Principled Technologies®

TEST REPORT
MAY 2006

SPEC CPU2000 SPECint_rate_base performance and power consumption on Intel- and AMD-processor-based servers

Executive summary:

Intel Corporation (Intel) commissioned Principled Technologies (PT) to measure the SPEC CPU2000 SPECint_rate_base performance of dual-processor servers using the following three processors:

- 64-bit Intel Xeon Processor 3.60 GHz
- Dual-Core Intel Xeon Processor 5160
- Dual-Core AMD Opteron 285

SPEC CPU2000 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 CPU2000 and other SPEC benchmarks, see www.spec.org.)

The SPEC CPU2000 benchmark consists of two benchmark suites, each of which focuses on a different aspect of compute-intensive performance. CINT2000 measures and compares compute-intensive integer performance, while CFP2000 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 CINT2000 SPECint_rate_base benchmark.

KEY FINDINGS

- The Dual-Core Intel Xeon Processor 5160-based server delivered almost 84 percent more peak performance/watt than the Dual-Core AMD Opteron 285-based server (see Figure 1). (We calculated performance/watt using system-level power measurements.)
- The Dual-Core Intel Xeon Processor 5160-based server delivered almost 58 percent higher peak performance than the Dual-Core AMD Opteron 285-based server (see Figure 2).
- The Dual-Core Intel Xeon Processor 5160-based server had 14 percent lower average power usage while delivering its peak performance on the benchmark than the Dual-Core AMD Opteron 285-based server (see Figure 3 and 6).

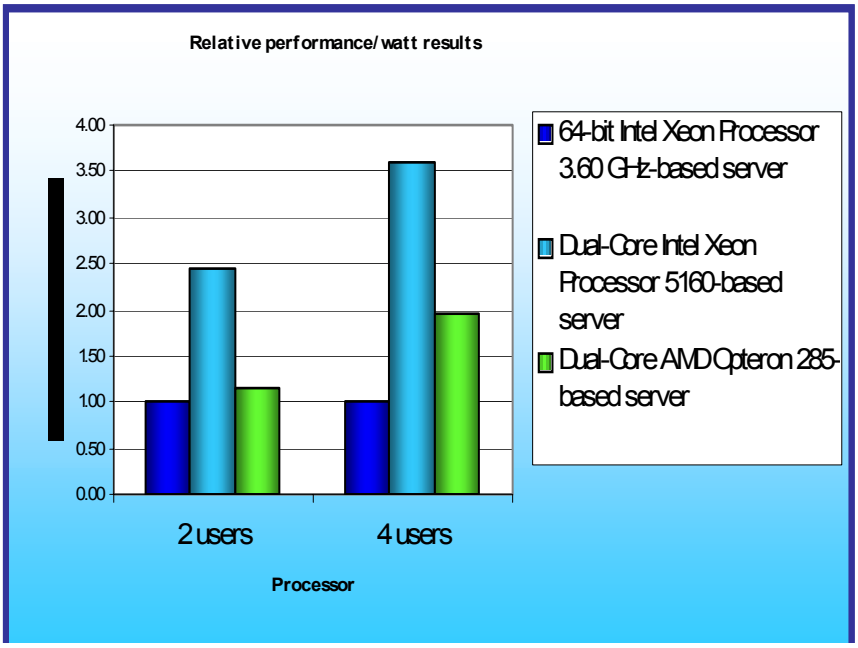


Figure 1: Performance/watt (dual-processor) results of the test servers running the SPECint_rate_base2000 workload. Higher numbers indicate better performance/watt.

In this section, we discuss the best results for each server. For details of the performance of each server each number of benchmark instances ("users), 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 lowest performance/watt configuration. The lowest system's performance/watt result is thus always 1.00. By normalizing, we make each data point in these charts a comparative number, with higher results indicating better performance/watt.

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

Performance/watt = the benchmark's score / average power consumption in watts during the time period in which the benchmark was delivering peak performance

As Figure 1 illustrates, the Dual-Core Intel Xeon Processor 5160-based server delivered almost 84 percent more performance/watt than the Dual-Core AMD Opteron 285-based server and almost 260 percent more performance/watt than the 64-bit Intel Xeon Processor 3.60 GHz-based server for SPECint_rate_base2000 with four users. The Dual-Core Intel Xeon Processor 5160-based server also delivered dramatically more performance/watt than the other servers on the SPECint_rate_base2000 test with two users.

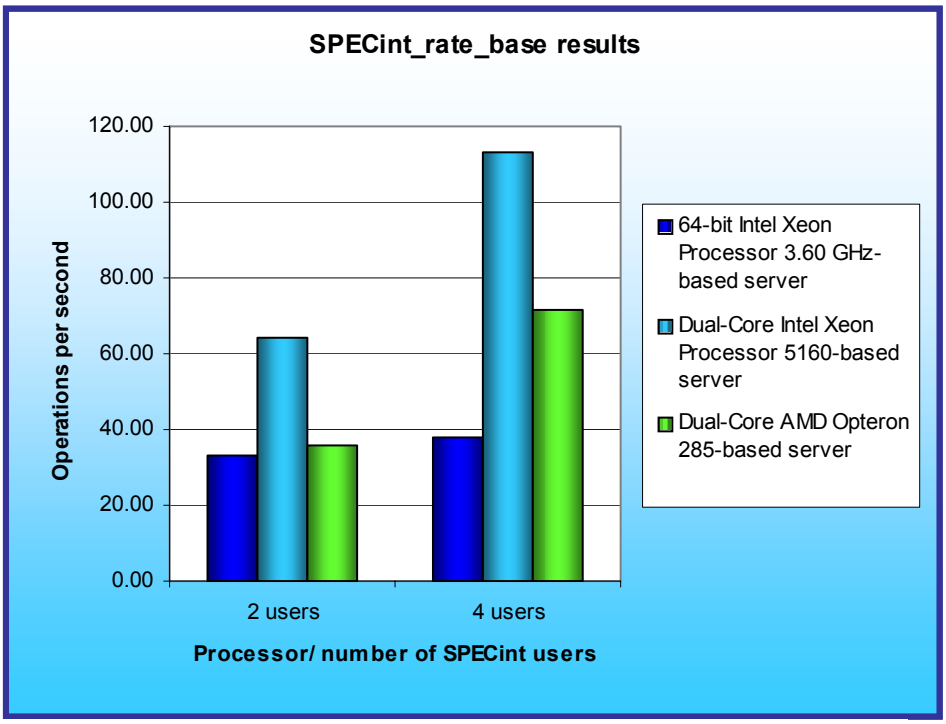


Figure 2: SPECint_rate_base2000 results for the three test servers. Higher numbers are better.

Figure 2 shows the SPECint_rate_base2000 results of the three test servers for two- and four-user runs. Each result is the SPECint_rate_base score in operations per second. By default, the benchmark performs three runs and uses the median result. A higher score is better.

For the four-user SPECint_rate_base2000 test, the Dual-Core Intel Xeon Processor 5160-based server produced the highest results (113) and yielded an almost 58 percent performance increase over the Dual-Core AMD Opteron 285-based server (71.7) and almost a 200 percent increase over the 64-bit Intel Xeon Processor 3.60 GHz-based server (33.7).

Figure 3 shows a plot of the power usage of the three servers as they were running the benchmark with four users. The red lines indicate the power measurement interval, the time during which the server was delivering peak performance and during which we captured power measurements. Lower power consumption is better. The Dual-Core Intel Xeon Processor 5160-based server both started with a lower power consumption while idle and achieved its peak performance while drawing less power—14.2 percent less—than the Dual-Core AMD Opteron 285-based server. (The drop in power consumption back to the idle state for both the Dual-Core Intel Xeon Processor 5160-based server and the Dual-Core AMD Opteron 285-based server occurred when each of those servers finished the workload.)

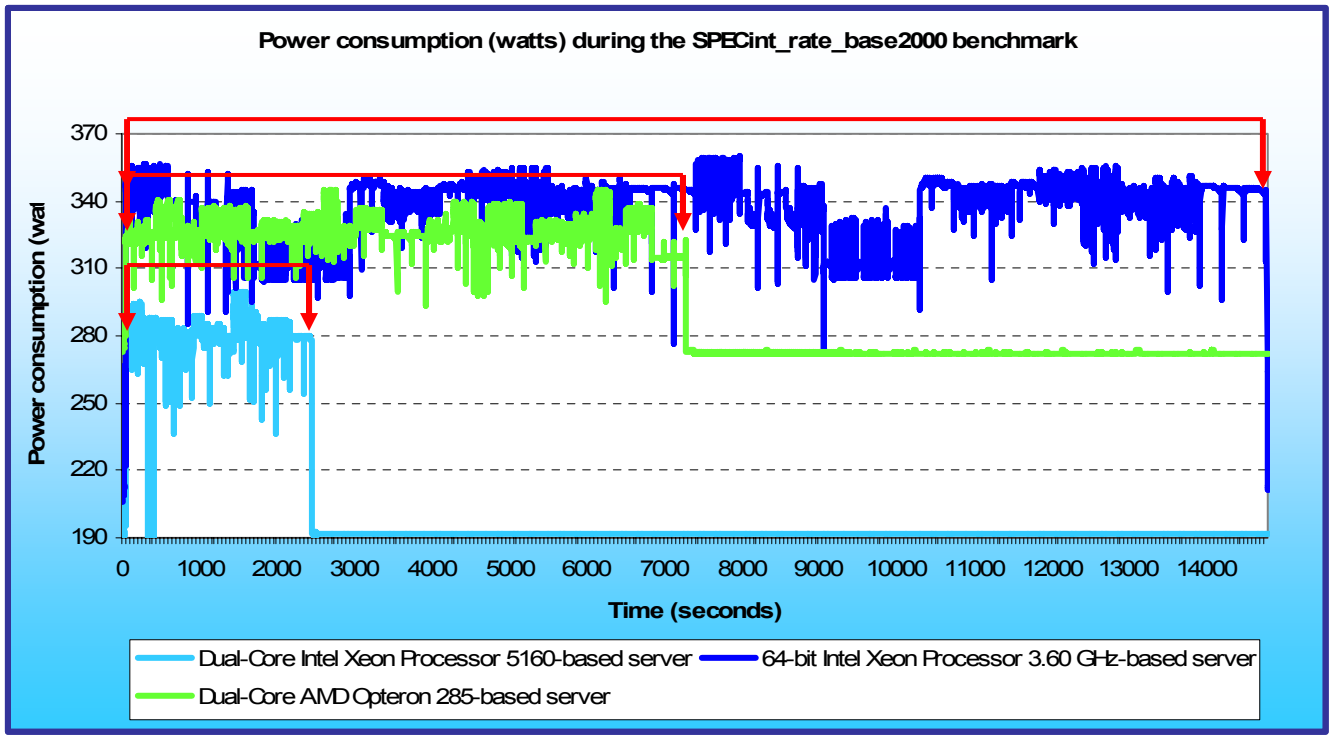


Figure 3: Power consumption (in watts) of each of the servers throughout the course of executing the SPECint_rate_base2000 benchmark with four users. Lower power consumption is better.

SPEC CPU2000 Workload

The SPEC CPU2000 workload includes two benchmark suites: CINT2000 and CFP2000. We ran only the CINT2000 benchmark, which focuses on measuring and comparing compute-intensive integer performance. Specifically, we measured the SPECint_rate_base2000 results for the three test servers with two and four users. This workload produces results as the average of twelve normalized throughput ratios with conservative optimization for each benchmark.

Figure 4 lists the 12 applications that compose the CINT2000 benchmark. Eleven of the applications were written in C; one (252.eon) was written in C++.

Name	Reference Time	Remarks
164.gzip	1400	Data compression utility
175.vpr	1400	FPGA circuit placement and routing
176.gcc	1100	C compiler
181.mcf	1800	Minimum cost network flow solver
186.crafty	1000	Chess program
197.parser	1800	Natural language processing
252.eon	1300	Ray tracing
253.perlbmk	1800	Perl
254.gap	1100	Computational group theory
255.vortex	1900	Object Oriented Database
256.bzip2	1500	Data compression utility
300.twolf	3000	Place and route simulator

Figure 4: The applications that make up the CINT2000 benchmark.

A CINT2000 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 5 shows the SPECint_rate_base2000 results for all three servers with two and four users. All three servers achieved their best SPECint_rate_base results with four users. (In SPEC's terms, these results are estimates, meaning we are not posting them on the SPEC Web site with all the SPEC required files. We do present here all the data necessary to reproduce these results.)

