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

ProLiant XL170r Gen9
(2.20 GHz, Intel Xeon E5-2699 v4)

$SPECfp®_rate2006 = $ 1070
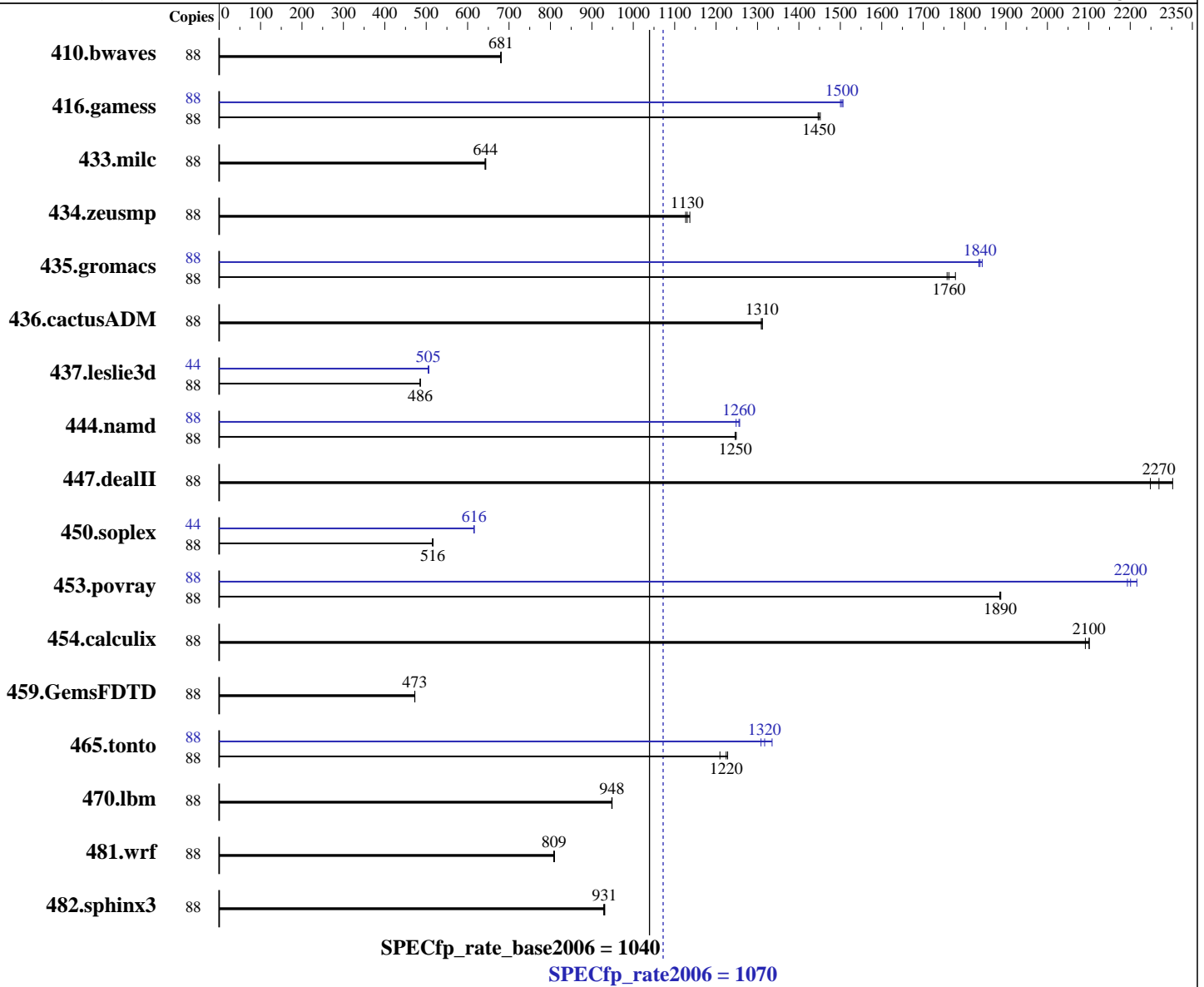
$SPECfp_rate_base2006 = $ 1040

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

Test date: Mar-2016
Hardware Availability: Mar-2016
Software Availability: Aug-2015

Copies

Benchmark	Copies	Result
410.bwaves	88	681
416.gamess	88	1500
416.gamess	88	1450
433.milc	88	644
434.zeusmp	88	1130
435.gromacs	88	1840
435.gromacs	88	1760
436.cactusADM	88	1310
437.leslie3d	44	505
437.leslie3d	88	486
444.namd	88	1260
444.namd	88	1250
447.dealII	88	2270
450.soplex	44	616
450.soplex	88	516
453.povray	88	2200
453.povray	88	1890
454.calculix	88	2100
459.GemsFDTD	88	473
465.tonto	88	1320
465.tonto	88	1220
470.lbm	88	948
481.wrf	88	809
482.sphinx3	88	931

