



SPEC CPU2006 SPECint_rate performance and power consumption on multiprocessor Intel- and AMD-based servers

Executive summary

Intel® Corporation (Intel) commissioned Principled Technologies (PT) to measure the SPEC* CPU2006 performance and power consumption on multiprocessor servers using the following three processors:

- AMD* Opteron* processor 8360 SE
- Intel Xeon® processor X7350
- Intel Xeon processor X7460

SPEC CPU2006 is an industry-standard benchmark created by the Standard Performance Evaluation Corp. (SPEC) to measure a server's compute-intensive performance. The benchmark consequently stresses the CPU and memory subsystems of the system under test. (For more information on SPEC CPU2006 and other SPEC benchmarks, see www.spec.org.)

The SPEC CPU2006 benchmark consists of two benchmark suites, each of which focuses on a different aspect of compute-intensive performance. CINT2006 measures and compares compute-intensive integer performance, while CFP2006 measures and compares compute-intensive floating-point performance. A "rate" version of each, which runs multiple instances of the benchmark to assess server throughput, is also available. We ran only the

CINT2006 SPECint_rate benchmark.

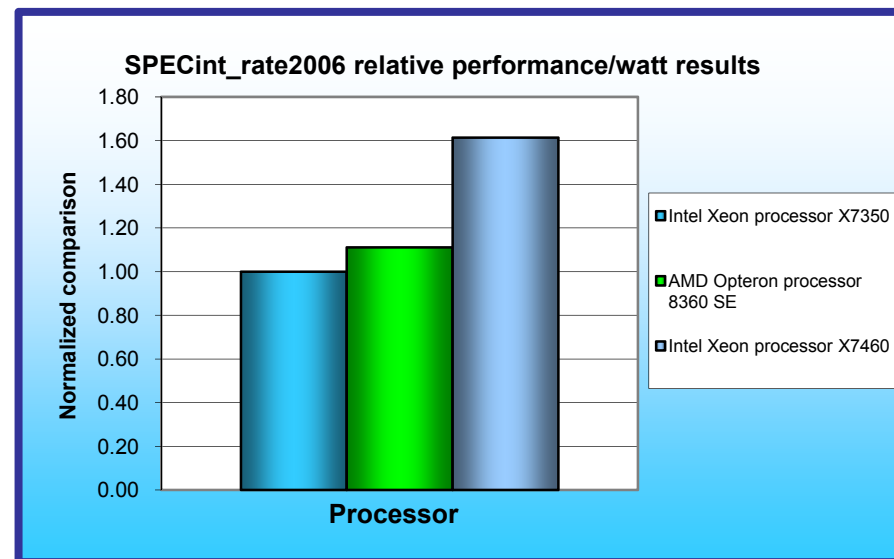


Figure 1: Normalized performance/watt results of the test servers. Higher numbers are better.

KEY FINDINGS

- The Intel Xeon processor X7460-based server delivered 45.1 percent more performance/watt than the AMD Opteron processor 8360 SE-based server and 61.4 percent more performance/watt than the Intel Xeon processor X7350-based server (see Figure 1). (We calculated performance/watt using system-level power measurements.)
- The Intel Xeon processor X7460-based server delivered 44.3 percent higher peak performance than the AMD Opteron processor 8360 SE-based server and 34.6 percent higher peak performance than the Intel Xeon processor X7350-based server (see Figure 2).

In this section, we discuss the best results for each server. For complete details of the performance of each server with varying thread counts, see the Test results section.

Figure 1 illustrates the performance/watt for each of the three servers. In this chart we normalized the results for each system to the system with the lowest performance/watt, which we set to 1.00. By normalizing, we make each data point in these charts a comparative number, with higher results indicating better performance/watt. Thus, higher numbers are better.

To calculate the performance/watt we used the following formula:

$$\frac{\text{benchmark score}}{\text{average power consumption in watts during period of peak performance}}$$

As Figure 1 illustrates, the Intel Xeon processor X7460-based server delivered 45.1 percent more performance/watt than the AMD Opteron processor 8360 SE-based server and 61.4 percent more performance/watt than the Intel Xeon processor X7350-based server.

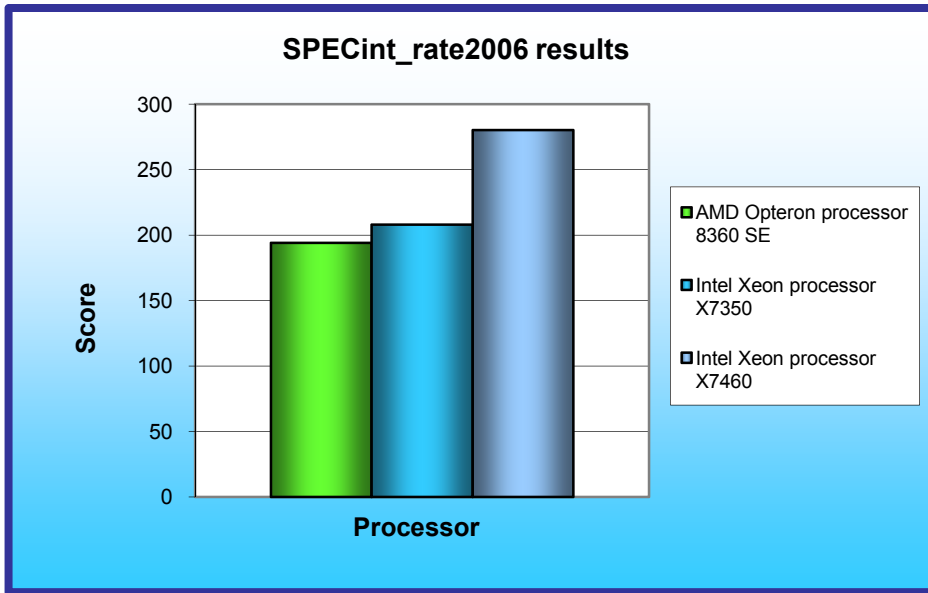


Figure 2 shows the SPECint_rate_2006 peak performance of each server. Intel Xeon processor X7460-based server achieved a score of 280. This is a 44.3 percent performance increase over the AMD Opteron processor 8360 SE-based server, which achieved a score of 194. The Intel Xeon processor X7460-based server showed a 34.6 percent performance increase over the Intel Xeon processor X7350-based server, which achieved a score of 208.

Figure 2: SPECint_rate2006 results of the test servers. Higher numbers are better.

Workload

The SPEC CPU2006 workload includes two benchmark suites: CINT2006 and CFP2006. (Note: SPEC and SPECint are trademarks of the Standard Performance Evaluation Corporation.) We ran only the CINT2006 benchmark, which focuses on measuring and comparing compute-intensive integer performance. Specifically, we measured the SPECint_rate2006 results for the test servers with 16 or 24 users.

Generally the best SPECint_rate2006 score occurs using the same number of users as execution units for a given server. The optimum user count for our testing was 16 users on the AMD Opteron processor 8360 SE-based and Xeon processor X7350-based servers and 24 users on the Intel Xeon processor X7460-based server. The difference in user counts between the servers is due to the different number or execution units (logical or physical processors) on those servers.

Figure 3 lists the 12 applications that compose the CINT2006 benchmark. SPEC wrote nine of the applications in C and three (471.omnetpp, 473.astar, 483.xalanbmk) in C++.

| Name | Application area |
|----------------|--------------------------------|
| 400.perlbench | Programming language |
| 401.bzip2 | Compression |
| 403.gcc | C compiler |
| 429.mcf | Combinatorial optimization |
| 445.gobmk | Artificial intelligence: Go |
| 456.hmmmer | Search gene sequence |
| 458.sjeng | Artificial intelligence: chess |
| 462.libquantum | Physics/quantum computing |
| 464.h264ref | Video compression |
| 471.omnetpp | Discrete event simulation |
| 473.astar | Path-finding algorithms |
| 483.xalanbmk | XML processing |

Figure 3: The applications that make up the CINT2006 benchmark.

A CINT2006 run performs each of the 12 application (tasks) three times and reports the median for each. It also calculates the geometric mean of those 12 results to produce an overall score.

Test results

Figure 4 details the results of our tests with 16 or 24 users for SPECint_rate2006. We determined the number of users based on the number of execution units in a given server. We used the same number of SPECint_rate2006 users as processor execution units, so there is a one-to-one ratio.

SPECint_rate2006 performs three runs of each benchmark in the test suite and records the median, so the final score is a median of three runs. Higher scores are better.

Figure 4 details the power consumption, in watts, of the test servers while idle and during the benchmark. The idle power is an average of a 2-minute power recording while the server was idle. The average power is an average power for the duration of the benchmark run.

| Server | SPECint_rate2006 results | Idle power | Average power |
|---|--------------------------|------------|---------------|
| AMD Opteron 8360 SE-based server | 194 | 449.4 | 733.4 |
| Intel Xeon processor X7350-based server | 208 | 540.5 | 874.3 |
| Intel Xeon processor X7460-based server | 280 | 494.1 | 729.4 |

Figure 4: Power consumption, in watts, of the test servers while idle and during the benchmark.

Test methodology

Figure 5 summarizes some of the key aspects of the configurations of the server systems; Appendix A provides detailed configuration information.

| Server | AMD Opteron processor 8360 SE-based server | Intel Xeon processor X7350-based server | Intel Xeon processor X7460-based server |
|---------------------------------------|---|---|---|
| Processor frequency (GHz) | 2.50 | 2.93 | 2.66 |
| Front-side bus frequency (MHz) | 2,000 with HyperTransport | 1,066 | 1,066 |
| Number of processor packages | 4 | 4 | 4 |
| Number of cores per processor package | 4 | 4 | 6 |
| Number of hardware threads per core | 1 | 1 | 1 |
| Motherboard | HP 013241-001 | Intel S7000FC4UR | Intel S7000FC4UR |
| Chipset | NVIDIA nForce Pro 2050 | Intel ID3600 | Intel ID3600 |
| RAM | Micron MT36HTF25672PY-667D1 ELPIDA EBE21AD4AJFA-6E-E | Kingston KVR667D2D4F5/2G | Kingston KVR667D2D4F5/2G |
| Hard drive | HP DG072BABCE | Seagate ST973401SS | Seagate ST973401SS |

Figure 5: Summary of some key aspects of the server configurations.

Intel configured and provided the two Intel Xeon processor-based servers. PT purchased the AMD Opteron processor-based server.

We used the default BIOS settings on the Intel Xeon processor X7460-based server and the Intel Xeon processor X7350-based server. We used the default BIOS settings on the AMD Opteron processor 8360 SE-based server with one exception, which was to change the HP Power Regulator for ProLiant setting from Dynamic Power Savings Mode to Static Performance Mode.

We began by installing a fresh copy of SUSE Linux* Enterprise Server 10 Service Pack 1. We installed only the default packages and disabled the firewall. We made no additional changes to the default installation options.

SPECCPU2006 configuration

Intel compiled and provided the SPEC CINT2006 executables, but followed SPEC's standard instructions for building the executables using the following software tools for both Intel processor-based servers:

- Intel C/C++ Compiler 11.0.042 for EM64T/MicroQuill SmartHeap v8.1
- MicroQuill SmartHeap v8.1

For the AMD Opteron processor 8360 SE-based server, we followed SPEC's standard instructions for building the CINT2006 executables. After studying the best results for this benchmark on the SPEC Web site, we chose the following software tools:

- Binutils 2.18.50.0.9
- MicroQuill SmartHeap v8.1

- PGI Server Complete 7.2-5
- Pathscale Compiler Suite 3.2

The benchmark requires configuration files. Intel provided the configuration files used for the Intel Xeon processor based servers. For the AMD Opteron 8360 SE-based server, we used a configuration file from a similar test online. From the SPEC Web site, we chose the most recent (as of the testing for this report) SPEC CPU2006 results that used the above compiler. We copied the configuration files for those results and used them, with modifications to reflect the appropriate system information about the server under test, in our testing. The configuration files we used appear in Appendix B.

We report only the base metrics for the SPECint_rate test. SPEC requires the base metrics for all reported results and sets compilation guidelines that testers must follow in building the executables for such tests.

To begin the benchmark, we performed the following steps:

- Open a command prompt.
- Change to the cpu2006 directory.
- Type “. /shrc” at the command prompt.
- Enter “runspec -c <config file name> -r 16 -T base -v 10 int” where
 - <config file name> = name of the configuration file
 - Where 16 = number of users (we used 24 for the Intel Xeon processor X7460-based server)

When the run completes, the benchmark puts the results in the directory /cpu2006/result. The result file names are of the form CINT2006.<number>.<suffix>. The suffixes are html, asc, raw, and pdf. The number is three digits and associates a result file with its log, e.g. CINT2006.002. asc and log.002.

Power measurement procedure

To record each server's power consumption during each test, we used an Extech* Instruments (www.extech.com) 380803 Power Analyzer/Datalogger. We connected the power cord from the server under test to the Power Analyzer's output load power outlet. We then plugged the power cord from the Power Analyzer's input voltage connection into a power outlet.

We used the Power Analyzer's Data Acquisition Software (version 2.11) to capture all recordings. We installed the software on a separate Intel processor-based PC, which we connected to the Power Analyzer via an RS-232 cable. We captured power consumption at 1-second intervals.

To gauge the idle power usage, we recorded the power usage for 2 minutes while each server was running the operating system but otherwise idle.

We then recorded the power usage (in watts) for each server during the testing at 1-second intervals. To compute the average power usage, we averaged the power usage during the time the server was producing its peak performance results. We call this time the power measurement interval. See Figure 4 (idle and average peak power) for the results of these measurements.