Server / # of users	2	4
64-bit Intel Xeon Processor 3.60 GHz-based server – 2 processors	33.2	37.7
Dual-Core Intel Xeon Processor 5160-based server – 2 processors	64.4	113.0
Dual-Core AMD Opteron 285-based server – 2 processors	36.0	71.7

Figure 5: SPECint_rate_ base2000 results of the servers with two and four users. Higher numbers are better.

Figure 6 details the average power consumption of the test servers during the median peak runs with two and four users. The Dual-Core Intel Xeon Processor 5160-based server had 14.2 percent lower average power usage during the SPECint_rate_base2000 four-user test than the Dual-Core AMD Opteron 285-based server.

Server / # of users	2	4
64-bit Intel Xeon Processor 3.60 GHz-based server – 2 processors	318.0	337.4
Dual-Core Intel Xeon Processor 5160-based server – 2 processors	252.8	281.1
Dual-Core AMD Opteron 285-based server – 2 processors	299.2	327.7

Figure 6: Average power usage (in watts) of the servers with varying user counts running SPECint_rate_base2000. Lower numbers are better.

Figure 7 details the power consumption, in watts, of the test servers while idle and during the peak (four-user) runs of the benchmark. The Dual-Core Intel Xeon Processor 5160-based server's power consumption while idle was almost 30 percent lower than that of the Dual-Core AMD Opteron 285-based server.

Server	Idle power (watts)	Average power (watts)
64-bit Intel Xeon Processor 3.60 GHz-based server – 2 processors	207.0	337.4
Dual-Core Intel Xeon Processor 5160-based server – 2 processors	192.2	281.1
Dual-Core AMD Opteron 285-based server – 2 processors	273.0	327.7

Figure 7: Average power usage (in watts) of the test servers while idle and during the runs of the SPECint_rate_base2000 test with four users. Lower numbers are better.

Test methodology

Figure 8 summarizes some of the key aspects of the configurations of the three server systems; Appendix A provides detailed configuration information.

Server	64-bit Intel Xeon Processor 3.60 GHz-based server	Dual-Core Intel Xeon Processor 5160-based server	Dual-Core AMD Opteron 285-based server
Processor frequency (GHz)	3.6GHz	3.0GHz	2.6GHz
Single/Dual-Core processors	Single	Dual	Dual
Motherboard	Intel SE7520AF2	Intel S5000PSL	UNIWIDE Technologies SS232-128-03
Chipset	Intel E7520 Chipset	Intel 5000P Chipset	NVIDIA nForce4 chipset
RAM (8GB in each)	8 x 1GB PC2-3200	8 x 1GB PC2-5300 FBDIMM	8 x 1GB PC-3200
Hard Drive	Western Digital WD1600YD	Western Digital WD1600YD	Western Digital WD1600YD

Figure 8: Summary of some key aspects of the server configurations.

Intel configured and provided all three servers.

The difference in RAM types reflects the capabilities of the three motherboards: The Intel SE7520AF2 motherboard offered a shared front-side bus speed of 800 MHz and contained DDR2 PC2-3200 400 MHz memory components. The Intel S5000PSL motherboard offered two independent front-side busses at a speed of 1333 MHz and contained Fully-Buffered DIMM (FBDIMM) modules that used commodity DDR2 PC2-5300 667MHz memory components. The UNIWIDE motherboard supported 184-pin DDR memory, and the highest memory speed available for the Dual-Core AMD Opteron 285-based server was DDR PC3200 400MHz RAM.

Another hardware difference between the servers was the number of processor cores, though all three systems offer four processing threads. The 64-bit Intel Xeon Processor 3.60 GHz-based server contained single-core processors with HT Technology. The Dual-Core Intel Xeon Processor 5160- and Dual-Core AMD Opteron 285-based server contained dual-core processors.

With the following exceptions, we used the default BIOS settings on each server: we disabled the HW Prefetcher and the Adjacent Cache Line Prefetcher on the Dual-Core Intel Xeon Processor 5160-based server. These options were disabled by default on the 64-bit Intel Xeon processor 3.60 GHz-based server and were not available on the Dual-Core AMD Opteron 285-based server.

We began by installing a fresh copy of Microsoft Windows 2003 Server Enterprise Edition, Service Pack 1 on each server. We followed this process for each installation:

1. Assign a computer name of “Server”.
2. For the licensing mode, use the default setting of five concurrent connections.
3. Enter a password for the administrator log on.
4. Select Eastern Time Zone.
5. Use typical settings for the Network installation.
6. Use “Testbed” for the workgroup.

We applied the following updates from the Microsoft Windows Update site:

- Security Update for Windows Server 2003 (KB908531)
- Windows Malicious Software Removal Tool – April 2006 (KB890830)
- Cumulative Security Update for Internet Explorer for Windows Server 2003 (KB912812)
- Security Update for Windows Server 2003 (KB911562)
- Cumulative Security Update for Outlook Express for Windows Server 2003 (KB911567)
- Security Update for Windows Server 2003 (KB913446)
- Security Update for Windows Media Player Plug-in (KB911564)
- Security Update for Windows Server 2003 (KB911927)
- Security Update for Windows Server 2003 (KB908519)
- Security Update for Windows Server 2003 (KB912919)
- Security Update for Windows Server 2003 (KB904706)
- Update for Windows Server 2003 (KB910437)
- Security Update for Windows Server 2003 (KB896424)
- Security Update for Windows Server 2003 (KB900725)
- Security Update for Windows Server 2003 (KB901017)
- Security Update for Windows Server 2003 (KB899589)
- Security Update for Windows Server 2003 (KB902400)
- Security Update for Windows Server 2003 (KB905414)
- Security Update for Windows Server 2003 (KB899591)
- Security Update for Windows Server 2003 (KB890046)
- Security Update for Windows Server 2003 (KB899587)
- Security Update for Windows Server 2003 (KB896358)
- Security Update for Windows Server 2003 (KB896422)
- Security Update for Windows Server 2003 (KB896428)
- Security Update for Windows Server 2003 (KB893756)
- Security Update for Windows Server 2003 (KB899588)
- Security Update for Windows Server 2003 (KB901214)
- Update for Windows Server 2003 (KB898715)

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 one-second intervals.

To gauge the idle power usage, we recorded the power usage 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 one-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 Figures 3 (power consumption over time), 6 (power consumption at different user counts), and 7 (idle and average peak power) for the results of these measurements.

SPECCPU2000 configuration

We followed SPEC's standard instructions for building the CINT2000 executables. After studying the best results for this benchmark on the SPEC Web site, we chose the following software tools:

- Intel C++ Compiler 9.0 for 32-bit
- Microsoft Visual Studio .Net 2003 (for libraries)
- SmartHeap Library Version 7.4 (from http://www.microquill.com/)

The benchmark requires configuration files. From the SPEC Web site we chose the most recent (as of the testing for this report) SPECCPU2000 results that AMD and Intel had submitted that used the above Intel 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 file we used for the Dual-Core Intel Xeon Processor 5160-based server and the 64-bit Intel Xeon Processor 3.60 GHz-based server appears in Appendix B. Appendix C presents the configuration file we used for the Dual-Core AMD Opteron 285-based server.

We used two SPEC distribution zip files: IA_SPECCPU2000v1.zip (for the Intel-based servers), and AMD_SPECCPU2000v1.zip (for the AMD-based server). We copied the appropriate version to each server and unzipped the file into the C:\SPECCPU2000v1.3 directory. We then modified the configuration files by entering the appropriate system information.

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. (SPEC also offers options for more aggressive, or "peak," tests. Though as the benchmark output in Appendix D show we ran those on two of the three servers—time did not permit us to run it on the third—we are not reporting those results here.)

To begin the benchmark, we performed the following steps:

- Open a command prompt.
- Change to the SPECCPU2000v1.3 directory.
- Type shrc at the command prompt.
- Enter "runspec -c <config file name> --reportable -T base <#> int" , where
  - <config file name> = name of the configuration file
  - <#> = is 2 or 4, depending on the number of users

When the run completes, the benchmark puts the results in the directory \SPECCPU2000v1.3\result. The result file names are of the form CINT2000.<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. CINT2000.002. asc and log.002.

Appendix A – Test server configuration information

This appendix provides detailed configuration information about each of the three test server systems.

Processors	64-bit Intel Xeon Processor 3.60 GHz	Dual-Core Intel Xeon Processor 5160	Dual-Core AMD Opteron 285
System configuration information			
General			
Processor and OS kernel: (physical, core, logical) / (UP, MP)	2P2C4L / MP	2P4C4L / MP	2P4C4L / MP
Number of physical processors	2	2	2
Single/Dual-core processors	Single	Dual	Dual
System Power Management Policy	Always On	Always On	Always On
CPU			
Vendor	Intel	Intel	AMD
Name	64-bit Intel Xeon Processor 3.60 GHz	Dual-Core Intel Xeon Processor 5160	Dual-Core AMD Opteron 285
Stepping	3	4	2
Socket type	mPGA-604	LGA 775	940
Core frequency (GHz)	3.6 GHz	3.0 GHz	2.6 GHz
Front-side bus frequency (MHz)	800 MHz	1333 MHz Dual Independent Busses (DIB)	2000 MHz HyperTransport
L1 Cache	16KB + 12KB	32KB + 32KB	64KB + 64KB
L2 Cache	2MB	4MB (Shared)	2MB (1MB per core)
Platform			
Vendor and model number	64-bit Intel Xeon Processor 3.60 GHz server	Dual-Core Intel Xeon Processor 5160 server	Dual-Core AMD Opteron 285 server
Motherboard model number	Intel SE7520AF2	Intel S5000PSL	UNIWIDE_SS232-128-03
Motherboard chipset	Intel E7520 Chipset	Intel 5000P Chipset	NVIDIA nForce4 Chipset
Motherboard revision number	C4	92	A3
Motherboard serial number	KRA145100053	TM63S00221	WTOPHTSA01020
BIOS name and version	American Megatrends Inc. SE7520AF20.86B.P.10.00.0109.020820 06139	American Megatrends Inc. S5000.86B.01.00.0036, 4/4/2006	American Megatrends Inc. 080012, 3/21/2006
BIOS settings	Default	HW Prefetcher and Adjacent Cache Line Prefetcher disabled	Default
Chipset INF driver	7.2.2.1006	7.3.0.1010	6.7
Memory module(s)			
Vendor and model number	Infineon HYS72T128000HR-5-A	Micron MT18HTF12872FDY	Corsair CMX1024RE-32000

Type	PC2-3200	FB-DIMM using PC2-5300 components	PC-3200
Speed (MHz)	400MHz	667MHz	400MHz
Speed in the system currently running @ (MHz)	400MHz	667MHz	400MHz
Timing/Latency (tCL-tRCD-iRP-tRASmin)	3-3-3-11	5-5-5-12	3-3-3-8
Size	8192MB	8192MB	8192MB
Number of RAM modules	8	8	8
Chip organization	Double-sided	Double-sided	Double-sided
Channel	Single	Dual	Dual
Hard disk			
Vendor and model number	Western Digital WD1600YD	Western Digital WD1600YD	Western Digital WD1600YD
Number of disks in system	1	1	1
Size	160GB	160GB	160GB
Buffer Size	16MB	16MB	16MB
RPM	7200	7200	7200
Type	SATA	SATA	SATA
Controller	Intel 82801EB Ultra ATA	Intel 631xESB Serial ATA	NVIDIA nForce4 Serial ATA
Controller driver	Intel 6.3.0.1005	Intel 7.3.0.1010	NVIDIA 5.10.2600.552
Operating system			
Name	Microsoft Windows 2003 Server, x32 Enterprise Edition	Microsoft Windows 2003 Server, x32 Enterprise Edition	Microsoft Windows 2003 Server, x32 Enterprise Edition
Build number	3790	3790	3790
Service Pack	SP1	SP1	SP1
Microsoft Windows update date	5/5/2006	5/5/2006	5/5/2006
File system	NTFS	NTFS	NTFS
Kernel	ACPI Multiprocessor x32-based PC	ACPI Multiprocessor x32-based PC	ACPI Multiprocessor x32-based PC
Language	English	English	English
Microsoft DirectX version	DirectX 9.0c	DirectX 9.0c	DirectX 9.0c
Graphics			
Vendor and model number	ATI Rage XL	ATI Rage XL	ATI Rage XL
Chipset	ATI Rage XL PCI	ATI Rage XL PCI	ATI Rage XL PCI
BIOS version	GR-xlints3y.019-4.333	BK-ATI VER008.005.023.000	GR-xlacrs3p.003-4.328
Type	Integrated	Integrated	Integrated
Memory size	8MB	8MB	8MB
Resolution	1024 x 768	1024 x 768	1024 x 768
Driver	ATI 5.10.2600.6014	ATI 5.10.2600.6014	ATI 5.10.2600.6014
Network card/subsystem			
Vendor and model number	Intel PRO/1000 MT Dual Port Network adapter	Intel PRO/1000 EB Network Connection	Broadcom dual NetXtreme Gigabit
Type	Integrated	Integrated	Integrated
Driver	Intel 8.6.11.0	Intel 9.3.28.0	Broadcom 8.48.0.0

Additional card information	2 x Intel PRO/1000 PT Dual Port Server Adapter	2 x Intel PRO/1000 PT Dual Port Server Adapter	2 x Intel PRO/1000 PT Dual Port Server Adapter
Additional card type	PCI – Express	PCI – Express	PCI – Express
Additional card driver	Intel 9.3.28.0	Intel 9.3.28.0	Intel 9.3.28.0
Optical drive			
Vendor and model number	Samsung TS-H325A	LITE-ON SOHD-16P9SV	Samsung SN-124
Type	DVD/CD-ROM	DVD/CD-ROM	CD-ROM
Interface	Internal	Internal	Internal
USB ports			
# of ports	5	6	4
Type of ports (USB 1.1, USB 2.0)	USB 2.0	USB 2.0	USB 2.0

Figure 9: Detailed system configuration information for the three test servers.

