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

$SPECfp^{®}\_rate2006 =$ 1030

ProLiant BL460c Gen9
(2.30 GHz, Intel Xeon E5-2697 v4)

SPECfp_rate_base2006 =   999

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

Copies

Benchmark	Copies	Result
410.bwaves	72	684
416.gamess	72	1380
416.gamess	72	1340
433.milc	72	644
434.zeusmp	72	1110
435.gromacs	72	1670
435.gromacs	72	1600
436.cactusADM	72	1270
437.leslie3d	36	506
437.leslie3d	72	489
444.namd	72	1120
447.dealII	72	2050
450.soplex	36	597
450.soplex	72	510
453.povray	72	2040
453.povray	72	1750
454.calculix	72	1930
459.GemsFDTD	72	470
465.tonto	72	1230
465.tonto	72	1160
470.lbm	72	946
481.wrf	72	807
482.sphinx3	72	917

SPECfp_rate_base2006 = 999

SPECfp_rate2006 = 1030

Hardware

CPU Name:	Intel Xeon E5-2697 v4
CPU Characteristics:	Intel Turbo Boost Technology up to 3.60 GHz
CPU MHz:	2300
FPU:	Integrated
CPU(s) enabled:	36 cores, 2 chips, 18 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 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 5 (multi-user, w/GUI)

Continued on next page

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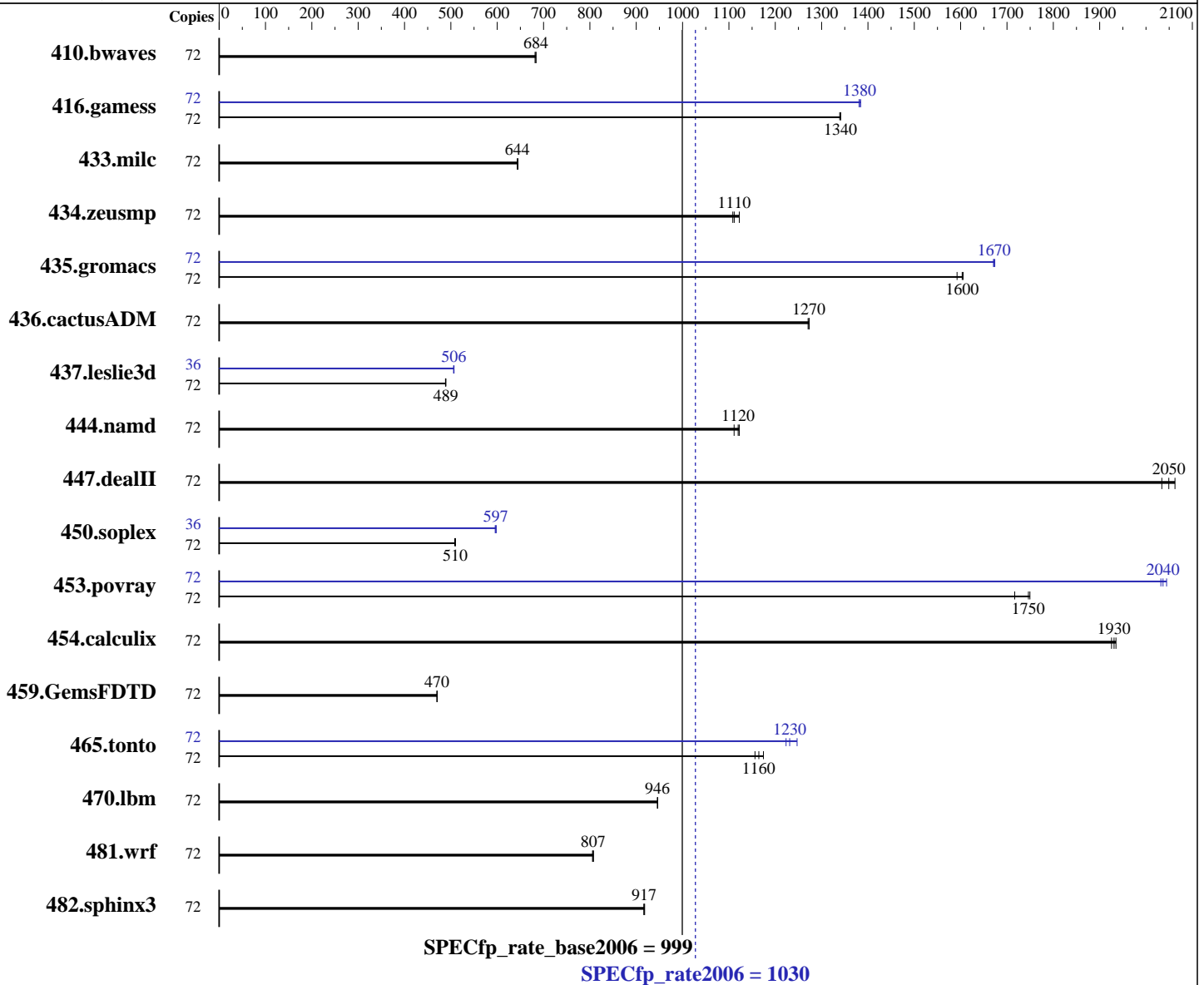SPECfp_rate2006 =   1030

