SPEC® CINT2006 Result
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Hewlett Packard Enterprise
(Test Sponsor: HPE)

ProLiant ML350 Gen9
(2.20 GHz, Intel Xeon E5-2699 v4)

SPECint®_rate2006 = 1790

SPECint_rate_base2006 = 1720

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

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Hardware

CPU Name:	Intel Xeon E5-2699 v4
CPU Characteristics:	Intel Turbo Boost Technology up to 3.60 GHz
CPU MHz:	2200
FPU:	Integrated
CPU(s) enabled:	44 cores, 2 chips, 22 cores/chip, 2 threads/core
CPU(s) orderable:	1,2 chips
Primary Cache:	32 KB I + 32 KB D on chip per core
Secondary Cache:	256 KB I+D on chip per core
L3 Cache:	55 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:	No
File System:	xfs
System State:	Run level 3 (multi-user)
Base Pointers:	32-bit
Peak Pointers:	32/64-bit
Other Software:	Microquill SmartHeap V10.2

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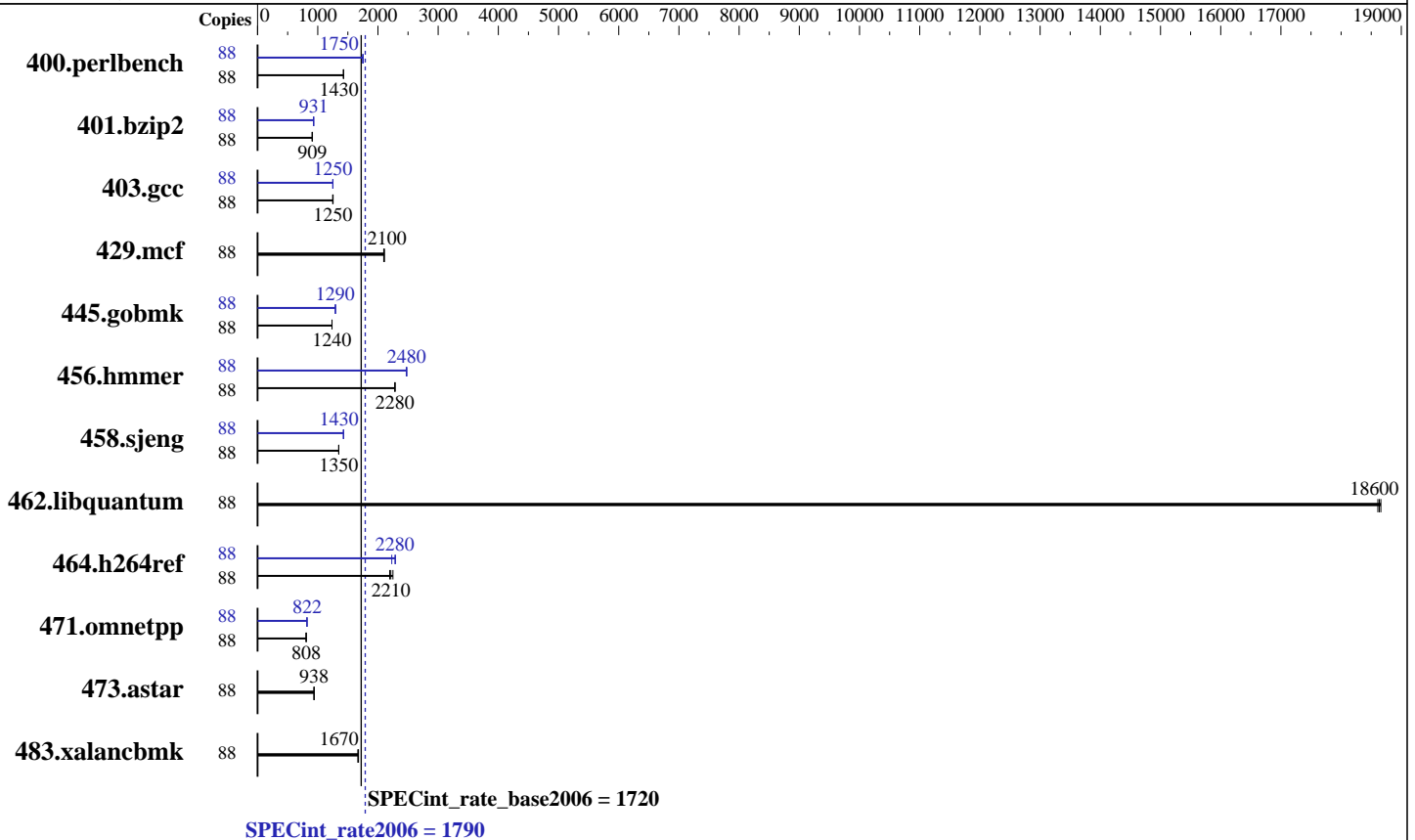
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Results Table