Appendix B – Configuration file for the two Intel processor-based servers

This appendix contains the benchmark configuration file we used to test the Dual-Core Intel Xeon Processor 5160-based server and the 64-bit Intel Xeon Processor 3.60 GHz-based server.

```
# Invocation command line:
# C:\cpu2000.1.3\bin\runspec -c cpu2000.v1.3.ic90.win32.p4.sse3.sep232005.cfg -T all -o asc all
############################################################################
############################################################################
#
# SPEC CPU2000 1.3 Intel Windows XP 32-bit config file for Pentium 4 with SSE3
# Sep 23 2005. Intel Compiler 9.0 20050430Z
############################################################################

VENDOR      = intel
action      = validate
tune        = base
ext         = cpu2000.v1.3.ic90.win32.p4.sse3.sep232005
PATHSEP     = /
check_md5=1
reportable=1

####################################################################
# These sections are listed as benchmark-tuning-extension-machine
####################################################################

default=default=default=default:
CC  = icl
CXX = icl
F77 = ifort
FC  = ifort
OBJ = .obj
#
# portability & libraries
#
176.gcc=default=default=default:
CPORTABILITY = -Dalloca=_alloca /F10000000
EXTRA_LDFLAGS = /F10000000
notes011= 176.gcc: -Dalloca=_alloca /F10000000

178.galgel=default=default=default:
EXTRA_FFLAGS = -FI /F32000000
EXTRA_LDFLAGS = /F32000000
notes011= 178.galgel:   -FI /F32000000

186.crafty=default=default=default:
CPORTABILITY = -DNT_i386
notes012= 186.crafy: -DNT_i386


253.perlbmk=default=default=default:
CPORTABILITY = -DSPEC_CPU2000_NTOS -DPERLDLL /MT
EXTRA_LDFLAGS = /MT
notes014= 253.perlbmk: -DSPEC_CPU2000_NTOS -DPERLDLL /MT

254.gap=default=default=default:
CPORTABILITY = -DSYS_HAS_CALLOC_PROTO -DSYS_HAS_MALLOC_PROTO
notes015= 254.gap: -DSYS_HAS_CALLOC_PROTO -DSYS_HAS_MALLOC_PROTO

####################################################################
# Baseline Tuning Flags
####################################################################

int=base=default=default:
PASS1_CFLAGS=   -fast -Qprof_gen
```

```
PASS2_CFLAGS=   -fast -Qprof_use
PASS1_LDFLAGS=  -fast -Qprof_gen
PASS2_LDFLAGS=  -fast -Qprof_use
EXTRA_LIBS=     shlW32M.lib
notes000= +FDO: PASS1=-Qprof_gen  PASS2=-Qprof_use
notes001= Base tuning for C programs:   -fast +FDO shlW32M.lib

252.eon=base=default=default:
PASS1_CXXFLAGS= -fast -Qcxx_features -Qprof_gen
PASS2_CXXFLAGS= -fast -Qcxx_features -Qprof_use
PASS1_LDFLAGS=  -fast -Qcxx_features -Qprof_gen
PASS2_LDFLAGS=  -fast -Qcxx_features -Qprof_use
notes002= Base tuning for C++ programs: -fast -Qcxx_features +FDO

fp=base=default=default:
PASS1_CFLAGS=          -fast -Qansi_alias -Qprof_gen
PASS2_CFLAGS=          -fast -Qansi_alias -Qprof_use
PASS1_FFLAGS=          -fast -Qansi_alias -Qprof_gen
PASS2_FFLAGS=          -fast -Qansi_alias -Qprof_use
PASS1_LDFLAGS=         -fast -Qansi_alias -Qprof_gen
PASS2_LDFLAGS=         -fast -Qansi_alias -Qprof_use
notes000= +FDO: PASS1=  -Qprof_gen  PASS2=-Qprof_use
notes001= Base tuning for Fortran programs:  -fast -Qansi_alias +FDO

177.mesa=base=default=default:
PASS1_CFLAGS=          -fast -Qprof_gen
PASS2_CFLAGS=          -fast -Qprof_use
PASS1_LDFLAGS=         -fast -Qprof_gen
PASS2_LDFLAGS=         -fast -Qprof_use
EXTRA_LIBS=     shlW32M.lib
notes002= Base tuning for 177.mesa:  -fast shlW32M.lib +FDO

179.art=base=default=default:
PASS1_CFLAGS=          -fast -Qprof_gen
PASS2_CFLAGS=          -fast -Qprof_use
PASS1_LDFLAGS=         -fast -Qprof_gen
PASS2_LDFLAGS=         -fast -Qprof_use
EXTRA_LIBS=     shlW32M.lib
notes003= Base tuning for 179.art:  -fast shlW32M.lib +FDO

183.equake=base=default=default:
PASS1_CFLAGS=          -fast -Qprof_gen
PASS2_CFLAGS=          -fast -Qprof_use
PASS1_LDFLAGS=         -fast -Qprof_gen
PASS2_LDFLAGS=         -fast -Qprof_use
EXTRA_LIBS=     shlW32M.lib
notes004= Base tuning for 183.equake:  -fast shlW32M.lib +FDO

188.ammp=base=default=default:
PASS1_CFLAGS=          -fast -Qprof_gen
PASS2_CFLAGS=          -fast -Qprof_use
PASS1_LDFLAGS=         -fast -Qprof_gen
PASS2_LDFLAGS=         -fast -Qprof_use
EXTRA_LIBS=     shlW32M.lib
notes005= Base tuning for 188.ammp:  -fast shlW32M.lib +FDO



######################################################################
# Peak Tuning Flags
######################################################################

#####################
# int2000 Peak tuning
#####################

164.gzip=peak=default=default:
PASS1_CFLAGS=          -fast -Qansi_alias -Oa -Qprof_gen
PASS2_CFLAGS=          -fast -Qansi_alias -Oa -Qprof_use
```

PASS1_LDFLAGS=   -fast -Qansi_alias -Oa -Qprof_gen
PASS2_LDFLAGS=   -fast -Qansi_alias -Oa -Qprof_use
notes021= 164.gzip: -fast -Qansi_alias -Oa +FDO

175.vpr=peak=default=default:
PASS1_CFLAGS=   -fast -Qansi_alias -Qprof_gen
PASS2_CFLAGS=   -fast -Qansi_alias -Qprof_use
PASS1_LDFLAGS=   -fast -Qansi_alias -Qprof_gen
PASS2_LDFLAGS=   -fast -Qansi_alias -Qprof_use
notes022= 175.vpr: -fast -Qansi_alias +FDO

176.gcc=peak=default=default:
basepeak=yes
notes023= 176.gcc: basepeak=yes

181.mcf=peak=default=default:
basepeak=yes
notes024= 181.mcf: basepeak=yes

186.crafty=peak=default=default:
PASS1_CFLAGS=   -fast -Qansi_alias -Oa -Qprof_gen
PASS2_CFLAGS=   -fast -Qansi_alias -Oa -Qprof_use
PASS1_LDFLAGS=   -fast -Qansi_alias -Oa -Qprof_gen
PASS2_LDFLAGS=   -fast -Qansi_alias -Oa -Qprof_use
notes025= 186.crafty: -fast -Qansi_alias -Oa +FDO

197.parser=peak=default=default:
PASS1_CFLAGS=   -fast -Qansi_alias -Qprof_gen
PASS2_CFLAGS=   -fast -Qansi_alias -Qprof_use
PASS1_LDFLAGS=   -fast -Qansi_alias -Qprof_gen
PASS2_LDFLAGS=   -fast -Qansi_alias -Qprof_use
notes026= 197.parser: -fast -Qansi_alias +FDO

252.eon=peak=default=default:
PASS1_CXXFLAGS=   -fast -Qprof_gen
PASS2_CXXFLAGS=   -fast -Qprof_use
PASS1_LDFLAGS=   -fast -Qprof_gen
PASS2_LDFLAGS=   -fast -Qprof_use
notes027= 252.eon: -fast +FDO

253.perlbmk=peak=default=default:
PASS1_CFLAGS=   -fast -Qansi_alias -Qprof_gen
PASS2_CFLAGS=   -fast -Qansi_alias -Qprof_use
PASS1_LDFLAGS=   -fast -Qansi_alias -Qprof_gen
PASS2_LDFLAGS=   -fast -Qansi_alias -Qprof_use
EXTRA_LIBS=   shlW32M.lib
notes028= 253.perlbmk: -fast -Qansi_alias +FDO shlW32M.lib

254.gap=peak=default=default:
basepeak=yes
notes029= 254.gap: basepeak=yes

255.vortex=peak=default=default:
basepeak=yes
notes030= 255.vortex   basepeak=yes

256.bzip2=peak=default=default:
PASS1_CFLAGS=   -fast -Oa -Qunroll1 -Qprof_gen
PASS2_CFLAGS=   -fast -Oa -Qunroll1 -Qprof_use
PASS1_LDFLAGS=   -fast -Oa -Qunroll1 -Qprof_gen
PASS2_LDFLAGS=   -fast -Oa -Qunroll1 -Qprof_use
notes031= 256.bzip2:   -fast -Oa -Qunroll1 +FDO