Appendix A – Test system configuration information

This appendix provides detailed configuration information about each of the test server systems, which we list in alphabetical order.

| Servers | AMD Opteron processor 8360 SE-based server | Intel Xeon processor X7350-based server | Intel Xeon processor X7460-based server |
|---|---|--|--|
| General processor setup | | | |
| Number of processor packages | 4 | 4 | 4 |
| Number of cores per processor package | 4 | 4 | 6 |
| Number of hardware threads per core | 1 | 1 | 1 |
| System Power Management Policy | Always On | Always On | Always On |
| CPU | | | |
| Vendor | AMD | Intel | Intel |
| Name | Quad-Core Opteron 8360 SE | Quad-Core Intel Xeon X7350 | Intel Xeon X7460 |
| Stepping | 3 | B | 1 |
| Socket type | Socket F (1207) | Socket P (478) | Socket P (478) |
| Core frequency (GHz) | 2.50 | 2.93 | 2.66 |
| Front-side bus frequency (MHz) | 2,000 with HyperTransport | 1,066 | 1,066 |
| L1 cache | 64 KB x 64 KB (per core) | 32 KB + 32 KB (per core) | 32 KB + 32 KB (per core) |
| L2 cache | 4 x 512 KB (512 KB per core) | 2 x 4 MB (each 4 MBs shared by 2 cores) | 3 x 3 MB (each 3 MB shared by 2 cores) |
| L3 cache | 2MB | N/A | 16 MB |
| Platform | | | |
| Vendor and model number | HP DL585 G5 | Intel Fox Cove | Intel Fox Cove |
| Motherboard model number | 013241-001 | S7000FC4UR | S7000FC4UR |
| Motherboard chipset | NVIDIA nForce Pro 2050 | Intel ID3600 | Intel ID3600 |
| Motherboard revision number | 0H | 01 | 01 |
| BIOS name and version | HP A07 (06/27/2008) | Intel SFC4UR.868.01.00.002 4.061320082253 (06/13/2008) | Intel SFC4UR.868.01.00.002 4.061320082253 (06/13/2008) |
| BIOS settings | Power Regulator for ProLiant set to Static Performance Mode | Default | Default |
| Memory module | | | |
| Vendor and model number | 8 x Micron MT36HTF25672PY-667D1, 8 x ELPIDA EBE21AD4AJFA-6E-E | Kingston KVR667D2D4F5/2G | Kingston KVR667D2D4F5/2G |
| Type | PC2-5300 DDR2 | PC2-5300 FB-DDR2 | PC2-5300 FB-DDR2 |
| Speed (MHz) | 667 | 667 | 667 |
| Speed in the system currently running @ (MHz) | 667 | 667 | 667 |

| Servers | AMD Opteron processor 8360 SE-based server | Intel Xeon processor X7350-based server | Intel Xeon processor X7460-based server |
|---------------------------------------|---|--|--|
| Timing/Latency (tCL-tRCD-iRP-tRASmin) | 5-5-5-15 | 5-5-5-15 | 5-5-5-15 |
| Size | 32 GB | 32 GB | 32 GB |
| Number of RAM modules | 16 x 2 GB | 16 x 2 GB | 16 x 2 GB |
| Chip organization | Double-sided | Double-sided | Double-sided |
| Hard disk | | | |
| Vendor and model number | HP DG072BABCE | Seagate ST973401SS | Seagate ST973401SS |
| Number of disks in system | 2 | 2 | 2 |
| Size | 72 GB | 73.4 GB | 73.4 GB |
| Buffer size | 16 MB | 8 MB | 8 MB |
| RPM | 10,000 | 10,000 | 10,000 |
| Type | SAS | SAS | SAS |
| Controller | HP Controller SA5xxx SA6xxx | LSI Logic MegaRAID SAS Driver | LSI Logic MegaRAID SAS Driver |
| Driver version | HP 3.6.14 | LSI 00.00.03.05-SLI | LSI 00.00.03.05-SLI |
| Operating system | | | |
| Name | SUSE Linux Enterprise Server 10 | SUSE Linux Enterprise Server 10 | SUSE Linux Enterprise Server 10 |
| Service Pack | SP 1 | SP 1 | SP 1 |
| File system | reiserfs | reiserfs | reiserfs |
| Kernel release | 2.6.16.46-0.12-smp | 2.6.16.46-0.12-smp | 2.6.16.46-0.12-smp |
| Kernel version | #1 SMP Thu May 17 14:00:09 UTC 2007 | #1 SMP Thu May 17 14:00:09 UTC 2007 | #1 SMP Thu May 17 14:00:09 UTC 2007 |
| Language | English | English | English |
| Graphics | | | |
| Vendor and model number | ATI ES1000 | ATI ES1000 | ATI ES1000 |
| Chipset | ES1000 | ES1000 | ES1000 |
| BIOS version | BK-ATI VER008.005.013.000 | BK-ATI VER008.005.031.000 | BK-ATI VER008.005.031.000 |
| Type | Integrated | Integrated | Integrated |
| Memory size | 32 MB | 32 MB | 32 MB |
| Resolution | 1,024 x 768 | 1,024 x 768 | 1,024 x 768 |
| Network card/subsystem | | | |
| Vendor and model number | Broadcom NetXtreme II BCM5706/5708 | Intel PRO/1000 EB | Intel PRO/1000 EB |
| Type | Integrated | Integrated | Integrated |
| Driver version | 1.5.5b | 7.3.15-k3-NAPI | 7.3.15-k3-NAPI |
| Optical drive | | | |
| Vendor and model number | HL-DT-ST RW/DVD GCC-C10N | Optiarc DVD-ROM DDU810A | Optiarc DVD-ROM DDU810A |
| USB ports | | | |
| Number | 4 | 5 | 5 |
| Type | USB 2.0 | USB 2.0 | USB 2.0 |
| Power supplies | | | |
| Total number | 2 | 2 | 2 |
| Wattage of each | 1,300W | 1,570W | 1570W |

| Servers | AMD Opteron processor 8360 SE-based server | Intel Xeon processor X7350-based server | Intel Xeon processor X7460-based server |
|---------------------|--|---|---|
| Cooling fans | | | |
| Total number | 6 | 8 | 8 |
| Dimensions | 5" x 5" | 4 x 80mm + 4 x 120mm | 4 x 80mm + 4 x 120mm |
| Voltage | 12V | 12V | 12 V |
| Amps | 3.3A | 4 x 1.76 A + 4 x 3.3 A | 4 x 1.76 A + 4 x 3.3 A |

Figure 6: Detailed system configuration information for the three test servers.

Appendix B – SPECint_rate configuration files

This appendix contains the benchmark configuration files we used to test the servers.

SUSE Linux Enterprise Server 10: AMD Opteron processor 8360 SE-based server

```
# Invocation command line:
# /cpu2006/bin/runspec -c hp-cpu2006-1.1-pgi7.2-ps3.2-linux-rate-v1 -r 16 -D -T all int
# output_root was not used for this run
#####
# Invocation command line:
# /cpu2006/bin/runspec --verbose=6 -r 8 -c amd123GH-hp -T all int
# output_root was not used for this run
#####
# AMD64 SPEC CPU2006 Configuration File for 64-bit Linux (Quad-Core)
#
# Compiler name/version:  PGI 7.2, Pathscale 3.2
# Operating system version: 64-bit SLES10 SP1
# Hardware: AMD Opteron (Quad-core)
# FP Base Pointer Size: 64-bit only
# FP Peak Pointer Size: 32/64-bit
# INT Base Pointer Size: 32/64-bit
# INT Peak Pointer Size: 32/64-bit
# Auto Parallization: Not Used
#
# Important! Please run with your stack size set to 'unlimited'.
# Failure to do so may cause 483.xalanbmk to get a stack overflow during execution.
# Using csh: ulimit
# Using bash: ulimit -s unlimited
#
# Set your LD_LIBRARY_PATH to the location of the dependency runtime libraries
#
# Please adjust the SHL_DIR variable to the directory containing the Smartheap library.

#####
# Header Section
#####
ext = hp-proliant-amd
ignore_errors = no
tune = base,peak
output_format = asc,pdf,raw,flags,cfg,html,csv
size = test,train,ref
check_md5 = yes
reportable = yes
env_vars = no
mean_anyway = yes
verbose = 6
# Adjust the make jobs flag for the number of cores.
makeflags = -j 4

#####
# Macro section
#####
# Modify this section to use the appropriate architecture flags

%define pgi_tp64 -tp barcelona-64
%define pgi_tp32 -tp barcelona

# Change this to 150 (Huge Pages=hp) for systems with 2GB of memory per copy
%define pgi_hp 120
%define pgi_sys_hp 1200

# Adjust the build jobs to the number of concurrent build processes
%define build_jobs 4

#####PATHSCALE MACRO notes
# If you are building and running on a Linux distro that
# uses the GCC v3.x compilers by default, then you need to either
```

```

# use "--define gnu3_fe" on the runspec command line or uncomment
# the "%define gnu3_fe" line below:
#
# %define gnu4_fe
# %define gnu3_fe
#
# gnu4_fe is the default, so really does not need to be defined.

flagsurl000= http://www.spec.org/cpu2006/flags/hp-PGI72-PS32-flags.20080722.xml

#####
# Include file containing the SUT hardware information
# as well as the submit command, tester information and notes
#####
#include: hp-barcelona.inc
# ---- Begin inclusion of 'hp-barcelona.inc'
#####
#####
# Submit Section
#####

# RATE
#This config file is set to run these binaries on a 2P, 8 core system. If this
#does not match the description of your system, change this config file,
#specifically "bind0","bind1","bind2", etc. to match your system. Use
#"man numactl" and "numactl --hardware" to better understand how to use
#this command.

bind0    = numactl -m 0 --physcpubind=0
bind1    = numactl -m 1 --physcpubind=1
bind2    = numactl -m 2 --physcpubind=2
bind3    = numactl -m 3 --physcpubind=3
bind4    = numactl -m 0 --physcpubind=4
bind5    = numactl -m 1 --physcpubind=5
bind6    = numactl -m 2 --physcpubind=6
bind7    = numactl -m 3 --physcpubind=7
bind8    = numactl -m 0 --physcpubind=8
bind9    = numactl -m 1 --physcpubind=9
bind10   = numactl -m 2 --physcpubind=10
bind11   = numactl -m 3 --physcpubind=11
bind12   = numactl -m 0 --physcpubind=12
bind13   = numactl -m 1 --physcpubind=13
bind14   = numactl -m 2 --physcpubind=14
bind15   = numactl -m 3 --physcpubind=15

# SPEED
# Below is an example numactl command for a speed run using
# 4 threads on a single Quad-core chip.
# Please adjust as needed for your system
#
# bind0    = numactl -l --physcpubind=0,1,2,3,4,5,6,7
# use_submit_for_speed = 1

submit    = echo "$command" > run.sh ; $BIND bash run.sh

#####
# Tester information
#####
default=default=default=default:
license_num    = 3
prepared_by    = Hewlett-Packard Company
test_sponsor   = Hewlett-Packard Company
tester         = Hewlett-Packard Company
#####

```

```

# Hardware information
#####
hw_cpu_name = AMD Opteron 8360 SE
hw_cpu_mhz = 2500
hw_disk = 2x72 GB SAS 10,000 RPM
hw_fpu = Integrated
hw_memory = 32 GB (16x2 GB, PC2-5300)
hw_vendor = Hewlett-Packard Company
hw_model000 = ProLiant DL585 G5
hw_model001 = (2.5 GHz AMD Opteron 8360 SE)
hw_avail = Jul-2008
hw_nchips = 4
hw_ncores = 16
hw_ncoresperchip= 4
hw_nthreadspercore = 1
hw_ncpuorder = 2,4 chips
hw_pcache = 64 KB I + 64 KB D on chip per core
hw_scache = 512 KB I+D on chip per core
hw_tcache = 2 MB I+D on chip per chip
hw_ocache = None
hw_other = None
sw_file = reiserfs
sw_os000 = SUSE Linux Enterprise Server 10 (x86_64) SP1,
sw_os001 = Kernel 2.6.16.46-0.12-smp
sw_state = Run level 3 (multi-user)

```

```
#####
```

```
# Notes
```

```
#####
```

```
int=default=default=default:
```

```
notes_os_000 = Environment stack size set to 'unlimited'
```

```
notes_os_005 = Max locked memory set to 2097152
```

```
notes_plat_000 =BIOS configuration:
```

```
notes_plat_005 = Power Regulator set to Static High Performance Mode
```

```
notes_os_010 = PGI_HUGE_PAGES set to 120.
```

```
notes_os_015 = Total number of huge pages available is 1950.
```

```
notes_os_020 = NCPUS set to number of cores
```

```
notes_submit_000 = numactl used to bind processes to CPUs
```

```
fp=default=default=default:
```

```
notes_os_000 = Environment stack size set to 'unlimited'
```

```
notes_os_005 = Max locked memory set to 2097152
```

```
notes_plat_000 =BIOS configuration:
```

```
notes_plat_005 = Power Regulator set to Static High Performance Mode
```

```
notes_os_010 = PGI_HUGE_PAGES set to 896.
```

```
notes_os_015 = Total number of huge pages available is 14336.
```

```
notes_os_020 = NCPUS set to number of cores
```

```
notes_submit_000 = numactl used to bind processes to CPUs
```

```
# ---- End inclusion of '/cpu2006/config/hp-barcelona.inc'
```

```
##### Software Info #####
```

```
fp=default=default=default:
```

```
sw_peak_ptrsize = 32/64-bit
```

```
sw_base_ptrsize = 64-bit
```

```
sw_avail = Jun-2008
```

```
sw_compiler1 = PGI Server Complete Version 7.2
```

```
sw_compiler2 = PathScale Compiler Suite Release 3.2
```

```
int=default=default=default:
```

```
sw_peak_ptrsize = 32/64-bit
```

```
sw_base_ptrsize = 32/64-bit
```

```
sw_other000 = binutils-2.18.50
```

```
sw_other001 = SmartHeap 8.1 32-bit Library for Linux
```

```
sw_avail = Jun-2008
```

