Hewlett Packard Enterprise  
(Test Sponsor: HPE)
ProLiant ML350 Gen9  
(2.10 GHz, Intel Xeon E5-2695 v4)

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

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**SPECint_rate2006** = 1440  
**SPECint_rate_base2006** = 1390

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### Hardware

<table>
<thead>
<tr>
<th>Field</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>CPU Name</td>
<td>Intel Xeon E5-2695 v4</td>
</tr>
<tr>
<td>CPU Characteristics</td>
<td>Intel Turbo Boost Technology up to 3.30 GHz</td>
</tr>
<tr>
<td>CPU MHz</td>
<td>2100</td>
</tr>
<tr>
<td>FPU</td>
<td>Integrated</td>
</tr>
<tr>
<td>CPU(s) enabled</td>
<td>36 cores, 2 chips, 18 cores/chip, 2 threads/core</td>
</tr>
<tr>
<td>CPU(s) orderable</td>
<td>1.2 chips</td>
</tr>
<tr>
<td>Primary Cache</td>
<td>32 KB I + 32 KB D on chip per core</td>
</tr>
<tr>
<td>Secondary Cache</td>
<td>256 KB I+D on chip per core</td>
</tr>
<tr>
<td>L3 Cache</td>
<td>45 MB I+D on chip per chip</td>
</tr>
<tr>
<td>Other Cache</td>
<td>None</td>
</tr>
<tr>
<td>Memory</td>
<td>512 GB (16 x 32 GB 2Rx4 PC4-2400T-R, running at 2133 MHz)</td>
</tr>
<tr>
<td>Disk Subsystem</td>
<td>1 x 800 GB SAS SSD, RAID 1</td>
</tr>
<tr>
<td>Other Hardware</td>
<td>None</td>
</tr>
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</table>

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### Software

<table>
<thead>
<tr>
<th>Field</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operating System</td>
<td>SUSE Linux Enterprise Server 12 (x86_64) SP1 Kernel 3.12.49-11-default</td>
</tr>
<tr>
<td>Compiler</td>
<td>C++: Version 16.0.0.101 of Intel C++ Studio XE for Linux</td>
</tr>
<tr>
<td>Auto Parallel</td>
<td>No</td>
</tr>
<tr>
<td>File System</td>
<td>xfs</td>
</tr>
<tr>
<td>System State</td>
<td>Run level 3 (multi-user)</td>
</tr>
<tr>
<td>Base Pointers</td>
<td>32-bit</td>
</tr>
<tr>
<td>Peak Pointers</td>
<td>32/64-bit</td>
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<tr>
<td>Other Software</td>
<td>Microquill SmartHeap V10.2</td>
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## Results Table

<table>
<thead>
<tr>
<th>Benchmark</th>
<th>Copies</th>
<th>Seconds</th>
<th>Ratio</th>
<th>Seconds</th>
<th>Ratio</th>
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</thead>
<tbody>
<tr>
<td>400.perlbench</td>
<td>72</td>
<td>638</td>
<td>1100</td>
<td>642</td>
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<td>643</td>
<td>1090</td>
<td>72</td>
<td>519</td>
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<tr>
<td>401.bzip2</td>
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<td>709</td>
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<td>710</td>
<td>975</td>
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<td>951</td>
<td>731</td>
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<td>403.mcf</td>
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<td>564</td>
<td>1030</td>
<td>564</td>
<td>1030</td>
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<td>429.gcc</td>
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<td>456.hmmer</td>
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<td>352</td>
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<tr>
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<td>473.astar</td>
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<td>657</td>
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<td>769</td>
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<td>771</td>
<td>657</td>
<td>771</td>
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<td>483.xalancbmk</td>
<td>72</td>
<td>346</td>
<td>1440</td>
<td>348</td>
<td>1430</td>
<td>346</td>
<td>1440</td>
<td>72</td>
<td>346</td>
<td>1440</td>
<td>348</td>
<td>1430</td>
<td>346</td>
<td>1440</td>
</tr>
</tbody>
</table>

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
runcspec command invoked through numactl i.e.:
umactl --interleave=all runspec <etc>

