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

ProLiant XL420 Gen9
(3.20 GHz, Intel Xeon E5-2667 v4)

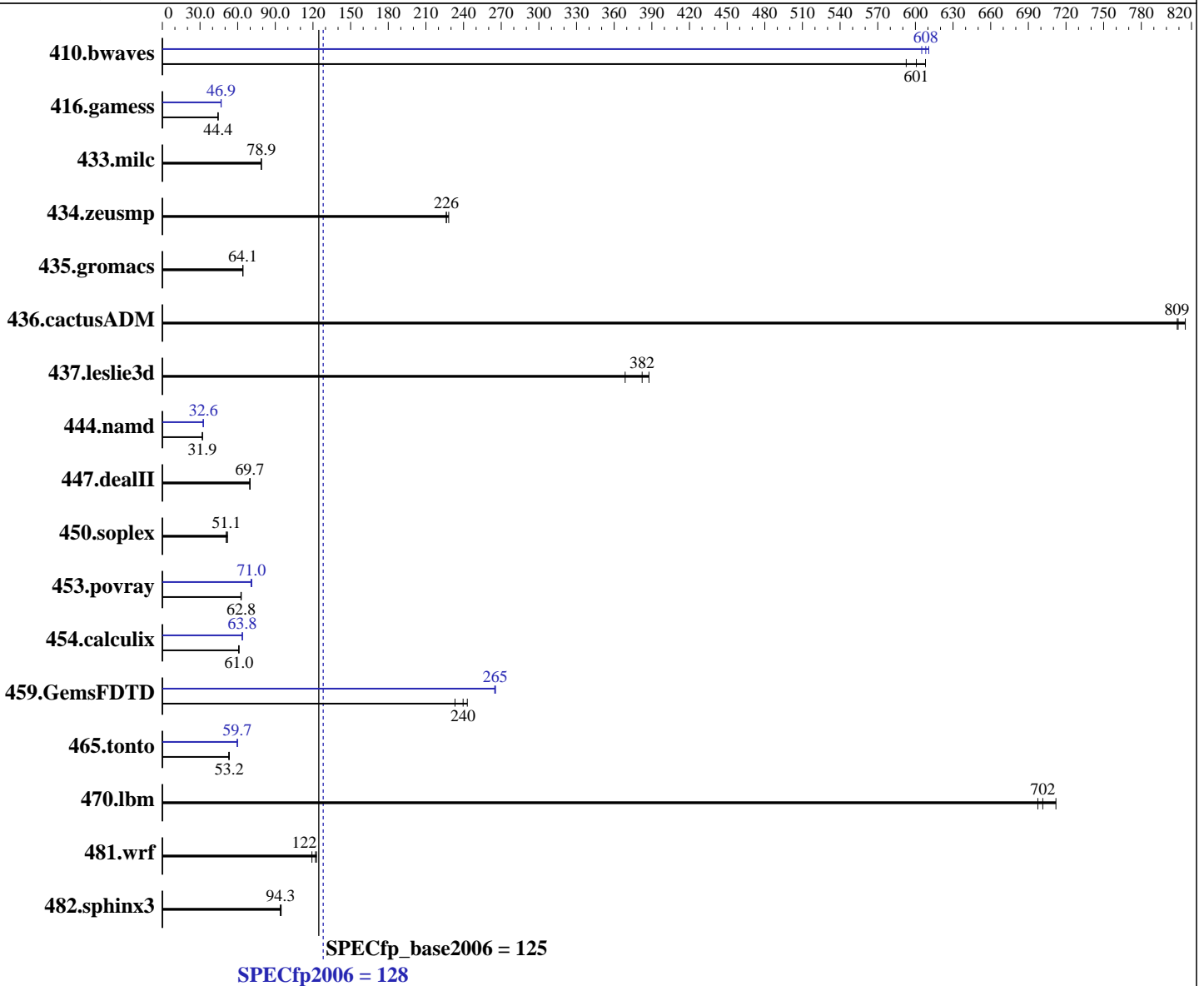$SPECfp^®2006 =$ 128

$SPECfp\_base2006 =$ 125

CPU2006 license: 3
Test sponsor: HPE
Tested by: HPE

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

- **410.bwaves** 608 / 601
- **416.gamess** 46.9 / 44.4
- **433.milc** 78.9
- **434.zeusmp** 226
- **435.gromacs** 64.1
- **436.cactusADM** 809
- **437.leslie3d** 382
- **444.namd** 32.6 / 31.9
- **447.dealII** 69.7
- **450.soplex** 51.1
- **453.povray** 71.0 / 62.8
- **454.calculix** 63.8 / 61.0
- **459.GemsFDTD** 265 / 240
- **465.tonto** 59.7 / 53.2
- **470.lbm** 702
- **481.wrf** 122
- **482.sphinx3** 94.3

SPECfp_base2006 = 125
SPECfp2006 = 128

Hardware

CPU Name:	Intel Xeon E5-2667 v4
CPU Characteristics:	Intel Turbo Boost Technology up to 3.60 GHz
CPU MHz:	3200
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

Continued on next page

Software

Operating System:	Red Hat Enterprise Linux Server release 7.2 (Maipo)
	Kernel 3.10.0-327.el7.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

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L3 Cache:	25 MB I+D on chip per chip	System State:	Run level 3 (multi-user)
Other Cache:	None	Base Pointers:	64-bit
Memory:	128 GB (8 x 16 GB 2Rx4 PC4-2400T-R)	Peak Pointers:	32/64-bit
Disk Subsystem:	2 x 400 GB SAS SSD, RAID 1	Other Software:	None
Other Hardware:	None		

Results Table

Benchmark	Base						Peak					
	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