sw_compiler000 = PGI Server Complete Version 7.2
sw_compiler001 = PathScale Compiler Suite Release 3.2

```
default=default=default=default:
#####
# Compiler selection
# default compiler is PGI
#
CC      = pgcc
CXX     = pgcpp
FC      = pgf95

SHL_DIR = /cpu2006/SmartHeap_8.1/lib

#####
# Optimization
#####
default=base=default=default:
EXTRA_LDFLAGS = -Bstatic_pgi

fp=base=default=default:
COPTIMIZE  = -fastsse -Msmartalloc=huge:%{pgi_hp} -Mfprelaxed -Mipa=jobs:%{build_jobs},fast,inline %{pgi_tp64}
FOPTIMIZE  = -fastsse -Mfprelaxed -Msmartalloc=huge:%{pgi_hp} -Mipa=jobs:%{build_jobs},fast,inline %{pgi_tp64}
CXXOPTIMIZE = -fastsse -Msmartalloc=huge:%{pgi_hp} -Mfprelaxed --zc_eh -Mipa=jobs:%{build_jobs},fast,inline %{pgi_tp64}

int=base=default=default:
COPTIMIZE  = -fastsse -Msmartalloc=huge:%{pgi_hp} -Mfprelaxed -Mipa=jobs:%{build_jobs},fast,inline %{pgi_tp64}
CXXOPTIMIZE = -fastsse -Msmartalloc=huge:%{pgi_hp} -Mfprelaxed --zc_eh -Mipa=jobs:%{build_jobs},fast,inline %{pgi_tp32}

#####
## FP Peak Flags
#####
fp=peak=default=default:
EXTRA_LIBS =
feedback   = 0
basepeak   = 0

410.bwaves=peak=default=default:
EXTRA_LDFLAGS = -Bstatic_pgi
FC           = pgf95
FOPTIMIZE    = -fastsse -Msmartalloc -Mprefetch=distance:12,nta -Mpre -Mfprelaxed %{pgi_tp64}
PASS1_FFLAGS = -Mphi
PASS1_LDFLAGS = -Mphi
PASS2_FFLAGS = -Mipa=jobs:%{build_jobs},fast,inline -Mpf
PASS2_LDFLAGS = -Mipa=jobs:%{build_jobs},fast,inline -Mpf
feedback     = 1

416.gamess=peak=default=default:
FC           = pathf95 -march=barcelona
FOPTIMIZE    = -O2 -OPT:Ofast:ro=3:unroll_size=256
PASS1_FFLAGS = -fb_create fbdata
PASS2_FFLAGS = -fb_opt fbdata
PASS1_LDFLAGS = -fb_create fbdata
PASS2_LDFLAGS = -fb_opt fbdata
feedback     = 1

433.milc=peak=default=default:
EXTRA_LDFLAGS = -Bstatic_pgi
CC           = pgcc
COPTIMIZE    = -fastsse -Msmartalloc=huge:%{pgi_hp} -Msafeptr -Mfprelaxed -Mipa=jobs:%{build_jobs},inline,arg,const,ptr,shape
%{pgi_tp64}

434.zeusmp=peak=default=default:
EXTRA_LDFLAGS = -Bstatic_pgi
FC           = pgf95
FOPTIMIZE    = -fastsse -Mfprelaxed -Msmartalloc=huge:150 -Mipa=jobs:%{build_jobs},fast,inline %{pgi_tp64}
basepeak     = 1

435.gromacs=peak=default=default:
```

```

EXTRA_LDFLAGS = -Bstatic_pgi
FC           = pgf95
CC           = pgcc
FOPTIMIZE   = -fastsse -Msmartalloc=huge:%{pgi_hp} -Mfprelaxed -Mfpapprox=rsqrt -Mipa=jobs:%{build_jobs},fast,inline %{pgi_tp64}
COPTIMIZE   = -fastsse -Msmartalloc=huge:%{pgi_hp} -Mfprelaxed -Mfpapprox=rsqrt -Mipa=jobs:%{build_jobs},fast,inline %{pgi_tp64}

```

```

436.cactusADM=peak=default=default:
CC           = pathcc -march=barcelona
FC           = pathf95 -march=barcelona
COPTIMIZE   = -Ofast -LNO:blocking=off
FOPTIMIZE   = -Ofast -LNO:blocking=off
PASS1_CFLAGS = -fb_create fbdata
PASS2_CFLAGS = -fb_opt fbdata
PASS1_FFLAGS = -fb_create fbdata
PASS2_FFLAGS = -fb_opt fbdata
PASS1_LDFLAGS = -fb_create fbdata
PASS2_LDFLAGS = -fb_opt fbdata
feedback    = 1

```

```

437.leslie3d=peak=default=default:
FC           = pgf95
EXTRA_LDFLAGS = -Bstatic_pgi
FOPTIMIZE   = -fastsse -Mvect=fuse -Msmartalloc=huge:%{pgi_hp} -Mprefetch=distance:8,t0 -Mfprelaxed %{pgi_tp64}
PASS1_FFLAGS = -Mpf=indirect
PASS1_LDFLAGS = -Mpf=indirect
PASS2_FFLAGS = -Mpfo=indirect -Mipa=jobs:%{build_jobs},fast,inline
PASS2_LDFLAGS = -Mpfo=indirect -Mipa=jobs:%{build_jobs},fast,inline
feedback    = 1

```

```

444.namd=peak=default=default:
EXTRA_LDFLAGS = -Bstatic_pgi
CXX          = pgcpp
CXXOPTIMIZE  = -fastsse -Munroll=n:4,m:8 -Msmartalloc=huge:%{pgi_hp} -Mnodepchk -Mfprelaxed --zc_eh %{pgi_tp64}
PASS1_CXXFLAGS = -Mpf
PASS1_LDFLAGS = -Mpf
PASS2_CXXFLAGS = -Mipa=jobs:%{build_jobs},fast,inline -Mpfo
PASS2_LDFLAGS = -Mipa=jobs:%{build_jobs},fast,inline -Mpfo
feedback    = 1

```

```

447.deall=peak=default=default:
CXX          = pathCC -march=barcelona
# Needed to avoid -DSPEC_CPU_LP64
PORTABILITY =
%ifdef %gnu3_fe
CXXOPTIMIZE = -Ofast -INLINE:aggressive=on -LNO:opt=0 -OPT:alias=disjoint -m32 -fno-exceptions
%else
CXXOPTIMIZE = -Ofast -static -INLINE:aggressive=on -fno-exceptions -m32
LDCXXFLAGS  = -lm
%endif

```

```

450.soplex=peak=default=default:
CXX          = pathCC -march=barcelona
CXXOPTIMIZE  = -m32 -O3 -TENV:frame_pointer=off -LNO:prefetch=1 -OPT:malloc_alg=1 -CG:load_exe=0
# Needed to avoid -DSPEC_CPU_LP64
PORTABILITY =
PASS1_CXXFLAGS = -fb_create fbdata
PASS2_CXXFLAGS = -fb_opt fbdata
PASS1_LDFLAGS = -fb_create fbdata
PASS2_LDFLAGS = -fb_opt fbdata
feedback    = 1

```

```

453.povray=peak=default=default:
CXX          = pathCC -march=barcelona
CXXOPTIMIZE  = -Ofast
PASS1_CXXFLAGS = -fb_create fbdata
PASS2_CXXFLAGS = -fb_opt fbdata
PASS1_LDFLAGS = -fb_create fbdata
PASS2_LDFLAGS = -fb_opt fbdata
feedback    = 1

```

```

454.calculix=peak=default=default:
CC      = pgcc
FC      = pgf95
EXTRA_LDFLAGS = -Bstatic_pgi
FOPTIMIZE  = -fastsse -Msmartalloc=huge:%{pgi_hp} -Mprefetch=t0 -Mpre -Mfprelaxed %{pgi_tp64}
COPTIMIZE  = -fastsse -Msmartalloc=huge:%{pgi_hp} -Mprefetch=t0 -Mpre -Mfprelaxed %{pgi_tp64}
PASS1_FFLAGS = -Mphi=indirect
PASS1_CFLAGS = -Mphi=indirect
PASS1_LDFLAGS = -Mphi=indirect
PASS2_FFLAGS = -Mpfo=indirect -Mipa=jobs:%{build_jobs},fast,inline
PASS2_CFLAGS = -Mpfo=indirect -Mipa=jobs:%{build_jobs},fast,inline
PASS2_LDFLAGS = -Mpfo=indirect -Mipa=jobs:%{build_jobs},fast,inline
feedback   = 1
459.GemsFDTD=peak=default=default:
FC      = pathf95 -march=barcelona
FOPTIMIZE  = -Ofast -LNO:fission=2:simd=2:prefetch Ahead=1 -CG:load_exe=0

465.tonto=peak=default=default:
FC      = pathf95 -march=barcelona
FOPTIMIZE  = -Ofast -OPT:alias=no_f90_pointer_alias -LNO:blocking=off -CG:load_exe=1 -IPA:plimit=525

470.lbm=peak=default=default:
CC      = pathcc -march=barcelona
COPTIMIZE  = -Ofast -CG:sse_cse_regs=0 -CG:locs_shallow_depth=1 -m3dnow

481.wrf=peak=default=default:
EXTRA_LDFLAGS = -Bstatic_pgi
CC      = pgcc
FC      = pgf95
FOPTIMIZE  = -fastsse -Mvect=noaltcode -Msmartalloc -Mprefetch=distance:8 -Mfprelaxed %{pgi_tp64}
COPTIMIZE  = -fastsse -Mvect=noaltcode -Msmartalloc -Mprefetch=distance:8 -Mfprelaxed %{pgi_tp64}

482.sphinx3=peak=default=default:
CC      = pgcc
EXTRA_LDFLAGS = -Bstatic_pgi
COPTIMIZE  = -fastsse -Mfprelaxed -Msmartalloc %{pgi_tp64}
PASS1_CFLAGS = -Mphi=indirect
PASS1_LDFLAGS = -Mphi=indirect
PASS2_CFLAGS = -Mpfo=indirect -Mipa=jobs:%{build_jobs},fast,inline
PASS2_LDFLAGS = -Mpfo=indirect -Mipa=jobs:%{build_jobs},fast,inline
feedback   = 1

#####
## INT Peak Flags
#####
int=peak=default=default:
EXTRA_LIBS =
feedback   = 0
basepeak   = 0

400.perlbench=peak=default=default:
CC      = pathcc -march=barcelona
COPTIMIZE  = -Ofast -IPA:plimit=20000 -LNO:opt=0 -WOPT:if_conv=0 -CG:local_sched_alg=1
PASS1_CFLAGS = -fb_create fbdata
PASS1_LDFLAGS = -fb_create fbdata
PASS2_CFLAGS = -fb_opt fbdata
PASS2_LDFLAGS = -fb_opt fbdata
feedback   = 1

401.bzip2=peak=default=default:
CC      = pgcc
EXTRA_LDFLAGS = -Bstatic_pgi
COPTIMIZE  = -fastsse -O4 -Msmartalloc=huge:%{pgi_hp} -Mprefetch=t0 -Mnounroll %{pgi_tp64}
PASS1_CFLAGS = -Mphi=indirect
PASS1_LDFLAGS = -Mphi=indirect
PASS2_CFLAGS = -Mpfo=indirect
PASS2_LDFLAGS = -Mpfo=indirect
feedback   = 1

```

```

403.gcc=peak=default=default:
CC      = pathcc -march=barcelona
PORTABILITY =
COPTIMIZE = -m32 -O3 -OPT:Ofast
PASS1_CFLAGS = -fb_create fbdata
PASS1_LDFLAGS = -fb_create fbdata
PASS2_CFLAGS = -fb_opt fbdata
PASS2_LDFLAGS = -fb_opt fbdata
feedback = 1

429.mcf=peak=default=default:
EXTRA_LDFLAGS = -Bstatic_pgi
CC      = pgcc
COPTIMIZE = -fastsse -Msmartalloc=huge:%{pgi_hp} -Mipa=jobs:%{build_jobs},fast,inline:1 %{pgi_tp32}

445.gobmk=peak=default=default:
CC      = pathcc -march=barcelona
COPTIMIZE = -O3 -OPT:alias=restrict -LNO:prefetch=1:ignore_feedback=off -CG:p2align=on
PASS1_CFLAGS = -fb_create fbdata
PASS1_LDFLAGS = -fb_create fbdata
PASS2_CFLAGS = -fb_opt fbdata
PASS2_LDFLAGS = -fb_opt fbdata
feedback = 1

456.hmmmer=peak=default=default:
EXTRA_LDFLAGS = -Bstatic_pgi
CC      = pgcc
COPTIMIZE = -fastsse -Mvect=partial -Munroll=n:8 -Msmartalloc=huge:%{pgi_hp} -Msafeptr -Mprefetch=t0 -Mfprelaxed -
Mipa=jobs:%{build_jobs},const,ptr,arg,inline %{pgi_tp64}

458.sjeng=peak=default=default:
EXTRA_LDFLAGS = -Bstatic_pgi
CC      = pgcc
COPTIMIZE = -fastsse -Msmartalloc=huge:%{pgi_hp} -Mfprelaxed %{pgi_tp64}
PASS1_CFLAGS = -Mpfi
PASS1_LDFLAGS = -Mpfi
PASS2_CFLAGS = -Mipa=jobs:%{build_jobs},fast,inline:1,noarg -Mpfo
PASS2_LDFLAGS = -Mipa=jobs:%{build_jobs},fast,inline:1,noarg -Mpfo
feedback = 1

462.libquantum=peak=default=default:
EXTRA_LDFLAGS = -Bstatic_pgi
CC      = pgcc
COPTIMIZE = -fastsse -Munroll=m:8 -Msmartalloc=huge:%{pgi_hp} -Mprefetch=distance:4 -Mfprelaxed -
Mipa=jobs:%{build_jobs},fast,inline,noarg %{pgi_tp64}

464.h264ref=peak=default=default:
CC      = pathcc -march=barcelona
COPTIMIZE = -O3 -IPA:plimit=20000 -OPT:alias=disjoint -LNO:prefetch=0 -CG:ptr_load_use=0:push_pop_int_saved_regs=off
PASS1_CFLAGS = -fb_create fbdata
PASS1_LDFLAGS = -fb_create fbdata
PASS2_CFLAGS = -fb_opt fbdata
PASS2_LDFLAGS = -fb_opt fbdata
feedback = 1

471.omnetpp=peak=default=default:
CXX     = pathCC -march=barcelona
CXXOPTIMIZE = -Ofast -CG:gcm=off -INLINE:aggressive=on -OPT:alias=disjoint -WOPT:if_conv=0 -m32
EXTRA_CXXLIBS = -L$(SHL_DIR) -lsmartheap

473.astar=peak=default=default:
EXTRA_LDFLAGS = -Bstatic_pgi
CXX     = pgccpp
CXXOPTIMIZE = -fastsse -O4 -Msmartalloc=huge:%{pgi_hp} -Msafeptr=global -Mfprelaxed --zc_eh %{pgi_tp32}
PASS1_CXXFLAGS = -Mpfi
PASS1_LDFLAGS = -Mpfi
PASS2_CXXFLAGS = -Mpfo -Mipa=jobs:%{build_jobs},fast,inline:6
PASS2_LDFLAGS = -Mpfo -Mipa=jobs:%{build_jobs},fast,inline:6

