 El Hewlett Packard Enterprise
 ProLiant ML350 Gen9
 (1.70 GHz, Intel Xeon E5-2603 v4)  

**SPECfp®2006 = 68.2**

**SPECfp_base2006 = 66.7**

<table>
<thead>
<tr>
<th>Hardware</th>
<th>Software</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU Name:</td>
<td>Operating System: Red Hat Enterprise Linux Server release 7.2</td>
</tr>
<tr>
<td>CPU Characteristics:</td>
<td>(Maipo)</td>
</tr>
<tr>
<td>CPU MHz: 1700</td>
<td>Kernel 3.10.0-327.el7.x86_64</td>
</tr>
<tr>
<td>FPU: Integrated</td>
<td>Compiler: C/C++: Version 16.0.0.101 of Intel C++ Studio XE</td>
</tr>
<tr>
<td>CPU(s) enabled: 12 cores, 2 chips, 6 cores/chip</td>
<td>for Linux;</td>
</tr>
<tr>
<td>CPU(s) orderable: 1,2 chip</td>
<td>Fortran: Version 16.0.0.101 of Intel Fortran</td>
</tr>
<tr>
<td>Primary Cache: 32 KB I + 24 KB D on chip per core</td>
<td>Studio XE for Linux</td>
</tr>
<tr>
<td>Secondary Cache: 256 KB I+D on chip per core</td>
<td>Auto Parallel: Yes</td>
</tr>
<tr>
<td></td>
<td>File System: xfs</td>
</tr>
</tbody>
</table>

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## SPEC CFP2006 Result

**Hewlett Packard Enterprise**
(Test Sponsor: HPE)
ProLiant ML350 Gen9
(1.70 GHz, Intel Xeon E5-2603 v4)

<table>
<thead>
<tr>
<th>CPU2006 license:</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test sponsor:</td>
<td>HPE</td>
</tr>
<tr>
<td>Tested by:</td>
<td>HPE</td>
</tr>
</tbody>
</table>

**System State:** Run level 3 (multi-user)
**Base Pointers:** 64-bit
**Peak Pointers:** 32/64-bit
**Other Software:** None

**L3 Cache:** 15 MB I+D on chip per chip
**Other Cache:** None
**Memory:** 512 GB (16 x 32 GB 2Rx4 PC4-2400T-R, running at 1866 MHz)
**Disk Subsystem:** 1 x 400 GB SAS SSD, RAID 1
**Other Hardware:** None

**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 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 Home Snoop

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## Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Base</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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<tr>
<td>410.bwaves</td>
<td>38.3</td>
<td>355</td>
<td>38.8</td>
<td>351</td>
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<td>351</td>
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<td>416.gamess</td>
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<td>26.1</td>
<td>459</td>
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<td>26.4</td>
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<td>459.GemsFDTD</td>
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<td>69.9</td>
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<tr>
<td>465.tonto</td>
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<td>27.6</td>
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<td>27.6</td>
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<td>64.5</td>
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<tr>
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<td>50.6</td>
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<td>386</td>
<td>50.5</td>
<td>386</td>
<td>50.6</td>
<td>386</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 Static High Performance Mode
- Minimum Processor Idle Power Core C-State set to C1E State
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-- Continued on next page
SPEC CFP2006 Result

Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant ML350 Gen9
(1.70 GHz, Intel Xeon E5-2603 v4)

SPECfp2006 = 68.2
SPECfp_base2006 = 66.7

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

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

Platform Notes (Continued)

Thermal Configuration set to Maximum Cooling
Processor Power and Utilization Monitoring set to Disabled
Memory Double Refresh Rate set to 1x Refresh
Energy Performance Bias set to Maximum Performance

Sysinfo program
/home/specuser/specsuite/HP_build_ic16uite_corrected_int_bins/cpu2006/config/sysinfo.rev6914
$Rev: 6914 $ $Date:: 2014-06-25 #$ e3fbb8667b5a285932ceab81e28219e1
running on ml350bdwspec Fri Jun 3 13:56:44 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: 528069176 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 ml350bdwspec 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 Jun 3 13:53

SPEC is set to:

Continued on next page
**SPEC CFP2006 Result**

**Hewlett Packard Enterprise**  
(Test Sponsor: HPE)  
ProLiant ML350 Gen9  
(1.70 GHz, Intel Xeon E5-2603 v4)  

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<th>66.7</th>
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</table>

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

**Test date:** Jun-2016  
**Hardware Availability:** Mar-2016  
**Software Availability:** Nov-2015

---

**Platform Notes (Continued)**

/home/specuser/specsuite/HP_build_ic16_suite_corrected_int_bins/cpu2006  
Filesystem Type Size Used Avail Use% Mounted on  
/dev/sda5 xfs 318G 163G 156G 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 P92 04/12/2016  
Memory:  
8x UNKNOWN NOT AVAILABLE  
16x UNKNOWN NOT AVAILABLE 32 GB 2 rank 2400 MHz, configured at 1866 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:  
16x UNKNOWN NOT AVAILABLE 32 GB 2 rank 2400 MHz, configured at 1866 MHz

---

**General Notes**

Environment variables set by runspec before the start of the run:  
KMP_AFFINITY = "granularity=fine,compact,1,0"  
OMP_NUM_THREADS = "12"  

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

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SPEC CFP2006 Result

Hewlett Packard Enterprise
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ProLiant ML350 Gen9
(1.70 GHz, Intel Xeon E5-2603 v4)

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

Base Portability Flags (Continued)

- 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 -parallel -opt-prefetch
-ansi-alias -fp-model fast=2
-qopt-prefetch-issue-excl-hint

C++ benchmarks:
-xCORE-AVX2 -ipo -O3 -no-prec-div -static -opt-prefetch -ansi-alias
-fp-model fast=2
-qopt-prefetch-issue-excl-hint

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 -fp-model fast=2
-qopt-prefetch-issue-excl-hint

Peak Compiler Invocation

C benchmarks:
icc  -m64

C++ benchmarks:
icpc  -m64
Hewlett Packard Enterprise  
ProLiant ML350 Gen9  
(1.70 GHz, Intel Xeon E5-2603 v4)  

**SPEC CFP2006 Result**

**CPU2006 license:** 3  
**Test sponsor:** HPE  
**Test date:** Jun-2016

**SPECfp2006 =** 68.2  
**SPECfp_base2006 =** 66.7

**Tested by:** HPE  
**Hardware Availability:** Mar-2016  
**Software Availability:** Nov-2015

---

**Peak Compiler Invocation (Continued)**

- Fortran benchmarks:  
  ifort -m64

- Benchmarks using both Fortran and C:  
  icc -m64 ifort -m64

---

**Peak Portability Flags**

Same as Base Portability Flags

---

**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) -prof-use(pass 2) -fno-alias  
-auto-ilp32

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-

Continued on next page
Peak Optimization Flags (Continued)

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
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) -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

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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 28 June 2016.