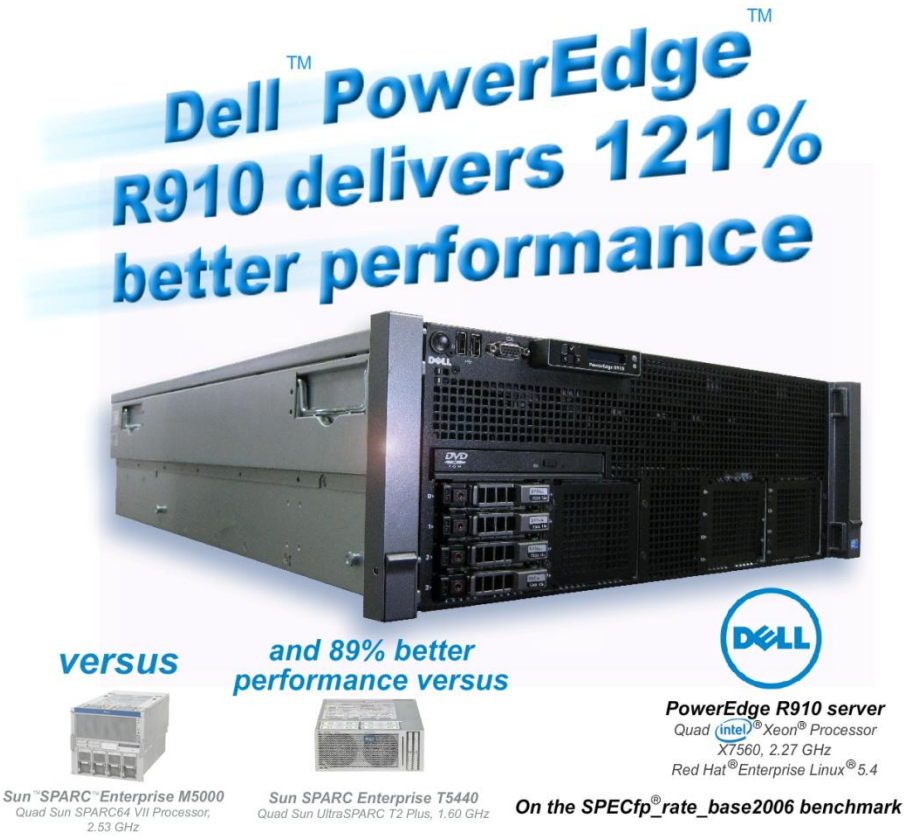
DELL VS. SUN SERVERS: R910 PERFORMANCE COMPARISON SPECfp_rate_base2006



OUR FINDINGS

The latest, most powerful Dell PowerEdge servers deliver better performance than Sun SPARC Enterprise servers. In Principled Technologies' tests in our labs, the Dell PowerEdge R910 server with four Intel Xeon Processor X7560s delivered higher performance results than the publicly available benchmark scores of the Sun SPARC Enterprise M5000 and T5440 servers. These results demonstrate the potential performance improvements of the Dell server.

OUR PROCESS

We used the SPECfp_rate_base2006 test of the industry-standard SPEC CPU2006 benchmark to focus on and measure the processor performance of the Dell PowerEdge R910 server. We then compared our results to publicly available SPECfp_rate_base2006 results of the two Sun servers.

MARCH 2010
A PRINCIPLED TECHNOLOGIES TEST REPORT
Commissioned by Dell Corp.

PROJECT OVERVIEW

The Dell PowerEdge R910 Server achieved a SPECfp_rate_base2006 score of 482, an 89.8 percent increase over the Sun SPARC Enterprise T5440 Server, which achieved a SPECfp_rate_base2006 score of 254, and a 121.1 percent increase over the Sun SPARC Enterprise M5000 Server, which achieved a SPECfp_rate_base2006 score of 218.[1] (See Figure 1.)

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 performance, is also available. (Note: SPEC and SPECfp are trademarks of the Standard Performance Evaluation Corporation.) For this report, we ran only the CFP2006 benchmark. Specifically, we measured the SPECfp_rate_base2006 results for our test server with 64 users.

Due to licensing issues, we did not actually test SPECfp_rate_base2006 on the Sun SPARC Enterprise T5440 and the Sun SPARC Enterprise M5000. Instead, we used the highest posted result for each Sun system on SPEC's site, which was 254 (http://www.spec.org/cpu2006/results/res2009q3/cpu2006-20090717-08193.html) for the

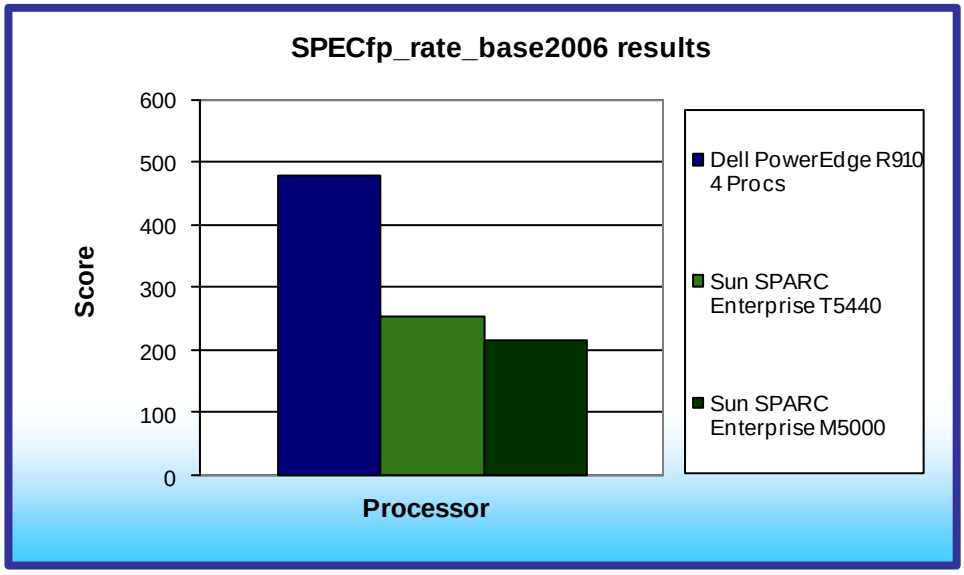


Figure 1: SPECfp_rate_base2006 results for the three servers. Higher numbers are better.

[1] Source: Principled Technologies®, Inc., "Dell vs. Sun servers: R910 performance comparison SPECfp_rate_base2006," a March 2010 report commissioned by Dell. For the latest SPECfp_rate_base2006 benchmarks, visit www.spec.org.

T5440 and 218 (http://www.spec.org/cpu2006/results/res2009q4/cpu2006-20091012-08881.html) for the M5000.

Figure 2 shows the system configuration overview for the similarly configured Dell PowerEdge R910, Sun SPARC Enterprise T5440, and Sun SPARC Enterprise M5000 servers.

Servers	Dell PowerEdge R910	Sun SPARC Enterprise T5440	Sun SPARC Enterprise M5000
Processors	Quad Intel Xeon Processor X7560, 2.27 GHz	Quad UltraSPARC T2 Plus, 1.60 GHz	Eight Sun SPARC64 VII Processor, 2.53 GHz
Memory	32 x 4GB PC3-8500 DDR3	64 x 4GB	64 x 2GB
Hard disks	2 x 73GB, SAS 6.0 GB/s	24 x 72GB, SAS	24 x 73GB, SAS
Operating system	Red Hat Enterprise Linux 5.4 (2.6.18-164.9.1.el5)	Solaris 10 5/09	Solaris 10 10/09
Compiler	Intel C/C++ Compiler 11.1.064	Sun Studio 12 Update 1	Sun Studio 12 Update 1

Figure 2: System configuration overview for the four test servers. See Appendix A for more details on the Dell PowerEdge server.

Generally, a system achieves the best SPECfp_rate_base2006 score using the same number of users as execution units for a given server. The optimum user count for our testing on our system was 64, the number of execution units (logical or physical processors) on those servers.

Figure 3 lists the 17 applications that compose the CFP2006 benchmark. SPEC wrote six of the applications in FORTRAN, three using C, four using both FORTRAN and C, and four in C++.

A SPEC CFP2006 run performs each of the 17 application (tasks) three times and reports the median for each. It also calculates the geometric mean of those 17 results to produce an overall score.