```

```

feedback    = 1

483.xalancbmk=peak=default=default:
CXX        = pathCC -march=barcelona
CXXOPTIMIZE = -Ofast -m32 -OPT:unroll_times_max=8 -CG:push_pop_int_saved_regs=off:ptr_load_use=0
EXTRA_CXXLIBS = -L$(SHL_DIR) -lsmartheap

#####
# Portability
#####

fp=default=default=default:
PORTABILITY = -DSPEC_CPU_LP64

int=default=default=default:
CPORTABILITY = -DSPEC_CPU_LP64

400.perlbench=default=default=default:
CPORTABILITY = -DSPEC_CPU_LP64 -DSPEC_CPU_LINUX_X64

403.gcc=peak=default=default:
CPORTABILITY =

429.mcf=peak=default=default:
CPORTABILITY =

435.gromacs=default=default=default:
LDPORTABILITY = -Mnomain

436.cactusADM=base=default=default:
LDPORTABILITY = -Mnomain

436.cactusADM=peak=default=default:
FPORTABILITY = -fno-second-underscore

454.calculix=default=default=default:
LDPORTABILITY = -Mnomain

447.deall=peak=default=default:
%ifdef % {gnu3_fe}
447.deall=default=default:
CXXPORTABILITY = -DSPEC_CPU_TABLE_WORKAROUND
%else
447.deall=default=default:
CXXPORTABILITY =
%endif

450.soplex=peak=default=default:
# Needed to avoid -DSPEC_CPU_LP64
PORTABILITY =

462.libquantum=default=default=default:
CPORTABILITY = -DSPEC_CPU_LP64 -DSPEC_CPU_LINUX

471.omnetpp=peak=default=default:
# Needed to avoid -DSPEC_CPU_LP64 on -m32 C++ base codes
PORTABILITY =

481.wrf=default=default=default:
CPORTABILITY = -DSPEC_CPU_CASE_FLAG -DSPEC_CPU_LINUX

483.xalancbmk=default=default:
CXXPORTABILITY = -DSPEC_CPU_LINUX
# Needed to avoid -DSPEC_CPU_LP64 on -m32 C++ base codes
PORTABILITY =

```


SUSE Linux Enterprise Server 10: Intel Xeon X7350-based server

```
#####
# This is a sample config file. It was tested with:
#
# Compiler name/version: Intel Compiler 11.0
# Operating system version: 64-Bit SUSE LINUX Enterprise Server 10 or later
# Hardware: Intel Core 2 and compatible Intel processors
# supporting Intel 64 and SSSE3
#
#####
# SPEC CPU2006 Intel Linux64 config file
# July 2008 Intel Compiler 11.0 for Linux64
#####
action = validate
tune = base
ext = cpu2006.1.1.ic11.0.linux64.core2.rate
PATHSEP = /
check_md5=1
reportable=1

#
# These are listed as benchmark-tuning-extension-machine
#
default=default=default=default:
CC = icc
CXX = icpc
FC=ifort
OBJ = .o
SMARTHEAP_DIR = /spec/cpu2006.1.1/lib

submit= MYMASK='printf '0x%x' \${(1<<\$SPECCOPYNUM)}'; taskset \$MYMASK $command

#####
# Compiler options
# for Dunnington use -xSSE4.1
# for processors prior to dunnington, replace -xSSE4.1 with -xSSSE3
#####
SSE = -xSSSE3
FAST = $(SSE) -ipo -O3 -no-prec-div -static
FASTNOSTATIC = $(SSE) -ipo -O3 -no-prec-div

#####
#
# portability & libraries
#
##### Portability Flags and Notes #####

400.perlbench=default:
CPORTABILITY= -DSPEC_CPU_LINUX_IA32

403.gcc=default:
EXTRA_CFLAGS= -Dalloca=_alloca

462.libquantum=default:
CPORTABILITY= -DSPEC_CPU_LINUX

483.xalanbmk=default:
CXXPORTABILITY= -DSPEC_CPU_LINUX

fp=default:
PORTABILITY = -DSPEC_CPU_LP64

435.gromacs=default=default=default:
LDPORTABILITY = -nofor_main

436.cactusADM=default=default=default:
```

LDPORTABILITY = -nofor_main

454.calculix=default=default=default:
LDPORTABILITY = -nofor_main

481.wrf=default=default=default:
CPORTABILITY = -DSPEC_CPU_CASE_FLAG -DSPEC_CPU_LINUX

Tuning Flags

#####

Base tuning default optimization
Feedback directed optimization not allowed in baseline for CPU2006
However there is no limit on the number of flags as long as the same
flags are used in the same order for all benchmarks of a given language

471.omnetpp,473.aster,483.xalanbmk=default:
EXTRA_LIBS= -L\$(SMARTHEAP_DIR) -lsmartheap
EXTRA_LDFLAGS= -WI,-z,muldefs

int=base=default=default:
COPTIMIZE= \$(FAST) -inline-calloc -opt-malloc-options=3 -opt-prefetch
CXXOPTIMIZE= \$(FASTNOSTATIC) -opt-prefetch

fp=base=default=default:
OPTIMIZE= \$(FAST) -opt-prefetch

#####

Peak Tuning Flags int 2006 fast

#####

int=peak=default:
COPTIMIZE= \$(FAST) -opt-prefetch
CXXOPTIMIZE= \$(FASTNOSTATIC) -opt-prefetch
PASS1_CFLAGS = -prof-gen
PASS2_CFLAGS = -prof-use
PASS1_CXXFLAGS = -prof-gen
PASS2_CXXFLAGS = -prof-use
PASS1_LDFLAGS = -prof-gen
PASS2_LDFLAGS = -prof-use

400.perlbench=peak=default:
COPTIMIZE= \$(FAST) -ansi-alias -opt-prefetch

401.bzip2=peak=default:
CC= /opt/intel/Compiler/11.0/042/bin/intel64/icc -L/opt/intel/Compiler/11.0/042/ipp/em64t/lib -I/opt/intel/Compiler/11.0/042/ipp/em64t/include
CPORTABILITY= -DSPEC_CPU_LP64
COPTIMIZE= \$(FAST) -opt-prefetch -ansi-alias

403.gcc=peak=default:
COPTIMIZE = \$(FAST) -inline-calloc -opt-malloc-options=3
feedback=0

429.mcf=peak=default:
COPTIMIZE= \$(FAST) -opt-prefetch

445.gobmk=peak=default:
COPTIMIZE= \$(SSE) -O2 -ipo -no-prec-div -ansi-alias

456.hmmer=peak=default:
CC= /opt/intel/Compiler/11.0/042/bin/intel64/icc -L/opt/intel/Compiler/11.0/042/ipp/em64t/lib -I/opt/intel/Compiler/11.0/042/ipp/em64t/include
CPORTABILITY= -DSPEC_CPU_LP64
COPTIMIZE= \$(FAST) -unroll2 -ansi-alias
feedback=no

458.sjeng=peak=default:
COPTIMIZE= \$(FAST) -unroll4

```

462.libquantum=peak=default:
COPTIMIZE= $(FAST) -opt-malloc-options=3 -parallel -par-runtime-control -opt-prefetch
feedback=no
copies=1
submit=

464.h264ref=peak=default:
COPTIMIZE= $(FAST) -unroll2 -ansi-alias

471.omnetpp=peak=default:
CXXOPTIMIZE= $(FASTNOSTATIC) -ansi-alias -opt-ra-region-strategy=block

473.astar=peak=default:
CXXOPTIMIZE= $(FASTNOSTATIC) -ansi-alias -opt-ra-region-strategy=routine

483.xalancbmk=peak=default:
basepeak=yes

#####
# Peak Tuning Flags for FP
#####
fp=peak=default:
OPTIMIZE= $(FAST)
COPTIMIZE= -auto-ilp32
CXXOPTIMIZE= -auto-ilp32
PASS1_CFLAGS = -prof-gen
PASS2_CFLAGS = -prof-use
PASS1_CXXFLAGS = -prof-gen
PASS2_CXXFLAGS = -prof-use
PASS1_FFLAGS = -prof-gen
PASS2_FFLAGS = -prof-use
PASS1_LDFLAGS = -prof-gen
PASS2_LDFLAGS = -prof-use

410.bwaves=peak=default:
OPTIMIZE= $(FAST) -opt-prefetch
feedback=0
#####
#####
%ifdef %{stoakleydp8cores}
copies=4
submit= if `test $SPECCOPYNUM -le 1`; then taskset -c $SPECCOPYNUM $command ; else taskset -c `expr $SPECCOPYNUM + 4`
$command ; fi
%endif
#####
#####

416.games=peak=default:
OPTIMIZE= $(FAST) -unroll2 -Ob0 -ansi-alias -scalar-rep-

433.milc=peak=default:
OPTIMIZE= $(FAST) -fno-alias
COPTIMIZE=

435.gromacs=peak=default:
OPTIMIZE= $(FAST) -opt-prefetch

436.cactusADM=peak=default:
OPTIMIZE= $(FAST) -unroll2 -opt-prefetch -parallel
copies=1
submit=

437.leslie3d=peak=default:
PORTABILITY =
FC= /opt/intel/Compiler/11.0/042/bin/ia32/fort -L/opt/intel/Compiler/11.0/042/ipp/ia32/lib -l/opt/intel/Compiler/11.0/042/ipp/ia32/include
OPTIMIZE= $(FAST) -opt-malloc-options=3 -opt-prefetch
#####
#####

```

```

%ifdef %{stoakleydp8cores}
copies=4
submit= if `test $SPECCOPYNUM -le 1`; then taskset -c $SPECCOPYNUM $command ; else taskset -c `expr $SPECCOPYNUM + 4`
$command ; fi
%endif
#####
#####

444.namd=peak=default:
CXXOPTIMIZE= $(FAST) -fno-alias -auto-ilp32

447.deall=peak=default:
CXXOPTIMIZE= $(FAST) -unroll2 -ansi-alias -scalar-rep-

450.soplex=peak=default:
PORTABILITY =
CXX= /opt/intel/Compiler/11.0/042/bin/ia32/icpc -L/opt/intel/Compiler/11.0/042/ipp/ia32/lib -l/opt/intel/Compiler/11.0/042/ipp/ia32/include
OPTIMIZE= $(FAST) -opt-malloc-options=3
CXXOPTIMIZE=

453.povray=peak=default:
CXXOPTIMIZE= $(FAST) -unroll4 -ansi-alias

454.calculix=peak=default:
OPTIMIZE= $(FAST)
feedback=0

459.GemsFDTD=peak=default:
OPTIMIZE= $(FAST) -unroll2 -Ob0 -opt-prefetch

465.tonto=peak=default:
OPTIMIZE= $(FAST) -unroll4 -auto

470.lbm=peak=default:
OPTIMIZE= $(FAST) -opt-prefetch
feedback=no

#####
#####
%ifdef %{bensleydp8cores}
copies=2
submit= if `test $SPECCOPYNUM -le 0`; then taskset -c $SPECCOPYNUM $command ; else taskset -c `expr $SPECCOPYNUM + 4`
$command ; fi
%endif

%ifdef %{stoakleydp8cores}
copies=4
submit= if `test $SPECCOPYNUM -le 1`; then taskset -c $SPECCOPYNUM $command ; else taskset -c `expr $SPECCOPYNUM + 4`
$command ; fi
%endif

%ifdef %{tgt4p16cores}
copies=8
submit= if `test $SPECCOPYNUM -le 3`; then taskset -c $SPECCOPYNUM $command ; else taskset -c `expr $SPECCOPYNUM + 8`
$command ; fi
%endif

%ifdef %{dgt4p24cores}
copies=12
submit= $[top]/mysubmit.pl $SPECCOPYNUM "$command"
%endif

%ifdef %{dgt4p16cores}
copies=8
submit= $[top]/mysubmit.pl $SPECCOPYNUM "$command"
%endif
#####
#####