## 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 Double Refresh Rate set to 1x Refresh
  Continued on next page
Hewlett Packard Enterprise  
(Test Sponsor: HPE)  
ProLiant ML350 Gen9  
(2.10 GHz, Intel Xeon E5-2695 v4)

<table>
<thead>
<tr>
<th>SPECmetric</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>SPECint_rate2006</td>
<td>1440</td>
</tr>
<tr>
<td>SPECint_rate_base2006</td>
<td>1390</td>
</tr>
</tbody>
</table>

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

**Platform Notes (Continued)**

Energy Performance Bias set to Maximum Performance  
Sysinfo program /home/specuser/cpu2006/ic16/config/sysinfo.rev6914  
$Rev: 6914 $ $Date:: 2014-06-25 #$ e3fbb8667b5a285932ceab81e28219e1  

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 E5-2695 v4 @ 2.10GHz  
- 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: 529088116 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"  
- PRETTY_NAME="SUSE Linux Enterprise Server 12 SP1"  
- ID=sles  
- ANSI_COLOR="0;32"  
- CPE_NAME="cpe:/o:suse:sles:12:sp1"

uname -a:  
(8d714a0) x86_64 x86_64 x86_64 GNU/Linux

run-level 3 Apr 6 11:16

Continued on next page
SPEC CINT2006 Result

Hewlett Packard Enterprise
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SPECint_rate2006 = 1440
SPECint_rate_base2006 = 1390

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

Platform Notes (Continued)

SPEC is set to: /home/specuser/cpu2006/ic16
Files system Type Size Used Avail Use% Mounted on
/dev/sda4 xfs 703G 279G 425G 40% /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 03/23/2016
Memory:
8x UNKNOWN NOT AVAILABLE
1x UNKNOWN NOT AVAILABLE 32 GB 1 rank 2400 MHz, configured at 2133 MHz
15x UNKNOWN NOT AVAILABLE 32 GB 2 rank 2400 MHz, configured at 2133 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 two lines reading as:
1x UNKNOWN NOT AVAILABLE 32 GB 1 rank 2400 MHz, configured at 2133 MHz
15x UNKNOWN NOT AVAILABLE 32 GB 2 rank 2400 MHz, configured at 2133 MHz

There was an error on this result with dmidecode pulling DIMM information. All memory
was dual rank, and the first line with the 1x label should say 2 rank, instead of 1 rank.

General Notes

Environment variables set by runspec before the start of the run:
LD_LIBRARY_PATH = */home/specuser/cpu2006/ic16/libs/32:/home/specuser/cpu2006/ic16/libs/64:/home/specuser/cpu2006/ic16/sh*

Binaries compiled on a system with 1x Intel Core i5-4670K CPU + 32GB
memory using RedHat EL 7.1

Base Compiler Invocation

C benchmarks:
icc -m32 -L/opt/intel/compilers_and_libraries_2016/linux/compiler/lib/ia32_lin

C++ benchmarks:
icpc -m32 -L/opt/intel/compilers_and_libraries_2016/linux/compiler/lib/ia32_lin

Base Portability Flags

400.perlbench: -D_FILE_OFFSET_BITS=64 -DSPEC_CPU_LINUX_IA32
401.bzip2: -D_FILE_OFFSET_BITS=64
403.gcc: -D_FILE_OFFSET_BITS=64
### SPEC CINT2006 Result

- **Test Sponsor:** HPE  
- **Test date:** Apr-2016  
- **CPU2006 license:** 3  
- **Software Availability:** Dec-2015

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**SPECint_rate2006 =** 1440  
**SPECint_rate_base2006 =** 1390

---

#### Base Portability Flags (Continued)

- 429.mcf: `-D_FILE_OFFSET_BITS=64`
- 445.gobmk: `-D_FILE_OFFSET_BITS=64`
- 456.hmmer: `-D_FILE_OFFSET_BITS=64`
- 458.sjeng: `-D_FILE_OFFSET_BITS=64`
- 462.libquantum: `-D_FILE_OFFSET_BITS=64`  
- `DSPEC_CPU_LINUX`
- 464.h264ref: `-D_FILE_OFFSET_BITS=64`
- 471.omnetpp: `-D_FILE_OFFSET_BITS=64`
- 473.astar: `-D_FILE_OFFSET_BITS=64`
- 483.xalancbmk: `-D_FILE_OFFSET_BITS=64`  
- `DSPEC_CPU_LINUX`