Name	Application area
410.bwaves	Fluid Dynamics
416.gamess	Quantum Chemistry
433.mic	Physics/Quantum Chromodynamics
434.zeusmp	Physics/CFD
435.gromacs	Biochemistry/Molecular Dynamics
436.cactusADM	Physics/General Relativity
437.leslie3d	Fluid Dynamics
444.namd	Biology/Molecular Dynamics
447.dealII	Finite Element Analysis
450.soplex	Linear Programming, Optimization
453.povray	Image Ray-tracing
454.calculix	Structural Mechanics
459.GemsFDTD	Computational Electromagnetics
465.tonto	Quantum Chemistry
470.lBM	Fluid Dynamics
481.wrf	Weather
482.sphinx3	Speech recognition

Figure 3: The applications that make up the CFP2006 benchmark.

WHAT WE FOUND

Figure 4 details the results of our tests with the optimum number of users for SPECfp_rate_base2006. We determined the number of users based on the number of execution units in a given server. We used the same number of SPECfp_rate_base2006 users as processor execution units, so there is a one-to-one ratio.

SPECfp_rate_base2006 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.

Server	SPECfp_rate_base2006 results
Dell PowerEdge R910	482
Sun SPARC Enterprise T5440	254
Sun SPARC Enterprise M5000	218

Figure 4: SPECfp_rate_base2006 results for the four test servers. Higher scores are better.

HOW WE TESTED

Adjusting BIOS settings

We used all of the default BIOS settings on the Dell PowerEdge R910 server with one exception, which was to change the Power Management to Maximum Performance. Among the default settings that we kept were the following:

- Hardware Prefetcher enabled
- Adjacent Cache Line Prefetch enabled
- Node Interleaving disabled
- C States enabled

Setting up and configuring the Dell PowerEdge R910

We began by installing a fresh copy of Red Hat Enterprise Linux Server 5.4. We installed the default packages, disabled the firewall, and disabled SELinux. We made no additional changes to the default installation options.

After the base installation, we updated the kernel on the Dell PowerEdge R910 from 2.6.18-164.el5 to 2.6.18-164.9.1.el5. This new kernel provided proper Nehalem-EX support in Red Hat for the Dell PowerEdge R910.

SPEC CPU2006 configuration

Intel compiled and provided the SPEC CFP2006 executables, but followed SPEC's standard instructions for building the executables using the following software tools for the Dell PowerEdge R910:

- Intel C/C++ Compiler 11.1.064 for IA32 and Intel 64

- Intel Fortran 11.1.064 for IA32 and Intel 64
- MicroQuill SmartHeap v8.1
- Binutils 2.18.50.0.7.20080502

The benchmark requires configuration files. Intel provided the configuration files we used for the Dell PowerEdge R910. The configuration files we used appear in Appendix B.

We report only the base metrics for the SPECfp_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.

Conducting the test

To begin the benchmark, we performed the following steps:

1. Open a command prompt.
2. Change to the cpu2006 directory.
3. Type `. ./shrc` at the command prompt.
4. Type `runspec -c <config file name> -r <#> -T base -v 10 int` where
   - <config file name> = name of the configuration file
   - <#> = number of users (we used 64 users for our server)

When the run completes, the benchmark puts the results in the directory /cpu2006/result. The result file names are of the form CFP2006.<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., CFP2006.002. asc and log.

Appendix C provides the SPECfp_rate_base2006 output results for each of the three test servers.

APPENDIX A – TEST SERVER INFORMATION

Figure 5 presents detailed information for the Dell PowerEdge test server we used in this report.

Servers	Dell PowerEdge R910
General dimension information	
Height (inches)	7.00
Width (inches)	17.25
Depth (inches)	29.00
U size in server rack (U)	4
Power supplies	
Total number	4
Brand and model	Dell Z1100P-00
Wattage (W)	1,023
Cooling fans	
Total number	6
Dimensions (h x w)	5” x 5”
Voltage (V)	12
Amps (A)	4.80
General processor setup	
Number of processor packages	4
Number of cores per processor package	8
Number of hardware threads per core	2
CPU	
Vendor	Intel
Name	Xeon X7560
Stepping	D0
Socket type	LGA1567
Core frequency (GHz)	2.27
L1 cache	32 KB + 32 KB
L2 cache	256 KB (per core)
L3 cache (MB)	24
Platform	
Vendor and model number	Dell PowerEdge R910
Motherboard model number	0P658H
Motherboard revision number	X23
BIOS name and version	Dell 1.0.1 (02/19/2010)
BIOS settings	Power Management set to Maximum Performance
Memory modules	
Total RAM in system (GB)	128
Vendor and model number	Hynix HMT151R7BFR8C-G7
Type	PC3-8500 DDR3

Servers	Dell PowerEdge R910
Speed (MHz)	1,066
Speed in the system currently running @ (MHz)	1,066
Timing/latency (tCL-tRCD-iRP-tRASmin)	7-7-7-20
Size (GB)	128
Number of RAM modules	32
Chip organization	Double-sided
Hard disk	
Vendor and model number	Seagate ST973452SS
Number of disks in system	2
Size (GB)	73
Buffer size (MB)	16
RPM	15,000
Type	SAS 6.0 GB/s
Controller	Dell PERC H700
Operating system	
Name	Red Hat Enterprise Linux 5.4
Kernel release	2.6.18-164.9.1.el5 x86_64
Kernel version	SMP Wed Dec 9 03:27:37 EST 2009
File system	ext3
Language	English
Network card/subsystem	
Vendor and model number	Broadcom NetXtreme II 5709C Ethernet
Type	PCI-E
USB	
Number	4
Type	2.0

Figure 5: Detailed configuration information for the Dell PowerEdge test server.