```

481.wrf=peak=default:
basepeak=yes

482.sphinx3=peak=default:
PORTABILITY =
CC= /opt/intel/Compiler/11.0/042/bin/ia32/icc -L/opt/intel/Compiler/11.0/042/ipp/ia32/lib -I/opt/intel/Compiler/11.0/042/ipp/ia32/include
COPTIMIZE= -unroll2
feedback=no

```
#####  
#####  
%ifdef %{stoakleydp8cores}  
copies=4  
submit= if `test $SPECCOPYNUM -le 1`; then taskset -c $SPECCOPYNUM $command ; else taskset -c `expr $SPECCOPYNUM + 4`  
$command ; fi  
%endif  
  
%ifdef %{tgt4p16cores}  
copies=8  
submit= if `test $SPECCOPYNUM -le 3`; then taskset -c $SPECCOPYNUM $command ; else taskset -c `expr $SPECCOPYNUM + 8`  
$command ; fi  
%endif  
  
%ifdef %{dgt4p24cores}  
copies=12  
submit= $[top]/mysubmit.pl $SPECCOPYNUM "$command"  
%endif  
  
%ifdef %{dgt4p16cores}  
copies=8  
submit= $[top]/mysubmit.pl $SPECCOPYNUM "$command"  
%endif  
#####  
#####
```

```
#####  
# (Edit this to match your system)  
#####
```

default=default=default=default:
license_num = 3184
test_sponsor = Intel Corporation
hw_avail = Sep-2007
sw_avail = Sep-2008
tester = Principled Technologies
hw_cpu_name = Intel Trademarked CPU Name
hw_cpu_char =
hw_cpu_mhz: 2933
hw_cpu_name: Intel Xeon Processor X7350
hw_disk: 2x73.4 GB SAS, 10,000RPM
hw_fpu: Integrated
hw_memory: 32 GB (16x2 GB PC-5300F)
hw_model000: Intel Server Board S7000FC4UR (Intel Xeon X7350,
hw_model001: 2.93 GHz)
hw_nchips: 4
hw_ncores: 16
hw_ncoresperchip: 4hw_other = None
hw_pcache: 32 KB I + 32 KB D on chip per core
hw_scache: 8 MB I+D on chip per core, 4 MB shared / 2 cores
hw_tcache: Nonehw_ocache = None
hw_vendor = Intel Corporation
prepared_by = PT
sw_file = ReiserFS

sw_os = SuSe Linux Enterprise Server10 SP1
sw_state = Run level 3 (multi-user)

int=default=default=default:

sw_compiler001 = Intel C++ Compiler 11.0 for Linux
sw_compiler002 = Build 20080730 Package ID: l_cproc_b_11.0.042
sw_base_ptrsize = 32-bit
sw_peak_ptrsize = 32/64-bit
notes_020 = All benchmarks compiled in 32-bit mode except 401.bzip2 and 456.hmmmer,
notes_025 = for peak, are compiled in 64-bit mode
notes_026 = taskset was used to bind processes to cores except
notes_027 = for 462.libquantum peak
notes_028 = OMP_NUM_THREADS set to number of processors
notes_029 = KMP_AFFINITY set to "physical,0"
notes_030 = KMP_STACKSIZE set to 64M
sw_other001 = Microquill SmartHeap V8.1
sw_other002 = Binutils 2.18.50.0.7.20080502

fp=default=default=default:

sw_compiler001 = Intel C++ and Fortran Compiler 11.0 for Linux
sw_compiler002 = Build 20080730 Package ID: l_cproc_b_11.0.042, l_fproc_b_11.0.042
sw_base_ptrsize = 64-bit
sw_peak_ptrsize = 32/64-bit
notes_020 = All benchmarks compiled in 64-bit mode except 437.leslie3d, 450.soplex
notes_025 = and 482.sphinx3, at peak, are compiled in 32-bit mode
notes_026 = taskset was used to bind processes to cores except
notes_027 = for 436.cactusADM peak
notes_028 = OMP_NUM_THREADS set to number of processors
notes_029 = KMP_AFFINITY set to "physical,0"
notes_030 = KMP_STACKSIZE set to 64M

SUSE Linux Enterprise Server 10: Intel Xeon X7460-based server

```
# Invocation command line:
# /data1/cpu2006-1.1/bin/runspec --rate 24 -c cpu2006.1.1.ic11.0.linux64.dgt.rate.cfg --flagsurl=Intel-ic11.0-int-linux64-revA.xml,Intel-Linux64-
Platform.xml --define dgt4p24cores -v 7 -T all -o asc int
# output_root was not used for this run
#####
#####
# This is a sample config file. It was tested with:
#
#   Compiler name/version:   Intel Compiler 11.0
#   Operating system version: 64-Bit LINUX Enterprise Server 10 or later
#   Hardware:                Intel Core 2 and compatible Intel processors
#                           supporting Intel 64 and SSE4.1
#
#####
# SPEC CPU2006 Intel Linux64 config file
# July 2008 Intel Compiler 11.0 for Linux64
#####
action   = validate
tune     = base
ext      = cpu2006.1.1.ic11.0.linux64.dgt.rate
PATHSEP  = /
check_md5=1
reportable=1

#
# These are listed as benchmark-tuning-extension-machine
#
default=default=default=default:
CC = icc
CXX = icpc
FC=ifort
OBJ = .o
SMARTHEAP_DIR = /spec/cpu2006.1.1/lib

submit= MYMASK='printf '0x%x' \${(1<<1$SPECCOPYNUM)}'; taskset \${MYMASK} $command

#####
# Compiler options
# for Dunnington use -xSSE4.1
# for processors prior to dunnington, replace -xSSE4.1 with -xSSE3
#####
SSE      = -xSSE4.1
FAST     = $(SSE) -ipo -O3 -no-prec-div -static
FASTNOSTATIC = $(SSE) -ipo -O3 -no-prec-div

#####
#
# portability & libraries
#
##### Portability Flags and Notes #####

400.perlbench=default:
CPORTABILITY= -DSPEC_CPU_LINUX_IA32

403.gcc=default:
EXTRA_CFLAGS= -Dalloca=_alloca

462.libquantum=default:
CPORTABILITY= -DSPEC_CPU_LINUX

483.xalanbmk=default:
CXXPORTABILITY= -DSPEC_CPU_LINUX

fp=default:
PORTABILITY = -DSPEC_CPU_LP64
```

435.gromacs=default=default=default:
LDPORTABILITY = -nofor_main

436.cactusADM=default=default=default:
LDPORTABILITY = -nofor_main

454.calculix=default=default=default:
LDPORTABILITY = -nofor_main

481.wrf=default=default=default:
CPORTABILITY = -DSPEC_CPU_CASE_FLAG -DSPEC_CPU_LINUX

Tuning Flags
#####

Base tuning default optimization
Feedback directed optimization not allowed in baseline for CPU2006
However there is no limit on the number of flags as long as the same
flags are used in the same order for all benchmarks of a given language

471.omnetpp,473.astar,483.xalancbmk=default:
EXTRA_LIBS= -L\$(SMARTHEAP_DIR) -lsmarheap
EXTRA_LDFLAGS= -WI,-z,muldefs

int=base=default=default:
COPTIMIZE= \$(FAST) -inline-calloc -opt-malloc-options=3 -opt-prefetch
CXXOPTIMIZE= \$(FASTNOSTATIC) -opt-prefetch

fp=base=default=default:
OPTIMIZE= \$(FAST) -opt-prefetch

Peak Tuning Flags int 2006 fast
#####

int=peak=default:
COPTIMIZE= \$(FAST) -opt-prefetch
CXXOPTIMIZE= \$(FASTNOSTATIC) -opt-prefetch
PASS1_CFLAGS = -prof-gen
PASS2_CFLAGS = -prof-use
PASS1_CXXFLAGS = -prof-gen
PASS2_CXXFLAGS = -prof-use
PASS1_LDFLAGS = -prof-gen
PASS2_LDFLAGS = -prof-use

400.perlbench=peak=default:
COPTIMIZE= \$(FAST) -ansi-alias -opt-prefetch

401.bzip2=peak=default:
CC= /opt/intel/Compiler/11.0/042/bin/intel64/icc -L/opt/intel/Compiler/11.0/042/ipp/em64t/lib -I/opt/intel/Compiler/11.0/042/ipp/em64t/include
CPORTABILITY= -DSPEC_CPU_LP64
COPTIMIZE= \$(FAST) -opt-prefetch -ansi-alias

403.gcc=peak=default:
COPTIMIZE = \$(FAST) -inline-calloc -opt-malloc-options=3
feedback=0

429.mcf=peak=default:
COPTIMIZE= \$(FAST) -opt-prefetch

445.gobmk=peak=default:
COPTIMIZE= \$(SSE) -O2 -ipo -no-prec-div -ansi-alias

456.hmmmer=peak=default:
CC= /opt/intel/Compiler/11.0/042/bin/intel64/icc -L/opt/intel/Compiler/11.0/042/ipp/em64t/lib -I/opt/intel/Compiler/11.0/042/ipp/em64t/include
CPORTABILITY= -DSPEC_CPU_LP64

COPTIMIZE= \$(FAST) -unroll2 -ansi-alias
feedback=no

458.sjeng=peak=default:
COPTIMIZE= \$(FAST) -unroll4

462.libquantum=peak=default:
COPTIMIZE= \$(FAST) -opt-malloc-options=3 -parallel -par-runtime-control -opt-prefetch
feedback=no
copies=1
submit=

464.h264ref=peak=default:
COPTIMIZE= \$(FAST) -unroll2 -ansi-alias

471.omnetpp=peak=default:
CXXOPTIMIZE= \$(FASTNOSTATIC) -ansi-alias -opt-ra-region-strategy=block

473.astar=peak=default:
CXXOPTIMIZE= \$(FASTNOSTATIC) -ansi-alias -opt-ra-region-strategy=routine

483.xalanbmk=peak=default:
basepeak=yes

```
#####  
# Peak Tuning Flags for FP  
#####  
fp=peak=default:  
OPTIMIZE= $(FAST)  
COPTIMIZE= -auto-ilp32  
CXXOPTIMIZE= -auto-ilp32  
PASS1_CFLAGS = -prof-gen  
PASS2_CFLAGS = -prof-use  
PASS1_CXXFLAGS = -prof-gen  
PASS2_CXXFLAGS = -prof-use  
PASS1_FFLAGS = -prof-gen  
PASS2_FFLAGS = -prof-use  
PASS1_LDFLAGS = -prof-gen  
PASS2_LDFLAGS = -prof-use
```

410.bwaves=peak=default:
OPTIMIZE= \$(FAST) -opt-prefetch
feedback=0

```
#####  
#####  
%ifdef %{stoakleydp8cores}  
copies=4  
submit= if `test $SPECCOPYNUM -le 1`; then taskset -c $SPECCOPYNUM $command ; else taskset -c `expr $SPECCOPYNUM + 4`  
$command ; fi  
%endif  
#####  
#####
```

416.gamess=peak=default:
OPTIMIZE= \$(FAST) -unroll2 -Ob0 -ansi-alias -scalar-rep-

433.milc=peak=default:
OPTIMIZE= \$(FAST) -fno-alias
COPTIMIZE=

435.gromacs=peak=default:
OPTIMIZE= \$(FAST) -opt-prefetch

436.cactusADM=peak=default:
OPTIMIZE= \$(FAST) -unroll2 -opt-prefetch -parallel
copies=1
submit=

437.leslie3d=peak=default:

```

PORTABILITY =
FC= /opt/intel/Compiler/11.0/042/bin/ia32/fort -L/opt/intel/Compiler/11.0/042/ipp/ia32/lib -I/opt/intel/Compiler/11.0/042/ipp/ia32/include
OPTIMIZE= $(FAST) -opt-malloc-options=3 -opt-prefetch
#####
#####
%ifdef %{stoakleydp8cores}
copies=4
submit= if `test $SPECCOPYNUM -le 1`; then taskset -c $SPECCOPYNUM $command ; else taskset -c `expr $SPECCOPYNUM + 4`
$command ; fi
%endif
#####
#####

444.namd=peak=default:
CXXOPTIMIZE= $(FAST) -fno-alias -auto-ilp32

447.deall=peak=default:
CXXOPTIMIZE= $(FAST) -unroll2 -ansi-alias -scalar-rep-

450.soplex=peak=default:
PORTABILITY =
CXX= /opt/intel/Compiler/11.0/042/bin/ia32/icpc -L/opt/intel/Compiler/11.0/042/ipp/ia32/lib -I/opt/intel/Compiler/11.0/042/ipp/ia32/include
OPTIMIZE= $(FAST) -opt-malloc-options=3
CXXOPTIMIZE=

453.povray=peak=default:
CXXOPTIMIZE= $(FAST) -unroll4 -ansi-alias

454.calculix=peak=default:
OPTIMIZE= $(FAST)
feedback=0

459.GemsFDTD=peak=default:
OPTIMIZE= $(FAST) -unroll2 -Ob0 -opt-prefetch

465.tonto=peak=default:
OPTIMIZE= $(FAST) -unroll4 -auto

470.lbm=peak=default:
OPTIMIZE= $(FAST) -opt-prefetch
feedback=no

#####
#####
%ifdef %{bensleydp8cores}
copies=2
submit= if `test $SPECCOPYNUM -le 0`; then taskset -c $SPECCOPYNUM $command ; else taskset -c `expr $SPECCOPYNUM + 4`
$command ; fi
%endif

%ifdef %{stoakleydp8cores}
copies=4
submit= if `test $SPECCOPYNUM -le 1`; then taskset -c $SPECCOPYNUM $command ; else taskset -c `expr $SPECCOPYNUM + 4`
$command ; fi
%endif

%ifdef %{tgt4p16cores}
copies=8
submit= if `test $SPECCOPYNUM -le 3`; then taskset -c $SPECCOPYNUM $command ; else taskset -c `expr $SPECCOPYNUM + 8`
$command ; fi
%endif

%ifdef %{dgt4p24cores}
copies=12
submit= $[top]/mysubmit.pl $SPECCOPYNUM "$command"
%endif

%ifdef %{dgt4p16cores}
copies=8

```

```

submit= ${top}/mysubmit.pl $SPECCOPYNUM "$command"
%endif
#####
#####

481.wrf=peak=default:
basepeak=yes

482.sphinx3=peak=default:
PORTABILITY =
CC= /opt/intel/Compiler/11.0/042/bin/ia32/icc -L/opt/intel/Compiler/11.0/042/ipp/ia32/lib -I/opt/intel/Compiler/11.0/042/ipp/ia32/include
COPTIMIZE= -unroll2
feedback=no

#####
#####
%ifdef %{stoakleydp8cores}
copies=4
submit= if `test $SPECCOPYNUM -le 1`; then taskset -c $SPECCOPYNUM $command ; else taskset -c `expr $SPECCOPYNUM + 4`
$command ; fi
%endif

%ifdef %{tgt4p16cores}
copies=8
submit= if `test $SPECCOPYNUM -le 3`; then taskset -c $SPECCOPYNUM $command ; else taskset -c `expr $SPECCOPYNUM + 8`
$command ; fi
%endif

%ifdef %{dgt4p24cores}
copies=12
submit= ${top}/mysubmit.pl $SPECCOPYNUM "$command"
%endif

%ifdef %{dgt4p16cores}
copies=8
submit= ${top}/mysubmit.pl $SPECCOPYNUM "$command"
%endif
#####
#####

#####
# (Edit this to match your system)
#####

default=default=default=default:
license_num = 3184
test_sponsor = Intel Corporation
hw_avail = Sep-2008
sw_avail = Sep-2008
tester = Principled Technologies
hw_cpu_name = Intel Xeon X7460
hw_cpu_char =
hw_cpu_mhz = 2666
hw_disk = 73.4 GB SATA, 10,000RPM
hw_fpu = Integrated
hw_memory = 32 GB (16x2 GB PC-5300F)
hw_model = Intel Server Board
hw_ncpuorder = 1,2,4 chips
hw_ncores = 24
hw_nchips = 4
hw_ncoresperchip = 6
hw_nthreadspercore = 1
hw_other = None