300.twolf=peak=default=default:
PASS1_CFLAGS=   -fast -Qprof_gen
PASS2_CFLAGS=   -fast -O3 -Qprof_use
PASS1_LDFLAGS=   -fast -O3 -Qprof_gen
PASS2_LDFLAGS=   -fast -O3 -Qprof_use
EXTRA_LIBS=   shlW32M.lib

```
notes032= 300.twolf:    -fast -O3 +FDO shlW32M.lib

####################
# fp2000 Peak tuning
####################

168.wupwise=peak=default=default:
PASS1_F77FLAGS=         -fast -Qansi_alias -Qprof_gen
PASS2_F77FLAGS=         -fast -Qansi_alias -Qprof_use
PASS1_LDFLAGS=          -fast -Qansi_alias -Qprof_gen
PASS2_LDFLAGS=          -fast -Qansi_alias -Qprof_use
notes021= 168.wupwise:  -fast -Qansi_alias +FDO

171.swim=peak=default=default:
PASS1_F77FLAGS=         -fast -Qansi_alias -Qprof_gen
PASS2_F77FLAGS=         -fast -Qansi_alias -Qprof_use
PASS1_LDFLAGS=          -fast -Qansi_alias -Qprof_gen
PASS2_LDFLAGS=          -fast -Qansi_alias -Qprof_use
notes022= 171.swim:     -fast -Qansi_alias +FDO

172.mgrid=peak=default=default:
PASS1_F77FLAGS=         -fast -Qansi_alias -Qprof_gen
PASS2_F77FLAGS=         -fast -Qansi_alias -Qprof_use
PASS1_LDFLAGS=          -fast -Qansi_alias -Qprof_gen
PASS2_LDFLAGS=          -fast -Qansi_alias -Qprof_use
notes023= 172.mgrid:    -fast -Qansi_alias +FDO

173.applu=peak=default=default:
PASS1_F77FLAGS=       -fast -Qscalar_rep- -Qauto -Qprof_gen
PASS2_F77FLAGS=       -fast -Qscalar_rep- -Qauto -Qprof_use
PASS1_LDFLAGS=        -fast -Qscalar_rep- -Qauto -Qprof_gen
PASS2_LDFLAGS=        -fast -Qscalar_rep- -Qauto -Qprof_use
notes024= 173.applu:  -fast -Qscalar_rep- -Qauto  +FDO

177.mesa=peak=default=default:
basepeak=yes
notes025= 177.mesa:   basepeak=yes

178.galgel=peak=default=default:
PASS1_FFLAGS=           -fast -Qansi_alias -Qprof_gen
PASS2_FFLAGS=           -fast -Qansi_alias -Qprof_use
PASS1_LDFLAGS=          -fast -Qansi_alias -Qprof_gen
PASS2_LDFLAGS=          -fast -Qansi_alias -Qprof_use
notes026= 178.galgel:   -fast -Qansi_alias +FDO

179.art=peak=default=default:
basepeak=yes
notes027= 179.art:      basepeak=yes

183.equake=peak=default=default:
PASS1_CFLAGS=               -Oa -Qrcd -Qipo -Qprof_gen
PASS2_CFLAGS=           -QxP -Oa -Qrcd -Qipo -Qprof_use
PASS1_LDFLAGS=              -Oa -Qrcd -Qipo -Qprof_gen
PASS2_LDFLAGS=          -QxP -Oa -Qrcd -Qipo -Qprof_use
EXTRA_LIBS=     shlW32M.lib
notes028= 183.equake:   -QxP -Oa -Qrcd -Qipo shlW32M.lib +FDO

187.facerec=peak=default=default:
PASS1_FFLAGS=           -fast -Qunroll1 -Qscalar_rep- -Qprof_gen
PASS2_FFLAGS=           -fast -Qunroll1 -Qscalar_rep- -Qprof_use
PASS1_LDFLAGS=          -fast -Qunroll1 -Qscalar_rep- -Qprof_gen
PASS2_LDFLAGS=          -fast -Qunroll1 -Qscalar_rep- -Qprof_use
notes029= 187.facerec:  -fast -Qunroll1 -Qscalar_rep- +FDO

188.ammp=peak=default=default:
PASS1_CFLAGS=           -fast -Oa -Qprof_gen
PASS2_CFLAGS=           -fast -Oa -Qprof_use
PASS1_LDFLAGS=          -fast -Oa -Qprof_gen
PASS2_LDFLAGS=          -fast -Oa -Qprof_use
```

```
EXTRA_LIBS=     shlW32M.lib
notes030= 188.ammp:     -fast -Oa +FDO shlW32M.lib

189.lucas=peak=default=default:
PASS1_FFLAGS=           -fast -Qprefetch- -Qprof_gen
PASS2_FFLAGS=           -fast -Qprefetch- -Qprof_use
PASS1_LDFLAGS=          -fast -Qprefetch- -Qprof_gen
PASS2_LDFLAGS=          -fast -Qprefetch- -Qprof_use
notes031= 189.lucas:    -fast -Qprefetch- +FDO

191.fma3d=peak=default=default:
basepeak=yes
notes032= 191.fma3d:    basepeak=yes

200.sixtrack=peak=default=default:
PASS1_F77FLAGS=         -Qipo      -Qprof_gen
PASS2_F77FLAGS=         -Qipo -QxP -Qprof_use
PASS1_LDFLAGS=          -Qipo      -Qprof_gen
PASS2_LDFLAGS=          -Qipo -QxP -Qprof_use
notes033= 200.sixtrack: -Qipo -QxP +FDO

301.apsi=peak=default=default:
PASS1_F77FLAGS=         -fast -Qprof_gen
PASS2_F77FLAGS=         -fast -Qprof_use
PASS1_LDFLAGS=          -fast -Qprof_gen
PASS2_LDFLAGS=          -fast -Qprof_use
notes034= 301.apsi:     -fast +FDO

################################################################################
# System config information
################################################################################

default=default=default=default:
hw_vendor=
hw_model=
hw_cpu=
hw_cpu_mhz=
hw_fpu=
hw_ncpu=
hw_ncpuorder=
hw_parallel=
hw_pcache=
hw_scache=
hw_tcache=
hw_ocache=
hw_memory=
hw_disk=
hw_other=
sw_os=
sw_file=
sw_state=
company_name=
machine_name=
license_num=
tester_name=
test_date=
hw_avail=
sw_avail=
prepared_by=
config=
notes050=
notes051=
notes052=
notes053=
notes054=
notes055=

################################################################################
# Software information (Compilers and libraries)
```

```
##############################################################################

int=default=default=default:
sw_compiler1=Intel C++ Compiler 9.0 for 32-bit
sw_compiler2=applications Build 20050430Z (32-bit)
sw_compiler3=Microsoft Visual Studio .Net 2003(for libraries)
sw_compiler4=SmartHeap Library Version 7.4 from http://www.microquill.com/
notes010= Portability flags:
notes020= Peak tuning:
notes045= New 32-bt Windows tools used, approved in May-2005

fp=default=default=default:
sw_compiler1=Intel C++ and Fortran Compiler 9.0 for 32-bit
sw_compiler2=applications Build 20050430Z (32-bit)
sw_compiler3=Microsoft Visual Studio .Net 2003(for libraries)
sw_compiler4=SmartHeap Library Version 7.4 from http://www.microquill.com/
notes010= Portability:
notes020= Peak tuning:



__MD5__
164.gzip=base=cpu2000.v1.3.ic90.win32.p4.sse3.sep232005=default:
# Last updated Sat May  6 17:17:46 2006
optmd5=e5f122f50354d112be7948cbd000bf80
exemd5=a07b70a8c37aa6ee3bb80330eca87093

164.gzip=peak=cpu2000.v1.3.ic90.win32.p4.sse3.sep232005=default:
# Last updated Sat May  6 17:17:46 2006
optmd5=a99c01d176dd023e61a90e35357aa1c6
exemd5=bf622341e9a758259ca557ae15486074

175.vpr=base=cpu2000.v1.3.ic90.win32.p4.sse3.sep232005=default:
# Last updated Sat May  6 17:17:46 2006
optmd5=eba35ab8b77ec87dfa048807c29dc44f
exemd5=26504ec96d557f892225021c07123f1b

175.vpr=peak=cpu2000.v1.3.ic90.win32.p4.sse3.sep232005=default:
# Last updated Sat May  6 17:17:46 2006
optmd5=2d55fc2721d333aed0a2376b36a816a2
exemd5=c31713dd4e5e40a4c75889b6e47b74a0

176.gcc=base=cpu2000.v1.3.ic90.win32.p4.sse3.sep232005=default:
# Last updated Sat May  6 17:17:46 2006
optmd5=18f35abd0cf5e7330db4146a6ed5af20
exemd5=8dbb84478731c0a5a0de63e18733b89e

181.mcf=base=cpu2000.v1.3.ic90.win32.p4.sse3.sep232005=default:
# Last updated Sat May  6 17:17:46 2006
optmd5=1961e891a253e50d2991d8d64690031f
exemd5=d27b8c00eb5751417875d72dbc385456

186.crafty=base=cpu2000.v1.3.ic90.win32.p4.sse3.sep232005=default:
# Last updated Sat May  6 17:17:46 2006
optmd5=97d8c5ba4fab50bc502352c74fcb3ad9
exemd5=00322afeab8b958f5b4a77241641c3d0

186.crafty=peak=cpu2000.v1.3.ic90.win32.p4.sse3.sep232005=default:
# Last updated Sat May  6 17:17:46 2006
optmd5=d559c581b88e2edfb5824055769f4b02
exemd5=6f7bba1b170166c7a30a2712d836ad3a

197.parser=base=cpu2000.v1.3.ic90.win32.p4.sse3.sep232005=default:
# Last updated Sat May  6 17:17:46 2006
optmd5=dfa6d9f60bc6090b49d75734c4fbbcc1
exemd5=c7544595cbf6804f3632bd9854ac0e72

197.parser=peak=cpu2000.v1.3.ic90.win32.p4.sse3.sep232005=default:
# Last updated Sat May  6 17:17:46 2006
```

optmd5=d6092d19db59057bb78ea8938c889fc1
exemd5=09205a08c3017d4277b4c022f89c7ce8

252.eon=base=cpu2000.v1.3.ic90.win32.p4.sse3.sep232005=default:
# Last updated Sat May 6 17:17:46 2006
optmd5=a65ed3e6cb7afc2e36ecfeb00f3a5330
exemd5=8f7ea2f10d623bc08eaed2b64c3bbc4c

252.eon=peak=cpu2000.v1.3.ic90.win32.p4.sse3.sep232005=default:
# Last updated Sat May 6 17:17:46 2006
optmd5=ce9a07da7b4901429ca22b342dd260f6
exemd5=178c57ba8bacf24c8b56ff2ee7f03131

253.perlbmk=base=cpu2000.v1.3.ic90.win32.p4.sse3.sep232005=default:
# Last updated Sat May 6 17:17:46 2006
optmd5=d9fce91f31f3243109ed23a7c5f77184
exemd5=7c3daccbd134557179b5c644bdffeadc

253.perlbmk=peak=cpu2000.v1.3.ic90.win32.p4.sse3.sep232005=default:
# Last updated Sat May 6 17:17:46 2006
optmd5=75b0938d99c88208b671c508b467da1c
exemd5=82d41eb3934602059c49664e986373d7

254.gap=base=cpu2000.v1.3.ic90.win32.p4.sse3.sep232005=default:
# Last updated Sat May 6 17:17:46 2006
optmd5=d5570ef93927f01f46e3da2f361e3765
exemd5=79407387294a91a15e914385852cc840

255.vortex=base=cpu2000.v1.3.ic90.win32.p4.sse3.sep232005=default:
# Last updated Sat May 6 17:17:46 2006
optmd5=71f0d392cb71fb3e159847c9880b8f3f
exemd5=90a17611a352b98371382aaf2bc150fe

256.bzip2=base=cpu2000.v1.3.ic90.win32.p4.sse3.sep232005=default:
# Last updated Sat May 6 17:17:46 2006
optmd5=ac2ac34824963ca151d29a64924918a0
exemd5=6ce674a24cb9d435506987986cfbaea5

256.bzip2=peak=cpu2000.v1.3.ic90.win32.p4.sse3.sep232005=default:
# Last updated Sat May 6 17:17:46 2006
optmd5=ae5144166a2727e6b6a224133e808edf
exemd5=06661daecc731d0f1a13e6c016828668

300.twolf=base=cpu2000.v1.3.ic90.win32.p4.sse3.sep232005=default:
# Last updated Sat May 6 17:17:46 2006
optmd5=b66e50cc6f379af293222b1760ac5b53
exemd5=88aef334fc5388922fc7c757d2069df4

300.twolf=peak=cpu2000.v1.3.ic90.win32.p4.sse3.sep232005=default:
# Last updated Sat May 6 17:17:46 2006
optmd5=c751dedbf5b87bc0990dcebfaa3d4eb1
exemd5=3c11745c189d44505c52508e203e44a8

