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

ProLiant XL450 Gen9
(2.60 GHz, Intel Xeon E5-2690 v4)

$SPECfp^{®}\_rate2006 =$ 947
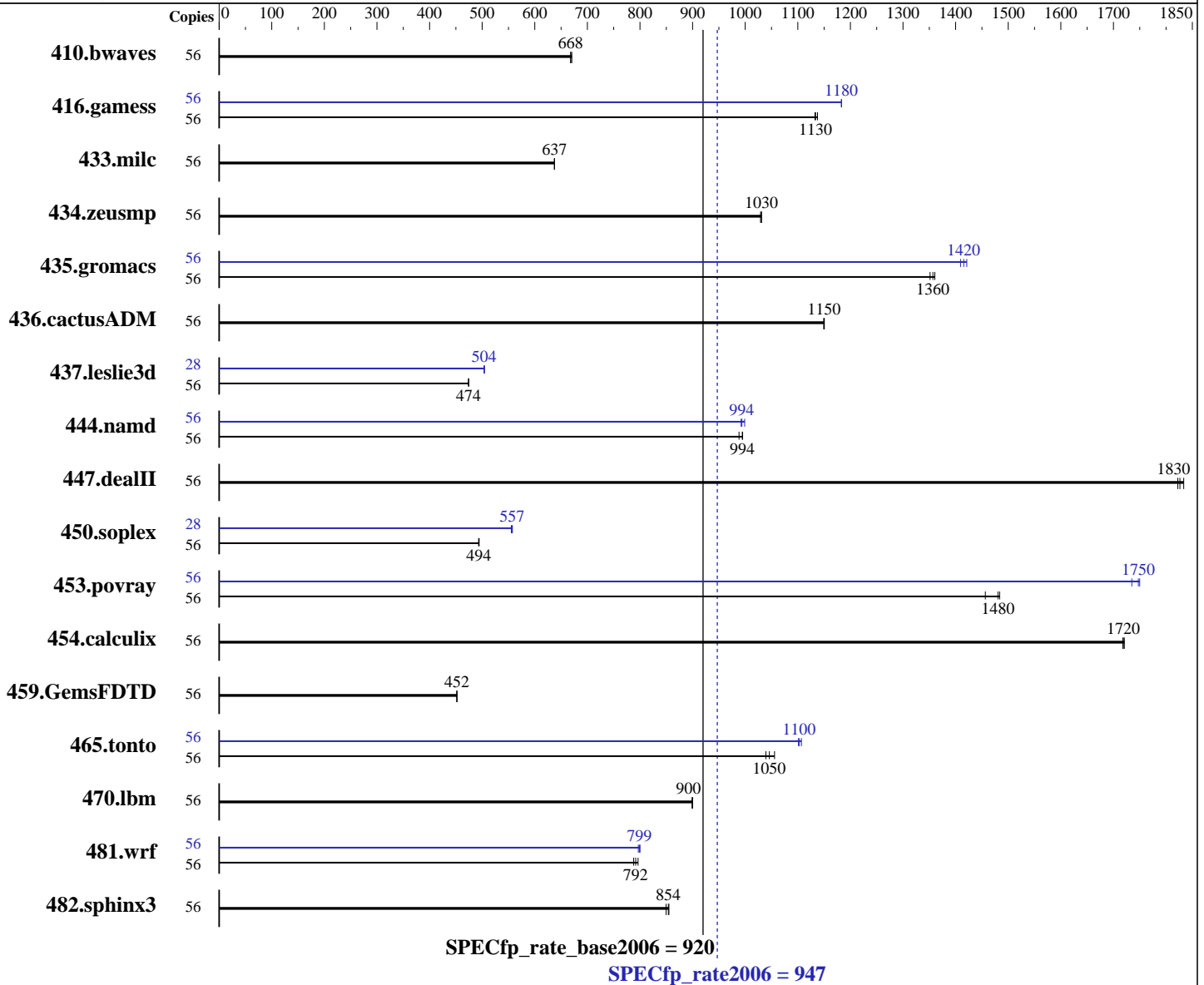
SPECfp_rate_base2006 = 920

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

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

SPECfp_rate_base2006 = 920

SPECfp_rate2006 = 947

Benchmark	Copies	Result
410.bwaves	56	668
416.gamess	56	1180
416.gamess	56	1130
433.milc	56	637
434.zeusmp	56	1030
435.gromacs	56	1420
435.gromacs	56	1360
436.cactusADM	56	1150
437.leslie3d	28	504
437.leslie3d	56	474
444.namd	56	994
444.namd	56	994
447.dealII	56	1830
450.soplex	28	557
450.soplex	56	494
453.povray	56	1750
453.povray	56	1480
454.calculix	56	1720
459.GemsFDTD	56	452
465.tonto	56	1100
465.tonto	56	1050
470.lbm	56	900
481.wrf	56	799
481.wrf	56	792
482.sphinx3	56	854