```

```
hw_pcache      = 32 KB I + 32 KB D on chip per core
hw_scache      = 9 MB I+D on chip per core, 3 MB shared / 2 cores
hw_tcache      = 16 MB
hw_ocache      = None
hw_vendor      = Intel Corporation
prepared_by    = PT
sw_file        = ext3
sw_os000       = Suse Linux Enterprise Server 10 SP1
sw_state       = Run level 3 (multi-user)
sw_other000    = Microquill SmartHeap V8.1
sw_other001    = Binutils 2.18.50.0.7.20080502
```

int=default=default=default:

```
sw_compiler000 = Intel C++ Compiler 11.0 for Linux
sw_compiler001 = Build 20080730 Package ID: l_cc_b_11.0.042
sw_base_ptrsize = 32-bit
sw_peak_ptrsize = 32/64-bit
notes_000      = All benchmarks compiled in 32-bit mode except 401.bzip2 and 456.hmmmer,
notes_005      = for peak, are compiled in 64-bit mode
notes_010      = taskset was used to bind processes to cores except
notes_015      = for 462.libquantum peak
notes_020      = OMP_NUM_THREADS set to number of processors
notes_025      = KMP_AFFINITY set to "physical,0"
notes_030      = KMP_STACKSIZE set to 64M
notes_035      = 'ulimit -s unlimited' was used to set the stacksize to unlimited prior to run
```

fp=default=default=default:

```
sw_compiler001 = Intel C++ and Fortran Compiler 11.0 for Linux
sw_compiler002 = Build 20080730 Package ID: l_cc_b_11.0.042, l_fc_b_11.0.042
sw_base_ptrsize = 64-bit
sw_peak_ptrsize = 32/64-bit
notes_020      = All benchmarks compiled in 64-bit mode except 437.leslie3d, 450.soplex
notes_025      = and 482.sphinx3, at peak, are compiled in 32-bit mode
notes_026      = taskset was used to bind processes to cores except
notes_027      = for 436.cactusADM peak
notes_028      = OMP_NUM_THREADS set to number of processors
notes_029      = KMP_AFFINITY set to "physical,0"
notes_030      = KMP_STACKSIZE set to 64M
```

The following section was added automatically, and contains settings that
did not appear in the original configuration file, but were added to the
raw file after the run.

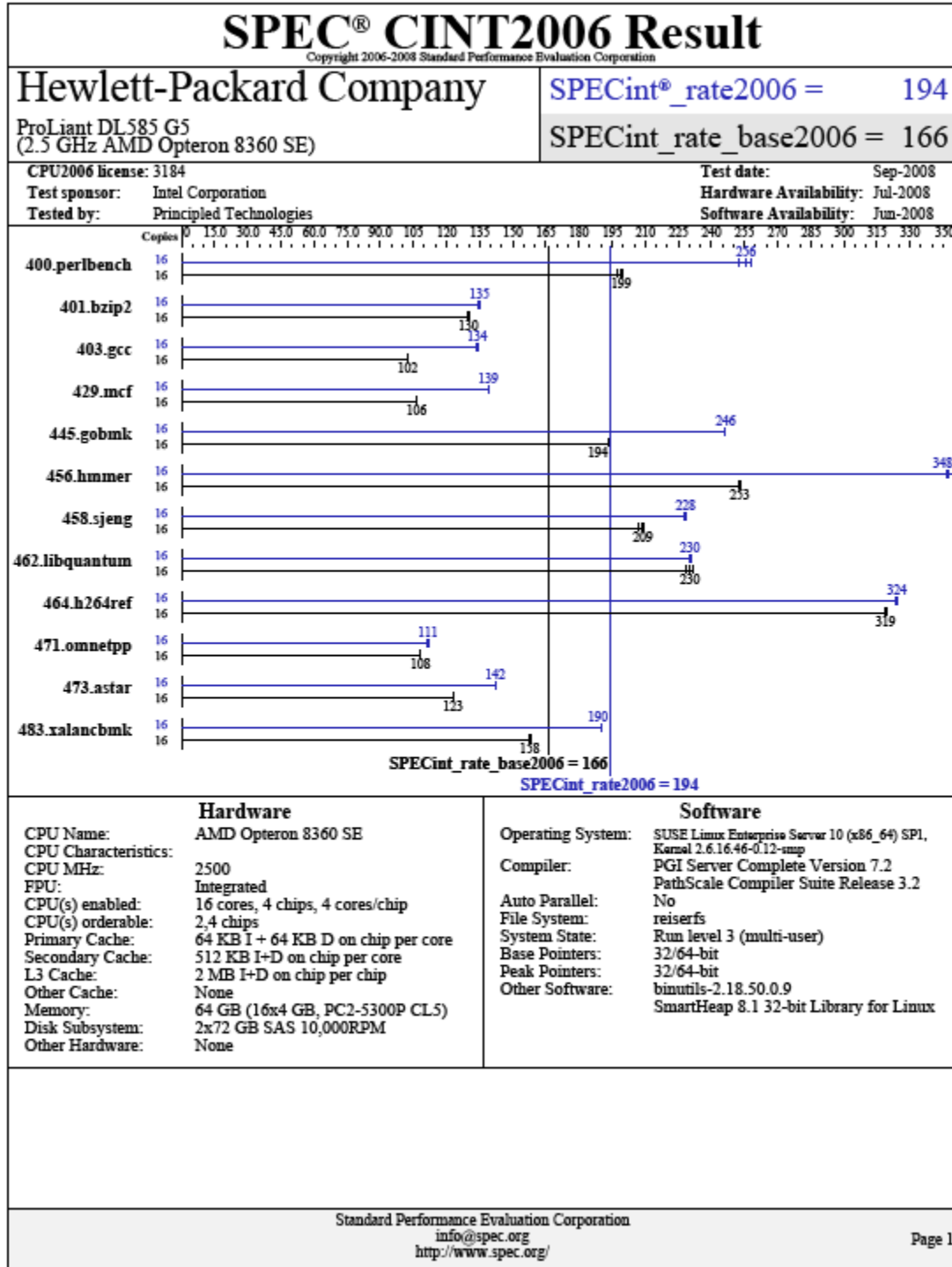
default:

```
flagsurl000 = Intel-ic11.0-int-linux64-revA.xml
flagsurl001 = Intel-Linux64-Platform.xml
```

Appendix C – SPECint_rate output

This appendix provides the output of the benchmark for each of the test servers.

SUSE Linux Enterprise Server 10: AMD Opteron processor 8360 SE-based server



SPEC CINT2006 Result

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Hewlett-Packard Company

SPECint_rate2006 = 194

ProLiant DL585 G5
(2.5 GHz AMD Opteron 8360 SE)

SPECint_rate_base2006 = 166

CPU2006 license: 3184

Test date: Sep-2008

Test sponsor: Intel Corporation

Hardware Availability: Jul-2008

Tested by: Principled Technologies

Software Availability: Jun-2008

Results Table

| Benchmark | Base | | | | | | | | Peak | | | | | | | |
|----------------|--------|-------------|------------|-------------|------------|-------------|------------|--------|------------|------------|-------------|------------|-------------|------------|--|--|
| | Copies | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio | Copies | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio | | |
| 400.perlbench | 16 | 782 | 200 | 791 | 198 | 786 | 199 | 16 | 619 | 253 | 606 | 258 | 612 | 256 | | |
| 401.bzip2 | 16 | 1182 | 131 | 1188 | 130 | 1190 | 130 | 16 | 1152 | 134 | 1145 | 135 | 1146 | 135 | | |
| 403.gcc | 16 | 1257 | 102 | 1259 | 102 | 1260 | 102 | 16 | 962 | 134 | 956 | 135 | 962 | 134 | | |
| 429.mcf | 16 | 1372 | 106 | 1374 | 106 | 1371 | 106 | 16 | 1052 | 139 | 1052 | 139 | 1051 | 139 | | |
| 445.gobmk | 16 | 867 | 194 | 867 | 194 | 867 | 194 | 16 | 682 | 246 | 681 | 246 | 681 | 246 | | |
| 456.hammer | 16 | 590 | 253 | 590 | 253 | 592 | 252 | 16 | 429 | 348 | 430 | 347 | 427 | 349 | | |
| 458.sjeng | 16 | 924 | 209 | 934 | 207 | 927 | 209 | 16 | 849 | 228 | 848 | 228 | 849 | 228 | | |
| 462.libquantum | 16 | 1449 | 229 | 1429 | 232 | 1440 | 230 | 16 | 1436 | 231 | 1442 | 230 | 1440 | 230 | | |
| 464.h264ref | 16 | 1107 | 320 | 1111 | 319 | 1111 | 319 | 16 | 1095 | 323 | 1092 | 324 | 1093 | 324 | | |
| 471.omnetpp | 16 | 925 | 108 | 923 | 108 | 926 | 108 | 16 | 897 | 111 | 896 | 112 | 899 | 111 | | |
| 473.astar | 16 | 913 | 123 | 914 | 123 | 913 | 123 | 16 | 791 | 142 | 791 | 142 | 790 | 142 | | |
| 483.xalanbmk | 16 | 702 | 157 | 701 | 158 | 699 | 158 | 16 | 581 | 190 | 581 | 190 | 580 | 190 | | |

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.
numactl used to bind processes to CPUs

Operating System Notes

Environment stack size set to 'unlimited'
Max locked memory set to 2097152
PGI HUGE PAGES set to 120.
Total number of huge pages available is 1950.
NCPUS set to number of cores

Platform Notes

BIOS configuration:
Power Regulator set to Static High Performance Mode

Base Compiler Invocation

C benchmarks:
pgcc

C++ benchmarks:
pgcpp

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SPEC CINT2006 Result

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SPECint_rate2006 = 194

ProLiant DL585 G5
(2.5 GHz AMD Opteron 8360 SE)

SPECint_rate_base2006 = 166

CPU2006 license: 3184

Test date: Sep-2008

Test sponsor: Intel Corporation

Hardware Availability: Jul-2008

Tested by: Principled Technologies

Software Availability: Jun-2008

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.hmmr: -DSPEC_CPU_LP64
458.sjeng: -DSPEC_CPU_LP64
462.libquantum: -DSPEC_CPU_LP64 -DSPEC_CPU_LINUX
464.h264ref: -DSPEC_CPU_LP64
483.xalanbmk: -DSPEC_CPU_LINUX
```

Base Optimization Flags

C benchmarks:

```
-fastsse -Msmartalloc-huge:150 -Mfprelaxed -Mipa-jobs:4 -Mipa-fast
-Mipa-inline -tp barcelona-64 -Bstatic_pgi
```

C++ benchmarks:

```
-fastsse -Msmartalloc-huge:150 -Mfprelaxed --zc_ah -Mipa-jobs:4
-Mipa-fast -Mipa-inline -tp barcelona -Bstatic_pgi
```

Peak Compiler Invocation

C benchmarks (except as noted below):

pgcc

400.perlbench: pathcc

403.gcc: pathcc

445.gobmk: pathcc

464.h264ref: pathcc

C++ benchmarks (except as noted below):

pathCC

473.astar: pgcpp

Peak Portability Flags

```
400.perlbench: -DSPEC_CPU_LP64 -DSPEC_CPU_LINUX_X64
401.bzip2: -DSPEC_CPU_LP64
```

Continued on next page

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SPEC CINT2006 Result

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SPECint_rate2006 = 194

ProLiant DL585 G5
(2.5 GHz AMD Opteron 8360 SE)

SPECint_rate_base2006 = 166

CPU2006 license: 3184

Test date: Sep-2008

Test sponsor: Intel Corporation

Hardware Availability: Jul-2008

Tested by: Principled Technologies

Software Availability: Jun-2008

Peak Portability Flags (Continued)

```
445.gobmk: -DSPFC_CPU_LP64
456.hmmr: -DSPFC_CPU_LP64
458.sjeng: -DSPFC_CPU_LP64
462.libquantum: -DSPFC_CPU_LP64 -DSPFC_CPU_LINUX
464.h264ref: -DSPFC_CPU_LP64
483.xalancbmk: -DSPFC_CPU_LINUX
```

Peak Optimization Flags

C benchmarks:

```
400.perlbench: -march-barcelona -fb create fbdata(pass 1)
               -fb opt fbdata(pass 2) -Ofast -IPA:plimit-20000 -LNO:opt-0
               -WOPT;if_conv-0 -CG:local_sched_alg-1

401.bzip2: -Mphi-indirect(pass 1) -Mphi-indirect(pass 2) -fastsse -O4
           -Msmartalloc-huge:150 -Mprefetch-t0 -Mnounroll
           -tp barcelona-64 -Bstatic_pgi

403.gcc: -march-barcelona -fb create fbdata(pass 1)
         -fb opt fbdata(pass 2) -m32 -O3 -OPT:Ofast

429.mcf: -fastsse -Msmartalloc-huge:150 -Mipa-jobs:4 -Mipa-fast
        -Mipa-inline:1 -tp barcelona -Bstatic_pgi

445.gobmk: -march-barcelona -fb create fbdata(pass 1)
           -fb opt fbdata(pass 2) -O3 -OPT:alias-restrict
           -LNO:prefetch-1 -LNO:ignore_feedback-off -CG:p2align-on

