### SPEC® CFP2006 Result

Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant XL450 Gen9
(1.70 GHz, Intel Xeon E5-2603 v4)

<table>
<thead>
<tr>
<th>SPECfp®2006</th>
<th>71.2</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECfp_base2006</td>
<td>69.6</td>
</tr>
</tbody>
</table>

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

#### Hardware

<table>
<thead>
<tr>
<th>Spec</th>
<th>Name</th>
<th>CPU Name</th>
<th>CPU Characteristics</th>
<th>CPU MHz</th>
<th>FPU</th>
<th>CPU(s) enabled</th>
<th>CPU(s) orderable</th>
<th>Primary Cache</th>
<th>Secondary Cache</th>
</tr>
</thead>
<tbody>
<tr>
<td>410</td>
<td>bwaves</td>
<td>Intel Xeon E5-2603 v4</td>
<td>12 cores, 2 chips, 6 cores/chip</td>
<td>1700</td>
<td>Integrated</td>
<td>12 cores, 2 chips, 6 cores/chip</td>
<td>32 KB I + 32 KB D on chip per core</td>
<td>256 KB I+D on chip per core</td>
<td></td>
</tr>
<tr>
<td>416</td>
<td>gamess</td>
<td>Integrated</td>
<td>1.2 chips</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>433</td>
<td>milc</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>434</td>
<td>zeusmp</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>435</td>
<td>gromacs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>436</td>
<td>cactusADM</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>437</td>
<td>leslie3d</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>444</td>
<td>namd</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>447</td>
<td>dealII</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>450</td>
<td>soplex</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>453</td>
<td>povray</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>454</td>
<td>calculix</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>459</td>
<td>GemsFDTD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>465</td>
<td>tonto</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>470</td>
<td>lbm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>481</td>
<td>wrf</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>482</td>
<td>sphinx3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

#### Software

<table>
<thead>
<tr>
<th>Spec</th>
<th>Name</th>
<th>Operating System</th>
<th>Compiler</th>
<th>Auto Parallel</th>
<th>File System</th>
</tr>
</thead>
<tbody>
<tr>
<td>410</td>
<td>bwaves</td>
<td>Red Hat Enterprise Linux Server release 7.2 (Maipo)</td>
<td>C++: Version 16.0.0.101 of Intel C++ Studio XE for Linux</td>
<td>Yes</td>
<td>xfs</td>
</tr>
<tr>
<td>416</td>
<td>gamess</td>
<td>Kernel 3.10.0-327.el7.x86_64</td>
<td>Studio XE for Linux; Fortran: Version 16.0.0.101 of Intel Fortran Studio XE for Linux</td>
<td></td>
<td></td>
</tr>
<tr>
<td>433</td>
<td>milc</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>434</td>
<td>zeusmp</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>435</td>
<td>gromacs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>436</td>
<td>cactusADM</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>437</td>
<td>leslie3d</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>444</td>
<td>namd</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>447</td>
<td>dealII</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>450</td>
<td>soplex</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>453</td>
<td>povray</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>454</td>
<td>calculix</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>459</td>
<td>GemsFDTD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>465</td>
<td>tonto</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>470</td>
<td>lbm</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>481</td>
<td>wrf</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>482</td>
<td>sphinx3</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

---

Continued on next page
## SPEC CFP2006 Result

**Hewlett Packard Enterprise**  
(Test Sponsor: HPE)  
ProLiant XL450 Gen9  
(1.70 GHz, Intel Xeon E5-2603 v4)  

**SPECfp2006 = 71.2**  
**SPECfp_base2006 = 69.6**

### CPU2006 license: 3

Test sponsor: HPE  
Tested by: HPE

L3 Cache: 15 MB I+D on chip per chip  
Other Cache: None  
Memory: 256 GB (16 x 16 GB 2Rx4 PC4-2400T-R, running at 1866 MHz)  
Disk Subsystem: 2 x 480 GB SATA SSD, RAID 1  
Other Hardware: None  
System State: Run level 3 (multi-user)  
Base Pointers: 64-bit  
Peak Pointers: 32/64-bit  
Other Software: None

### Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Seconds Base</th>
<th>Ratio Base</th>
<th>Seconds Peak</th>
<th>Ratio Peak</th>
</tr>
</thead>
<tbody>
<tr>
<td>410.bwaves</td>
<td>34.3</td>
<td>396</td>
<td>34.3</td>
<td>396</td>
</tr>
<tr>
<td>416.gamess</td>
<td>907</td>
<td>21.6</td>
<td>906</td>
<td>21.6</td>
</tr>
<tr>
<td>433.milc</td>
<td>183</td>
<td>50.0</td>
<td>184</td>
<td>49.8</td>
</tr>
<tr>
<td>434.zeusmp</td>
<td>62.0</td>
<td>147</td>
<td>62.4</td>
<td>146</td>
</tr>
<tr>
<td>435.gromacs</td>
<td>224</td>
<td>31.9</td>
<td>224</td>
<td>31.9</td>
</tr>
<tr>
<td>436.cactusADM</td>
<td>25.4</td>
<td>471</td>
<td>25.1</td>
<td>476</td>
</tr>
<tr>
<td>437.leslie3d</td>
<td>53.2</td>
<td>177</td>
<td>53.3</td>
<td>176</td>
</tr>
<tr>
<td>444.namd</td>
<td>532</td>
<td>15.1</td>
<td>532</td>
<td>15.1</td>
</tr>
<tr>
<td>447.dealII</td>
<td>326</td>
<td>35.1</td>
<td>325</td>
<td>35.1</td>
</tr>
<tr>
<td>450.soplex</td>
<td>304</td>
<td>27.4</td>
<td>299</td>
<td>27.9</td>
</tr>
<tr>
<td>453.povray</td>
<td>174</td>
<td>30.5</td>
<td>174</td>
<td>30.6</td>
</tr>
<tr>
<td>454.calculix</td>
<td>257</td>
<td>32.1</td>
<td>258</td>
<td>32.0</td>
</tr>
<tr>
<td>459.GemsFDTD</td>
<td>61.4</td>
<td>173</td>
<td>61.4</td>
<td>173</td>
</tr>
<tr>
<td>465.tonto</td>
<td>355</td>
<td>27.7</td>
<td>356</td>
<td>27.7</td>
</tr>
<tr>
<td>470.lbm</td>
<td>27.6</td>
<td>497</td>
<td>26.1</td>
<td>526</td>
</tr>
<tr>
<td>481.wrf</td>
<td>157</td>
<td>71.0</td>
<td>157</td>
<td>70.6</td>
</tr>
<tr>
<td>482.sphinx3</td>
<td>387</td>
<td>50.4</td>
<td>387</td>
<td>50.3</td>
</tr>
</tbody>
</table>

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:  
- Power Profile set to Custom  
- Power Regulator set to HP 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  
- QPI Snoop Configuration set to Home Snoop  
- Collaborative Power Control set to Disabled

Continued on next page
Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant XL450 Gen9
(1.70 GHz, Intel Xeon E5-2603 v4)

SPECfp2006 = 71.2
SPECfp_base2006 = 69.6

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

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 XL450-G9-node2 Thu May  5 11:15:58 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 E5-2603 v4 @ 1.70GHz
  2 "physical id"s (chips)
  12 "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 : 6
  siblings  : 6
  physical 0: cores 0 1 2 3 4 5
  physical 1: cores 0 1 2 3 4 5
  cache size : 15360 KB

From /proc/meminfo
MemTotal:       263713756 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)

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 4 09:20

SPEC is set to: /home/cpu2006
Filesystem  Type  Size  Used Avail Use% Mounted on
Continued on next page
**SPEC CFP2006 Result**

**Hewlett Packard Enterprise**
*(Test Sponsor: HPE)*

**ProLiant XL450 Gen9**
*(1.70 GHz, Intel Xeon E5-2603 v4)*

**SPECfp2006 =** 71.2
**SPECfp_base2006 =** 69.6

<table>
<thead>
<tr>
<th>CPU2006 license:</th>
<th>3</th>
<th>Test date:</th>
<th>May-2016</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test sponsor:</td>
<td>HPE</td>
<td>Hardware Availability:</td>
<td>Mar-2016</td>
</tr>
<tr>
<td>Tested by:</td>
<td>HPE</td>
<td>Software Availability:</td>
<td>Nov-2015</td>
</tr>
</tbody>
</table>

**Platform Notes (Continued)**

/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 03/10/2016
Memory:
16x UNKNOWN NOT AVAILABLE 16 GB 2 rank 2400 MHz, configured at 1866 MHz

(End of data from sysinfo program)

**General Notes**

Environment variables set by runspec before the start of the run:

KMP_AFFINITY = "granularity=fine,compact"
OMP_NUM_THREADS = "12"
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
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

Continued on next page
SPEC CFP2006 Result

Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant XL450 Gen9
(1.70 GHz, Intel Xeon E5-2603 v4)

SPECfp2006 = 71.2
SPECfp_base2006 = 69.6

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

Base Portability Flags (Continued)

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:
icc -m64

Fortran benchmarks:
ifort -m64

Benchmarks using both Fortran and C:
icc -m64 ifort -m64
Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant XL450 Gen9
(1.70 GHz, Intel Xeon E5-2603 v4)

SPECfp2006 = 71.2
SPECfp_base2006 = 69.6

Peak Portability Flags
Same as Base Portability Flags

Peak Optimization Flags

C benchmarks:
433.milc: basepeak = yes
470.lbm: basepeak = yes
482.sphinx3: -xCORE-AVX2 -ipo -O3 -no-prec-div -static -parallel
-optimizations -ansi-alias
-fp-model fast=2
-qopt-prefetch-issue-excl-hint -funroll-all-loops

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-ilkp32
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: 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) -prof-use(pass 2) -unroll2
-inline-level=0 -scalar-rep-
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

Continued on next page
**SPEC CFP2006 Result**

**Hewlett Packard Enterprise**
(Test Sponsor: HPE)
ProLiant XL450 Gen9
(1.70 GHz, Intel Xeon E5-2603 v4)

| SPECfp2006 = | 71.2 |
| SPECfp_base2006 = | 69.6 |

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

**Peak Optimization Flags (Continued)**

465.tonto:  -xCORE-AVX2(pass 2)  -prof-gen:threadsave(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-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

SPEC and SPECfp are registered trademarks of the Standard Performance Evaluation Corporation. All other brand and product names appearing in this result are trademarks or registered trademarks of their respective holders.

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

Tested with SPEC CPU2006 v1.2.  
Originally published on 1 June 2016.