SPEC® CFP2006 Result

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Hewlett Packard Enterprise

(Test Sponsor: HPE)

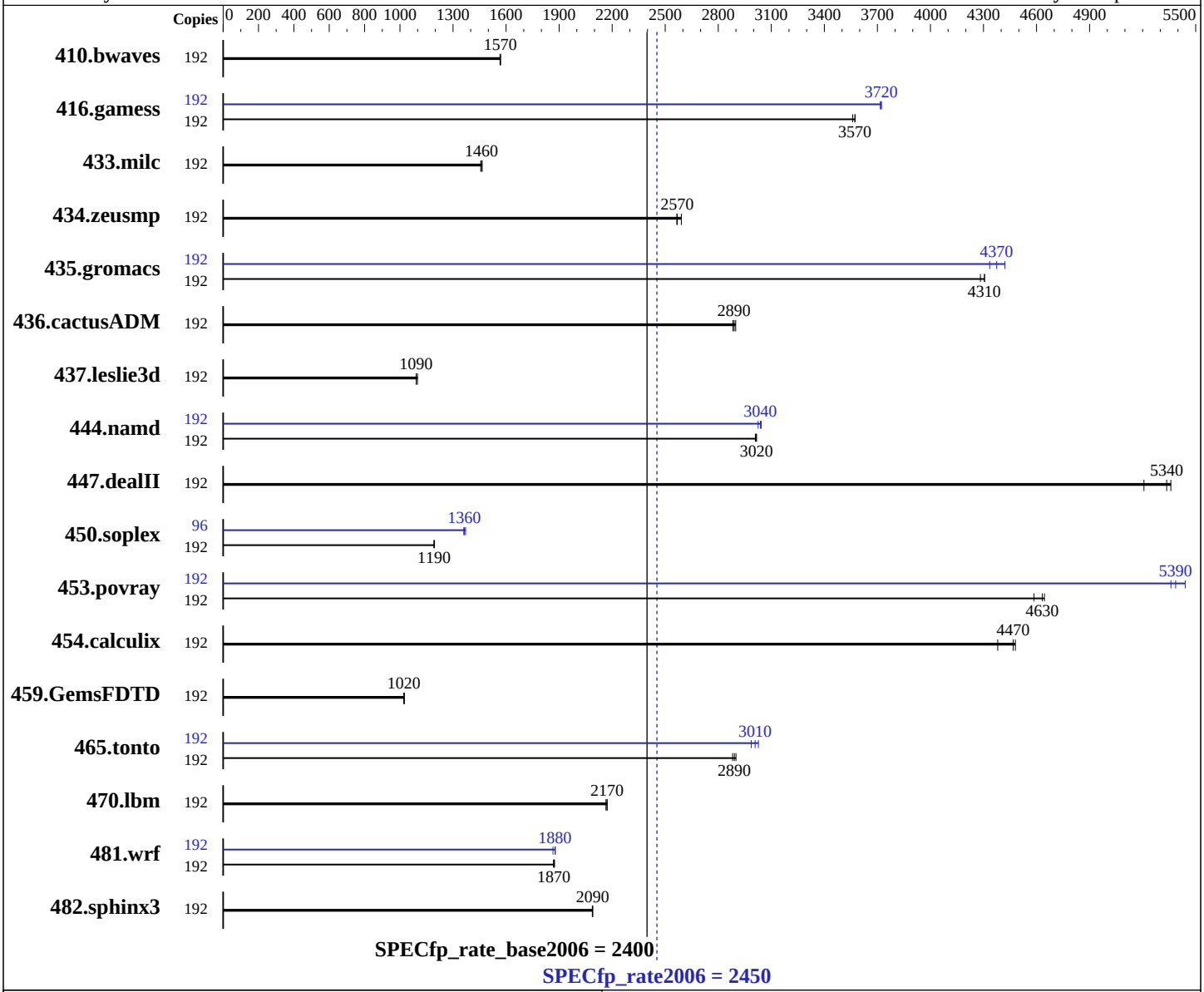
ProLiant DL580 Gen9
(2.40 GHz, Intel Xeon E7-8894 v4)

SPECfp®_rate2006 = 2450

SPECfp_rate_base2006 = 2400

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

Test date: Feb-2017
Hardware Availability: Mar-2017
Software Availability: Sep-2016



Hardware

CPU Name:	Intel Xeon E7-8894 v4
CPU Characteristics:	Intel Turbo Boost Technology up to 3.40 GHz
CPU MHz:	2400
FPU:	Integrated
CPU(s) enabled:	96 cores, 4 chips, 24 cores/chip, 2 threads/core
CPU(s) orderable:	2,4 chip
Primary Cache:	32 KB I + 32 KB D on chip per core
Secondary Cache:	256 KB I+D on chip per core

