Hewlett Packard Enterprise
(Test Sponsor: HPE)
ProLiant DL360 Gen9
(2.20 GHz, Intel Xeon E5-2650 v4)

**SPECint®2006 = 59.5**
**SPECint_base2006 = 57.1**

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

**Hardware**

- **CPU Name:** Intel Xeon E5-2650 v4
- **CPU Characteristics:** Intel Turbo Boost Technology up to 2.90 GHz
- **CPU MHz:** 2200
- **FPU:** Integrated
- **CPU(s) enabled:** 24 cores, 2 chips, 12 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
- **L3 Cache:** 30 MB I+D on chip per chip
- **Other Cache:** None
- **Memory:** 512 GB (16 x 32 GB 2Rx4 PC4-2400T-R)
- **Disk Subsystem:** 2 x 400 GB SAS SSD, RAID 1
- **Other Hardware:** None

**Software**

- **Operating System:** Red Hat Enterprise Linux Server release 7.2 (Maipo)
  - Kernel 3.10.0-327.el7.x86_64
- **Compiler:** C/C++: Version 16.0.0.101 of Intel C++ Studio XE for Linux
- **Auto Parallel:** Yes
- **File System:** xfs
- **System State:** Run level 3 (multi-user)
- **Base Pointers:** 32/64-bit
- **Peak Pointers:** 32/64-bit
- **Other Software:** Microquill SmartHeap V10.2
**SPEC CINT2006 Result**

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### Results Table

<table>
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<tr>
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<th>Seconds</th>
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<th>Seconds</th>
<th>Ratio</th>
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<tr>
<td>400.perlbench</td>
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<td>33.5</td>
<td>286</td>
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<td>34.2</td>
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<td>403.mcf</td>
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<td>56.5</td>
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<tr>
<td>483.xalanbmk</td>
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<td>71.6</td>
<td>96.5</td>
<td>71.5</td>
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</tr>
</tbody>
</table>

Results appear in the order in which they were run. Bold underlined text indicates a median measurement.

---

### Submit Notes

The config file option 'submit' was used.

---

### 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:
  - HP Power Profile set to Custom
  - HP Power Regulator 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
  - 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/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:

Continued on next page
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Test sponsor:  HPE
Tested by:  HPE

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

Platform Notes (Continued)

http://www.spec.org/cpu2006/Docs/config.html#sysinfo

From /proc/cpuinfo
  model name : Intel(R) Xeon(R) CPU E5-2650 v4@ 2.20GHz
  2 "physical id"s (chips)
  48 "processors"
cores, siblings (Caution: counting these is hw and system dependent. The
following excerpts from /proc/cpuinfo might not be reliable. Use with
cautions.)
cpu cores : 12
siblings : 24
physical 0: cores 0 1 2 3 4 5 8 9 10 11 12 13
physical 1: cores 0 1 2 3 4 5 8 9 10 11 12 13
cache size : 30720 KB

From /proc/meminfo
  MemTotal: 528064712 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 localhost.localdomain 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 12 18:24

  SPEC is set to: /cpu2006

  Filesystem  Type  Size  Used Avail Use% Mounted on
  /dev/sda4    xfs  460G 182G  279G  40% /

  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 P89 02/22/2016
  Memory:

Continued on next page
SPECint2006 = 59.5
SPECint_base2006 = 57.1

Platform Notes (Continued)

8x UNKNOWN NOT AVAILABLE
16x 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 512 GB and the dmidecode description should have one line reading as:
16x UNKNOWN NOT AVAILABLE 32 GB 2 rank 2400 MHz

General Notes

Environment variables set by runspec before the start of the run:
KMP_AFFINITY = "granularity=fine,scatter"
LD_LIBRARY_PATH = "/cpu2006/libs/32:/cpu2006/libs/64:/cpu2006/sh"
OMP_NUM_THREADS = "24"

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 -m64

C++ benchmarks:
  icpc -m64

Base Portability Flags

400.perlbench: -DSPEC_CPU_LP64 -DSPEC_CPU_LINUX_X64
401.bzip2: -DSPEC_CPU_LP64
403.gcc: -DSPEC_CPU_LP64
429.mcf: -DSPEC_CPU_LP64
445.gobmk: -DSPEC_CPU_LP64
456.hmmer: -DSPEC_CPU_LP64
458.sjeng: -DSPEC_CPU_LP64
462.libquantum: -DSPEC_CPU_LP64 -DSPEC_CPU_LINUX
464.h264ref: -DSPEC_CPU_LP64
471.omnetpp: -DSPEC_CPU_LP64
473.astar: -DSPEC_CPU_LP64
483.xalancbmk: -DSPEC_CPU_LP64 -DSPEC_CPU_LINUX