---

#### Base Optimization Flags

**C benchmarks:**
- `-xCORE-AVX2 -ipo -O3 -no-prec-div -opt-prefetch`
- `-opt-mem-layout-trans=3`

**C++ benchmarks:**
- `-xCORE-AVX2 -ipo -O3 -no-prec-div -opt-prefetch`
- `-opt-mem-layout-trans=3 -Wl,-z,muldefs -L/sh -lsmartheap`

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#### Base Other Flags

**C benchmarks:**
- `403.gcc: -Dalloca=_alloca`

---

#### Peak Compiler Invocation

**C benchmarks (except as noted below):**
- `icc -m32 -L/opt/intel/compilers_and_libraries_2016/linux/compiler/lib/ia32_lin`
- `400.perlbench: icc -m64`
- `401.bzip2: icc -m64`
- `456.hmmer: icc -m64`
- `458.sjeng: icc -m64`

**C++ benchmarks:**
- `icpc -m32 -L/opt/intel/compilers_and_libraries_2016/linux/compiler/lib/ia32_lin`
Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant ML350 Gen9
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SPECint_rate2006 = 1440
SPECint_rate_base2006 = 1390

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

Peak Portability Flags

400.perlbench: -D_FILE_OFFSET_BITS=64 -DSPEC_CPU_LP64 -DSPEC_CPU_LINUX_X64
400.perlbench: -DSPEC_CPU_LINUX_X64
401.bzip2: -D_FILE_OFFSET_BITS=64 -DSPEC_CPU_LP64
402.cmake: -D_FILE_OFFSET_BITS=64
403.gcc: -D_FILE_OFFSET_BITS=64
429.mcf: -D_FILE_OFFSET_BITS=64
445.gobmk: -D_FILE_OFFSET_BITS=64
456.hmmer: -D_FILE_OFFSET_BITS=64 -DSPEC_CPU_LP64
456.hmmer: -DSPEC_CPU_LINUX_X64
458.sjeng: -D_FILE_OFFSET_BITS=64 -DSPEC_CPU_LP64
462.libquantum: -D_FILE_OFFSET_BITS=64 -DSPEC_CPU_LINUX
464.h264ref: -D_FILE_OFFSET_BITS=64

Peak Optimization Flags

C benchmarks:

400.perlbench: -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) -auto-ilp32

401.bzip2: -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) -opt-prefetch -auto-ilp32 -ansi-alias

403.gcc: -xCORE-AVX2 -ipo -O3 -no-prec-div

429.mcf: basepeak = yes

445.gobmk: -xCORE-AVX2(pass 2) -prof-gen:threadsafe(pass 1) -prof-use(pass 2) -par-num-threads=1(pass 1) -ansi-alias -opt-mem-layout-trans=3

456.hmmer: -xCORE-AVX2 -ipo -O3 -no-prec-div -unroll2 -auto-ilp32

458.sjeng: -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 -auto-ilp32

462.libquantum: basepeak = yes

464.h264ref: -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 -ansi-alias
SPEC CINT2006 Result

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SPECint_rate2006 = 1440
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CPU2006 license: 3
Test date: Apr-2016
Test sponsor: HPE
Hardware Availability: Mar-2016
Tested by: HPE
Software Availability: Dec-2015

Peak Optimization Flags (Continued)

C++ benchmarks:

471.omnetpp: -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) -ansi-alias
-opt-ra-region-strategy=block -Wl,-z,muldefs
-LL -lsmartheap

473.astar: basepeak = yes
483.xalancbmk: basepeak = yes

Peak Other Flags

C benchmarks:

403.gcc: -Dalloca=_alloca

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/Intel-ic16.0-official-linux64.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/Intel-ic16.0-official-linux64.xml

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For other inquiries, please contact webmaster@spec.org.

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