Appendix C – Configuration file for the AMD processor-based server

This appendix contains the configuration file we used to test the Dual-Core AMD Opteron 285-based server.

```
# Invocation command line:
# C:\cpu2000\bin\runspec -c amd461K8.cfg -T all int
############################################################################
############################################################################
# Global Information
############################################################################

#Get the HW and SW specs from the include file
#include: SUT.inc
# ---- Begin inclusion of 'C:/cpu2000/config/SUT.inc'
############################################################################
# Machine-specific section
############################################################################
hw_cpu       =
hw_cpu_mhz   =
hw_disk      =
hw_fpu       =
hw_memory    =
hw_vendor    =
hw_model     =
hw_avail     =
hw_ncpu      =
hw_ncpuorder =
hw_ocache    =
hw_other     =
hw_parallel  =
hw_pcache    =
hw_scache    =
hw_tcache    =
sw_file      =
sw_os        =
sw_state     =

# Note: For rate runs, "start /affinity" will be used by default.
# This usually result in a higher performance for a multi-CPU/multi-core platform.
# If you do not want to use this, or if your Windows operating system does not
# support this, comment/edit the next line.
submit= specperl -e "system sprintf qq{start /b /wait /affinity %x %s}, (1<<$SPECUSERNUM), qq{ $command } "

# System setup notes
# To add notes, uncomment these lines below and add the comments
#notes6000    =
#notes6010    =
notes6020    =
notes6040    =
notes6060    =
notes6070    =
#notes6080    = /NUMPROC=1 flag added to boot.ini to invoke uniprocessor environment.
#notes6090    =
#notes6100    = 'start /b /wait /affinity' command is used to bind CPU(s) to processes
############################################################################
# Software and license-specific section
############################################################################
license_num  =
test_date    =
prepared_by  =
company_name =
tester_name  =
reportable   =
# ---- End inclusion of 'C:/cpu2000/config/SUT.inc'
```

```
action      = validate
tune        = base
ext         = amd461K8.i90.p60.exe
output_format=asc,html,config,ps,pdf
check_md5=1
hw_parallel= no
VENDOR      = AMD

#
# These are listed as benchmark-tuning-extension-machine
#

###################
# Compiler Setup #
###################

int=default=default=default:
CC = icl
CXX = icl
OBJ=.obj

fp=default=default=default:
CC = pgcc
F77 = pgf90
FC = pgf90
LDOPT =  -o $@
OBJ = .o
OBJOPT = -c -o $@

############################
# portability & libraries #
############################

178.galgel=default=default=default:
notes0041=  178.galgel:                -Mfixed
EXTRA_FFLAGS = -Mfixed

176.gcc=default=default=default:
notes0040=    176.gcc:      -Dalloca=_alloca /F10000000
CPORTABILITY = -Dalloca=_alloca /F10000000
EXTRA_LDFLAGS = /F10000000

186.crafty=default=default=default:
notes0050=    186.crafty:   -DNT_i386
CPORTABILITY = -DNT_i386

253.perlbmk=default=default=default:
notes0060=    253.perlbmk:  -DSPEC_CPU2000_NTOS -DPERLDLL /MT
CPORTABILITY = -DSPEC_CPU2000_NTOS -DPERLDLL /MT
EXTRA_LDFLAGS = /MT

254.gap=default=default=default:
notes0070=    254.gap:      -DSYS_HAS_CALLOC_PROTO -DSYS_HAS_MALLOC_PROTO
CPORTABILITY = -DSYS_HAS_CALLOC_PROTO -DSYS_HAS_MALLOC_PROTO

#################################################################
# Baseline Tuning Flags
#################################################################

###################################
# int2000                         #
# Base tuning default optimization #
###################################
int=base=default=default:
notes0080=  Baseline C:   -O3 -Qipo -Op +FDO
COPTIMIZE=    -O3 -Qipo -Op
PASS1_CFLAGS= -Qprof_gen
PASS2_CFLAGS= -Qprof_use
PASS1_LDFLAGS= -Qprof_gen
```

```
PASS2_LDFLAGS= -Qprof_use

252.eon=base=default=default:
notes0081=  Baseline C++: -O3 -Qipo -Qcxx-features +FDO
CXXOPTIMIZE=  -O3 -Qipo -Qcxx-features
PASS1_CXXFLAGS= -Qprof_gen
PASS2_CXXFLAGS= -Qprof_use

####################################
# fp2000                           #
# Base tuning default optimization #
####################################
fp=base=default=default:
notes0085=  Baseline: Fortran:  pgf90   -fastsse -Mipa=fast,inline +FDO
notes0080=  Baseline: C      :  pgcc    -fastsse -Mipa=fast,inline
FOPTIMIZE=   -fastsse -Mipa=fast,inline
F77OPTIMIZE= -fastsse -Mipa=fast,inline
COPTIMIZE=  -fastsse -Mipa=fast,inline
PASS1_FFLAGS=   -Mpfi
PASS2_FFLAGS=   -Mpfo
PASS1_F77FLAGS=              -Mpfi
PASS2_F77FLAGS=              -Mpfo
ONESTEP=1

177.mesa=base=default=default:
feedback=0

179.art=base=default=default:
feedback=0

183.equake=base=default=default:
feedback=0

188.ammp=base=default=default:
feedback=0

#####################################################################
# Peak Tuning Flags
#####################################################################

####################
# Int peak options #
####################

int=default=default=default:
notes0085= Peak Tuning:

164.gzip=peak=default=default:
notes0090=  164.gzip:     -O3 -Qipo -QxW +FDO
COPTIMIZE=   -O3 -Qipo -QxW
PASS1_CFLAGS= -Qprof_gen
PASS2_CFLAGS= -Qprof_use
PASS1_LDFLAGS= -Qprof_gen
PASS2_LDFLAGS= -Qprof_use

175.vpr=peak=default=default:
notes0100=  175.vpr:      -O3 -Qipo -QxW +FDO
notes0110=               -Qoption,c,-ip_ninl_max_stats=2000,-ip_ninl_max_total_stats=4500
COPTIMIZE=   -O3 -Qipo -QxW -Qoption,c,-ip_ninl_max_stats=2000,-ip_ninl_max_total_stats=4500
PASS1_CFLAGS= -Qprof_gen
PASS2_CFLAGS= -Qprof_use
PASS1_LDFLAGS= -Qprof_gen
PASS2_LDFLAGS= -Qprof_use

176.gcc=peak=default=default:
notes0120=  176.gcc:      -O3 -Qipo -QxW -Oi- -Qunroll3 +FDO
COPTIMIZE=   -O3 -Qipo -QxW -Oi- -Qunroll3
PASS1_CFLAGS= -Qprof_gen
PASS2_CFLAGS= -Qprof_use
```

PASS1_LDFLAGS= -Qprof_gen
PASS2_LDFLAGS= -Qprof_use

181.mcf=peak=default=default:
notes0130= 181.mcf: -O3 -Qipo -QaxN +FDO
COPTIMIZE= -O3 -Qipo -QaxN
PASS1_CFLAGS= -Qprof_gen
PASS2_CFLAGS= -Qprof_use
PASS1_LDFLAGS= -Qprof_gen
PASS2_LDFLAGS= -Qprof_use

186.crafty=peak=default=default:
notes0140= 186.crafty: -O3 -Qipo -QxW +FDO
COPTIMIZE= -O3 -Qipo -QxW
PASS1_CFLAGS= -Qprof_gen
PASS2_CFLAGS= -Qprof_use
PASS1_LDFLAGS= -Qprof_gen
PASS2_LDFLAGS= -Qprof_use

197.parser=peak=default=default:
notes0150= 197.parser: -QxW +FDO -Oi- -Qipo
COPTIMIZE= -QxW -Oi- -Qipo
PASS1_CFLAGS= -Qprof_gen
PASS2_CFLAGS= -Qprof_use
PASS1_LDFLAGS= -Qprof_gen
PASS2_LDFLAGS= -Qprof_use

252.eon=peak=default=default:
notes0160= 252.eon: -O3 -Qipo -QxW +FDO -Qansi_alias
notes0170= -Qoption,c,-ip_ninl_max_stats=2000,-ip_ninl_max_total_stats=4500
CXXOPTIMIZE= -O3 -Qipo -QxW -Qansi_alias -Qoption,c,-ip_ninl_max_stats=2000,-ip_ninl_max_total_stats=4500
PASS1_CXXFLAGS= -Qprof_gen
PASS2_CXXFLAGS= -Qprof_use
PASS1_LDFLAGS= -Qprof_gen
PASS2_LDFLAGS= -Qprof_use

253.perlbmk=peak=default=default:
notes0180= 253.perlbmk: -O3 -Qipo -QxW +FDO
COPTIMIZE= -O3 -Qipo -QxW
PASS1_CFLAGS= -Qprof_gen
PASS2_CFLAGS= -Qprof_use
PASS1_LDFLAGS= -Qprof_gen
PASS2_LDFLAGS= -Qprof_use

254.gap=peak=default=default:
notes0190= 254.gap: basepeak = yes
COPTIMIZE= -O3 -Qipo -QxW
PASS1_CFLAGS= -Qprof_gen
PASS2_CFLAGS= -Qprof_use
PASS1_LDFLAGS= -Qprof_gen
PASS2_LDFLAGS= -Qprof_use
basepeak=yes

255.vortex=peak=default=default:
notes0210= 255.vortex: -O3 -Qipo -arch:SSE +FDO -Oi- shlW32M.lib
notes0220= -Qoption,c,-ip_ninl_max_stats=2000,-ip_ninl_max_total_stats=4500
COPTIMIZE= -O3 -Qipo -arch:SSE -Oi- -Qoption,c,-ip_ninl_max_stats=2000,-ip_ninl_max_total_stats=4500
PASS1_CFLAGS= -Qprof_gen
PASS2_CFLAGS= -Qprof_use
PASS1_LDFLAGS= -Qprof_gen
PASS2_LDFLAGS= -Qprof_use
EXTRA_LIBS= shlW32M.lib

256.bzip2=peak=default=default:
notes0230= 256.bzip2: -O3 -Qipo -Qunroll2
COPTIMIZE= -O3 -Qipo -Qunroll2