456.hmmr: -fastsse -Mvect-partial -Munroll-n:8 -Msmartalloc-huge:150
         -Msafeptr -Mprefetch-t0 -Mfprelaxed -Mipa-jobs:4
         -Mipa-const -Mipa-ptr -Mipa-arg -Mipa-inline
         -tp barcelona-64 -Bstatic_pgi

458.sjeng: -Mphi(pass 1) -Mipa-jobs:4(pass 2) -Mipa-fast(pass 2)
           -Mipa-inline:1(pass 2) -Mipa-noarg(pass 2) -Mphi(pass 2)
           -fastsse -Msmartalloc-huge:150 -Mfprelaxed
           -tp barcelona-64 -Bstatic_pgi

462.libquantum: -fastsse -Munroll-m:8 -Msmartalloc-huge:150
               -Mprefetch-distance:4 -Mfprelaxed -Mipa-jobs:4 -Mipa-fast
               -Mipa-inline -Mipa-noarg -tp barcelona-64 -Bstatic_pgi

464.h264ref: -march-barcelona -fb create fbdata(pass 1)
             -fb opt fbdata(pass 2) -O3 -IPA:plimit-20000
             -OPT:alias-disjoint -LNO:prefetch-0 -CG:ptr_load_use-0
             -CG:push_pop_int_saved_regs-off
```

Continued on next page

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SPEC CINT2006 Result

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Hewlett-Packard Company

SPECint_rate2006 = 194

ProLiant DL585 G5
(2.5 GHz AMD Opteron 8360 SE)

SPECint_rate_base2006 = 166

CPU2006 license: 3184

Test date: Sep-2008

Test sponsor: Intel Corporation

Hardware Availability: Jul-2008

Tested by: Principled Technologies

Software Availability: Jun-2008

Peak Optimization Flags (Continued)

C++ benchmarks:

```
471.omnetpp: -march-barcelona -Ofast -CG:gcm-off -INLINE:aggressive-on
             -OPT:alias-disjoint -WOPT:if_conv-0 -m32
             -L/cpu2006/SmartHeap -lsmarheap

473.astar: -Mpf1(pass 1) -Mpf0(pass 2) -Mipa-jobs:4(pass 2)
           -Mipa-fast(pass 2) -Mipa-inline:6(pass 2) -fastsse -O4
           -Msmartalloc-huge:150 -Msafeptr-global -Mfprelaxed --zc_eh
           -tp barcelona -Bstatic_pgi

483.xalanbmk: -march-barcelona -Ofast -m32 -OPT:unroll_times_max-8
             -CG:push_pop_int_saved_regs-off -CG:ptr_load_use-0
             -L/cpu2006/SmartHeap -lsmarheap
```

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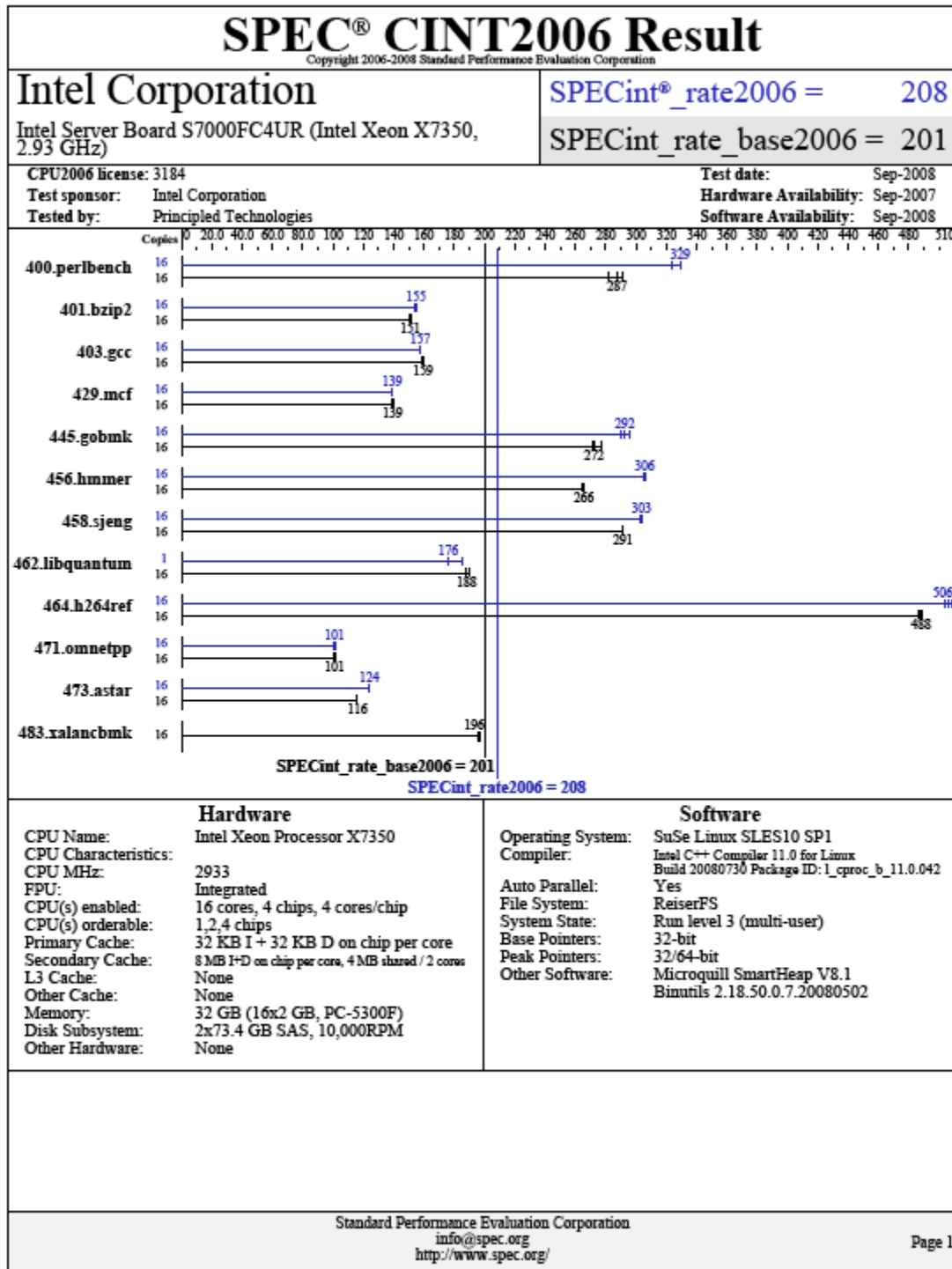
For questions about this result, please contact the tester.
For other inquiries, please contact webmaster@spec.org.

Tested with SPEC CPU2006 v1.1.
Report generated on Mon Sep 29 09:41:35 2008 by SPEC CPU2006 PS/PDF formatter v6128.

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SUSE Linux Enterprise Server 10: Intel Xeon X7350-based server



SPEC CINT2006 Result

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Intel Corporation

SPECint_rate2006 = 208

Intel Server Board S7000FC4UR (Intel Xeon X7350, 2.93 GHz)

SPECint_rate_base2006 = 201

CPU2006 license: 3184

Test date: Sep-2008

Test sponsor: Intel Corporation

Hardware Availability: Sep-2007

Tested by: Principled Technologies

Software Availability: Sep-2008

Results Table

| Benchmark | Base | | | | | | | Peak | | | | | | |
|----------------|--------|------------|------------|-------------|------------|-------------|------------|--------|-------------|------------|------------|------------|------------|------------|
| | Copies | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio | Copies | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio |
| 400.perlbench | 16 | 556 | 281 | 537 | 291 | <u>544</u> | <u>287</u> | 16 | 475 | 329 | <u>475</u> | <u>329</u> | 483 | 324 |
| 401.bzip2 | 16 | 1023 | 151 | 1021 | 151 | <u>1023</u> | <u>151</u> | 16 | 998 | 155 | <u>999</u> | <u>155</u> | 1001 | 154 |
| 403.gcc | 16 | <u>809</u> | <u>159</u> | 808 | 159 | 811 | 159 | 16 | <u>818</u> | <u>157</u> | 817 | 158 | 819 | 157 |
| 429.mcf | 16 | 1043 | 140 | <u>1048</u> | <u>139</u> | 1052 | 139 | 16 | <u>1051</u> | <u>139</u> | 1052 | 139 | 1050 | 139 |
| 445.gobmk | 16 | 605 | 277 | <u>617</u> | <u>272</u> | 619 | 271 | 16 | 568 | 295 | <u>574</u> | <u>292</u> | 578 | 291 |
| 456.hammer | 16 | 561 | 266 | <u>562</u> | <u>266</u> | 565 | 264 | 16 | 488 | 306 | <u>489</u> | <u>306</u> | 490 | 305 |
| 458.sjeng | 16 | 665 | 291 | <u>665</u> | <u>291</u> | 666 | 291 | 16 | <u>638</u> | <u>303</u> | 638 | 303 | 638 | 303 |
| 462.libquantum | 16 | 1747 | 190 | <u>1763</u> | <u>188</u> | 1771 | 187 | 1 | 118 | 175 | <u>118</u> | <u>176</u> | 112 | 186 |
| 464.h264ref | 16 | 725 | 489 | <u>725</u> | <u>488</u> | 727 | 487 | 16 | 702 | 504 | <u>699</u> | <u>506</u> | 696 | 509 |
| 471.omnetpp | 16 | 986 | 101 | <u>991</u> | <u>101</u> | 996 | 100 | 16 | 989 | 101 | 993 | 101 | <u>991</u> | <u>101</u> |
| 473.astar | 16 | 968 | 116 | 972 | 116 | <u>969</u> | <u>116</u> | 16 | <u>907</u> | <u>124</u> | 909 | 124 | 905 | 124 |
| 483.xalanbmk | 16 | 560 | 197 | 563 | 196 | <u>562</u> | <u>196</u> | 16 | 560 | 197 | 563 | 196 | <u>562</u> | <u>196</u> |

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.

Platform Notes

Bios Settings:
 Adjacent Cache Line Prefetcher- Disabled
 Hardware Prefetcher- Disabled
 Enhanced Intel Speedstep Technology- Enabled
 High Bandwidth- Disabled

General Notes

All benchmarks compiled in 32-bit mode except 401.bzip2 and 456.hammer, for peak, are compiled in 64-bit mode
 taskset was used to bind processes to cores except for 462.libquantum peak
 OMP_NUM_THREADS set to number of processors
 KMP_AFFINITY set to "physical,0"
 KMP_STACKSIZE set to 64M
 'ulimit -s unlimited' was used to set the stacksize to unlimited prior to run

Base Compiler Invocation

C benchmarks:
 icc

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Intel Corporation

Intel Server Board S7000FC4UR (Intel Xeon X7350,
2.93 GHz)

SPECint_rate2006 = 208

SPECint_rate_base2006 = 201

CPU2006 license: 3184

Test sponsor: Intel Corporation

Tested by: Principled Technologies

Test date: Sep-2008

Hardware Availability: Sep-2007

Software Availability: Sep-2008

Base Compiler Invocation (Continued)

C++ benchmarks:
icpc

Base Portability Flags

400.perlbench: -DSPEC_CPU LINUX IA32
462.libquantum: -DSPEC_CPU LINUX
483.xalancbmk: -DSPEC_CPU LINUX

Base Optimization Flags

C benchmarks:
-xSSSE3 -ipo -O3 -no-prec-div -static -inline-calloc -opt -malloc
ions-3 -prefetch

C++ benchmarks:
-xSSSE3 -ipo -O3 -no-prec-div -opt -prefetch -Wl,-z,muldefs
-L/spec/cpu2006.1.1/lib -lsmartheap

Base Other Flags

C benchmarks:
403.gcc: -Dalloca-_alloca

Peak Compiler Invocation

C benchmarks (except as noted below):
icc

401.bzip2: /opt/intel/Compiler/11.0/042/bin/intel64/icc
-L/opt/intel/Compiler/11.0/042/ipp/em64t/lib
-I/opt/intel/Compiler/11.0/042/ipp/em64t/include

456.hmmcr: /opt/intel/Compiler/11.0/042/bin/intel64/icc
-L/opt/intel/Compiler/11.0/042/ipp/em64t/lib
-I/opt/intel/Compiler/11.0/042/ipp/em64t/include

C++ benchmarks:
icpc

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SPEC CINT2006 Result

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SPECint_rate2006 = 208

Intel Server Board S7000FC4UR (Intel Xeon X7350,
2.93 GHz)

SPECint_rate_base2006 = 201

CPU2006 license: 3184

Test date: Sep-2008

Test sponsor: Intel Corporation

Hardware Availability: Sep-2007

Tested by: Principled Technologies

Software Availability: Sep-2008

Peak Portability Flags

400.peribench: -DSPEC_CPU_LINUX_IA32
401.bzip2: -DSPEC_CPU_LP64
456.hammer: -DSPEC_CPU_LP64
462.libquantum: -DSPEC_CPU_LINUX
483.xalanbmk: -DSPEC_CPU_LINUX

Peak Optimization Flags

C benchmarks:

400.peribench: -prof-gen(pass 1) -prof-use(pass 2) -xSSSE3 -ipo -O3
-no-prec-div -static -ansi-alias -opt -prefetch
401.bzip2: -prof-gen(pass 1) -prof-use(pass 2) -xSSSE3 -ipo -O3
-no-prec-div -static -opt -prefetch -ansi-alias
403.gcc: -xSSSE3 -ipo -O3 -no-prec-div -static -inline-calloc
-opt -malloc ions-3
429.mcf: -prof-gen(pass 1) -prof-use(pass 2) -xSSSE3 -ipo -O3
-no-prec-div -static -opt -prefetch
445.gobmk: -prof-gen(pass 1) -prof-use(pass 2) -xSSSE3 -O2 -ipo
-no-prec-div -ansi-alias
456.hammer: -xSSSE3 -ipo -O3 -no-prec-div -static -unroll2
-ansi-alias
458.sjeng: -prof-gen(pass 1) -prof-use(pass 2) -xSSSE3 -ipo -O3
-no-prec-div -static -unroll4
462.libquantum: -xSSSE3 -ipo -O3 -no-prec-div -static -opt -malloc
ions-3 -parallel -par-runtime-control -prefetch
464.h264ref: -prof-gen(pass 1) -prof-use(pass 2) -xSSSE3 -ipo -O3
-no-prec-div -static -unroll2 -ansi-alias

C++ benchmarks:

471.omnetpp: -prof-gen(pass 1) -prof-use(pass 2) -xSSSE3 -ipo -O3
-no-prec-div -ansi-alias -opt -ra-region-strategy-block
-Wl,-z,muldefs -L/spec/cpu2006.1.1/lib -lsmarheap
473.astar: -prof-gen(pass 1) -prof-use(pass 2) -xSSSE3 -ipo -O3
-no-prec-div -ansi-alias -opt -ra-region-strategy-routine
-Wl,-z,muldefs -L/spec/cpu2006.1.1/lib -lsmarheap

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SPECint_rate2006 = 208

SPECint_rate_base2006 = 201

CPU2006 license: 3184

Test sponsor: Intel Corporation

Tested by: Principled Technologies

Test date: Sep-2008

Hardware Availability: Sep-2007

Software Availability: Sep-2008

Peak Optimization Flags (Continued)

483.xalanbmk: basepeak - yes

Peak Other Flags

Same as Base Other Flags

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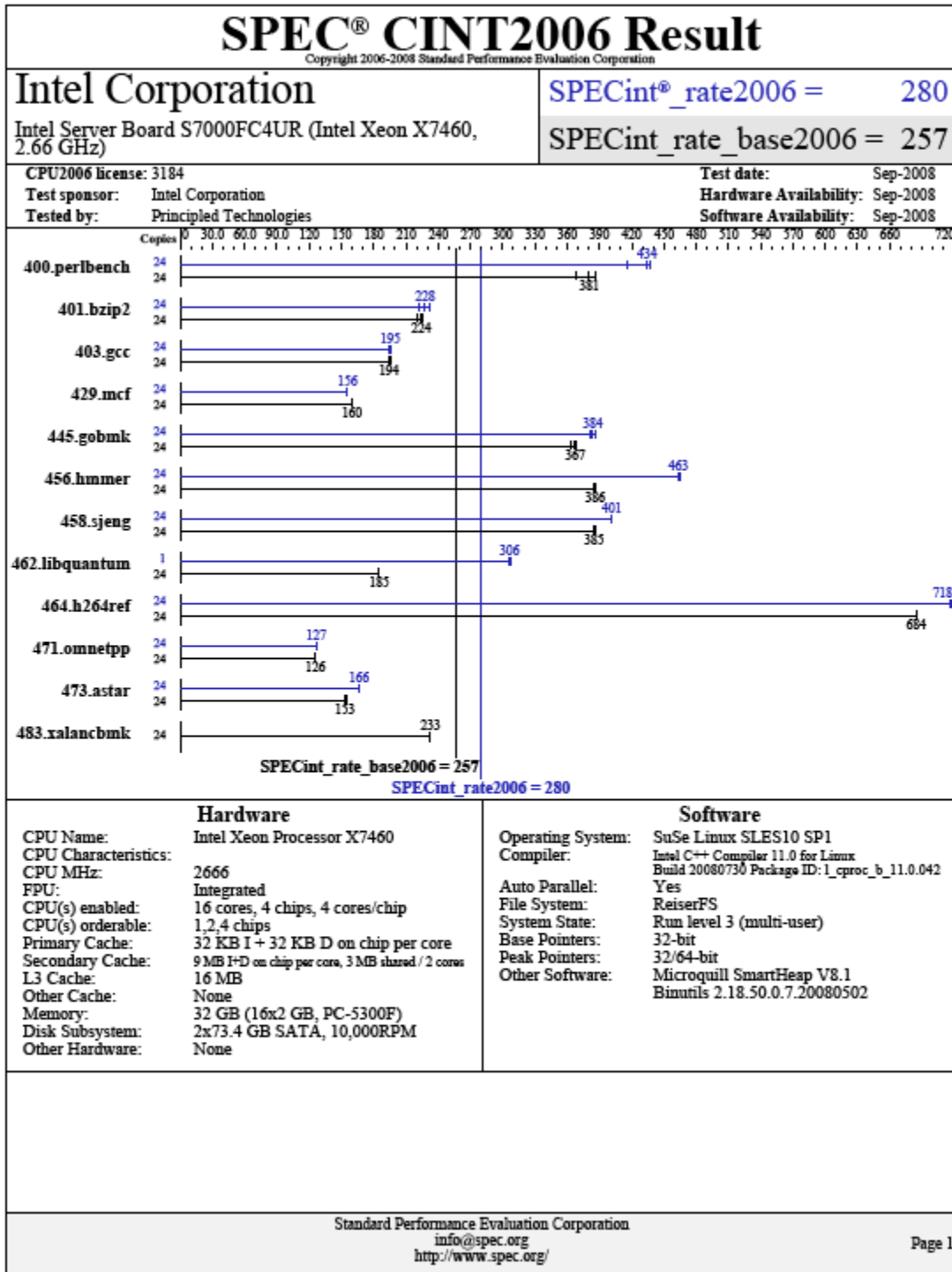
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SUSE Linux Enterprise Server 10: Intel Xeon X7460-based server



SPEC CINT2006 Result

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SPECint_rate2006 = 280

Intel Server Board S7000FC4UR (Intel Xeon X7460, 2.66 GHz)

SPECint_rate_base2006 = 257

CPU2006 license: 3184

Test date: Sep-2008

Test sponsor: Intel Corporation

Hardware Availability: Sep-2008

Tested by: Principled Technologies

Software Availability: Sep-2008

Results Table

| Benchmark | Base | | | | | | | Peak | | | | | | |
|----------------|--------|------------|------------|-------------|------------|-------------|------------|--------|-------------|------------|-------------|------------|-------------|------------|
| | Copies | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio | Copies | Seconds | Ratio | Seconds | Ratio | Seconds | Ratio |
| 400.perlbench | 24 | <u>616</u> | <u>381</u> | 637 | 368 | 607 | 386 | 24 | 563 | 417 | 536 | 437 | <u>540</u> | <u>434</u> |
| 401.bzip2 | 24 | 1047 | 221 | 1029 | 225 | <u>1033</u> | <u>224</u> | 24 | 1040 | 223 | <u>1018</u> | <u>228</u> | 1000 | 232 |
| 403.gcc | 24 | 988 | 195 | <u>995</u> | <u>194</u> | 997 | 194 | 24 | 991 | 195 | <u>990</u> | <u>195</u> | 987 | 196 |
| 429.mcf | 24 | 1372 | 160 | 1371 | 160 | <u>1371</u> | <u>160</u> | 24 | 1408 | 155 | 1407 | 156 | <u>1407</u> | <u>156</u> |
| 445.gobmk | 24 | 684 | 368 | <u>685</u> | <u>367</u> | 692 | 364 | 24 | 651 | 386 | <u>656</u> | <u>384</u> | 661 | 381 |
| 456.hammer | 24 | 581 | 385 | <u>580</u> | <u>386</u> | 580 | 386 | 24 | 484 | 463 | 482 | 465 | <u>483</u> | <u>463</u> |
| 458.sjeng | 24 | 755 | 385 | 753 | 386 | <u>754</u> | <u>385</u> | 24 | 725 | 401 | 723 | 402 | <u>724</u> | <u>401</u> |
| 462.libquantum | 24 | 2692 | 185 | 2687 | 185 | <u>2690</u> | <u>185</u> | 1 | <u>67.7</u> | <u>306</u> | 67.5 | 307 | 67.9 | 305 |
| 464.h264ref | 24 | <u>776</u> | <u>684</u> | 776 | 684 | 775 | 686 | 24 | 742 | 716 | 740 | 718 | <u>740</u> | <u>718</u> |
| 471.omnetpp | 24 | 1195 | 126 | <u>1195</u> | <u>126</u> | 1194 | 126 | 24 | 1186 | 127 | 1185 | 127 | <u>1185</u> | <u>127</u> |
| 473.astar | 24 | 1087 | 155 | 1101 | 153 | <u>1100</u> | <u>153</u> | 24 | 1011 | 167 | 1015 | 166 | <u>1014</u> | <u>166</u> |
| 483.xalanbmk | 24 | 712 | 233 | 713 | 232 | <u>712</u> | <u>233</u> | 24 | 712 | 233 | 713 | 232 | <u>712</u> | <u>233</u> |

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.

Platform Notes

Bios Settings:
 Adjacent Cache Line Prefetcher- Disabled
 Hardware Prefetcher- Disabled
 Enhanced Intel Speedstep Technology- Enabled
 High Bandwidth- Disabled

General Notes

All benchmarks compiled in 32-bit mode except 401.bzip2 and 456.hammer, for peak, are compiled in 64-bit mode
 taskset was used to bind processes to cores except for 462.libquantum peak
 OMP_NUM_THREADS set to number of processors
 KMP_AFFINITY set to "physical,0"
 KMP_STACKSIZE set to 64M
 'ulimit -s unlimited' was used to set the stacksize to unlimited prior to run

Base Compiler Invocation

C benchmarks:
 icc

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Intel Server Board S7000FC4UR (Intel Xeon X7460,
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SPECint_rate_base2006 = 257

CPU2006 license: 3184

Test date: Sep-2008

Test sponsor: Intel Corporation

Hardware Availability: Sep-2008

Tested by: Principled Technologies

Software Availability: Sep-2008

Base Compiler Invocation (Continued)

C++ benchmarks:
icpc

Base Portability Flags

400.perlbench: -DSPEC_CPU LINUX IA32
462.libquantum: -DSPEC_CPU LINUX
483.xalancbmk: -DSPEC_CPU LINUX

Base Optimization Flags

C benchmarks:

-xSSE4.1 -ipo -O3 -no-prec-div -static -inline-calloc
-opt-malloc-options=3 -opt-prefetch

C++ benchmarks:

-xSSE4.1 -ipo -O3 -no-prec-div -opt-prefetch -w1, -z, muldefs
-L/spec/cpu2006.1.1/lib -lsmartheap

Base Other Flags

C benchmarks:

403.gcc: -Dalloca-_alloca

Peak Compiler Invocation

C benchmarks (except as noted below):

icc

401.bzip2: /opt/intel/Compiler/11.0/042/bin/intel64/icc
-L/opt/intel/Compiler/11.0/042/ipp/em64t/lib
-I/opt/intel/Compiler/11.0/042/ipp/em64t/include

456.hmmmer: /opt/intel/Compiler/11.0/042/bin/intel64/icc
-L/opt/intel/Compiler/11.0/042/ipp/em64t/lib
-I/opt/intel/Compiler/11.0/042/ipp/em64t/include

C++ benchmarks:

icpc

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SPECint_rate2006 = 280

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SPECint_rate_base2006 = 257

CPU2006 license: 3184

Test date: Sep-2008

Test sponsor: Intel Corporation

Hardware Availability: Sep-2008

Tested by: Principled Technologies

Software Availability: Sep-2008

Peak Portability Flags