Hardware

CPU Name: Intel Xeon E5-2690 v4
CPU Characteristics: Intel Turbo Boost Technology up to 3.50 GHz
CPU MHz: 2600
FPU: Integrated
CPU(s) enabled: 28 cores, 2 chips, 14 cores/chip, 2 threads/core
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 3.10.0-229.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: No
File System: xfs

Continued on next page

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CPU2006 license: 3	**Test date:** May-2016
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L3 Cache:	35 MB I+D on chip per chip	System State:	Run level 3 (multi-user)
Other Cache:	None	Base Pointers:	32/64-bit
Memory:	256 GB (8 x 32 GB 2Rx4 PC4-2400T-R)	Peak Pointers:	32/64-bit
Disk Subsystem:	2 x 480 GB SATA SSD, RAID 1	Other Software:	None
Other Hardware:	None		

Results Table

Benchmark	Copies	Base Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Peak Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
410.bwaves	56	1139	668	**1139**	**668**	1135	670	56	1139	668	**1139**	**668**	1135	670
416.gamess	56	968	1130	964	1140	**967**	**1130**	56	**927**	**1180**	927	1180	927	1180
433.milc	56	**806**	**637**	807	637	806	638	56	**806**	**637**	807	637	806	638
434.zeusmp	56	495	1030	494	1030	**494**	**1030**	56	495	1030	494	1030	**494**	**1030**
435.gromacs	56	294	1360	**295**	**1360**	296	1350	56	281	1420	284	1410	**282**	**1420**
436.cactusADM	56	**582**	**1150**	582	1150	582	1150	56	**582**	**1150**	582	1150	582	1150
437.leslie3d	56	1111	474	**1110**	**474**	1109	475	28	522	504	**522**	**504**	522	504
444.namd	56	451	995	**452**	**994**	454	988	56	450	999	453	992	**452**	**994**
447.dealII	56	**351**	**1830**	352	1820	349	1830	56	**351**	**1830**	352	1820	349	1830
450.soplex	56	945	494	947	493	**946**	**494**	28	**419**	**557**	419	557	421	555
453.povray	56	**201**	**1480**	201	1480	205	1460	56	170	1750	172	1730	**170**	**1750**
454.calculix	56	268	1720	269	1720	**269**	**1720**	56	268	1720	269	1720	**269**	**1720**
459.GemsFDTD	56	1316	452	**1314**	**452**	1314	452	56	1316	452	**1314**	**452**	1314	452
465.tonto	56	530	1040	**527**	**1050**	522	1060	56	498	1110	**500**	**1100**	500	1100
470.lbm	56	855	900	856	899	**855**	**900**	56	855	900	856	899	**855**	**900**
481.wrf	56	**790**	**792**	794	788	785	796	56	782	800	785	797	**783**	**799**
482.sphinx3	56	**1278**	**854**	1284	850	1277	855	56	**1278**	**854**	1284	850	1277	855

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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SPECfp_rate_base2006 = 920

CPU2006 license: 3
Test sponsor: HPE
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Test date: May-2016
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Platform Notes

```
BIOS Configuration:
  Power Profile set to Custom
  Power Regulator 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
  Energy/Performance Bias set to Balanced Performance
  QPI Snoop Configuration set to Cluster on Die
  Collaborative Power Control set to Disabled
  Thermal Configuration set to Maximum Cooling
  Processor Power and Utilization Monitoring set to Disabled
  Memory Refresh Rate set to 1x Refresh
  Memory Patrol Scrubbing set to Disabled

Sysinfo program /home/cpu2006/config/sysinfo.rev6914
$Rev: 6914 $ $Date:: 2014-06-25 #$ e3fbb8667b5a285932ceab81e28219e1
running on XL450-G9-node2 Fri May 20 00:37:48 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 E5-2690 v4@ 2.60GHz
      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:       263707796 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
```

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Platform Notes (Continued)

```
   uname -a:
      Linux XL450-G9-node2 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 May 19 15:54

   SPEC is set to: /home/cpu2006
      Filesystem      Type  Size  Used Avail Use% Mounted on
      /dev/sda4       xfs   438G   20G  419G   5% /
   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 U21 02/22/2016
      Memory:
      8x UNKNOWN NOT AVAILABLE
      8x 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 256 GB and the dmidecode description should have one line reading as:
   8x 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/cpu2006/libs/32:/home/cpu2006/libs/64:/home/cpu2006/sh"

   Environment variables set by runspec before the start of the run:
  LD_LIBRARY_PATH = "/cpu2006/libs/32:/cpu2006/libs/64:/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

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Base Compiler Invocation (Continued)

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-HSW-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-HSW-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.

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