300.twolf=peak=default=default:
notes0240= 300.twolf: -O3 -Qipo -QxW +FDO -Qunroll3 shlW32M.lib -Qansi_alias

```
COPTIMIZE=   -O3 -Qipo -QxW -Qunroll3 -Qansi_alias
PASS1_CFLAGS= -Qprof_gen
PASS2_CFLAGS= -Qprof_use
PASS1_LDFLAGS= -Qprof_gen
PASS2_LDFLAGS= -Qprof_use
EXTRA_LIBS= shlW32M.lib

####################
# FP peak options #
####################

168.wupwise=peak=default=default:
notes0100=  168.wupwise:        pgf90   -fastsse -Mipa=fast,inline -Mnovect
F77OPTIMIZE=       -fastsse -Mipa=fast,inline -Mnovect
F77=        pgf90
LDOPT =  -o $@
OBJ = .o
OBJOPT = -c -o $@
feedback=0
ONESTEP=1

171.swim=peak=default=default:
notes0110=  171.swim:           ifort   -Qipo  -O3  -QaxN -QxW -Qunroll0 +FDO
F77= ifort
F77OPTIMIZE= -Qipo -O3 -QaxN -QxW -Qunroll0
PASS1_F77FLAGS= -Qprof_gen
PASS2_F77FLAGS= -Qprof_use
PASS1_LDFLAGS= -Qprof_gen
PASS2_LDFLAGS= -Qprof_use
LDOPT = -Fe$@
OBJ = .obj
OBJOPT = -c -Fo $@

172.mgrid=peak=default=default:
notes0120=  172.mgrid:          pgf90   -fastsse -Mipa=fast,inline
F77OPTIMIZE=       -fastsse -Mipa=fast,inline
F77=        pgf90
LDOPT =  -o $@
OBJ = .o
OBJOPT = -c -o $@
feedback=0
ONESTEP=1

173.applu=peak=default=default:
notes0130=  173.applu:          ifort   -Qipo  -O3 -QaxN -QxW -auto +FDO
F77= ifort
F77OPTIMIZE= -Qipo -O3 -QaxN -QxW -auto
PASS1_F77FLAGS= -Qprof_gen
PASS2_F77FLAGS= -Qprof_use
PASS1_LDFLAGS= -Qprof_gen
PASS2_LDFLAGS= -Qprof_use
LDOPT = -Fe$@
OBJ = .obj
OBJOPT = -c -Fo $@

177.mesa=peak=default=default:
notes0140=  177.mesa:           icl     -Qipo -QxW -Qunroll1 -Qansi_alias +FDO
notes0141=                      -Qoption,c,-ip_ninl_max_stats=1500,-ip_ninl_max_total_stats=4500
CC=  icl
COPTIMIZE=   -Qipo -QxW -Qunroll1 -Qansi_alias -Qoption,c,-ip_ninl_max_stats=1500,-ip_ninl_max_total_stats=4500
PASS1_CFLAGS= -Qprof_gen
PASS2_CFLAGS= -Qprof_use
PASS1_LDFLAGS= -Qprof_gen
PASS2_LDFLAGS= -Qprof_use
LDOPT = -Fe$@
OBJ = .obj
OBJOPT = -c -Fo $@

178.galgel=peak=default=default:
```

```
notes0150=  178.galgel:         pgf90   -fastsse -Mipa=fast,safe -Munix -lacml
notes0151=                       RM_SOURCES=lapak.f90
FOPTIMIZE       = -fastsse  -Mipa=fast,safe -Munix
FC= pgf90
EXTRA_LIBS      = -lacml
RM_SOURCES      = lapak.f90
feedback=0
LDOPT =  -o $@
OBJ = .o
OBJOPT = -c -o $@
ONESTEP= 1

179.art=peak=default=default:
notes0160=  179.art:            pgcc     basepeak=yes
basepeak= yes

183.equake=peak=default=default:
notes0170=  183.equake:         icl     -O3 -Qipo -QxW +FDO
COPTIMIZE=   -O3 -Qipo -QxW
CC= icl
PASS1_CFLAGS= -Qprof_gen
PASS2_CFLAGS= -Qprof_use
PASS1_LDFLAGS= -Qprof_gen
PASS2_LDFLAGS= -Qprof_use
LDOPT =  -Fe$@
OBJ = .obj
OBJOPT = -c -Fo $@

187.facerec=peak=default=default:
notes0180=  187.facerec:        pgf90   basepeak=1
basepeak=1

188.ammp=peak=default=default:
notes0190=  188.ammp:           icl     -Oa   -QxW  -Zp4 -Qansi_alias
COPTIMIZE=   -Oa -QxW -Zp4 -Qansi_alias
CC= icl
LDOPT =  -Fe$@
OBJ = .obj
OBJOPT = -c -Fo $@
feedback=0

189.lucas=peak=default=default:
notes0200=  189.lucas:          ifort   -Qipo -QxW -Qunroll1
FC= ifort
FOPTIMIZE=   -Qipo -QxW -Qunroll1
LDOPT = -Fe$@
OBJ = .obj
OBJOPT = -c -Fo $@
feedback=0

191.fma3d=peak=default=default:
notes0210=  191.fma3d:          pgf90   -Mipa=fast,inline -fastsse -Mnovect +FDO
FOPTIMIZE= -Mipa=fast,inline -fastsse -Mnovect
FC=         pgf90
PASS1_FFLAGS= -Mpfi
PASS2_FFLAGS= -Mpfo
LDOPT =  -o $@
OBJ = .o
OBJOPT = -c -o $@
ONESTEP=1

200.sixtrack=peak=default=default:
notes0220=  200.sixtrack:       pgf90   -fastsse -Mipa=fast,inline
F77= pgf90
F77OPTIMIZE= -fastsse -Mipa=fast,inline
LDOPT =  -o $@
OBJ = .o
OBJOPT = -c -o $@
feedback=0
```

```
ONESTEP=1

301.apsi=peak=default=default:
notes0230=  301.apsi:          pgf90   -fastsse -Mipa=fast,inline
F77= pgf90
F77OPTIMIZE= -fastsse -Mipa=fast,inline
LDOPT =  -o $@
OBJ = .o
OBJOPT = -c -o $@
feedback=0
ONESTEP=1

####################################################################

int=default=default=default:
notes0010=  shlW32M.lib is the SmartHeap library V7.0 from MicroQuill (www.microquill.com)
notes0020=  +FDO: PASS1=-Qprof_gen  PASS2=-Qprof_use
notes0030=  Portability:
sw_avail= Sep-2005
sw_compiler0010= Intel C++ 9.0 build 20050912Z for IA32
sw_compiler0020= Microsoft Visual Studio .NET 7.0.9466 (libraries)
sw_compiler0030= MicroQuill Smartheap Library 7.0

fp=default=default=default:
notes0010=  +FDO:
notes0011=            icl, ifort  : PASS1=-Qprof_gen  PASS2=-Qprof_use
notes0012=            pgf90       : PASS1=-Mpfi       PASS2=-Mpfo
notes0015=  ifort is the Intel Fortran compiler, icl is the Intel C++ compiler and
notes0020=  pgf90 is the PGI Fortran 90 compiler.
notes0021=  pgcc is the PGI C compiler.
notes0025=  ONESTEP is set to 1 for every compile with the PGI compilers.
notes0040=  Portability:
notes0090=  Peak tuning:
sw_avail= Oct-2005
sw_compiler0010= Intel C++ 9.0 build 20050912Z for IA32,
sw_compiler0011= Intel Fortran 9.0 build 20050912Z for IA32,
sw_compiler0013= Microsoft Visual Studio .NET 7.0.9466 (libraries)
sw_compiler0015= PGI Fortran compiler 6.0-5 for Windows XP,
sw_compiler0016= PGI C compiler 6.0-5 for Windows XP,
sw_compiler0017= ACML Version 2.5.3 (bundled with PGI 6.0-5)


__MD5__
164.gzip=base=amd461K8.i90.p60.exe=default:
# Last updated Sat May  6 16:30:31 2006
optmd5=325318084d88f0dbad3fc1eddfde2bae
exemd5=f726acc437b4c0eb6c60bed59e91e3ad

175.vpr=base=amd461K8.i90.p60.exe=default:
# Last updated Sat May  6 16:30:31 2006
optmd5=15975c84a46a02ccf615f6c3dbf365e3
exemd5=d5de75073aeb6cd76f82c06bdd325dec

176.gcc=base=amd461K8.i90.p60.exe=default:
# Last updated Sat May  6 16:30:31 2006
optmd5=9dfe5388793ac1001d93b68685524886
exemd5=e8a7453847f922d16768366ef15ecf57

181.mcf=base=amd461K8.i90.p60.exe=default:
# Last updated Sat May  6 16:30:31 2006
optmd5=54bb583a3015cbbd7b3b76e80580dd69
exemd5=eea2be6e0ec1bf1bfd8b657fdf8babc1

186.crafty=base=amd461K8.i90.p60.exe=default:
# Last updated Sat May  6 16:30:31 2006
optmd5=6f9ec139ac9fb0d215b3ba9ad06237cb
exemd5=305c38d795fcbe8df35ecaad1b0f4305

197.parser=base=amd461K8.i90.p60.exe=default:
```

```
# Last updated Sat May  6 16:30:31 2006
optmd5=b1671377aa81cfe0f593e4db20cbe9d3
exemd5=3491415e2d2151f217f30bad86cf3c2d

252.eon=base=amd461K8.i90.p60.exe=default:
# Last updated Sat May  6 16:30:31 2006
optmd5=ff2958770ff00d59714de671f46b7e80
exemd5=2257db9c1d2d112a85789a29ea9d9612

253.perlbmk=base=amd461K8.i90.p60.exe=default:
# Last updated Sat May  6 16:30:31 2006
optmd5=b9369661539879b8c6c79da83c9c8a7c
exemd5=6ef1462a225e90eff33be7055aa31826

254.gap=base=amd461K8.i90.p60.exe=default:
# Last updated Sat May  6 16:30:31 2006
optmd5=f9fab64b4a2a236a497979f0b4bbd3e1
exemd5=f7e123f97e2f9ddbde5d58cf0d552c04

255.vortex=base=amd461K8.i90.p60.exe=default:
# Last updated Sat May  6 16:30:31 2006
optmd5=a486d93310d36e1752765c43f9374734
exemd5=70a8b33d9b6ea410baf074d68bf2a8a3

256.bzip2=base=amd461K8.i90.p60.exe=default:
# Last updated Sat May  6 16:30:31 2006
optmd5=8105f7cfc185a39a7c04949693574b39
exemd5=4fd6ff168ce9e8207dde5aff2791f067

300.twolf=base=amd461K8.i90.p60.exe=default:
# Last updated Sat May  6 16:30:31 2006
optmd5=d06e1d9bcc43ff7c5138fea54dc7e8d1
exemd5=d7da6ded71dee9d7902e1f04058edc8e

164.gzip=peak=amd461K8.i90.p60.exe=default:
# Last updated Mon May  8 14:09:55 2006
optmd5=b18368cfe33277ad69427ca23706df92
exemd5=40dd4865d34ce29c121a64748449dc3b

175.vpr=peak=amd461K8.i90.p60.exe=default:
# Last updated Mon May  8 14:09:55 2006
optmd5=771dfe1782a890296b8e8416a09a10ec
exemd5=8259f03c01275a0e603166537bc1031a

176.gcc=peak=amd461K8.i90.p60.exe=default:
# Last updated Mon May  8 14:09:55 2006
optmd5=5b99171a8611c6acd519ff5bf6ce5591
exemd5=38ba0e4b782075ee83afe4345fbf6a45

181.mcf=peak=amd461K8.i90.p60.exe=default:
# Last updated Mon May  8 14:09:55 2006
optmd5=0ab9a06536e2695d93b03150de5e4edf
exemd5=af064a6ef3c62ebdc32a6342f688d4df

186.crafty=peak=amd461K8.i90.p60.exe=default:
# Last updated Mon May  8 14:09:55 2006
optmd5=8c3863681b65722ce171de196ffe9e76
exemd5=eb11bee5e773cede9ece126e33d7a31e

197.parser=peak=amd461K8.i90.p60.exe=default:
# Last updated Mon May  8 14:09:55 2006
optmd5=5dfe3f82f74204b632db33b30f382468
exemd5=201015d5684d00c70e04aab4ad06a57a

252.eon=peak=amd461K8.i90.p60.exe=default:
# Last updated Mon May  8 14:09:55 2006
optmd5=e9ccb7fb2718b8c455077fef54406d79
exemd5=6804edd2def6317427739328fdfef6ee
```

253.perlbmk=peak=amd461K8.i90.p60.exe=default:
# Last updated Mon May 8 14:09:55 2006
optmd5=3648b75142fff77b90fcd3d80f3d5cba
exemd5=8bacc89369cbcb1e2da10472c803f389

255.vortex=peak=amd461K8.i90.p60.exe=default:
# Last updated Mon May 8 14:09:55 2006
optmd5=2b9db0b8d53f651a7c14c093d1265365
exemd5=9e52fd24a2a0817bbbdb14cb0708005f

256.bzip2=peak=amd461K8.i90.p60.exe=default:
# Last updated Mon May 8 14:09:55 2006
optmd5=adf93199266b491e4904f15d0e4cea50
exemd5=36a446054451825dcb6452af4b781963

300.twolf=peak=amd461K8.i90.p60.exe=default:
# Last updated Mon May 8 14:09:55 2006
optmd5=a21239caa4ee119660fbb7d60643c735
exemd5=4561e5cc9b553b35e3eada51e7cc72df

Appendix D – SPECint_rate output

This appendix provides the output of the benchmark for both the two-user and four-user runs on each of the three test servers.

64-bit Intel Xeon Processor 3.60 GHz-based server – 2 processors (2 users)

CINT2000 Result

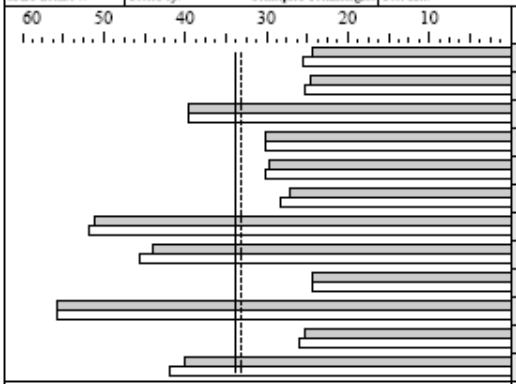
Intel Corporation

Intel SE7520AF2 Server Board (3.6GHz, Intel Xeon processor)

SPECint_rate2000 = 33.9

SPECint_rate_base2000 = 33.2

SPEC license #: | Tested by: Principled Technologies | Test date: | Hardware Avail: | Software Avail:



Benchmark	Base Copies	Base Runtime	Base Ratio	Copies	Runtime	Ratio
164.gzip	2	133	24.3	2	127	25.6
175.vpr	2	133	24.5	2	128	25.3
176.gcc	2	64.6	39.5	2	64.6	39.5
181.mcf	2	138	30.2	2	138	30.2
186.crafty	2	78.2	29.7	2	77.0	30.1
197.parser	2	154	27.2	2	147	28.4
252.eon	2	59.0	51.1	2	58.2	51.8
253.perlbmk	2	95.1	43.9	2	91.8	45.5
254.gap	2	104	24.4	2	104	24.4
255.vortex	2	79.1	55.7	2	79.1	55.7
256.bzip2	2	138	25.3	2	134	26.0
300.twolf	2	174	40.1	2	167	41.8

Hardware

CPU:	Intel Xeon (3.6GHz, 2MB L2, 800MHz bus)
CPU MHz:	3600
FPU:	Integrated
CPU(s) enabled:	1 core, 1 chip, 1 core/chip (Hyper-Threading Technology enabled)
CPU(s) orderable:	1,2
Parallel:	No
Primary Cache:	12KB(I) + 16KB(D)
Secondary Cache:	2MB
L3 Cache:	N/A
Other Cache:	N/A
Memory:	8 x 1GB PC2-3200
Disk Subsystem:	1 x 160 GB SATA WDC WD1600
Other Hardware:	

