SPEC® CFP2006 Result
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Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant ML350 Gen9
(1.70 GHz, Intel Xeon E5-2650L v4)

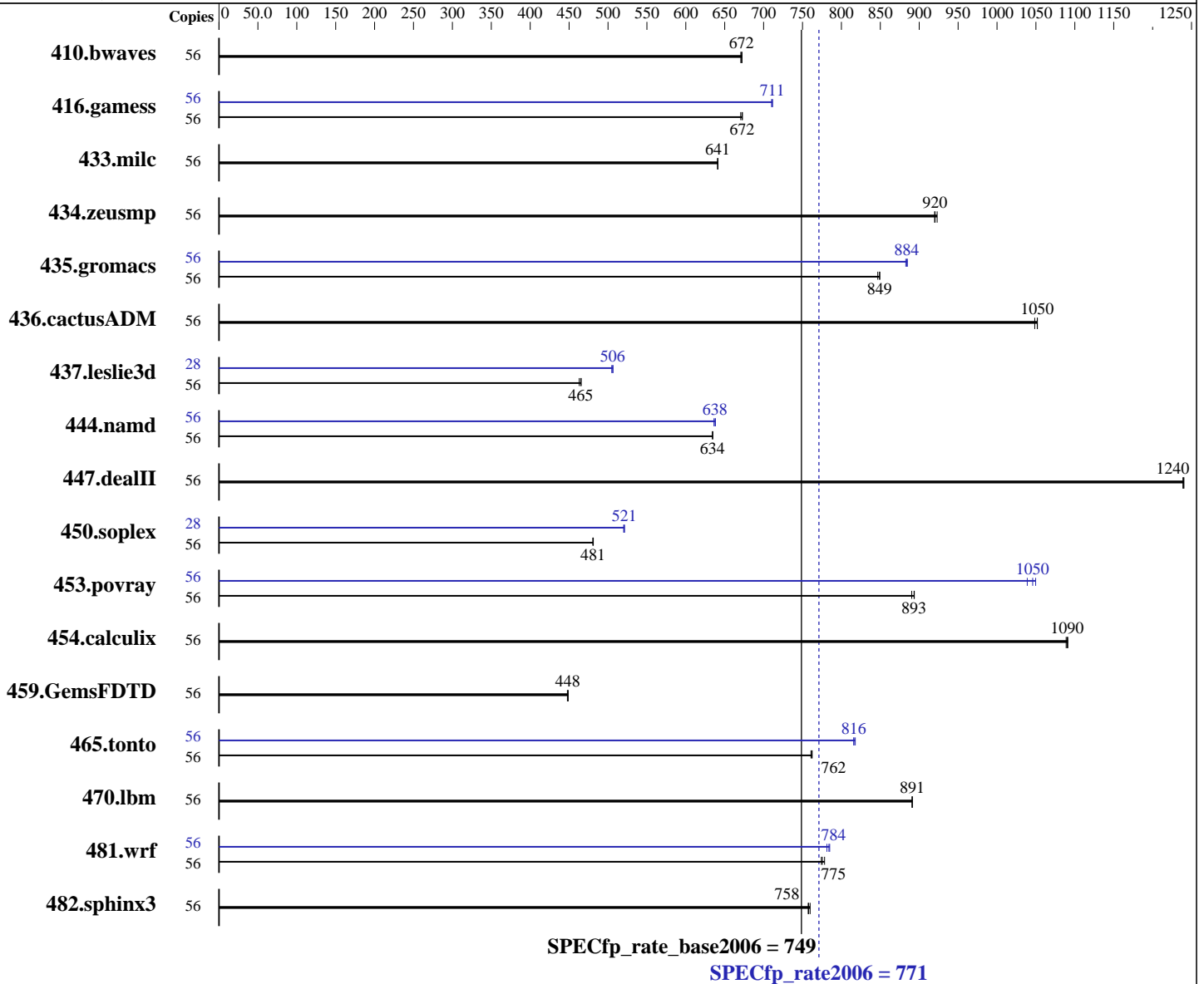$SPECfp®\_rate2006 = \quad 771$

$SPECfp\_rate\_base2006 = \quad 749$

CPU2006 license: 3	**Test date:** May-2016
Test sponsor: HPE	**Hardware Availability:** Mar-2016
Tested by: HPE	**Software Availability:** Dec-2015

Copies

- 410.bwaves — 56 — 672
- 416.gamess — 56 — 711; 56 — 672
- 433.milc — 56 — 641
- 434.zeusmp — 56 — 920
- 435.gromacs — 56 — 884; 56 — 849
- 436.cactusADM — 56 — 1050
- 437.leslie3d — 28 — 506; 56 — 465
- 444.namd — 56 — 638; 56 — 634
- 447.dealII — 56 — 1240
- 450.soplex — 28 — 521; 56 — 481
- 453.povray — 56 — 1050; 56 — 893
- 454.calculix — 56 — 1090
- 459.GemsFDTD — 56 — 448
- 465.tonto — 56 — 816; 56 — 762
- 470.lbm — 56 — 891
- 481.wrf — 56 — 784; 56 — 775
- 482.sphinx3 — 56 — 758