```
400.perlbench: -DSPEC_CPU_LINUX_IA32
401.bzip2: -DSPEC_CPU_LP64
456.hmmmer: -DSPEC_CPU_LP64
462.libquantum: -DSPEC_CPU_LINUX
483.xalanbmk: -DSPEC_CPU_LINUX
```

Peak Optimization Flags

C benchmarks:

```
400.perlbench: -prof-gen(pass 1) -prof-use(pass 2) -xSSE4.1 -ipo -O3
-no-prec-div -static -ansi-alias -opt-prefetch

401.bzip2: -prof-gen(pass 1) -prof-use(pass 2) -xSSE4.1 -ipo -O3
-no-prec-div -static -opt-prefetch -ansi-alias

403.gcc: -xSSE4.1 -ipo -O3 -no-prec-div -static -inline-calloc
-opt-malloc-options-3

429.mcf: -prof-gen(pass 1) -prof-use(pass 2) -xSSE4.1 -ipo -O3
-no-prec-div -static -opt-prefetch

445.gobmk: -prof-gen(pass 1) -prof-use(pass 2) -xSSE4.1 -O2 -ipo
-no-prec-div -ansi-alias

456.hmmmer: -xSSE4.1 -ipo -O3 -no-prec-div -static -unroll2
-ansi-alias

458.sjeng: -prof-gen(pass 1) -prof-use(pass 2) -xSSE4.1 -ipo -O3
-no-prec-div -static -unroll4

462.libquantum: -xSSE4.1 -ipo -O3 -no-prec-div -static
-opt-malloc-options-3 -parallel -par-runtime-control
-opt-prefetch

464.h264ref: -prof-gen(pass 1) -prof-use(pass 2) -xSSE4.1 -ipo -O3
-no-prec-div -static -unroll2 -ansi-alias
```

C++ benchmarks:

```
471.omnetpp: -prof-gen(pass 1) -prof-use(pass 2) -xSSE4.1 -ipo -O3
-no-prec-div -ansi-alias -opt-ra-region-strategy-block
-Wl,-z,muldefs -L/spec/cpu2006.1.1/lib -lsmartheap

473.astar: -prof-gen(pass 1) -prof-use(pass 2) -xSSE4.1 -ipo -O3
-no-prec-div -ansi-alias -opt-ra-region-strategy-routine
-Wl,-z,muldefs -L/spec/cpu2006.1.1/lib -lsmartheap
```

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SPECint_rate2006 = 280

Intel Server Board S7000FC4UR (Intel Xeon X7460,
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SPECint_rate_base2006 = 257

CPU2006 license: 3184

Test date: Sep-2008

Test sponsor: Intel Corporation

Hardware Availability: Sep-2008

Tested by: Principled Technologies

Software Availability: Sep-2008

Peak Optimization Flags (Continued)

483.xalanbmk: basepeak - yes

Peak Other Flags

Same as Base Other Flags

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Tested with SPEC CPU2006 v1.1.
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