Software

Operating System:	Windows Server 2003 Enterprise Edition SP1
Compiler:	Intel C++ Compiler 9.0 for 32-bit applications Build 20050402Z (32-bit) Microsoft Visual Studio .Net 2003(for libraries) SmartHeap Library Version 7.4 from http://www.microquill.com/
File System:	NTFS
System State:	Default

Notes/Tuning Information

```
+FDO: PASS1=-Qprof_gen  PASS2=-Qprof_use
Base tuning for C programs:   -fast +FDO shlW32M.lib
Base tuning for C++ programs: -fast -Qcxx_features +FDO
Portability flags:
176.gcc: -Dalloca=_alloca /F10000000
186.crafy: -DNT_i386
253.perlbmk: -DSPEC_CPU2000_NTOS -DPERLDLL /MT
254.gap: -DSYS_HAS_CALLOC_PROTO -DSYS_HAS_MALLOC_PROTO
Peak tuning:
164.gzip:     -fast -Qansi_alias -Oa  +FDO
175.vpr:      -fast -Qansi_alias +FDO
176.gcc:      basepeak=yes
181.mcf:      basepeak=yes
186.crafty:   -fast -Qansi_alias -Oa +FDO
197.parser:   -fast -Qansi_alias  +FDO
252.eon:      -fast +FDO
253.perlbmk:  -fast -Qansi_alias +FDO shlW32M.lib
254.gap:      basepeak=yes
255.vortex    basepeak=yes
256.bzip2:   -fast -Oa -Qunroll1 +FDO
```

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CINT2000 Result

Intel Corporation	SPECint_rate2000 = 33.9
Intel SE7520AF2 Server Board (3.6GHz, Intel Xeon processor)	SPECint_rate_base2000 = 33.2

SPEC license #:	Tested by: Principled Technologies	Test date:	Hardware Avail:	Software Avail:

Notes/Tuning Information (Continued)

```
300.twolf:    -fast -O3 +FDO shlW32M.lib
New 32-bt Windows tools used, approved in May-2005
```

64-bit Intel Xeon Processor 3.60 GHz-based server – 2 processors (4 users)

CINT2000 Result

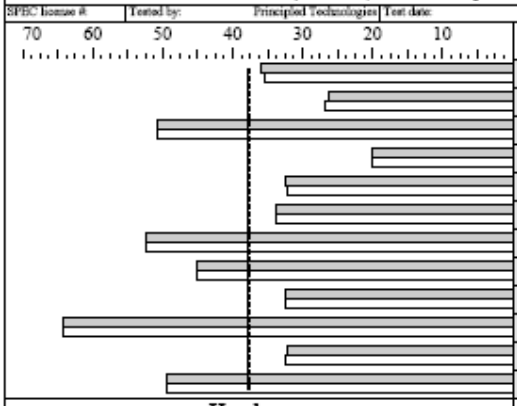
Intel Corporation

Intel SE7520AF2 Server Board (3.6GHz, Intel Xeon processor)

SPECint_rate2000 = 37.7

SPECint_rate_base2000 = 37.7

SPEC license #: | Tested by: Principled Technologies | Test date: | Hardware Avail: | Software Avail:



Benchmark	Base Copies	Base Runtime	Base Ratio	Copies	Runtime	Ratio
164.gzip	4	181	35.9	4	184	35.4
175.vpr	4	247	26.3	4	242	26.9
176.gcc	4	101	50.7	4	101	50.7
181.mcf	4	417	20.0	4	417	20.0
186.crafty	4	143	32.5	4	145	32.1
197.parser	4	247	33.8	4	246	33.9
252.eon	4	115	52.3	4	115	52.5
253.perlbmk	4	185	45.2	4	186	45.0
254.gap	4	158	32.4	4	158	32.4
255.vortex	4	137	64.3	4	137	64.3
256.bzip2	4	217	32.1	4	215	32.4
300.twolf	4	282	49.4	4	282	49.3

Hardware

CPU:	Intel Xeon (3.6GHz, 2MB L2, 800MHz bus)
CPU MHz:	3600
FPU:	Integrated
CPU(s) enabled:	1 core, 1 chip, 1 core/chip (Hyper-Threading Technology enabled)
CPU(s) orderable:	1,2
Parallel:	No
Primary Cache:	12KB(I) + 16KB(D)
Secondary Cache:	2MB
L3 Cache:	N/A
Other Cache:	N/A
Memory:	8 x 1GB PC2-3200
Disk Subsystem:	1 x 160 GB SATA WDC WD1600
Other Hardware:	

Software

Operating System:	Windows Server 2003 Enterprise Edition SP1
Compiler:	Intel C++ Compiler 9.0 for 32-bit applications Build 20050402Z (32-bit) Microsoft Visual Studio .Net 2003(for libraries) SmartHeap Library Version 7.4 from http://www.microquill.com/
File System:	NTFS
System State:	Default

Notes/Tuning Information

```
+FDO: PASS1=-Qprof_gen  PASS2=-Qprof_use
Base tuning for C programs:   -fast +FDO shlW32M.lib
Base tuning for C++ programs: -fast -Qcxx_features +FDO
Portability flags:
176.gcc: -Dalloca=_alloca /F10000000
186.crafy: -DNT_i386
253.perlbmk: -DSPEC_CPU2000_NTOS -DPERLDLL /MT
254.gap: -DSYS_HAS_CALLOC_PROTO -DSYS_HAS_MALLOC_PROTO
Peak tuning:
164.gzip:     -fast -Qansi_alias -Oa  +FDO
175.vpr:      -fast -Qansi_alias +FDO
176.gcc:      basepeak=yes
181.mcf:      basepeak=yes
186.crafty:   -fast -Qansi_alias -Oa +FDO
197.parser:   -fast -Qansi_alias  +FDO
252.eon:      -fast +FDO
253.perlbmk:  -fast -Qansi_alias +FDO shlW32M.lib
254.gap:      basepeak=yes
255.vortex    basepeak=yes
256.bzip2:   -fast -Oa -Qunroll1 +FDO
```

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CINT2000 Result

Intel Corporation	SPECint_rate2000 = 37.7
Intel SE7520AF2 Server Board (3.6GHz, Intel Xeon processor)	SPECint_rate_base2000 = 37.7

SPEC license #:	Tested by: Principled Technologies	Test date:	Hardware Avail:	Software Avail:

Notes/Tuning Information (Continued)

```
300.twolf:    -fast -O3 +FDO shlW32M.lib
New 32-bt Windows tools used, approved in May-2005
```

Dual-Core Intel Xeon Processor 5160-based server – 2 processors (2 users)

CINT2000 Result

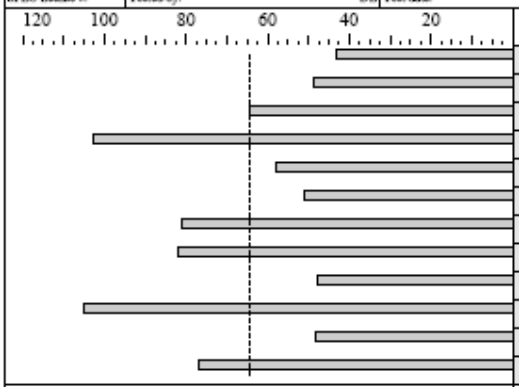
Intel Corporation

Dual-Core Intel Xeon Processor 5160-based server(3.0 GHz)

SPECint_rate2000 = --

SPECint_rate_base2000 = 64.4

SPEC license #: | Tested by: | DE | Test date: | Hardware Avail: | Software Avail:



Benchmark	Base Copies	Base Runtime	Base Ratio	Copies	Runtime	Ratio
164.gzip	2	74.9	43.4			
175.vpr	2	66.4	48.9			
176.gcc	2	39.7	64.2			
181.mcf	2	40.7	103			
186.crafty	2	40.0	58.0			
197.parser	2	82.1	50.9			
252.eon	2	37.2	81.1			
253.perlbmk	2	51.0	81.9			
254.gap	2	53.3	47.8			
255.vortex	2	42.0	105			
256.bzip2	2	72.3	48.1			
300.twolf	2	90.5	76.9			

Hardware

CPU:	Dual-Core Intel Xeon Processor 5160 (3.0GHz, 1333 MHz bus)
CPU MHz:	3000
FPU:	Integrated
CPU(s) enabled:	4 core, 2 chip, 2 core/chip
CPU(s) orderable:	1,2
Parallel:	No
Primary Cache:	32KB + 32KB
Secondary Cache:	4MB (2MB per core)
L3 Cache:	N/A
Other Cache:	N/A
Memory:	----------
Disk Subsystem:	----------
Other Hardware:	----------

Software

Operating System:	Windows Server 2003 SP1
Compiler:	Intel C++ Compiler 9.0 for 32-bit applications Build 20050402Z (32-bit) Microsoft Visual Studio .Net 2003(for libraries) SmartHeap Library Version 7.4 from http://www.microquill.com/
File System:	NTFS
System State:	Default

Notes/Tuning Information

```
+FDO: PASS1=-Qprof_gen  PASS2=-Qprof_use
Base tuning for C programs:   -fast +FDO shlW32M.lib
Base tuning for C++ programs: -fast -Qcxx_features +FDO
Portability flags:
176.gcc: -Dalloca=_alloca /F10000000
186.crafy: -DNT_i386
253.perlbmk: -DSPEC_CPU2000_NTOS -DPERLDLL /MT
254.gap: -DSYS_HAS_CALLOC_PROTO -DSYS_HAS_MALLOC_PROTO
Peak tuning:
164.gzip:     -fast -Qansi_alias -Oa  +FDO
175.vpr:      -fast -Qansi_alias +FDO
176.gcc:      basepeak=yes
181.mcf:      basepeak=yes
186.crafty:   -fast -Qansi_alias -Oa +FDO
197.parser:   -fast -Qansi_alias  +FDO
252.eon:      -fast +FDO
253.perlbmk:  -fast -Qansi_alias +FDO shlW32M.lib
254.gap:      basepeak=yes
255.vortex    basepeak=yes
256.bzip2:   -fast -Oa -Qunroll1 +FDO
```

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http://www.spec.org/

CINT2000 Result

Intel Corporation

Dual-Core Intel Xeon Processor 5160-based server(3.0 GHz)

SPECint_rate2000 = --

SPECint_rate_base2000 = 64.4

SPEC license #:	Tested by:	DE	Test date:	Hardware Avail:	Software Avail:

Notes/Tuning Information (Continued)

```
300.twolf:    -fast -O3 +FDO shlW32M.lib
New 32-bt Windows tools used, approved in May-2005
```

Standard Performance Evaluation Corporation
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Dual-Core Intel Xeon Processor 5160-based server – 2 processors (4 users)

CINT2000 Result

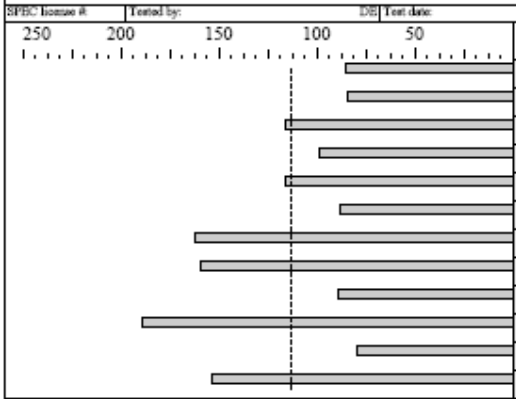
Intel Corporation

Dual-Core Intel Xeon Processor 5160-based server(3.0 GHz)

SPECint_rate2000 = --

SPECint_rate_base2000 = 113

SPEC license #: | Tested by: | DB | Test date: | Hardware Avail: | Software Avail:



Benchmark	Base Copies	Base Runtime	Base Ratio	Copies	Runtime	Ratio
164.gzip	4	75.9	85.5			
175.vpr	4	77.0	84.4			
176.gcc	4	44.1	116			
181.mcf	4	85.0	98.3			
186.crafty	4	40.0	116			
197.parser	4	94.6	88.3			
252.eon	4	37.2	162			
253.perlbmk	4	52.6	159			
254.gap	4	57.1	89.4			
255.vortex	4	46.6	189			
256.bzip2	4	88.2	78.9			
300.twolf	4	90.6	154			