APPENDIX B – SPECFP_RATE_BASE2006 CONFIGURATION FILES

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

Red Hat Enterprise Linux 5.4 server: Dell PowerEdge R910

```
############################################################################
# This is a sample config file. It was tested with:
#
#      Compiler name/version:       Intel Compiler 11.1
#      Operating system version:    64-Bit SUSE LINUX Enterprise Server 10 or
later
#      Hardware:                    Intel processors supporting SSE4.2
#
############################################################################
# SPEC CPU2006 Intel Linux64 config file
# Sep 2009 IC 11.1 Linux64
############################################################################
action      = validate
tune        = base
ext         = cpu2006.1.1.ic11.1.linux64.sse42.rate.jan182010
PATHSEP     = /
check_md5=1
reportable=1
bench_post_setup=sync

#
# These are listed as benchmark-tuning-extension-machine
#
int=default=default=default:
CC=  icc  -m32
CXX= icpc -m32
OBJ = .o
SMARTHEAP32_DIR = /home/cmplr/usr3/alrahate/cpu2006.1.1.ic11.1/libic11.1-32bit
SMARTHEAP64_DIR = /home/cmplr/usr3/alrahate/cpu2006.1.1.ic11.1/libic11.1-64bit

fp=default=default=default:
CC=  icc   -m64
CXX= icpc  -m64
FC=  ifort -m64
OBJ = .o

# For UP systems, we need to know if the processors are ordered across cores
first or in order
# If across cores, processors 0, 1, 2 and 3 are on distinct physical cores
# Otherwise, processors 0, 2, 4 and 6 are on distinct physical cores

default:
submit       = numactl --localalloc --physcpubind=$SPECCOPYNUM $command

%ifdef %{no-numa)
submit       = taskset -c $SPECCOPYNUM $command
%endif
```

```
##############################################################################
# Compiler options
# for Nehalem use -xSSE4.2
# for processors prior to dunnington, replace -xSSE4.1 with -xSSSE3
##############################################################################
default:
SSE          = -xSSE4.2
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.xalancbmk=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$(SMARTHEAP32_DIR) -lsmartheap
EXTRA_LDFLAGS= -Wl,-z,muldefs

int=base=default=default:
COPTIMIZE=    $(FAST) -opt-prefetch
CXXOPTIMIZE=  $(FASTNOSTATIC)  -opt-prefetch

fp=base=default=default:
OPTIMIZE=     $(FAST)

#############################################################
# Peak Tuning Flags int 2006 fast
#############################################################
int=peak=default:
COPTIMIZE=       -auto-ilp32 -ansi-alias
CXXOPTIMIZE=     -ansi-alias
PASS1_CFLAGS     = -prof-gen
PASS2_CFLAGS     = $(FAST) -prof-use
PASS1_CXXFLAGS   = -prof-gen
PASS2_CXXFLAGS   = $(FASTNOSTATIC) -prof-use
PASS1_LDCFLAGS   = -prof-gen
PASS2_LDCFLAGS   = $(FAST) -prof-use
PASS1_LDCXXFLAGS = -prof-gen
PASS2_LDCXXFLAGS = $(FASTNOSTATIC) -prof-use

400.perlbench=peak=default:
COPTIMIZE= -ansi-alias

401.bzip2=peak=default:
CC= icc -m64
CPORTABILITY= -DSPEC_CPU_LP64
COPTIMIZE= -opt-prefetch -ansi-alias -auto-ilp32

403.gcc=peak=default:
COPTIMIZE = $(FAST)
feedback=0

429.mcf=peak=default:
COPTIMIZE= $(FAST) -opt-prefetch
feedback=0
#############################################################################
#################################################
%ifdef %{smt-on}
%ifdef %{physicallogical}
submit       = numactl --localalloc --physcpubind=`expr 2 \\* $SPECCOPYNUM`
$command
%ifdef %{no-numa)
submit       = taskset -c `expr 2 \\* $SPECCOPYNUM` $command
%endif
```

```
%endif
%endif

%ifdef %{up-dale}
copies=2
%endif
%ifdef %{up-nhm}
copies=4
%endif
%ifdef %{dp-nhm}
copies=8
%endif
%ifdef %{up-wsm-6c}
copies=6
%endif
%ifdef %{dp-wsm-6c}
copies=12
%endif
################################################################################
################################################

445.gobmk=peak=default:
COPTIMIZE= -O2 -ipo -no-prec-div -ansi-alias
PASS1_CFLAGS     = -prof-gen
PASS2_CFLAGS     = $(SSE) -prof-use
PASS1_LDCFLAGS   = -prof-gen
PASS2_LDCFLAGS   = $(SSE) -prof-use

456.hmmer=peak=default:
CC= icc -m64
CPORTABILITY= -DSPEC_CPU_LP64
COPTIMIZE=  $(FAST) -unroll2 -ansi-alias -auto-ilp32
feedback=no
################################################################################
################################################
%ifdef %{smt-on}
%ifdef %{physicallogical}
submit       = numactl --localalloc --physcpubind=`expr 2 \\* $SPECCOPYNUM`
$command
%ifdef %{no-numa)
submit       = taskset -c `expr 2 \\* $SPECCOPYNUM` $command
%endif
%endif
%endif

%ifdef %{up-dale}
copies=2
%endif
%ifdef %{up-nhm}
copies=4
%endif
%ifdef %{dp-nhm}
```

```
copies=8
%endif
%ifdef %{up-wsm-6c}
copies=6
%endif
%ifdef %{dp-wsm-6c}
copies=12
%endif
################################################################################
################################################

458.sjeng=peak=default:
CC= icc -m64
CPORTABILITY= -DSPEC_CPU_LP64
COPTIMIZE= -unroll4 -auto-ilp32

462.libquantum=peak=default:
CC= icc -m64
CPORTABILITY= -DSPEC_CPU_LP64 -DSPEC_CPU_LINUX
COPTIMIZE=    $(FAST) -auto-ilp32 -opt-prefetch
feedback=no

464.h264ref=peak=default:
COPTIMIZE= -unroll2 -ansi-alias

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

473.astar=peak=default:
CXX= icpc -m64
CXXPORTABILITY= -DSPEC_CPU_LP64
EXTRA_LIBS=  -L$(SMARTHEAP64_DIR) -lsmartheap64
CXXOPTIMIZE= -ansi-alias -opt-ra-region-strategy=routine

483.xalancbmk=peak=default:
basepeak=yes

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

```
410.bwaves=peak=default:
OPTIMIZE=    $(FAST)  -opt-prefetch
feedback=0
################################################################################
################################################
%ifdef %{smt-on}
%ifdef %{physicallogical}
submit       = numactl --localalloc --physcpubind=`expr 2 \\* $SPECCOPYNUM`
$command
%ifdef %{no-numa)
submit       = taskset -c `expr 2 \\* $SPECCOPYNUM` $command
%endif
%endif
%endif

%ifdef %{up-dale}
copies=2
%endif
%ifdef %{up-nhm}
copies=4
%endif
%ifdef %{dp-nhm}
copies=8
%endif
%ifdef %{up-wsm-6c}
copies=6
%endif
%ifdef %{dp-wsm-6c}
copies=12
%endif
%ifdef %{1p-nhm-ex}
copies=8
%endif
%ifdef %{2p-nhm-ex}
copies=16
%endif
%ifdef %{4p-nhm-ex}
copies=32
%endif
################################################################################
################################################

416.gamess=peak=default:
OPTIMIZE= -unroll2 -Ob0 -ansi-alias -scalar-rep-
################################################################################
################################################
%ifdef %{smt-on}
%ifdef %{physicallogical}
submit       = numactl --localalloc --physcpubind=`expr 2 \\* $SPECCOPYNUM`
$command
%ifdef %{no-numa)
submit       = taskset -c `expr 2 \\* $SPECCOPYNUM` $command
```

```
%endif
%endif
%endif

%ifdef %{up-dale}
copies=2
%endif
%ifdef %{up-nhm}
copies=4
%endif
%ifdef %{dp-nhm}
copies=8
%endif
%ifdef %{up-wsm-6c}
copies=6
%endif
%ifdef %{dp-wsm-6c}
copies=12
%endif
################################################################################
################################################

433.milc=peak=default:
OPTIMIZE= -fno-alias -opt-prefetch
COPTIMIZE=

434.zeusmp=peak=default:
basepeak=yes

435.gromacs=peak=default:
OPTIMIZE= -opt-prefetch

436.cactusADM=peak=default:
basepeak=yes

437.leslie3d=peak=default:
OPTIMIZE=     $(FAST)
feedback=no
################################################################################
################################################
%ifdef %{smt-on}
%ifdef %{physicallogical}
submit       = numactl --localalloc --physcpubind=`expr 2 \\* $SPECCOPYNUM`
$command
%ifdef %{no-numa)
submit       = taskset -c `expr 2 \\* $SPECCOPYNUM` $command
%endif
%endif
%endif

%ifdef %{up-dale}
copies=2
```

```
%endif
%ifdef %{up-nhm}
copies=4
%endif
%ifdef %{dp-nhm}
copies=8
%endif
%ifdef %{up-wsm-6c}
copies=6
%endif
%ifdef %{dp-wsm-6c}
copies=12
%endif
%ifdef %{1p-nhm-ex}
copies=8
%endif
%ifdef %{2p-nhm-ex}
copies=16
%endif
%ifdef %{4p-nhm-ex}
copies=32
%endif
################################################################################
################################################

444.namd=peak=default:
CXXOPTIMIZE= -fno-alias -auto-ilp32

447.dealII=peak=default:
CXXOPTIMIZE= -unroll2 -ansi-alias -scalar-rep-

450.soplex=peak=default:
PORTABILITY =
CXX= icpc -m32
OPTIMIZE= -opt-malloc-options=3
CXXOPTIMIZE=
################################################################################
################################################
%ifdef %{smt-on}
%ifdef %{physicallogical}
submit       = numactl --localalloc --physcpubind=`expr 2 \\* $SPECCOPYNUM`
$command
%ifdef %{no-numa)
submit       = taskset -c `expr 2 \\* $SPECCOPYNUM` $command
%endif
%endif
%endif

%ifdef %{up-dale}
copies=2
%endif
%ifdef %{up-nhm}
```

```
copies=4
%endif
%ifdef %{dp-nhm}
copies=8
%endif
%ifdef %{up-wsm-6c}
copies=6
%endif
%ifdef %{dp-wsm-6c}
copies=12
%endif
################################################################################
################################################

453.povray=peak=default:
CXXOPTIMIZE= -unroll4 -ansi-alias

454.calculix=peak=default:
basepeak=yes

459.GemsFDTD=peak=default:
OPTIMIZE= -unroll2 -Ob0
################################################################################
################################################
%ifdef %{smt-on}
%ifdef %{physicallogical}
submit       = numactl --localalloc --physcpubind=`expr 2 \\* $SPECCOPYNUM`
$command
%ifdef %{no-numa)
submit       = taskset -c `expr 2 \\* $SPECCOPYNUM` $command
%endif
%endif
%endif

%ifdef %{up-dale}
copies=2
%endif
%ifdef %{up-nhm}
copies=4
%endif
%ifdef %{dp-nhm}
copies=8
%endif
%ifdef %{up-wsm-6c}
copies=6
%endif
%ifdef %{dp-wsm-6c}
copies=12
%endif
################################################################################
################################################
```

```
465.tonto=peak=default:
OPTIMIZE= -unroll4 -auto -inline-calloc -opt-malloc-options=3