410.bwaves	22.4	608	22.9	593	**22.6**	**601**	22.5	605	22.3	611	**22.3**	**608**
416.gamess	**441**	**44.4**	441	44.4	442	44.3	**418**	**46.9**	418	46.9	419	46.7
433.milc	116	78.9	117	78.7	**116**	**78.9**	116	78.9	117	78.7	**116**	**78.9**
434.zeusmp	40.2	226	39.9	228	**40.2**	**226**	40.2	226	39.9	228	**40.2**	**226**
435.gromacs	**111**	**64.1**	111	64.1	111	64.2	**111**	**64.1**	111	64.1	111	64.2
436.cactusADM	14.7	815	**14.8**	**809**	14.8	809	14.7	815	**14.8**	**809**	14.8	809
437.leslie3d	24.2	388	25.5	369	**24.6**	**382**	24.2	388	25.5	369	**24.6**	**382**
444.namd	251	31.9	**251**	**31.9**	251	31.9	246	32.6	**246**	**32.6**	246	32.6
447.dealII	164	69.9	164	69.7	**164**	**69.7**	164	69.9	164	69.7	**164**	**69.7**
450.soplex	164	50.9	161	51.9	**163**	**51.1**	164	50.9	161	51.9	**163**	**51.1**
453.povray	**84.7**	**62.8**	84.7	62.8	85.0	62.6	**74.9**	**71.0**	75.3	70.6	74.7	71.2
454.calculix	135	61.1	136	60.8	**135**	**61.0**	**129**	**63.8**	129	63.8	130	63.6
459.GemsFDTD	45.5	233	**44.3**	**240**	43.7	243	40.1	265	40.0	265	**40.0**	**265**
465.tonto	**185**	**53.2**	185	53.3	186	52.9	164	59.8	165	59.6	**165**	**59.7**
470.lbm	19.3	712	19.7	698	**19.6**	**702**	19.3	712	19.7	698	**19.6**	**702**
481.wrf	**91.6**	**122**	93.7	119	90.9	123	**91.6**	**122**	93.7	119	90.9	123
482.sphinx3	206	94.7	**207**	**94.3**	207	94.0	206	94.7	**207**	**94.3**	207	94.0

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"
Transparent Huge Pages enabled with:
    echo always > /sys/kernel/mm/transparent_hugepage/enabled
```

Platform Notes

