# SPEC® CFP2006 Result
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## Huawei

Huawei CH121 V5 (Intel Xeon Silver 4116)

$SPECfp®\_rate2006 =$ 934
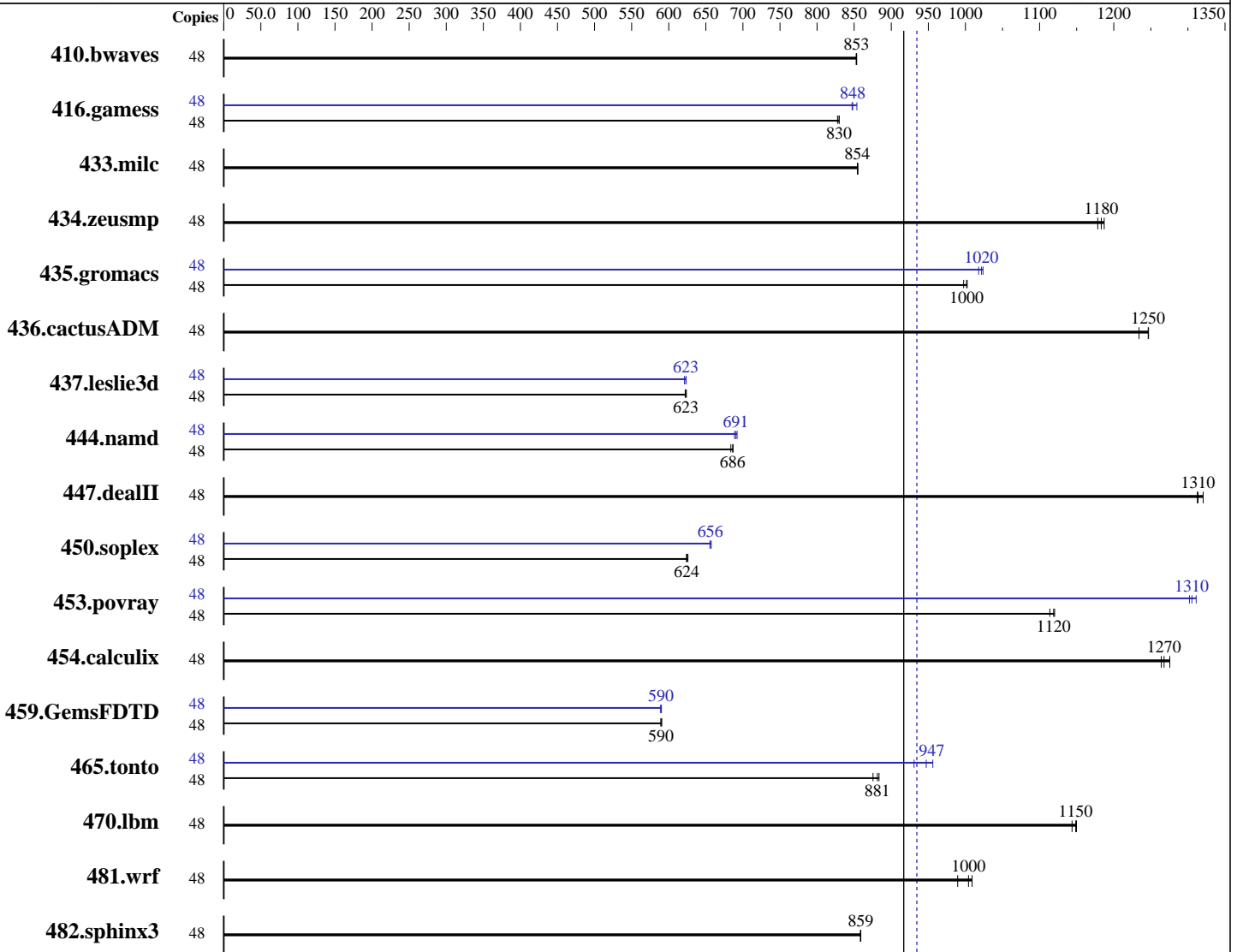
$SPECfp\_rate\_base2006 =$ 917

**CPU2006 license:** 3175
**Test sponsor:** Huawei
**Tested by:** Huawei

**Test date:** Jul-2017
**Hardware Availability:** Sep-2017
**Software Availability:** Nov-2016

| Benchmark | Copies | Result |
|---|---|---|
| 410.bwaves | 48 | 853 |
| 416.gamess | 48 | 848 |
| | 48 | 830 |
| 433.milc | 48 | 854 |
| 434.zeusmp | 48 | 1180 |
| 435.gromacs | 48 | 1020 |
| | 48 | 1000 |
| 436.cactusADM | 48 | 1250 |
| 437.leslie3d | 48 | 623 |
| | 48 | 623 |
| 444.namd | 48 | 691 |
| | 48 | 686 |
| 447.dealII | 48 | 1310 |
| 450.soplex | 48 | 656 |
| | 48 | 624 |
| 453.povray | 48 | 1310 |
| | 48 | 1120 |
| 454.calculix | 48 | 1270 |
| 459.GemsFDTD | 48 | 590 |
| | 48 | 590 |
| 465.tonto | 48 | 947 |
| | 48 | 881 |
| 470.lbm | 48 | 1150 |
| 481.wrf | 48 | 1000 |
| 482.sphinx3 | 48 | 859 |