SPECfp_rate_base2006 = 1040

SPECfp_rate2006 = 1070

Hardware

CPU Name: Intel Xeon E5-2699 v4
CPU Characteristics: Intel Turbo Boost Technology up to 3.60 GHz
CPU MHz: 2200
FPU: Integrated
CPU(s) enabled: 44 cores, 2 chips, 22 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)
Kernel 3.12.43-52.6-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: ReiserFS
System State: Run level 3 (multi-user)
Continued on next page

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L3 Cache:	55 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 400 GB SAS SSD, 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	88	1760	680	**1756**	**681**	1755	681	88	1760	680	**1756**	**681**	1755	681
416.gamess	88	**1190**	**1450**	1191	1450	1187	1450	88	1148	1500	1144	1510	**1146**	**1500**
433.milc	88	1259	642	1255	644	**1255**	**644**	88	1259	642	1255	644	**1255**	**644**
434.zeusmp	88	**709**	**1130**	711	1130	705	1140	88	**709**	**1130**	711	1130	705	1140
435.gromacs	88	353	1780	357	1760	**357**	**1760**	88	342	1830	**342**	**1840**	341	1840
436.cactusADM	88	803	1310	**802**	**1310**	802	1310	88	803	1310	**802**	**1310**	802	1310
437.leslie3d	88	1703	486	1704	485	**1703**	**486**	44	817	507	**819**	**505**	819	505
444.namd	88	565	1250	**566**	**1250**	566	1250	88	**562**	**1260**	562	1260	565	1250
447.dealII	88	437	2300	448	2250	**444**	**2270**	88	437	2300	448	2250	**444**	**2270**
450.soplex	88	**1422**	**516**	1421	517	1425	515	44	596	616	**596**	**616**	596	615
453.povray	88	248	1890	248	1890	**248**	**1890**	88	**213**	**2200**	213	2190	211	2220
454.calculix	88	346	2100	347	2090	**346**	**2100**	88	346	2100	347	2090	**346**	**2100**
459.GemsFDTD	88	1977	472	**1976**	**473**	1976	473	88	1977	472	**1976**	**473**	1976	473
465.tonto	88	705	1230	**707**	**1220**	716	1210	88	662	1310	649	1340	**657**	**1320**
470.lbm	88	1275	948	**1275**	**948**	1274	949	88	1275	948	**1275**	**948**	1274	949
481.wrf	88	1214	810	1217	808	**1216**	**809**	88	1214	810	1217	808	**1216**	**809**
482.sphinx3	88	**1843**	**931**	1842	931	1847	928	88	**1843**	**931**	1842	931	1847	928

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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Test date: Mar-2016
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Platform Notes

```
BIOS Configuration:
  HP Power Profile set to Custom
  HP 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
  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
Intel Hyperthreading set to Enabled

Sysinfo program /cpu2006-HP/config/sysinfo.rev6914
$Rev: 6914 $ $Date:: 2014-06-25 #$ e3fbb8667b5a285932ceab81e28219e1
running on linux-gz1s Tue Mar  8 14:37:51 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 E5-2699 v4 @ 2.20GHz
      2 "physical id"s (chips)
      88 "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 : 11
      siblings  : 22
      physical 0: cores 0 1 2 3 4 5 8 9 10 11 12 16 17 18 19 20 21 24 25 26 27
      28
      physical 1: cores 0 1 2 3 4 5 8 9 10 11 12 16 17 18 19 20 21 24 25 26 27
      28
   cache size : 28160 KB

From /proc/meminfo
   MemTotal:      264257068 kB
   HugePages_Total:        0
   Hugepagesize:        2048 kB

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

From /etc/*release* /etc/*version*
   SuSE-release:
      SUSE Linux Enterprise Server 12 (x86_64)
      VERSION = 12
      PATCHLEVEL = 0
      # 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:
```

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Platform Notes (Continued)

```
        NAME="SLES"
        VERSION="12"
        VERSION_ID="12"
        PRETTY_NAME="SUSE Linux Enterprise Server 12"
        ID="sles"
        ANSI_COLOR="0;32"
        CPE_NAME="cpe:/o:suse:sles:12"

  uname -a:
     Linux linux-gz1s 3.12.43-52.6-default #1 SMP Wed May 20 12:44:39 UTC 2015
     (fc0ceac) x86_64 x86_64 x86_64 GNU/Linux

  run-level 5 Mar 7 15:39

  SPEC is set to: /cpu2006-HP
     Filesystem      Type   Size  Used Avail Use% Mounted on
     /dev/sda3       btrfs  369G   26G  341G   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 U14 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 = "/cpu2006-HP/libs/32:/cpu2006-HP/libs/64:/cpu2006-HP/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

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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
-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/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: `-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: basepeak = yes

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-revE.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-revE.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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