470.lbm=peak=default:
OPTIMIZE= -opt-malloc-options=3 -ansi-alias
################################################################################
################################################
%ifdef %{smt-on}
%ifdef %{physicallogical}
submit       = numactl --localalloc --physcpubind=`expr 2 \\* $SPECCOPYNUM`
$command
%ifdef %{no-numa)
submit       = taskset -c `expr 2 \\* $SPECCOPYNUM` $command
%endif
%endif
%endif

%ifdef %{up-dale}
copies=2
%endif
%ifdef %{up-nhm}
copies=4
%endif
%ifdef %{dp-nhm}
copies=8
%endif
%ifdef %{up-wsm-6c}
copies=6
%endif
%ifdef %{dp-wsm-6c}
copies=12
%endif
%ifdef %{1p-nhm-ex}
copies=7
%endif
%ifdef %{2p-nhm-ex}
copies=14
%endif
%ifdef %{4p-nhm-ex}
copies=28
%endif
################################################################################
################################################

481.wrf=peak=default:
basepeak=yes

482.sphinx3=peak=default:
PORTABILITY=
CC= icc -m32
OPTIMIZE= $(FAST)
COPTIMIZE= -unroll2
```

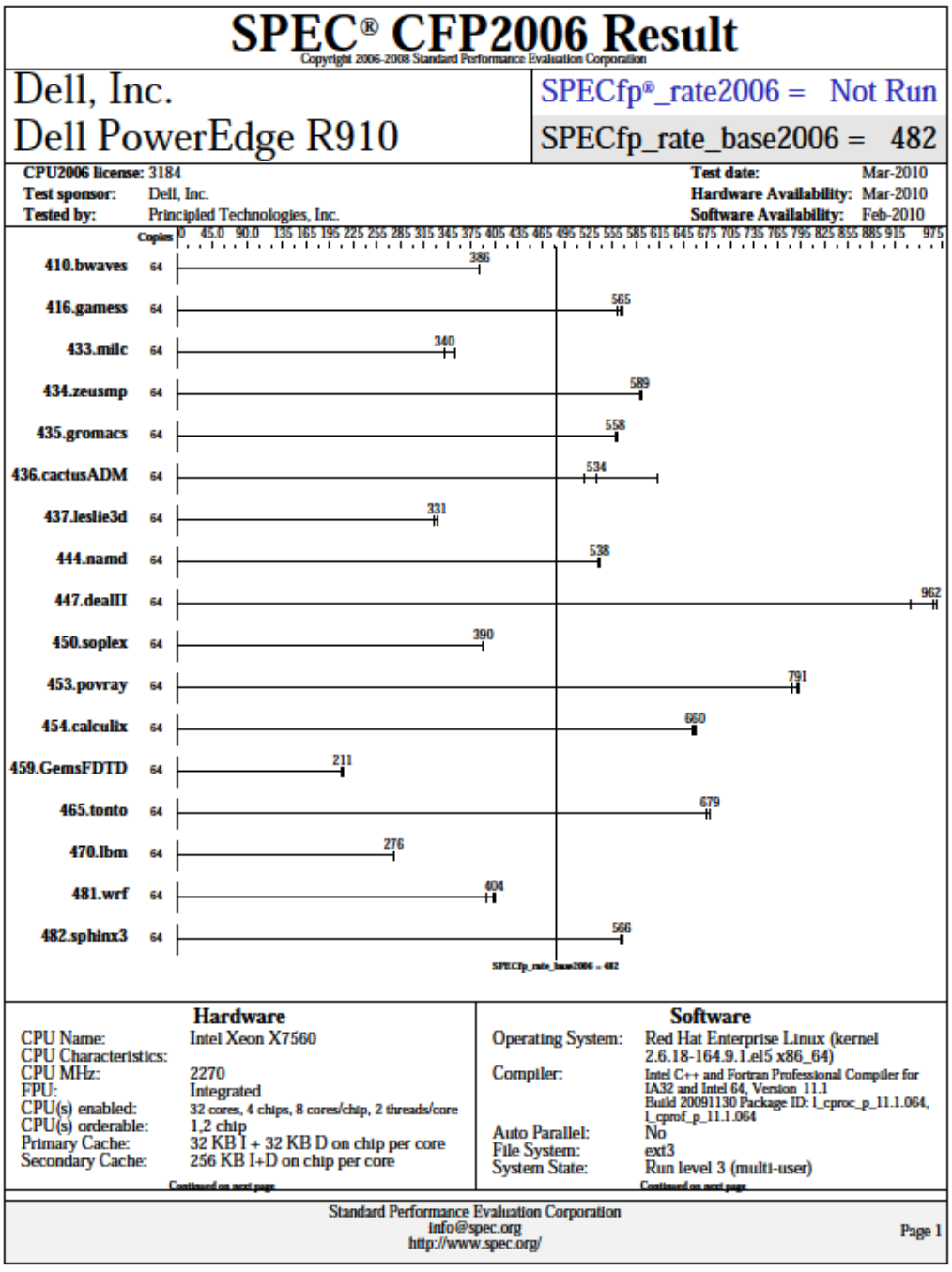
```
feedback=no

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

default=default=default=default:
license_num      = 3184
test_sponsor     = Dell, Inc
hw_avail         = Mar-2010
sw_avail         = Feb-2010
tester           = Principled Technologies, Inc.
hw_cpu_name      = Intel Xeon X7560
hw_cpu_char      =
hw_cpu_mhz       = 2270
hw_disk          = 73 GB SAS, 15000RPM
hw_fpu           = Integrated
hw_memory        = 128 GB (32 x 4 GB DDR3-8500) GB
hw_model         = Dell PowerEdge R910
hw_ncpuorder     = 1,2,3,4 chip
hw_ncores        = 32
hw_nchips        = 4
hw_ncoresperchip = 8
hw_nthreadspercore = 2
hw_other         = None
hw_pcache        = 32 KB I + 32 KB D on chip per core
hw_scache        = 256 MB I+D on chip per core
hw_tcache        = 24 MB
hw_ocache        = None
hw_vendor        = Dell, Inc.
prepared_by      = Principled Technologies, Inc.
sw_file          = ext3
sw_os            = Red Hat Enterprise Linux (kernel 2.6.18-164.9.1.el5 x86_64)
sw_state         = Run level 3 (multi-user)
notes_submit_000 = numactl was used to bind copies to the cores
%ifdef %{no-numa)
notes_submit_000 = taskset was used to bind copies to the cores
%endif

int=default=default=default:
sw_compiler001   = Intel C++ Professional Compiler for IA32 and Intel 64, Version
11.1
sw_compiler002   = Build 20091130 Package ID: l_cproc_p_11.1.064
sw_base_ptrsize  = 32-bit
sw_peak_ptrsize  = 32/64-bit
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 Professional Compiler for IA32 and Intel
64, Version  11.1
```

```
sw_compiler002   = Build 20091130 Package ID: l_cproc_p_11.1.064,
l_cprof_p_11.1.064
sw_base_ptrsize  = 64-bit
sw_peak_ptrsize  = 32/64-bit
sw_other001      = Binutils 2.18.50.0.7.20080502
```

APPENDIX C – SPECFP_rate_base2006 OUTPUT

This appendix provides the SPECfp_rate_base2006 output files from the median run for the test servers.

Red Hat Enterprise Linux 5.4 server: Dell PowerEdge R910



SPEC CFP2006 Result

Dell, Inc.
Dell PowerEdge R910

SPECfp_rate2006 = Not Run

SPECfp_rate_base2006 = 482

CPU2006 license: 3184
Test sponsor: Dell, Inc.
Tested by: Principled Technologies, Inc.

Test date: Mar-2010
Hardware Availability: Mar-2010
Software Availability: Feb-2010

Hardware (Continued)

L3 Cache: 24 MB I+D on chip per chip
Other Cache: None
Memory: 128 GB (32 x 4 GB DDR3-8500)
Disk Subsystem: 73 GB SAS, 15000RPM
Other Hardware: None

Software (Continued)

Base Pointers: 64-bit
Peak Pointers: 32/64-bit
Other Software: Binutils 2.18.50.0.7.20080502

Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
410.bwaves	64	2253	386	2259	385	**2254**	**386**							
416.gamess	64	2209	567	**2216**	**565**	2231	562							
433.milc	64	1655	355	1726	340	**1726**	**340**							
434.zeusmp	64	983	592	**988**	**589**	989	589							
435.gromacs	64	819	558	**819**	**558**	815	561							
436.cactusADM	64	1251	612	**1432**	**534**	1476	518							
437.leslie3d	64	**1816**	**331**	1815	331	1833	328							
444.namd	64	954	538	**954**	**538**	957	537							
447.dealII	64	**761**	**962**	757	967	783	935							
450.soplex	64	1369	390	**1368**	**390**	1367	390							
453.povray	64	430	792	435	783	**431**	**791**							
454.calculix	64	**800**	**660**	800	660	805	656							
459.GemsFDTD	64	3214	211	3231	210	**3216**	**211**							
465.tonto	64	927	679	933	675	**928**	**679**							
470.lbm	64	3186	276	**3186**	**276**	3184	276							
481.wrf	64	1760	406	1813	394	**1769**	**404**							
482.sphinx3	64	**2202**	**566**	2198	567	2203	566							

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 was used to bind copies to the cores
```

Base Compiler Invocation

C benchmarks:
```
icc   -m64
```

C++ benchmarks:
```
icpc  -m64
```

Continued on next page

SPEC CFP2006 Result

Dell, Inc.
Dell PowerEdge R910

SPECfp_rate2006 = Not Run
SPECfp_rate_base2006 = 482

CPU2006 license: 3184
Test sponsor: Dell, Inc.
Tested by: Principled Technologies, Inc.