SPECfp_rate_base2006 = 917

SPECfp_rate2006 = 934

## Hardware

| | |
|---|---|
| CPU Name: | Intel Xeon Silver 4116 |
| CPU Characteristics: | Intel Turbo Boost Technology up to 3.00 GHz |
| CPU MHz: | 2100 |
| FPU: | Integrated |
| CPU(s) enabled: | 24 cores, 2 chips, 12 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: | 1 MB I+D on chip per core |

*Continued on next page*

## Software

| | |
|---|---|
| Operating System: | Red Hat Enterprise Linux Server release 7.3 (Maipo)<br>3.10.0-514.el7.x86_64 |
| Compiler: | C/C++: Version 17.0.0.098 of Intel C/C++ Compiler for Linux;<br>Fortran: Version 17.0.0.098 of Intel Fortran Compiler for Linux |
| Auto Parallel: | No |
| File System: | xfs |

*Continued on next page*

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| | | | |
|---|---|---|---|
| L3 Cache: | 16.5 MB I+D on chip per chip | System State: | Run level 3 (multi-user) |
| Other Cache: | None | Base Pointers: | 32/64-bit |
| Memory: | 384 GB (24 x 16 GB 2Rx8 PC4-2666V-R, running at 2400 MHz) | Peak Pointers: | 32/64-bit |
| | | Other Software: | None |
| Disk Subsystem: | 1 x 1200 GB SAS, 10000 RPM | | |
| Other Hardware: | None | | |

## Results Table

| Benchmark | Base | | | | | | Peak | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Copies | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio | Copies | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio |
| 410.bwaves | 48 | **765** | **853** | 765 | 853 | 764 | 853 | 48 | **765** | **853** | 765 | 853 | 764 | 853 |
| 416.gamess | 48 | **1133** | **830** | 1136 | 828 | 1133 | 830 | 48 | 1101 | 854 | **1108** | **848** | 1109 | 847 |
| 433.milc | 48 | 516 | 854 | 515 | 855 | **516** | **854** | 48 | 516 | 854 | 515 | 855 | **516** | **854** |
| 434.zeusmp | 48 | **369** | **1180** | 371 | 1180 | 368 | 1190 | 48 | **369** | **1180** | 371 | 1180 | 368 | 1190 |
| 435.gromacs | 48 | **342** | **1000** | 342 | 1000 | 344 | 998 | 48 | 337 | 1020 | 335 | 1020 | **335** | **1020** |
| 436.cactusADM | 48 | 465 | 1230 | 460 | 1250 | **460** | **1250** | 48 | 465 | 1230 | 460 | 1250 | **460** | **1250** |
| 437.leslie3d | 48 | 723 | 624 | **724** | **623** | 725 | 622 | 48 | **724** | **623** | 726 | 621 | 724 | 624 |
| 444.namd | 48 | 563 | 684 | **561** | **686** | 561 | 687 | 48 | **557** | **691** | 559 | 689 | 556 | 692 |
| 447.dealII | 48 | 416 | 1320 | 418 | 1310 | **418** | **1310** | 48 | 416 | 1320 | 418 | 1310 | **418** | **1310** |
| 450.soplex | 48 | 640 | 626 | 642 | 624 | **641** | **624** | 48 | **610** | **656** | 609 | 657 | 611 | 656 |
| 453.povray | 48 | 229 | 1110 | **228** | **1120** | 228 | 1120 | 48 | 196 | 1300 | 195 | 1310 | **196** | **1310** |
| 454.calculix | 48 | **312** | **1270** | 313 | 1260 | 310 | 1280 | 48 | **312** | **1270** | 313 | 1260 | 310 | 1280 |
| 459.GemsFDTD | 48 | **864** | **590** | 864 | 589 | 862 | 591 | 48 | 865 | 589 | **864** | **590** | 863 | 590 |
| 465.tonto | 48 | **536** | **881** | 540 | 875 | 535 | 884 | 48 | 494 | 956 | **499** | **947** | 507 | 931 |
| 470.lbm | 48 | 577 | 1140 | **574** | **1150** | 574 | 1150 | 48 | 577 | 1140 | **574** | **1150** | 574 | 1150 |
| 481.wrf | 48 | 542 | 990 | **534** | **1000** | 531 | 1010 | 48 | 542 | 990 | **534** | **1000** | 531 | 1010 |
| 482.sphinx3 | 48 | 1089 | 859 | **1089** | **859** | 1090 | 858 | 48 | 1089 | 859 | **1089** | **859** | 1090 | 858 |

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

## Submit Notes

The numactl mechanism was used to bind copies to processors. The config file option 'submit' was used to generate numactl commands to bind each copy to a specific processor. For details, please see the config file.