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L3 Cache:	45 MB I+D on chip per chip	Base Pointers:	32/64-bit
Other Cache:	None	Peak Pointers:	32/64-bit
Memory:	256 GB (8 x 32 GB 2Rx4 PC4-2400T-R)	Other Software:	None
Disk Subsystem:	2 x 500 GB SAS HDD 10K , RAID 1		
Other Hardware:	None		

Results Table

Benchmark	Base						Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
410.bwaves	72	1435	682	**1432**	**684**	1431	684	72	1435	682	**1432**	**684**	1431	684
416.gamess	72	**1051**	**1340**	1051	1340	1053	1340	72	**1020**	**1380**	1021	1380	1018	1380
433.milc	72	1027	644	**1027**	**644**	1025	645	72	1027	644	**1027**	**644**	1025	645
434.zeusmp	72	591	1110	**590**	**1110**	584	1120	72	591	1110	**590**	**1110**	584	1120
435.gromacs	72	320	1610	323	1590	**321**	**1600**	72	308	1670	307	1670	**307**	**1670**
436.cactusADM	72	676	1270	**676**	**1270**	677	1270	72	676	1270	**676**	**1270**	677	1270
437.leslie3d	72	1384	489	**1384**	**489**	1386	488	36	669	506	668	507	**668**	**506**
444.namd	72	520	1110	515	1120	**516**	**1120**	72	520	1110	515	1120	**516**	**1120**
447.dealII	72	399	2060	405	2030	**402**	**2050**	72	399	2060	405	2030	**402**	**2050**
450.soplex	72	1178	510	1181	508	**1178**	**510**	36	504	596	502	598	**503**	**597**
453.povray	72	**219**	**1750**	219	1750	223	1720	72	187	2040	**188**	**2040**	188	2030
454.calculix	72	308	1930	307	1940	**308**	**1930**	72	308	1930	307	1940	**308**	**1930**
459.GemsFDTD	72	1626	470	**1624**	**470**	1623	471	72	1626	470	**1624**	**470**	1623	471
465.tonto	72	**608**	**1160**	603	1170	613	1160	72	579	1220	**575**	**1230**	568	1250
470.lbm	72	1045	946	**1046**	**946**	1046	946	72	1045	946	**1046**	**946**	1046	946
481.wrf	72	996	808	**997**	**807**	998	806	72	996	808	**997**	**807**	998	806
482.sphinx3	72	1531	916	**1530**	**917**	1528	918	72	1531	916	**1530**	**917**	1528	918

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 = 999

CPU2006 license: 3
Test sponsor: HPE
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Test date: Mar-2016
Hardware Availability: Mar-2016
Software Availability: Nov-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 Refresh Rate set to 1x Refresh
Sysinfo program /home/cpuv1.3/cpu2006/config/sysinfo.rev6914
$Rev: 6914 $ $Date:: 2014-06-25 #$ e3fbb8667b5a285932ceab81e28219e1
running on bl460c2-gen9-b Mon Apr  4 11:49:13 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 E5-2697 v4 @ 2.30GHz
      2 "physical id"s (chips)
      72 "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 : 18
      siblings  : 36
      physical 0: cores 0 1 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27
      physical 1: cores 0 1 2 3 4 8 9 10 11 16 17 18 19 20 24 25 26 27
   cache size : 23040 KB

From /proc/meminfo
   MemTotal:       264322528 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"
      VERSION="12-SP1"
      VERSION_ID="12.1"
```
<div align="center">Continued on next page</div>

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Platform Notes (Continued)

```
        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 bl460c2-gen9-b 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 5 Apr 4 11:41

  SPEC is set to: /home/cpuv1.3/cpu2006
     Filesystem      Type  Size  Used Avail Use% Mounted on
     /dev/sda4       xfs   424G  218G  206G  52% /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 I36 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/cpuv1.3/cpu2006/libs/32:/home/cpuv1.3/cpu2006/libs/64:/home/cpuv1.3/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
    -qopt-prefetch-issue-excl-hint -auto-p32 -ansi-alias
    -opt-mem-layout-trans=3
```

C++ benchmarks:
```
    -xCORE-AVX2 -ipo -O3 -no-prec-div -static -opt-prefetch
    -qopt-prefetch-issue-excl-hint -auto-p32 -ansi-alias
    -opt-mem-layout-trans=3
```

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
    -qopt-prefetch-issue-excl-hint -auto-p32 -ansi-alias
    -opt-mem-layout-trans=3
```

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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/compiler/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:

Continued on next page

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Peak Optimization Flags (Continued)

444.namd: basepeak = yes

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
```

436.cactusADM: basepeak = yes

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Peak Optimization Flags (Continued)

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

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

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

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