Benchmark	Base						Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
400.perlbench	88	602	1430	**602**	**1430**	603	1430	88	490	1750	492	1750	**492**	**1750**
401.bzip2	88	931	912	937	906	**934**	**909**	88	910	933	912	931	**912**	**931**
403.gcc	88	568	1250	564	1260	**566**	**1250**	88	567	1250	565	1250	**566**	**1250**
429.mcf	88	381	2110	383	2100	**382**	**2100**	88	381	2110	383	2100	**382**	**2100**
445.gobmk	88	746	1240	**746**	**1240**	747	1240	88	712	1300	**714**	**1290**	715	1290
456.hmmer	88	359	2290	**360**	**2280**	360	2280	88	331	2480	**331**	**2480**	332	2470
458.sjeng	88	789	1350	789	1350	**789**	**1350**	88	**746**	**1430**	745	1430	747	1430
462.libquantum	88	**97.8**	**18600**	97.7	18700	98.0	18600	88	**97.8**	**18600**	97.7	18700	98.0	18600
464.h264ref	88	866	2250	887	2190	**879**	**2210**	88	850	2290	**853**	**2280**	873	2230
471.omnetpp	88	683	806	**680**	**808**	680	809	88	**669**	**822**	669	822	672	818
473.astar	88	**659**	**938**	659	938	656	941	88	**659**	**938**	659	938	656	941
483.xalancbmk	88	**363**	**1670**	362	1680	364	1670	88	**363**	**1670**	362	1680	364	1670

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
    runspec command invoked through numactl i.e.:
    numactl --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 Refresh Rate set to 1x Refresh

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Platform Notes (Continued)

```
   Energy Performance Bias set to Maximum Performance
 Sysinfo program /home/specuser/specsuite/ic16/config/sysinfo.rev6914
 $Rev: 6914 $ $Date:: 2014-06-25 #$ e3fbb8667b5a285932ceab81e28219e1
 running on ml350bdwspec Thu Mar  3 09:23:41 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 E5-2699 v4 @ 2.20GHz
       2 "physical id"s (chips)
       88 "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 : 22
       siblings  : 44
       physical 0: cores 0 1 2 3 4 5 8 9 10 11 12 16 17 18 19 20 21 24 25 26 27
       28
       physical 1: cores 0 1 2 3 4 5 8 9 10 11 12 16 17 18 19 20 21 24 25 26 27
       28
    cache size : 28160 KB

 From /proc/meminfo
    MemTotal:       528059244 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)
    system-release-cpe: cpe:/o:redhat:enterprise_linux:7.2:ga:server

 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 Mar 3 09:08

 SPEC is set to: /home/specuser/specsuite/ic16
    Filesystem     Type   Size  Used Avail Use% Mounted on
    /dev/sda5      xfs    318G  162G  157G  51% /home
```
Continued on next page

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Platform Notes (Continued)

```
  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 02/22/2016
    Memory:
    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:
  LD_LIBRARY_PATH = "/home/specuser/specsuite/ic16/libs/32:/home/specuser/specsuite/ic16/libs/64:/home/specuser/specsuite/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
         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
```

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Base Portability Flags (Continued)

   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`

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`

Peak Portability Flags

   400.perlbench: `-D_FILE_OFFSET_BITS=64 -DSPEC_CPU_LP64 -DSPEC_CPU_LINUX_X64`
     401.bzip2: `-D_FILE_OFFSET_BITS=64 -DSPEC_CPU_LP64`
      403.gcc: `-D_FILE_OFFSET_BITS=64`
      429.mcf: `-D_FILE_OFFSET_BITS=64`
   445.gobmk: `-D_FILE_OFFSET_BITS=64`

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Peak Portability Flags (Continued)

```
   456.hmmer: -D_FILE_OFFSET_BITS=64 -DSPEC_CPU_LP64
   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
  471.omnetpp: -D_FILE_OFFSET_BITS=64
    473.astar: -D_FILE_OFFSET_BITS=64
483.xalancbmk: -D_FILE_OFFSET_BITS=64 -DSPEC_CPU_LINUX
```

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
```

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
```

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Peak Optimization Flags (Continued)

471.omnetpp (continued):
```
-L/sh -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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