SPECfp_rate_base2006 = 749

SPECfp_rate2006 = 771

Hardware

CPU Name:	Intel Xeon E5-2650L v4
CPU Characteristics:	Intel Turbo Boost Technology up to 2.50 GHz
CPU MHz:	1700
FPU:	Integrated
CPU(s) enabled:	28 cores, 2 chips, 14 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

Continued on next page

Software

Operating System:	SUSE Linux Enterprise Server 12 (x86_64) SP1 Kernel 3.12.49-11-default
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:	No
File System:	xfs
System State:	Run level 3 (multi-user)

Continued on next page

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L3 Cache:	35 MB I+D on chip per chip	Base Pointers:	32/64-bit
Other Cache:	None	Peak Pointers:	32/64-bit
Memory:	512 GB (16 x 32 GB 2Rx4 PC4-2400T-R)	Other Software:	None
Disk Subsystem:	1 x 800 GB SAS SSD, RAID 0		
Other Hardware:	None		

Results Table

Benchmark	Base						Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
410.bwaves	56	1132	672	1135	671	**1133**	**672**	56	1132	672	1135	671	**1133**	**672**
416.gamess	56	1630	673	1635	671	**1631**	**672**	56	1541	711	**1542**	**711**	1544	710
433.milc	56	802	641	**802**	**641**	802	641	56	802	641	**802**	**641**	802	641
434.zeusmp	56	554	920	**554**	**920**	552	923	56	554	920	**554**	**920**	552	923
435.gromacs	56	**471**	**849**	472	847	471	849	56	**452**	**884**	453	883	452	885
436.cactusADM	56	638	1050	636	1050	**636**	**1050**	56	638	1050	636	1050	**636**	**1050**
437.leslie3d	56	**1132**	**465**	1137	463	1131	466	28	521	505	**520**	**506**	520	506
444.namd	56	**708**	**634**	708	634	708	635	56	704	638	**704**	**638**	706	636
447.dealII	56	**517**	**1240**	517	1240	517	1240	56	**517**	**1240**	517	1240	517	1240
450.soplex	56	972	480	971	481	**971**	**481**	28	449	520	**448**	**521**	448	521
453.povray	56	333	894	**333**	**893**	335	890	56	**285**	**1050**	287	1040	284	1050
454.calculix	56	423	1090	**424**	**1090**	424	1090	56	423	1090	**424**	**1090**	424	1090
459.GemsFDTD	56	1324	449	1327	448	**1325**	**448**	56	1324	449	1327	448	**1325**	**448**
465.tonto	56	724	761	**723**	**762**	723	762	56	674	818	**675**	**816**	675	816
470.lbm	56	**864**	**891**	864	891	864	891	56	**864**	**891**	864	891	864	891
481.wrf	56	804	778	808	774	**807**	**775**	56	801	781	**798**	**784**	797	785
482.sphinx3	56	**1440**	**758**	1436	760	1441	757	56	**1440**	**758**	1436	760	1441	757

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"
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>

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CPU2006 license: 3
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Test date: May-2016
Hardware Availability: Mar-2016
Software Availability: Dec-2015

Platform Notes

```
BIOS Configuration:
  Intel Hyperthreading Option set to Enabled
  Power Profile set to Custom
  Power Regulator set to Static High Performance Mode
  Minimum Processor Idle Power Core C-State set to C1E State
  Minimum Processor Idle Power Package C-State set to No Package State
  Collaborative Power Control set to Disabled
  QPI Snoop Configuration set to Cluster On Die
  Thermal Configuration set to Maximum Cooling
  Processor Power and Utilization Monitoring set to Disabled
  Memory Double Refresh Rate set to 1x Refresh
  Energy Performance Bias set to Maximum Performance
Sysinfo program
/home/specuser/cpu2006/HP_compiled_binaries_latest/cpu2006/config/sysinfo.rev6914
$Rev: 6914 $ $Date:: 2014-06-25 #$ e3fbb8667b5a285932ceab81e28219e1
running on linux-7m51 Thu May 26 01:02:19 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 E5-2650L v4@ 1.70GHz
      2 "physical id"s (chips)
      56 "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 : 14
      siblings  : 28
      physical 0: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14
      physical 1: cores 0 1 2 3 4 5 6 8 9 10 11 12 13 14
   cache size : 17920 KB

From /proc/meminfo
   MemTotal:       529090292 kB
   HugePages_Total:       0
   Hugepagesize:       2048 kB

/usr/bin/lsb_release -d
   SUSE Linux Enterprise Server 12 SP1

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"
```