Test date: Mar-2010
Hardware Availability: Mar-2010
Software Availability: Feb-2010

Base Compiler Invocation (Continued)

Fortran benchmarks:
ifort -m64

Benchmarks using both Fortran and C:
icc -m64 ifort -m64

Base Portability Flags

410.bwaves: -DSPEC_CPU_LP64
416.gamess: -DSPEC_CPU_LP64
433.milc: -DSPEC_CPU_LP64
434.zeusmp: -DSPEC_CPU_LP64
435.gromacs: -DSPEC_CPU_LP64 -nofor_main
436.cactusADM: -DSPEC_CPU_LP64 -nofor_main
437.leslie3d: -DSPEC_CPU_LP64
444.namd: -DSPEC_CPU_LP64
447.dealII: -DSPEC_CPU_LP64
450.soplex: -DSPEC_CPU_LP64
453.povray: -DSPEC_CPU_LP64
454.calculix: -DSPEC_CPU_LP64 -nofor_main
459.GemsFDTD: -DSPEC_CPU_LP64
465.tonto: -DSPEC_CPU_LP64
470.lbm: -DSPEC_CPU_LP64
481.wrf: -DSPEC_CPU_LP64 -DSPEC_CPU_CASE_FLAG -DSPEC_CPU_LINUX
482.sphinx3: -DSPEC_CPU_LP64

Base Optimization Flags

C benchmarks:
-xSSE4.2 -ipo -O3 -no-prec-div -static

C++ benchmarks:
-xSSE4.2 -ipo -O3 -no-prec-div -static

Fortran benchmarks:
-xSSE4.2 -ipo -O3 -no-prec-div -static

Benchmarks using both Fortran and C:
-xSSE4.2 -ipo -O3 -no-prec-div -static

SPEC CFP2006 Result

Dell, Inc.
Dell PowerEdge R910

SPECfp_rate2006 = Not Run

SPECfp_rate_base2006 = 482

CPU2006 license: 3184
Test sponsor: Dell, Inc.
Tested by: Principled Technologies, Inc.

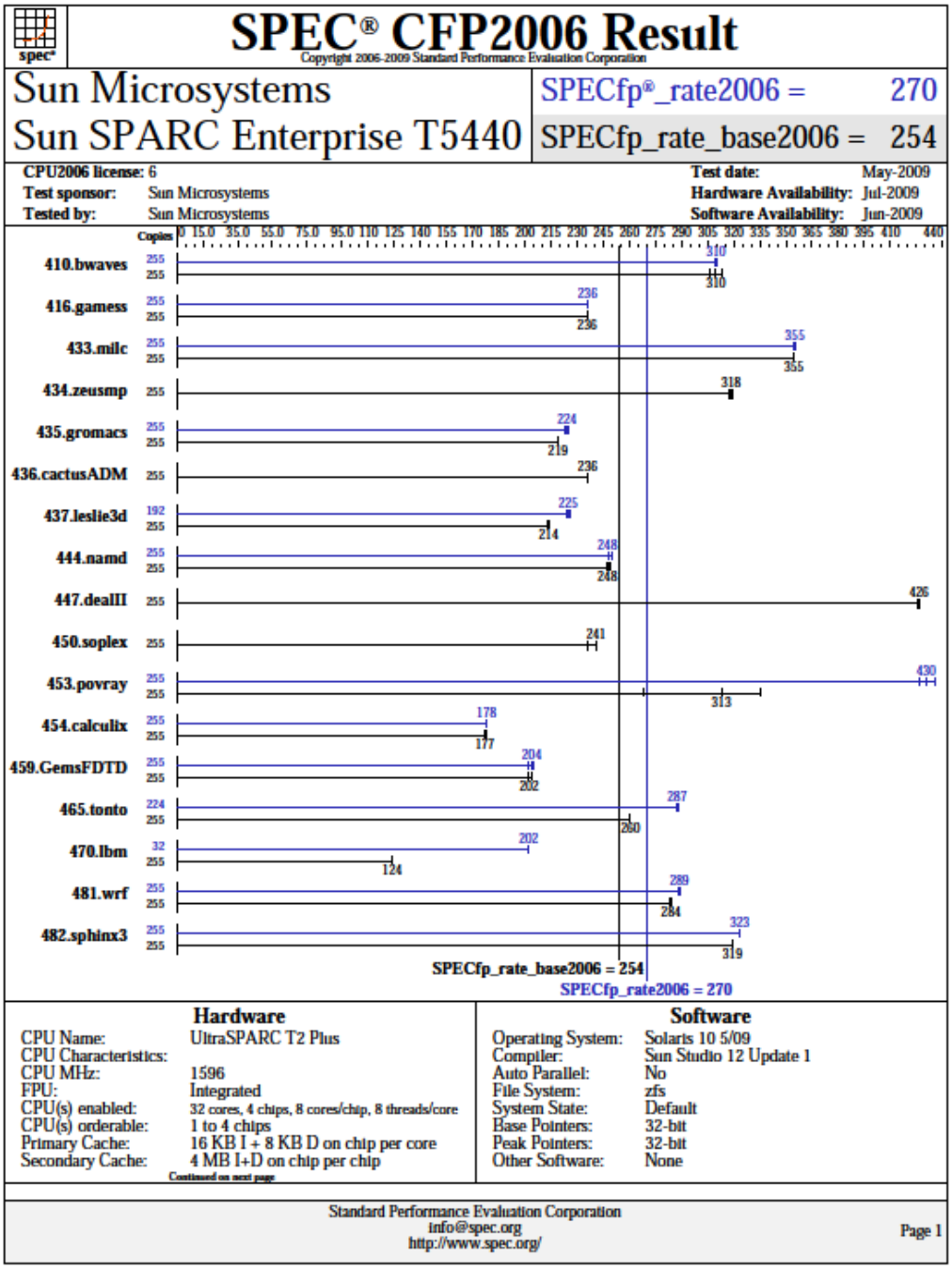
Test date: Mar-2010
Hardware Availability: Mar-2010
Software Availability: Feb-2010

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 Mar 15 06:45:20 2010 by SPEC CPU2006 PS/PDF formatter v6128.

Solaris 10 5/09 server: Sun SPARC Enterprise T5440

http://www.spec.org/cpu2006/results/res2009q3/cpu2006-20090717-08193.html



SPEC CFP2006 Result

Sun Microsystems
Sun SPARC Enterprise T5440

SPECfp_rate2006 = 270

SPECfp_rate_base2006 = 254

CPU2006 license: 6
Test sponsor: Sun Microsystems
Tested by: Sun Microsystems

Test date: May-2009
Hardware Availability: Jul-2009
Software Availability: Jun-2009

Hardware (Continued)

L3 Cache: None
Other Cache: None
Memory: 256 GB (64 x 4 GB)
Disk Subsystem: 536 GB using ZFS 3-way mirroring on 24x 15K SUN72G FC (on 2x SE3510)
Other Hardware: None

Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
410.bwaves	255	11053	314	11297	307	**11190**	**310**	255	**11189**	**310**	11180	310	11215	309
416.gamess	255	**21186**	**236**	21187	236	21151	236	255	21153	236	**21163**	**236**	21177	236
433.milc	255	6600	355	6606	354	**6602**	**355**	255	6597	355	**6594**	**355**	6593	355
434.zeusmp	255	7258	320	7311	317	**7289**	**318**	255	7258	320	7311	317	**7289**	**318**
435.gromacs	255	8326	219	8304	219	**8314**	**219**	255	8153	223	8102	225	**8125**	**224**
436.cactusADM	255	**12910**	**236**	12921	236	12895	236	255	**12910**	**236**	12921	236	12895	236
437.leslie3d	255	11238	213	**11227**	**214**	11218	214	192	**8032**	**225**	7978	226	8043	224
444.namd	255	**8233**	**248**	8207	249	8285	247	255	8191	250	8236	248	**8231**	**248**
447.dealII	255	6839	427	**6842**	**426**	6858	425	255	6839	427	**6842**	**426**	6858	425
450.soplex	255	8989	237	**8834**	**241**	8827	241	255	8989	237	**8834**	**241**	8827	241
453.povray	255	**4336**	**313**	4042	336	5064	268	255	3178	427	3110	436	**3152**	**430**
454.calculix	255	11846	178	11885	177	**11883**	**177**	255	11837	178	11826	178	**11831**	**178**
459.GemsFDTD	255	**13373**	**202**	13272	204	13423	202	255	**13276**	**204**	13227	205	13385	202
465.tonto	255	9630	261	9634	260	**9634**	**260**	224	7670	287	**7668**	**287**	7659	288
470.lbm	255	**28328**	**124**	28242	124	28409	123	32	2176	202	**2177**	**202**	2177	202
481.wrf	255	**10036**	**284**	10046	284	10009	285	255	9869	289	9860	289	**9867**	**289**
482.sphinx3	255	15558	319	**15571**	**319**	15583	319	255	15349	324	15371	323	**15368**	**323**

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

Compiler Invocation Notes

```
Sun Studio 12 Update 1 pre-release build 41.1 was used.
```

Submit Notes

```
A processor set was created using
  psrset -c 1-255
and the runspec process was placed into the set using
  psrset -e 1
The config file option 'submit' was used to select specific
```

Continued on next page

SPEC CFP2006 Result

Sun Microsystems
Sun SPARC Enterprise T5440

SPECfp_rate2006 = 270

SPECfp_rate_base2006 = 254

CPU2006 license: 6
Test sponsor: Sun Microsystems
Tested by: Sun Microsystems

Test date: May-2009
Hardware Availability: Jul-2009
Software Availability: Jun-2009

Submit Notes (Continued)

```
processors within the set, along with the pbind command.
```

Operating System Notes

```
ulimit -s 131072 was used to allow the stack to grow
up to 131072 KB (aka 128 MB).  Note that saying "131072"
is preferable to "unlimited", because there is a tradeoff
between space for the stack vs. space for the heap.


/etc/system parameters
   autoup=600
      Causes pages older than the listed number of seconds to
      be written by fsflush.
   tune_t_fsflushr=10
      Controls how many seconds elapse between runs of the
      page flush daemon, fsflush.
   tsb_rss_factor=128
      Suggests that the the size of the TSB (Translation Storage Buffer)
      may be increased if it is more than 25% (128/512) full.  Doing so
      may reduce TSB traps, at the cost of additional kernel memory.
   zfs:zfs_arc_max = 0x10000000
      Limits the consumption of memory by the zfs file system

The "webconsole" service was turned off using
    svcadm disable webconsole

The system had 229 GB of swap space.
```

Platform Notes

```
This result was measured on a Sun SPARC Enterprise T5440.
The Sun SPARC Enterprise T5440 and the Fujitsu SPARC
Enterprise T5440 are electrically equivalent.
```

Compiler Invocation

C benchmarks:
    cc

C++ benchmarks:
    CC

Fortran benchmarks:
    f90

Continued on next page

SPEC CFP2006 Result

Sun Microsystems
Sun SPARC Enterprise T5440

SPECfp_rate2006 = 270
SPECfp_rate_base2006 = 254

CPU2006 license: 6
Test sponsor: Sun Microsystems
Tested by: Sun Microsystems

Test date: May-2009
Hardware Availability: Jul-2009
Software Availability: Jun-2009

Compiler Invocation (Continued)

Benchmarks using both Fortran and C:
cc f90

Base Optimization Flags

C benchmarks:
-g -fast -xipo=2 -xpagesize=4M -xprefetch_level=2 -xalias_level=std
-xprefetch_level=3 -xprefetch_auto_type=indirect_array_access
-M /usr/lib/ld/map.bssalign

C++ benchmarks:
-g0 -library=stlport4 -fast -xipo=2 -xpagesize=4M -xprefetch_level=2
-xdepend -xalias_level=compatible -M /usr/lib/ld/map.bssalign

Fortran benchmarks:
-g -fast -xipo=2 -xpagesize=4M -xprefetch_level=2
-M /usr/lib/ld/map.bssalign

Benchmarks using both Fortran and C:
-g -fast(cc) -fast(f90) -xipo=2 -xpagesize=4M -xprefetch_level=2
-xalias_level=std -xprefetch_level=3
-xprefetch_auto_type=indirect_array_access -M /usr/lib/ld/map.bssalign

Peak Optimization Flags

C benchmarks:

433.milc: -g -xprofile=collect:./feedback(pass 1)
-xprofile=use:./feedback(pass 2) -fast -xpagesize=4M
-M /usr/lib/ld/map.bssalign -xipo=2 -xprefetch_level=2
-xprefetch_auto_type=indirect_array_access -xalias_level=std
-fsimple=1

470.lbm: -g -xprofile=collect:./feedback(pass 1)
-xprofile=use:./feedback(pass 2) -fast -xpagesize=4M
-M /usr/lib/ld/map.bssalign -xprefetch_level=3 -xipo=2
-xrestrict

482.sphinx3: -g -xprofile=collect:./feedback(pass 1)
-xprofile=use:./feedback(pass 2) -fast -xpagesize=4M
-M /usr/lib/ld/map.bssalign -xinline= -xprefetch_level=2
-Wc,-Qlp-ol-1 -xrestrict -xalias_level=strong -fsimple=1
-xlinkopt=2 -lfast

C++ benchmarks:

Continued on next page

Peak Optimization Flags (Continued)

444.namd: -g0 -library=stlport4 -xprofile-collect:./feedback(pass 1)
-xprofile-use:./feedback(pass 2) -fast -xpagesize-4M
-xdepend -xalias_level-compatible
-M /usr/lib/ld/map.bssalign -xprefetch_level-1 -xlinkopt-2

447.dealII: basepeak = yes

450.soplex: basepeak = yes

453.povray: -g0 -library-stlport4 -xprofile-collect:./feedback(pass 1)
-xprofile-use:./feedback(pass 2) -fast -xpagesize-64K
-xdepend -xalias_level-compatible -xipo-2 -xrestrict
-xlinkopt-2

Fortran benchmarks:

410.bwaves: -g -xprofile-collect:./feedback(pass 1)
-xprofile-use:./feedback(pass 2) -fast -xpagesize-4M
-M /usr/lib/ld/map.bssalign -xipo-2 -xprefetch_level-2

416.gamess: -g -xprofile-collect:./feedback(pass 1)
-xprofile-use:./feedback(pass 2) -fast -xpagesize-4M
-M /usr/lib/ld/map.bssalign -xlinkopt-2

434.zeusmp: basepeak = yes

437.leslie3d: -g -fast -xpagesize_heap-4M -xpagesize_stack-64K
-M /usr/lib/ld/map.bssalign -xprefetch_level-3
-xprefetch-latx:1.6 -qoption cg -Qlp-1 -qoption cg -Qlp-fa-0
-qoption cg -Qlp-fl-1 -qoption cg -Qlp-av-448
-qoption cg -Qlp-t-4

459.GemsFDTD: -g -fast -xpagesize-4M -M /usr/lib/ld/map.bssalign
-fsimple-1

465.tonto: -g -fast -xpagesize-4M -M /usr/lib/ld/map.bssalign -xipo-2
-lfast

Benchmarks using both Fortran and C:

435.gromacs: -g -xprofile-collect:./feedback(pass 1)
-xprofile-use:./feedback(pass 2) -fast(cc) -fast(f90)
-xpagesize-4M -M /usr/lib/ld/map.bssalign -xipo-1 -xinline-
-xarch-generic -xchip-generic -fsimple-0

436.cactusADM: basepeak = yes

454.calculix: -g -fast(cc) -fast(f90) -xpagesize-4M
-M /usr/lib/ld/map.bssalign -xipo-2 -xvector
-xprefetch_level-1

Continued on next page

SPEC CFP2006 Result

Sun Microsystems
Sun SPARC Enterprise T5440

SPECfp_rate2006 = 270

SPECfp_rate_base2006 = 254

CPU2006 license: 6
Test sponsor: Sun Microsystems
Tested by: Sun Microsystems

Test date: May-2009
Hardware Availability: Jul-2009
Software Availability: Jun-2009