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Software

Operating System:	SUSE Linux Enterprise Server 12 (x86_64) SP1, Kernel 3.12.49-11-default
Compiler:	C/C++: Version 17.0.0.098 of Intel C/C++ Compiler for Linux; Fortran: Version 17.0.0.098 of Intel Fortran Compiler for Linux
Auto Parallel:	No
File System:	xfs
System State:	Run level 3 (multi-user)

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L3 Cache: 60 MB I+D on chip per chip
Other Cache: None
Memory: 512 GB (32 x 16 GB 2Rx4 PC4-2400T-R, running at 1600 MHz)
Disk Subsystem: 1 x 800 GB NVMe PCIe SSD, RAID 0
Other Hardware: DL580 Gen9 NVMe SSD Express Bay Enablement Kit

Base Pointers: 32-bit
Peak Pointers: 32/64-bit
Other Software: None

Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
410.bwaves	192	1663	1570	**1665**	**1570**	1667	1570	192	1663	1570	**1665**	**1570**	1667	1570
416.gamess	192	**1052**	**3570**	1052	3570	1056	3560	192	**1010**	**3720**	1010	3720	1012	3720
433.milc	192	1203	1460	**1206**	**1460**	1210	1460	192	1203	1460	**1206**	**1460**	1210	1460
434.zeusmp	192	681	2570	**680**	**2570**	674	2590	192	681	2570	**680**	**2570**	674	2590
435.gromacs	192	318	4310	**318**	**4310**	320	4280	192	310	4420	**313**	**4370**	316	4330
436.cactusADM	192	**794**	**2890**	792	2900	796	2880	192	**794**	**2890**	792	2900	796	2880
437.leslie3d	192	**1652**	**1090**	1642	1100	1653	1090	192	**1652**	**1090**	1642	1100	1653	1090
444.namd	192	**511**	**3020**	511	3020	512	3010	192	**507**	**3040**	506	3040	509	3030
447.dealII	192	410	5360	422	5210	**412**	**5340**	192	410	5360	422	5210	**412**	**5340**
450.soplex	192	1340	1200	1344	1190	**1342**	**1190**	96	588	1360	**587**	**1360**	584	1370
453.povray	192	220	4640	**221**	**4630**	223	4590	192	191	5360	**190**	**5390**	188	5440
454.calculix	192	362	4380	354	4480	**355**	**4470**	192	362	4380	354	4480	**355**	**4470**
459.GemsFDTD	192	1988	1020	**1992**	**1020**	1994	1020	192	1988	1020	**1992**	**1020**	1994	1020
465.tonto	192	**653**	**2890**	651	2900	656	2880	192	624	3030	**628**	**3010**	633	2990
470.lbm	192	1215	2170	**1215**	**2170**	1219	2160	192	1215	2170	**1215**	**2170**	1219	2160
481.wrf	192	1144	1870	**1146**	**1870**	1148	1870	192	**1143**	**1880**	1141	1880	1150	1870
482.sphinx3	192	1790	2090	1792	2090	**1791**	**2090**	192	1790	2090	1792	2090	**1791**	**2090**

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 by default
Filesystem page cache cleared with:
 echo 1 >       /proc/sys/vm/drop_caches
runspec command invoked through numactl i.e.:
 numactl --interleave=all runspec <etc>
```

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
Sysinfo program /home/arun/cpu2006_copy/config/sysinfo.rev6993
Revision 6993 of 2015-11-06 (b5e8d4b4eb51ed28d7f98696cbe290c1)
running on dl580_manju Tue Feb  7 15:04:53 2017

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 E7-8894 v4 @ 2.40GHz
      4 "physical id"s (chips)
      192 "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 : 24
      siblings  : 48
      physical 0: cores 0 1 2 3 4 5 8 9 10 11 12 13 16 17 18 19 20 21 24 25 26
      27 28 29
      physical 1: cores 0 1 2 3 4 5 8 9 10 11 12 13 16 17 18 19 20 21 24 25 26
      27 28 29
      physical 2: cores 0 1 2 3 4 5 8 9 10 11 12 13 16 17 18 19 20 21 24 25 26
      27 28 29
      physical 3: cores 0 1 2 3 4 5 8 9 10 11 12 13 16 17 18 19 20 21 24 25 26
      27 28 29
   cache size : 30720 KB

From /proc/meminfo
   MemTotal:       529303984 kB
   HugePages_Total:       0
   Hugepagesize:       2048 kB

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"
```

Continued on next page

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 dl580_manju 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 Jan 24 15:39