Hardware

CPU:	Dual-Core Intel Xeon Processor 5160 (3.0GHz, 1333 MHz bus)
CPU MHz:	3000
FPU:	Integrated
CPU(s) enabled:	4 core, 2 chip, 2 core/chip
CPU(s) orderable:	1,2
Parallel:	No
Primary Cache:	32KB + 32KB
Secondary Cache:	4MB (2MB per core)
L3 Cache:	N/A
Other Cache:	N/A
Memory:	_____
Disk Subsystem:	_____
Other Hardware:	_____

Software

Operating System:	Windows Server 2003 SP1
Compiler:	Intel C++ Compiler 9.0 for 32-bit applications Build 20050402Z (32-bit) Microsoft Visual Studio .Net 2003(for libraries) SmartHeap Library Version 7.4 from http://www.microquill.com/
File System:	NTFS
System State:	Default

Notes/Tuning Information

```
+FDO: PASS1=-Qprof_gen  PASS2=-Qprof_use
Base tuning for C programs:   -fast +FDO shlW32M.lib
Base tuning for C++ programs: -fast -Qcxx_features +FDO
Portability flags:
176.gcc: -Dalloca=_alloca /F10000000
186.crafy: -DNT_i386
253.perlbmk: -DSPEC_CPU2000_NTOS -DPERLDLL /MT
254.gap: -DSYS_HAS_CALLOC_PROTO -DSYS_HAS_MALLOC_PROTO
Peak tuning:
164.gzip:     -fast -Qansi_alias -Oa  +FDO
175.vpr:      -fast -Qansi_alias +FDO
176.gcc:      basepeak=yes
181.mcf:      basepeak=yes
186.crafty:   -fast -Qansi_alias -Oa +FDO
197.parser:   -fast -Qansi_alias  +FDO
252.eon:      -fast +FDO
253.perlbmk:  -fast -Qansi_alias +FDO shlW32M.lib
254.gap:      basepeak=yes
255.vortex    basepeak=yes
256.bzip2:   -fast -Oa -Qunroll1 +FDO
```

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CINT2000 Result

Intel Corporation	SPECint_rate2000 = --
Dual-Core Intel Xeon Processor 5160-based server(3.0 GHz)	SPECint_rate_base2000 = 113

SPEC license #:	Tested by:	DE	Test date:	Hardware Avail:	Software Avail:

Notes/Tuning Information (Continued)

```
300.twolf:    -fast -O3 +FDO shlW32M.lib
New 32-bt Windows tools used, approved in May-2005
```

Standard Performance Evaluation Corporation
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http://www.spec.org/

Dual-Core AMD Opteron 285-based server – 2 processors (2 users)

CINT2000 Result

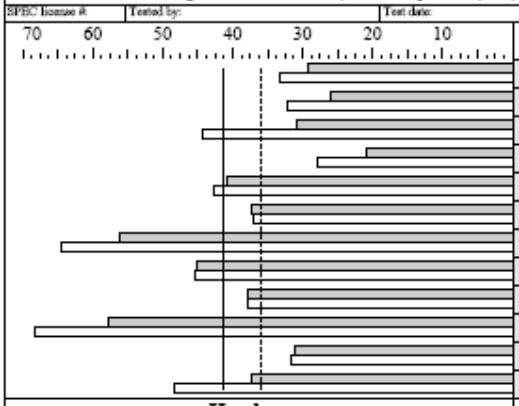
Advanced Micro Devices

UNIWIDE Technologies SS232-128-03, AMD Opteron (TM) 285

SPECint_rate2000 = 41.2

SPECint_rate_base2000 = 36.0

SPEC license #: | Tested by: | Test date: May-2006 | Hardware Avail: | Software Avail: Sep-2005



Benchmark	Base Copies	Base Runtime	Base Ratio	Copies	Runtime	Ratio
164.gzip	2	111	29.2	2	98.1	33.1
175.vpr	2	125	26.0	2	101	32.3
176.gcc	2	83.0	30.8	2	57.7	44.2
181.mcf	2	201	20.8	2	149	28.0
186.crafty	2	57.0	40.7	2	54.4	42.7
197.parser	2	112	37.2	2	113	37.0
252.eon	2	53.8	56.0	2	46.8	64.4
253.perlbmk	2	92.4	45.2	2	92.0	45.4
254.gap	2	67.7	37.7	2	67.7	37.7
255.vortex	2	76.3	57.8	2	64.5	68.3
256.bzip2	2	112	31.1	2	110	31.6
300.twolf	2	186	37.3	2	144	48.3

Hardware

CPU:	AMD Opteron (TM) 285
CPU MHz:	2600
FPU:	Integrated
CPU(s) enabled:	4 cores, 2 chips, 2 core/chip
CPU(s) orderable:	1,2
Parallel:	no
Primary Cache:	64KBI + 64KBD on chip
Secondary Cache:	1MB per core
L3 Cache:	N/A
Other Cache:	N/A
Memory:	8 x 1GB, DDR400
Disk Subsystem:	SATA, 160 GB
Other Hardware:	None

Software

Operating System:	Windows Server 2003 Enterprise edition SP1 (32-bit)
Compiler:	Intel C++ 9.0 build 20050912Z for IA32 Microsoft Visual Studio .NET 7.0.9466 (libraries) MicroQuill Smartheap Library 7.0
File System:	NTFS
System State:	default

Notes/Tuning Information

```
Tested by Principled Technologies
  shlW32M.lib is the SmartHeap library V7.0 from MicroQuill (www.microquill.com)
  +FDO: PASS1=-Qprof_gen  PASS2=-Qprof_use
  Portability:
    176.gcc:      -Dalloca=_alloca /F10000000
    186.crafty:   -DNT_i386
    253.perlbmk:  -DSPEC_CPU2000_NTOS -DPERLDLL /MT
    254.gap:      -DSYS_HAS_CALLOC_PROTO -DSYS_HAS_MALLOC_PROTO
  Baseline C:   -O3 -Qipo -Op +FDO
  Baseline C++: -O3 -Qipo -Qcxx-features +FDO
 Peak Tuning:
  164.gzip:     -O3 -Qipo -QxW +FDO
  175.vpr:      -O3 -Qipo -QxW +FDO
                -Qoption,c,-ip_ninl_max_stats=2000,-ip_ninl_max_total_stats=4500
  176.gcc:      -O3 -Qipo -QxW -Oi- -Qunroll3 +FDO
  181.mcf:      -O3 -Qipo -QaxN      +FDO
  186.crafty:   -O3 -Qipo -QxW +FDO
  197.parser:   -QxW +FDO -Oi- -Qipo
  252.eon:      -O3 -Qipo -QxW +FDO -Qansi_alias
               -Qoption,c,-ip_ninl_max_stats=2000,-ip_ninl_max_total_stats=4500
```

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CINT2000 Result

Advanced Micro Devices

UNIWIDE Technologies SS232-128-03, AMD Opteron (TM) 285

SPECint_rate2000 = 41.2

SPECint_rate_base2000 = 36.0

SPEC license #:	Tested by:	Test date: May-2006	Hardware Avail:	Software Avail: Sep-2005

Notes/Tuning Information (Continued)

```
253.perlbmk:  -O3 -Qipo -QxW +FDO
254.gap:       basepeak = yes
255.vortex:   -O3 -Qipo -arch:SSE  +FDO -Oi- shlW32M.lib
              -Qoption,c,-ip_ninl_max_stats=2000,-ip_ninl_max_total_stats=4500
256.bzip2:    -O3 -Qipo                -Qunroll2
300.twolf:    -O3 -Qipo -QxW +FDO      -Qunroll3 shlW32M.lib -Qansi_alias
```

Dual-Core AMD Opteron 285-based server – 2 processors (4 users)

CINT2000 Result

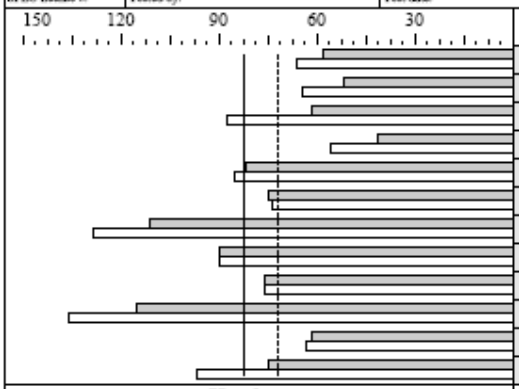
Advanced Micro Devices

UNIWIDE Technologies SS232-128-03, AMD Opteron (TM) 285

SPECint_rate2000 = 82.1

SPECint_rate_base2000 = 71.7

SPEC license #: | Tested by: | Test date: May-2006 | Hardware Avail: | Software Avail: Sep-2005



Benchmark	Base Copies	Base Runtime	Base Ratio	Copies	Runtime	Ratio
164.gzip	4	112	58.1	4	98.6	65.9
175.vpr	4	125	51.9	4	101	64.4
176.gcc	4	83.3	61.2	4	58.4	87.5
181.mcf	4	201	41.5	4	150	55.7
186.crafty	4	57.0	81.5	4	54.5	85.2
197.parser	4	112	74.5	4	113	73.8
252.eon	4	54.2	111	4	46.9	129
253.perlbmk	4	92.8	90.0	4	92.9	89.9
254.gap	4	67.2	76.0	4	67.2	76.0
255.vortex	4	76.6	115	4	65.0	136
256.bzip2	4	113	61.5	4	110	63.2
300.twolf	4	187	74.4	4	144	96.4

Hardware

CPU:	AMD Opteron (TM) 285
CPU MHz:	2600
FPU:	Integrated
CPU(s) enabled:	4 cores, 2 chips, 2 core/chip
CPU(s) orderable:	1,2
Parallel:	no
Primary Cache:	64KBI + 64KBD on chip
Secondary Cache:	1MB per core
L3 Cache:	N/A
Other Cache:	N/A
Memory:	8 x 1GB, DDR400
Disk Subsystem:	SATA, 160 GB
Other Hardware:	None

Software

Operating System:	Windows Server 2003 Enterprise edition SP1 (32-bit)
Compiler:	Intel C++ 9.0 build 20050912Z for IA32 Microsoft Visual Studio .NET 7.0.9466 (libraries) MicroQuill Smartheap Library 7.0
File System:	NTFS
System State:	default

Notes/Tuning Information

```
Tested by Principled Technologies
  shlW32M.lib is the SmartHeap library V7.0 from MicroQuill (www.microquill.com)
  +FDO: PASS1=-Qprof_gen  PASS2=-Qprof_use
  Portability:
    176.gcc:       -Dalloca=_alloca /F10000000
    186.crafty:    -DNT_i386
    253.perlbmk:   -DSPEC_CPU2000_NTOS -DPERLDLL /MT
    254.gap:       -DSYS_HAS_CALLOC_PROTO -DSYS_HAS_MALLOC_PROTO
  Baseline C:    -O3 -Qipo -Op +FDO
  Baseline C++: -O3 -Qipo -Qcxx-features +FDO
 Peak Tuning:
  164.gzip:      -O3 -Qipo -QxW +FDO
  175.vpr:       -O3 -Qipo -QxW +FDO
                 -Qoption,c,-ip_ninl_max_stats=2000,-ip_ninl_max_total_stats=4500
  176.gcc:       -O3 -Qipo -QxW -Oi- -Qunroll3 +FDO
  181.mcf:       -O3 -Qipo -QaxN      +FDO
  186.crafty:    -O3 -Qipo -QxW +FDO
  197.parser:    -QxW +FDO -Oi- -Qipo
  252.eon:       -O3 -Qipo -QxW +FDO -Qansi_alias
                -Qoption,c,-ip_ninl_max_stats=2000,-ip_ninl_max_total_stats=4500
```

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CINT2000 Result

Advanced Micro Devices	SPECint_rate2000 = 82.1
UNIWIDE Technologies SS232-128-03, AMD Opteron (TM) 285	SPECint_rate_base2000 = 71.7

SPEC license #:	Tested by:	Test date: May-2006	Hardware Avail:	Software Avail: Sep-2005

Notes/Tuning Information (Continued)

```
253.perlbmk:  -O3 -Qipo -QxW +FDO
254.gap:       basepeak = yes
255.vortex:   -O3 -Qipo -arch:SSE  +FDO -Oi- shlW32M.lib
              -Qoption,c,-ip_ninl_max_stats=2000,-ip_ninl_max_total_stats=4500
256.bzip2:    -O3 -Qipo                 -Qunroll2
300.twolf:    -O3 -Qipo -QxW +FDO       -Qunroll3 shlW32M.lib -Qansi_alias
```

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