```
BIOS Configuration:
   Intel Hyperthreading set to Disabled
   Power Profile set to Custom
   Power Regulator set to HP Static High Performance Mode
   Minimum Processor Idle Power Core C-State set to C6 State
   Minimum Processor Idle Power Package C-State set to No Package State
   QPI Snoop Configuration set to Home Snoop
   Collaborative Power Control set to Disabled
```

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CPU2006 license: 3
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Platform Notes (Continued)

```
   Thermal Configuration set to Maximum Cooling
   Processor Power and Utilization Monitoring set to Disabled
   Memory Refresh Rate set to 1x Refresh

 Sysinfo program /home/cpu2006/config/sysinfo.rev6914
 $Rev: 6914 $ $Date:: 2014-06-25 #$ e3fbb8667b5a285932ceab81e28219e1
 running on mvb-xl420-g9 Wed Apr 27 11:31:00 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 E5-2667 v4 @ 3.20GHz
       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 2 3 4 8 10 11 12
       physical 1: cores 0 2 3 4 8 10 11 12
    cache size : 25600 KB

 From /proc/meminfo
    MemTotal:       131600460 kB
    HugePages_Total:        0
    Hugepagesize:        2048 kB

 From /etc/*release* /etc/*version*
    os-release:
       NAME="Red Hat Enterprise Linux Server"
       VERSION="7.2 (Maipo)"
       ID="rhel"
       ID_LIKE="fedora"
       VERSION_ID="7.2"
       PRETTY_NAME="Red Hat Enterprise Linux Server 7.2 (Maipo)"
       ANSI_COLOR="0;31"
       CPE_NAME="cpe:/o:redhat:enterprise_linux:7.2:GA:server"
    redhat-release: Red Hat Enterprise Linux Server release 7.2 (Maipo)
    system-release: Red Hat Enterprise Linux Server release 7.2 (Maipo)
    system-release-cpe: cpe:/o:redhat:enterprise_linux:7.2:ga:server

 uname -a:
    Linux mvb-xl420-g9 3.10.0-327.el7.x86_64 #1 SMP Thu Oct 29 17:29:29 EDT 2015
    x86_64 x86_64 x86_64 GNU/Linux

 run-level 3 Apr 27 11:14

 SPEC is set to: /home/cpu2006
    Filesystem      Type   Size   Used Avail Use% Mounted on
```

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Platform Notes (Continued)

```
    /dev/sda4       xfs   364G   22G  342G   7% /
 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 U19 02/29/2016
  Memory:
   8x UNKNOWN NOT AVAILABLE
   8x UNKNOWN NOT AVAILABLE 16 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 128 GB and the dmidecode description should have one line reading as:
 8x UNKNOWN NOT AVAILABLE 16 GB 2 rank 2400 MHz
```

General Notes

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

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

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

Base Portability Flags

```
    410.bwaves: -DSPEC_CPU_LP64
```

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Base Portability Flags (Continued)

```
      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 -parallel -opt-prefetch
    -ansi-alias -qopt-prefetch-issue-excl-hint
```

C++ benchmarks:
```
    -xCORE-AVX2 -ipo -O3 -no-prec-div -static -opt-prefetch -ansi-alias
```

Fortran benchmarks:
```
    -xCORE-AVX2 -ipo -O3 -no-prec-div -static -parallel -opt-prefetch
    -fp-model fast=2
    -qopt-prefetch-issue-excl-hint
```

Benchmarks using both Fortran and C:
```
    -xCORE-AVX2 -ipo -O3 -no-prec-div -static -parallel -opt-prefetch
    -ansi-alias -qopt-prefetch-issue-excl-hint
    -fp-model fast=2
```

Peak Compiler Invocation

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

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

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

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Peak Compiler Invocation (Continued)

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: -xCORE-AVX2 -ipo -O3 -no-prec-div -static -parallel
             -opt-prefetch
             -fp-model fast=2
             -qopt-prefetch-issue-excl-hint -funroll-all-loops

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-
```

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Peak Optimization Flags (Continued)

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:

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/HP-Platform-Flags-Intel-V1.2-HSW-revE.html
http://www.spec.org/cpu2006/flags/HP-Compiler-Flags-Intel-V1.2-BDW-revE.html

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

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

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