Peak Optimization Flags (Continued)

481.wrf: -g -xprofile=collect:./feedback(pass 1)
-xprofile=use:./feedback(pass 2) -fast(cc) -fast(f90)
-xpagesize=4M -M /usr/lib/ld/map.bssalign -xlinkopt=2

Other Flags

C benchmarks:
-xjobs=32 -V -#

C++ benchmarks:
-xjobs=32 -verbose=diags,version

Fortran benchmarks:
-xjobs=32 -V -v

Benchmarks using both Fortran and C:
-xjobs=32 -V -# -v

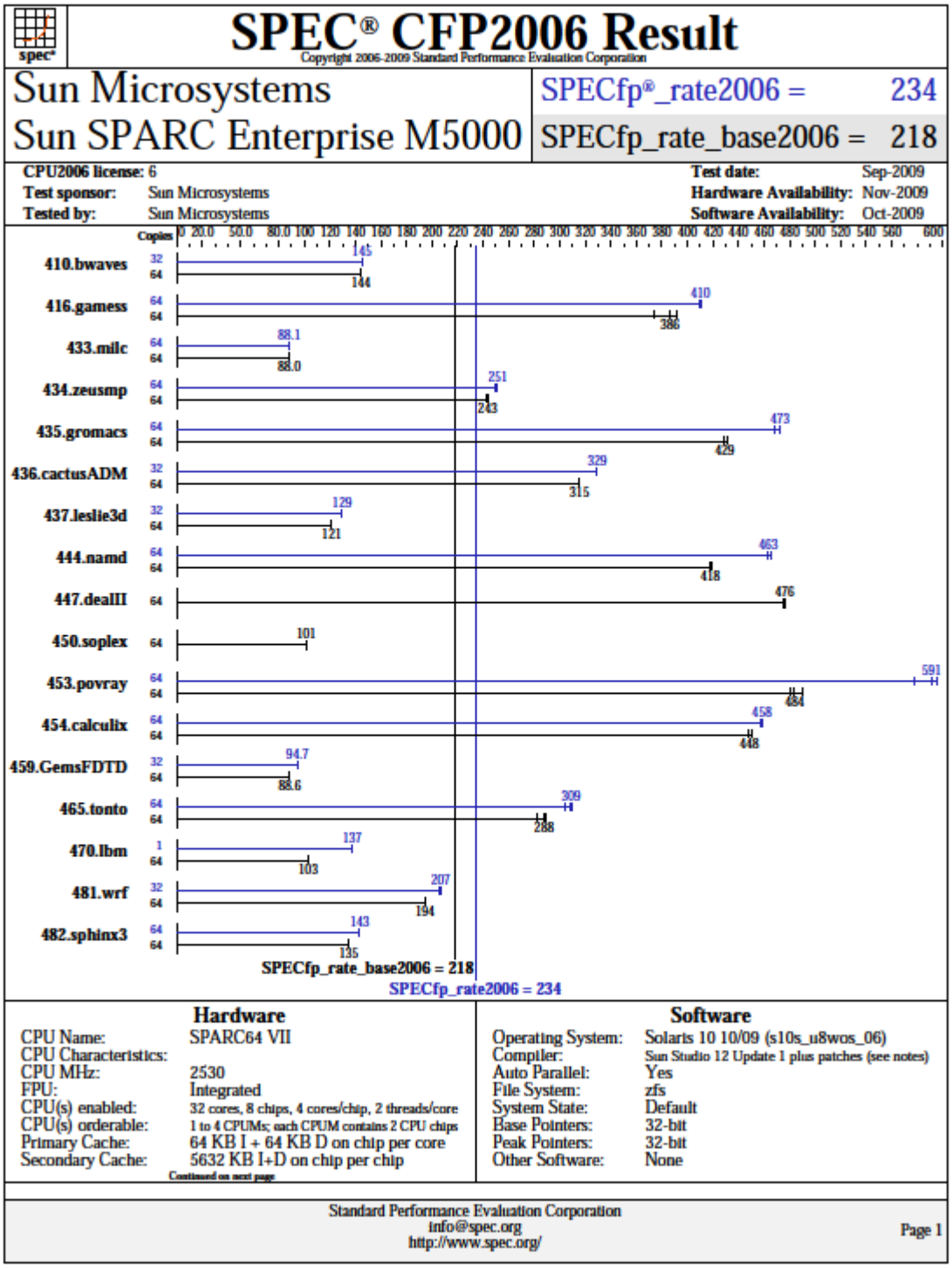
The flags file that was used to format this result can be browsed at
http://www.spec.org/cpu2006/flags/Sun-Solaris-Studio12-12u1-and-gccfss4.2.r3.html

You can also download the XML flags source by saving the following link:
http://www.spec.org/cpu2006/flags/Sun-Solaris-Studio12-12u1-and-gccfss4.2.r3.xml

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 Wed Aug 5 18:22:22 2009 by SPEC CPU2006 PS/PDF formatter v6323.

Solaris 10 10/09 server: Sun SPARC Enterprise M5000
http://www.spec.org/cpu2006/results/res2009q4/cpu2006-20091012-08881.html



SPEC CFP2006 Result

Sun Microsystems
Sun SPARC Enterprise M5000

SPECfp_rate2006 = 234

SPECfp_rate_base2006 = 218

CPU2006 license: 6
Test sponsor: Sun Microsystems
Tested by: Sun Microsystems

Test date: Sep-2009
Hardware Availability: Nov-2009
Software Availability: Oct-2009

Hardware (Continued)

L3 Cache: None
Other Cache: None
Memory: 128 GB (64 x 2 GB), 8-way interleaved
Disk Subsystem: 536 GB (zfs 8 x 3-way mirrors) on 24 x 73GB 15000RPM FC-AL disks in 2 x SE3510 enclosures
Other Hardware: None

Results Table

Benchmark	Base							Peak						
	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio	Copies	Seconds	Ratio	Seconds	Ratio	Seconds	Ratio
410.bwaves	64	6043	144	6034	144	**6035**	**144**	32	**3001**	**145**	3002	145	3001	145
416.gamess	64	3199	392	3347	374	**3243**	**386**	64	3058	410	3050	411	**3056**	**410**
433.milc	64	**6674**	**88.0**	6676	88.0	6672	88.1	64	6665	88.2	6667	88.1	**6665**	**88.1**
434.zeusmp	64	**2393**	**243**	2401	243	2390	244	64	**2318**	**251**	2317	251	2331	250
435.gromacs	64	**1065**	**429**	1067	428	1059	432	64	967	473	**967**	**473**	976	468
436.cactusADM	64	2423	316	**2425**	**315**	2426	315	32	1163	329	1161	329	**1161**	**329**
437.leslie3d	64	4968	121	**4966**	**121**	4961	121	32	**2324**	**129**	2323	129	2325	129
444.namd	64	1230	417	1227	418	**1229**	**418**	64	**1108**	**463**	1103	466	1108	463
447.dealII	64	**1538**	**476**	1541	475	1534	477	64	**1538**	**476**	1541	475	1534	477
450.soplex	64	5262	101	5273	101	**5270**	**101**	64	5262	101	5273	101	**5270**	**101**
453.povray	64	694	491	**704**	**484**	708	481	64	589	578	572	595	**576**	**591**
454.calculix	64	1172	451	1180	448	**1178**	**448**	64	1152	458	**1152**	**458**	1153	458
459.GemsFDTD	64	7677	88.5	**7667**	**88.6**	7666	88.6	32	3584	94.7	3587	94.7	**3587**	**94.7**
465.tonto	64	2226	283	2179	289	**2189**	**288**	64	**2040**	**309**	2032	310	2074	304
470.lbm	64	8553	103	8555	103	**8553**	**103**	1	100	137	**100**	**137**	100	137
481.wrf	64	3667	195	3681	194	**3679**	**194**	32	1738	206	**1730**	**207**	1729	207
482.sphinx3	64	**9272**	**135**	9269	135	9279	134	64	8712	143	**8710**	**143**	8698	143

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

Compiler Invocation Notes

```
Sun Studio 12 Update 1 was used, plus patch 119963-17

Sun Studio compiler patches are available at
  http://developers.sun.com/sunstudio/downloads/patches/ss12u1_patches.jsp
```

Submit Notes

```
Processes were assigned to specific processors using 'pbind'
commands.  The config file option 'submit' was used, along
```

