

450.soplex: basepeak = yes

453.povray: -xCORE-AVX2(pass 2) -prof-gen(pass 1) -ipo(pass 2) -O3(pass 2) -no-prec-div(pass 2) -prof-use(pass 2) -unroll4 -ansi-alias

Fortran benchmarks:

410.bwaves: basepeak = yes

416.gamess: -xCORE-AVX2(pass 2) -prof-gen(pass 1) -ipo(pass 2) -O3(pass 2) -no-prec-div(pass 2) -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(pass 1) -ipo(pass 2) -O3(pass 2) -no-prec-div(pass 2) -prof-use(pass 2) -unroll2 -inline-level=0 -opt-prefetch -parallel

465.tonto: -xCORE-AVX2(pass 2) -prof-gen(pass 1) -ipo(pass 2) -O3(pass 2) -no-prec-div(pass 2) -prof-use(pass 2) -inline-calloc -opt-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 -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-ic15.0-official-linux64.html`
`http://www.spec.org/cpu2006/flags/Lenovo-Platform-Settings-V1.2-HSW-revC.html`

You can also download the XML flags sources by saving the following links:
`http://www.spec.org/cpu2006/flags/Intel-ic15.0-official-linux64.xml`
`http://www.spec.org/cpu2006/flags/Lenovo-Platform-Settings-V1.2-HSW-revC.xml`


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