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Platform Notes (Continued)

```
        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 linux-7m51 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 May 26 00:59

  SPEC is set to: /home/specuser/cpu2006/HP_compiled_binaries_latest/cpu2006
     Filesystem      Type   Size  Used Avail Use% Mounted on
     /dev/sda4       xfs    703G  236G  468G  34% /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 HP P92 04/12/2016
   Memory:
    8x UNKNOWN NOT AVAILABLE
    16x UNKNOWN NOT AVAILABLE 32 GB 2 rank 2400 MHz

  (End of data from sysinfo program)
   Regarding the sysinfo display about the memory installed, the correct amount of
   memory is 512 GB and the dmidecode description should have one line reading as:
   16x UNKNOWN NOT AVAILABLE 32 GB 2 rank 2400 MHz
```

General Notes

```
 Environment variables set by runspec before the start of the run:
 LD_LIBRARY_PATH = "/home/specuser/cpu2006/HP_compiled_binaries_latest/cpu2006/libs/32:/home/specuser/cpu2006/HP_compiled_binaries_latest/cpu2006/libs/64:/home/specuser/cpu2006/HP_compiled_binaries_latest/cpu2006/sh"


 Binaries compiled on a system with 1x Intel Xeon E5-2660 v4 CPU + 128GB
 memory using RedHat EL 7.2
```

Base Compiler Invocation

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

C++ benchmarks:
```
     icpc  -m64
```

Continued on next page

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Base Compiler Invocation (Continued)

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
          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 -static -opt-prefetch -auto-ilp32
    -ansi-alias -opt-mem-layout-trans=3 -qopt-prefetch-issue-excl-hint

C++ benchmarks:
    -xCORE-AVX2 -ipo -O3 -no-prec-div -static -opt-prefetch
    -fp-model fast=2   -auto-ilp32 -ansi-alias

Fortran benchmarks:
    -xCORE-AVX2 -ipo -O3 -no-prec-div -static -opt-prefetch
    -qopt-prefetch-issue-excl-hint

Benchmarks using both Fortran and C:
    -xCORE-AVX2 -ipo -O3 -no-prec-div -static -opt-prefetch -auto-ilp32
    -ansi-alias -opt-mem-layout-trans=3 -qopt-prefetch-issue-excl-hint

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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_2016/linux/lib/ia32_lin

Fortran benchmarks:
       ifort -m64

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

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:

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Peak Optimization Flags (Continued)

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) -static(pass 2)`
`-opt-mem-layout-trans=3(pass 2) -prof-use(pass 2) -fno-alias`
`-auto-ilp32`

447.dealII: basepeak = yes

450.soplex: `-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) -static(pass 2)`
`-opt-mem-layout-trans=3(pass 2) -prof-use(pass 2)`
`-opt-malloc-options=3`

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) -static(pass 2)`
`-opt-mem-layout-trans=3(pass 2) -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) -static(pass 2) -prof-use(pass 2)`
`-unroll2 -inline-level=0 -scalar-rep-`

434.zeusmp: basepeak = yes

437.leslie3d: `-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) -static(pass 2) -prof-use(pass 2)`
`-opt-malloc-options=3 -opt-prefetch`

459.GemsFDTD: basepeak = yes

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) -static(pass 2) -prof-use(pass 2)`
`-unroll4 -auto -inline-calloc -opt-malloc-options=3`

Benchmarks using both Fortran and C:

435.gromacs: `-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) -static(pass 2)`
`-opt-mem-layout-trans=3(pass 2) -prof-use(pass 2)`
`-opt-prefetch -auto-ilp32`

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Peak Optimization Flags (Continued)

436.cactusADM: basepeak = yes

454.calculix: basepeak = yes

481.wrf: -xCORE-AVX2 -ipo -O3 -no-prec-div -static -auto-ilp32

The flags files that were used to format this result can be browsed at
http://www.spec.org/cpu2006/flags/HP-Compiler-Flags-Intel-V1.2-BDW-revF.html
http://www.spec.org/cpu2006/flags/HP-Platform-Flags-Intel-V1.2-HSW-revE.html

You can also download the XML flags sources by saving the following links:
http://www.spec.org/cpu2006/flags/HP-Compiler-Flags-Intel-V1.2-BDW-revF.xml
http://www.spec.org/cpu2006/flags/HP-Platform-Flags-Intel-V1.2-HSW-revE.xml

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

Tested with SPEC CPU2006 v1.2.
Report generated on Thu Jun 30 14:06:24 2016 by SPEC CPU2006 PS/PDF formatter v6932.
Originally published on 14 June 2016.