Base Optimization Flags

C benchmarks:
  -xCORE-AVX2 -ipo -O3 -no-prec-div -parallel -opt-prefetch -auto-p32

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SPEC CINT2006 Result

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Base Optimization Flags (Continued)

C++ benchmarks:
-xCORE-AVX2 -ipo -O3 -no-prec-div -opt-prefetch -auto-p32
-Wl,-z,muldefs -L/sh -lsmartheap64

Base Other Flags

C benchmarks:
403.gcc: -Dalloca=_alloca

Peak Compiler Invocation

C benchmarks (except as noted below):
icc -m64
400.perlbench: icc -m32 -L/opt/intel/compilers_and_libraries_2016/linux/compiler/lib/ia32_lin
445.gobmk: icc -m32 -L/opt/intel/compilers_and_libraries_2016/linux/compiler/lib/ia32_lin

C++ benchmarks (except as noted below):
icpc -m32 -L/opt/intel/compilers_and_libraries_2016/linux/compiler/lib/ia32_lin
473.astar: icpc -m64

Peak Portability Flags

400.perlbench: -D_FILE_OFFSET_BITS=64 -DSPEC_CPU_LINUX_IA32
401.bzip2: -DSPEC_CPU_LP64
403.gcc: -DSPEC_CPU_LP64
429.mcf: -DSPEC_CPU_LP64
445.gobmk: -D_FILE_OFFSET_BITS=64
456.hmmer: -DSPEC_CPU_LP64 -DSPEC_CPU_LINUX
458.sjeng: -DSPEC_CPU_LP64
462.libquantum: -DSPEC_CPU_LP64 -DSPEC_CPU_LINUX
464.h264ref: -DSPEC_CPU_LP64
471.omnetpp: -D_FILE_OFFSET_BITS=64
473.astar: -DSPEC_CPU_LP64
483.xalancbmk: -D_FILE_OFFSET_BITS=64 -DSPEC_CPU_LINUX
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Software Availability: Nov-2015  

Peak Optimization Flags  

C benchmarks:  
400.perlbmk: \(-xCORE-AVX2\)(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) \(-opt-prefetch\)  
\(-ansi-alias\)  
401.bzip2: \(-xCORE-AVX2\)(pass 2) \(-prof-gen:threadsafe\)(pass 1)  
\(-ipo\)(pass 2) \(-O3\)(pass 2) \(-no-prec-div\)  
\(-par-num-threads=1\)(pass 1) \(-prof-use\)(pass 2) \(-auto-ilp32\)  
\(-opt-prefetch\) \(-ansi-alias\)  
403.gcc: \(-xCORE-AVX2\) \(-ipo\) \(-O3\) \(-no-prec-div\) \(-inline-calloc\)  
\(-opt-malloc-options=3\) \(-auto-ilp32\)  
429.mcf: \(-xCORE-AVX2\) \(-ipo\) \(-O3\) \(-no-prec-div\) \(-parallel\)  
\(-opt-prefetch\) \(-auto-p32\)  
445.gobmk: \(-xCORE-AVX2\)(pass 2) \(-prof-gen:threadsafe\)(pass 1)  
\(-prof-use\)(pass 2) \(-par-num-threads=1\)(pass 1) \(-ansi-alias\)  
456.hmmer: basepeak = yes  
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) \(-unroll4\)  
462.libquantum: basepeak = yes  
464.h264ref: basepeak = yes  

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)  
\(-opt-ra-region-strategy=block\) \(-ansi-alias\)  
\(-Wl,-z,muldefs\) \(-L/sh\) \(-lsmartheap\)  
473.astar: \(-xCORE-AVX2\) \(-ipo\) \(-O3\) \(-no-prec-div\) \(-opt-prefetch\)  
\(-auto-p32\) \(-Wl,-z,muldefs\) \(-L/sh\) \(-lsmartheap64\)  
483.xalancbmk: \(-xCORE-AVX2\) \(-ipo\) \(-O3\) \(-no-prec-div\) \(-opt-prefetch\)  
\(-ansi-alias\) \(-Wl,-z,muldefs\) \(-L/sh\) \(-lsmartheap\)
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**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 questions about this result, please contact the tester.  
For other inquiries, please contact webmaster@spec.org.

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