Continued on next page

SPEC CFP2006 Result

Sun Microsystems
Sun SPARC Enterprise M5000

SPECfp_rate2006 = 234

SPECfp_rate_base2006 = 218

CPU2006 license: 6
Test sponsor: Sun Microsystems
Tested by: Sun Microsystems

Test date: Sep-2009
Hardware Availability: Nov-2009
Software Availability: Oct-2009

Submit Notes (Continued)

```
with a list of processors in the 'BIND' variable, to generate
the pbind commands.  (For details, please see the config file.)
```

Operating System Notes

```
ulimit -s 131072 was used to allow the stack to grow
up to 131072 KB (aka 128 MB).  Note that saying "131072"
is preferable to "unlimited", because there is a tradeoff
between space for the stack vs. space for the heap.


System Tunables (/etc/system parameters):

tune_t_fsflushr=10
    Controls how many seconds elapse between runs of the
    page flush daemon, fsflush.
autoup=600
    Causes pages older than the listed number of seconds to
    be written by fsflush.
zfs:zfs_arc_max = 0x10000000
    Control the amount of memory used by ZFS for caching
lpg_alloc_prefer=1
    Prefer local pages, even if not easily available

Other System Settings:

The webconsole service was turned off using
    svcadm disable webconsole

The system had 50 GB of swap space
```

Platform Notes

```
Memory is 8-way interleaved by filling all slots with
the same capacity DIMMs.

This result is measured on a Sun SPARC Enterprise M5000
Server.  The Sun SPARC Enterprise M5000 and the Fujitsu
SPARC Enterprise M5000 are electrically equivalent.
```

General Notes

```
Environment variables set by runspec before the start of the run:
   OMP_NUM_THREADS = "64"
   SUNW_MP_PROCBIND = "true"
   SUNW_MP_THR_IDLE = "SPIN"
```

Continued on next page

SPEC CFP2006 Result

Sun Microsystems
Sun SPARC Enterprise M5000

SPECfp_rate2006 = 234
SPECfp_rate_base2006 = 218

CPU2006 license: 6
Test sponsor: Sun Microsystems
Tested by: Sun Microsystems

Test date: Sep-2009
Hardware Availability: Nov-2009
Software Availability: Oct-2009

General Notes (Continued)

```
447.dealII (peak): "apache_stdcxx_4_2_1" src.alt was used.

447.dealII (base): "apache_stdcxx_4_2_1" src.alt was used.
```

Compiler Invocation

C benchmarks:
```
cc
```

C++ benchmarks:
```
CC
```

Fortran benchmarks:
```
f90
```

Benchmarks using both Fortran and C:
```
cc f90
```

Base Optimization Flags

C benchmarks:
```
-fast -fma=fused -xipo=2 -xpagesize=4M -xalias_level=std
-xprefetch_auto_type=indirect_array_access -xprefetch_level=3
```

C++ benchmarks:
```
-xdepend -fast -fma=fused -xipo=2 -xpagesize=4M
-xalias_level=compatible -xprefetch=latx:0.5 -library=no%Cstd
-I/export/home/apache/stdcxx-4.2.1/include
-I/export/home/apache/stdcxx-4.2.1/build/include
-L/export/home/apache/stdcxx-4.2.1/build/lib
-R/export/home/apache/stdcxx-4.2.1/build/lib -lstd8d
```

Fortran benchmarks:
```
-fast -fma=fused -xipo=2 -xpagesize=4M -xprefetch_level=2
```

Benchmarks using both Fortran and C:
```
-fast(cc) -fast(f90) -fma=fused -xipo=2 -xpagesize=4M
-xalias_level=std -xprefetch_auto_type=indirect_array_access
-xprefetch_level=3 -xprefetch_level=2
```

Peak Optimization Flags

C benchmarks:

Continued on next page

Peak Optimization Flags (Continued)

433.milc: -fast -xpagesize-4M -fma-fused -xipo-2 -xprefetch_level-2
-fsimple-1 -xprefetch_auto_type-indirect_array_access
-W2,-Ainline:rs-400 -xalias_level-std

470.lbm: -fast -xpagesize-4M -xprefetch_level-3 -xipo-2 -fma-fused
-xvector -xarch-generic -xautopar -xreduction

482.sphinx3: -xprofile-collect:./feedback(pass 1)
-xprofile-use:./feedback(pass 2) -fast -xpagesize-4M
-fma-fused -xipo-2 -xinline- -xprefetch-no%auto
-xalias_level-strong -lfast -ll2amm

C++ benchmarks:

444.namd: -xdepend -xprofile-collect:./feedback(pass 1)
-xprofile-use:./feedback(pass 2) -fast -xpagesize-4M
-xalias_level-compatible -library-stlport4 -fma-fused
-xipo-2 -xprefetch-no%auto -xlinkopt-2

447.dealII: basepeak - yes

450.soplex: basepeak - yes

453.povray: -xdepend -xprofile-collect:./feedback(pass 1)
-xprofile-use:./feedback(pass 2) -fast -xpagesize-4M
-xalias_level-compatible -library-stlport4 -xipo-2
-xlinkopt-2

Fortran benchmarks:

410.bwaves: -fast -xpagesize-4M -fma-fused -xipo-2 -xprefetch_level-2

416.gamess: -xprofile-collect:./feedback(pass 1)
-xprofile-use:./feedback(pass 2) -fast -xpagesize-4M
-fma-fused -xipo-2 -xprefetch-no%auto

434.zeusmp: -fast -xpagesize-4M -fma-fused -xipo-2 -xprefetch_level-1
-ll2amm

437.leslie3d: -fast -xpagesize-4M -xprefetch-no

459.GemsFDTD: -fast -xpagesize-4M -fma-fused -fsimple-1 -xprefetch-no

465.tonto: -xprofile-collect:./feedback(pass 1)
-xprofile-use:./feedback(pass 2) -fast -xpagesize-4M
-xipo-2 -xprefetch-no -lfast -ll2amm

Benchmarks using both Fortran and C:

Continued on next page

SPEC CFP2006 Result

Sun Microsystems
Sun SPARC Enterprise M5000

SPECfp_rate2006 = 234

SPECfp_rate_base2006 = 218

CPU2006 license: 6
Test sponsor: Sun Microsystems
Tested by: Sun Microsystems

Test date: Sep-2009
Hardware Availability: Nov-2009
Software Availability: Oct-2009

Peak Optimization Flags (Continued)

435.gromacs: -xprofile-collect:./feedback(pass 1)
-xprofile-use:./feedback(pass 2) -fast(cc) -fast(f90)
-xpagesize-4M -fma-fused -xipo-2 -xchip-generic -xinline-
-fsimple-0

436.cactusADM: -fast(cc) -fast(f90) -xpagesize-4M -fma-fused -xipo-2
-xprefetch-latx:0.7 -fsimple-1

454.calculix: -fast(cc) -fast(f90) -xpagesize-4M -fma-fused -xipo-2
-xprefetch_level-1 -xalias_level-std
-xprefetch_auto_type-indirect_array_access

481.wrf: -xprofile-collect:./feedback(pass 1)
-xprofile-use:./feedback(pass 2) -fast(cc) -fast(f90)
-xpagesize-4M -xipo-2 -xprefetch_level-2

Other Flags

C benchmarks:
-xjobs-32 -V -#

C++ benchmarks:
-xjobs-32 -verbose-diags,version

Fortran benchmarks:
-xjobs-32 -V -v

Benchmarks using both Fortran and C:
-xjobs-32 -V -# -v

The flags file that was used to format this result can be browsed at
http://www.spec.org/cpu2006/flags/Sun-Solaris-Studio12-12u1-and-gccfss4.2.r4.html

You can also download the XML flags source by saving the following link:
http://www.spec.org/cpu2006/flags/Sun-Solaris-Studio12-12u1-and-gccfss4.2.r4.xml

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 Wed Oct 28 11:53:47 2009 by SPEC CPU2006 PS/PDF formatter v6323.

ABOUT PRINCIPLED TECHNOLOGIES

Principled Technologies, Inc.
1007 Slater Road, Suite 250
Durham, NC, 27703
www.principledtechnologies.com

We provide industry-leading technology assessment and fact-based marketing services. We bring to every assignment extensive experience with and expertise in all aspects of technology testing and analysis, from researching new technologies, to developing new methodologies, to testing with existing and new tools.

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Our founders, Mark L. Van Name and Bill Catchings, have worked together in technology assessment for over 20 years. As journalists, they published over a thousand articles on a wide array of technology subjects. They created and led the Ziff-Davis Benchmark Operation, which developed such industry-standard benchmarks as Ziff Davis Media's Winstone and WebBench. They founded and led eTesting Labs, and after the acquisition of that company by Lionbridge Technologies were the head and CTO of VeriTest.