## Operating System Notes

Stack size set to unlimited using "ulimit -s unlimited"

## Platform Notes

BIOS configuration:
Set Power Efficiency Mode to Performance
Set Patrol Scrub to Disable

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# Platform Notes (Continued)

```
Sysinfo program /spec17/config/sysinfo.rev6993
Revision 6993 of 2015-11-06 (b5e8d4b4eb51ed28d7f98696cbe290c1)
running on localhost.localdomain Thu Jul 20 22:10:56 2017

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) Silver 4116 CPU @ 2.10GHz
      2 "physical id"s (chips)
      48 "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 : 12
      siblings  : 24
      physical 0: cores 0 1 2 3 4 5 8 9 10 11 12 13
      physical 1: cores 0 1 2 3 4 5 8 9 10 11 12 13
   cache size : 16896 KB

From /proc/meminfo
   MemTotal:       394144692 kB
   HugePages_Total:        0
   Hugepagesize:        2048 kB

From /etc/*release* /etc/*version*
   os-release:
      NAME="Red Hat Enterprise Linux Server"
      VERSION="7.3 (Maipo)"
      ID="rhel"
      ID_LIKE="fedora"
      VERSION_ID="7.3"
      PRETTY_NAME="Red Hat Enterprise Linux Server 7.3 (Maipo)"
      ANSI_COLOR="0;31"
      CPE_NAME="cpe:/o:redhat:enterprise_linux:7.3:GA:server"
   redhat-release: Red Hat Enterprise Linux Server release 7.3 (Maipo)
   system-release: Red Hat Enterprise Linux Server release 7.3 (Maipo)
   system-release-cpe: cpe:/o:redhat:enterprise_linux:7.3:ga:server

uname -a:
   Linux localhost.localdomain 3.10.0-514.el7.x86_64 #1 SMP Wed Oct 19 11:24:13
   EDT 2016 x86_64 x86_64 x86_64 GNU/Linux

run-level 3 Jul 19 11:54

SPEC is set to: /spec17
   Filesystem     Type  Size  Used Avail Use% Mounted on
   /dev/sda2      xfs   262G   86G  176G  33% /
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 INSYDE Corp. 0.20 07/14/2017
   Memory:
    24x Samsung M393A2K43BB1-CTD 16 GB 2 rank 2666 MHz, configured at 2400 MHz

  (End of data from sysinfo program)
```

## General Notes

```
Environment variables set by runspec before the start of the run:
LD_LIBRARY_PATH = "/spec17/libs/32:/spec17/libs/64:/spec17/sh10.2"

 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 with:
 echo always > /sys/kernel/mm/transparent_hugepage/enabled
 Filesystem page cache cleared with:
 echo 1>      /proc/sys/vm/drop_caches
 runspec command invoked through numactl i.e.:
 numactl --interleave=all runspec <etc>
```

## 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 -qopt-prefetch -auto-p32
-qopt-mem-layout-trans=3
```

C++ benchmarks:
```
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -auto-p32
-qopt-mem-layout-trans=3
```

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

Benchmarks using both Fortran and C:
```
-xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch -auto-p32
-qopt-mem-layout-trans=3
```

# Peak Compiler Invocation

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

C++ benchmarks (except as noted below):
```
icpc -m64
```

```
450.soplex: icpc -m32 -L/opt/intel/compilers_and_libraries_2017/linux/lib/ia32
```

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

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

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# Peak 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
 450.soplex: -D_FILE_OFFSET_BITS=64
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
```

# 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
          -qopt-mem-layout-trans=3

447.dealII: basepeak = yes

450.soplex: -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) -qopt-malloc-options=3
          -qopt-mem-layout-trans=3

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 -qopt-mem-layout-trans=3
```

Fortran benchmarks:

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# Peak Optimization Flags (Continued)

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: -xCORE-AVX2 -ipo -O3 -no-prec-div -qopt-prefetch

459.GemsFDTD: Same as 437.leslie3d

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

Benchmarks using both Fortran and C:

435.gromacs: -prof-gen(pass 1) -prof-use(pass 2) -xCORE-AVX2(pass 2)
             -par-num-threads=1(pass 1) -qopt-prefetch -auto-ilp32
             -qopt-mem-layout-trans=3

436.cactusADM: basepeak = yes

454.calculix: basepeak = yes

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/Huawei-Platform-Settings-SKL-V1.6.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/Huawei-Platform-Settings-SKL-V1.6.xml

For questions about this result, please contact the tester.
For other inquiries, please contact webmaster@spec.org.

Tested with SPEC CPU2006 v1.2.
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