  SPEC is set to: /home/arun/cpu2006_copy
     Filesystem     Type  Size  Used Avail Use% Mounted on
     /dev/nvme0n1p4 xfs   703G  572G  132G  82% /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 U17 12/08/2016
    Memory:
     64x UNKNOWN NOT AVAILABLE
     32x UNKNOWN NOT AVAILABLE 16 GB 2 rank 2400 MHz, configured at 1600 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:
  32x UNKNOWN NOT AVAILABLE 16 GB 2 rank 2400 MHz, configured at 1600 MHz
```

General Notes

```
 Environment variables set by runspec before the start of the run:
 LD_LIBRARY_PATH = "/home/arun/cpu2006_copy/libs/32:/home/arun/cpu2006_copy/libs/64:/home/arun/cpu2006_copy/sh10.2"

  Binaries compiled on a system with 1x Intel Core i7-4790K CPU + 32GB RAM
  memory using Redhat Enterprise Linux 7.2
```

Base Compiler Invocation

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

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

Continued on next page

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 -no-prec-sqrt -static
-qopt-prefetch -fp-model fast=2
-qopt-prefetch-issue-excl-hint -auto-ilp32 -ansi-alias
-qopt-mem-layout-trans=3 -unroll-aggressive
-use-intel-optimized-headers -qopt-matmul -qopt-subscript-in-range
-qopt-assume-safe-padding -qopt-calloc -inline-calloc
-qopt-malloc-options=3

C++ benchmarks:
-xCORE-AVX2 -ipo -O3 -no-prec-div -no-prec-sqrt -static
-qopt-prefetch -fp-model fast=2
-qopt-prefetch-issue-excl-hint -auto-ilp32 -ansi-alias
-qopt-mem-layout-trans=3 -use-intel-optimized-headers
-unroll-aggressive -qopt-calloc -inline-calloc -qopt-malloc-options=3

Fortran benchmarks:
-xCORE-AVX2 -ipo -O3 -no-prec-div -no-prec-sqrt -static
-qopt-prefetch -fp-model fast=2

Continued on next page

Base Optimization Flags (Continued)

Fortran benchmarks (continued):
`-qopt-prefetch-issue-excl-hint`

Benchmarks using both Fortran and C:
`-xCORE-AVX2 -ipo -O3 -no-prec-div -no-prec-sqrt -static`
`-qopt-prefetch -fp-model fast=2`
`-qopt-prefetch-issue-excl-hint -auto-ilp32 -ansi-alias`
`-qopt-mem-layout-trans=3 -unroll-aggressive`
`-use-intel-optimized-headers -qopt-matmul -qopt-subscript-in-range`
`-qopt-assume-safe-padding -qopt-calloc -inline-calloc`
`-qopt-malloc-options=3`

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_2017/linux/lib/ia32`

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`

Continued on next page

Peak Portability Flags (Continued)

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:

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) -no-prec-sqrt(pass 2)
-static(pass 2) -qopt-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) -no-prec-sqrt(pass 2)
-static(pass 2) -qopt-mem-layout-trans=3(pass 2)
-prof-use(pass 2) -qopt-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) -no-prec-sqrt(pass 2)
-static(pass 2) -qopt-mem-layout-trans=3(pass 2)
-prof-use(pass 2) -unroll4 -ansi-alias

Fortran benchmarks:

410.bwaves: basepeak = yes

416.gamess: -prof-gen=threadsafe(pass 1) -prof-use(pass 2)
-xCORE-AVX2(pass 2) -par-num-threads=1(pass 1) -ipo(pass 2)
-O3(pass 2) -no-prec-div(pass 2) -no-prec-sqrt(pass 2)
-static(pass 2) -unroll2 -inline-level=0 -scalar-rep-

434.zeusmp: basepeak = yes

437.leslie3d: basepeak = yes

Continued on next page

Peak Optimization Flags (Continued)

459.GemsFDTD: basepeak = yes

465.tonto: -prof-gen=threadsafe(pass 1) -prof-use(pass 2) -xCORE-AVX2(pass 2) -par-num-threads=1(pass 1) -ipo(pass 2) -O3(pass 2) -no-prec-div(pass 2) -no-prec-sqrt(pass 2) -static(pass 2) -unroll4 -auto -inline-calloc -qopt-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) -no-prec-sqrt(pass 2) -static(pass 2) -qopt-mem-layout-trans=3(pass 2) -prof-use(pass 2) -qopt-prefetch -auto-ilp32

436.cactusADM: basepeak = yes

454.calculix: basepeak = yes

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

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/HPE-Compiler-Flags-Intel-V1.2-HSW-revH.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/HPE-Compiler-Flags-Intel-V1.2-HSW-revH.xml

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