SPECjbb2005 performance and power consumption on uniprocessor Intel-processor-based servers

Executive summary

Intel Corporation (Intel) commissioned Principled Technologies (PT) to measure the SPECjbb2005 performance of servers using the following three processors:

- Intel Pentium D processor 840
- Intel Pentium D processor 950
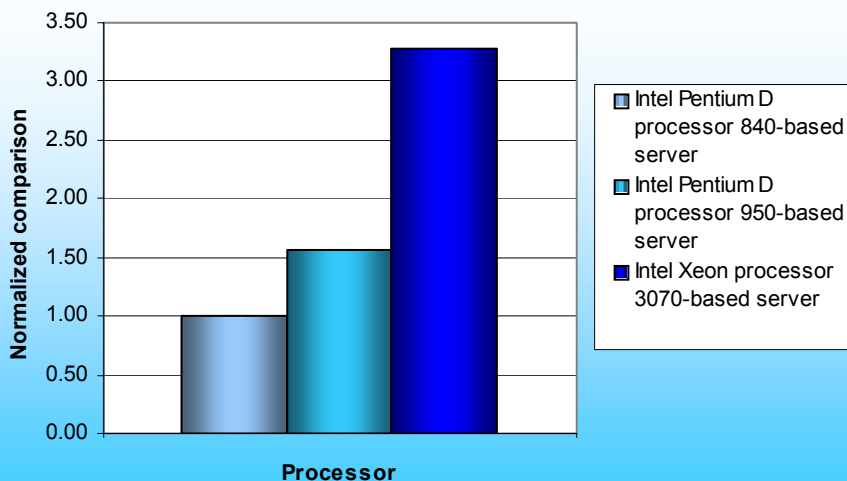- Intel Xeon processor 3070

SPECjbb2005 is an industry-standard benchmark created by the Standard Performance Evaluation Corp. (SPEC) to measure a server's Java performance. SPEC modeled SPECjbb2005 on the three-tier client/server architecture, with the middle layer as the primary focus. Per SPEC. "Random input selection represents the first (user) tier. SPECjbb2005 fully implements the middle tier business logic. The third tier is represented by tables of objects, implemented by Java Collections, rather than a separate database." (www.spec.org/jbb2005/docs/UserGuide.html).

KEY FINDINGS

- The Intel Xeon processor 3070-based server delivered 110.2 percent more performance/watt than the Intel Pentium D processor 950-based server (see Figure 1). (We calculated performance/watt using system-level power measurements.)

- The Intel Xeon processor 3070-based server delivered almost 55 percent higher peak performance than the Intel Pentium D processor 950-based server (see Figure 2).

- The Intel Xeon processor 3070-based server had over 26 percent lower average power usage while delivering its peak performance on the benchmark than the Intel Pentium D processor 950-based server (see Figures 3 and 8).

SPECjbb2005 utilizes multiple special data groups and multiple threads as it runs. Each data unit is a "warehouse", which is a roughly 25MB collection of data objects. Each thread represents an active user posting transaction requests within a warehouse. The benchmark run begins with one warehouse and then increases the number of warehouses; its goal is to saturate the server's processor capacity. As the number of warehouses increases, so does the number of threads. The benchmark's results portray the server's throughput in bops (business operations per second). Because bops is a rate, a higher number of bops is better. (For more information on SPECjbb2005, go to www.spec.org.)

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

Figure 1 illustrates the performance/watt for each of the three servers. In this chart, we normalized the results for each system to the 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.

Relative performance/watt results

Legend:
- Intel Pentium D processor 840-based server
- Intel Pentium D processor 950-based server
- Intel Xeon processor 3070-based server

Figure 1: Performance/watt results of the test servers running SPECjbb2005. Higher numbers indicate 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 Intel Xeon processor 3070-based server delivered 110.2 percent more performance/watt than the Intel Pentium D processor 950-based server and 227.7 percent more performance/watt than the Intel Pentium D processor 840-based server.

Figure 2 shows the SPECjbb2005 results, in bops, of the three test servers. Each result is the median peak score of three runs of the benchmark. See the "Test Results" section for the scores from all three runs. A higher SPECjbb2005 score indicates the server is able to handle more Java requests and thus deliver greater throughput.
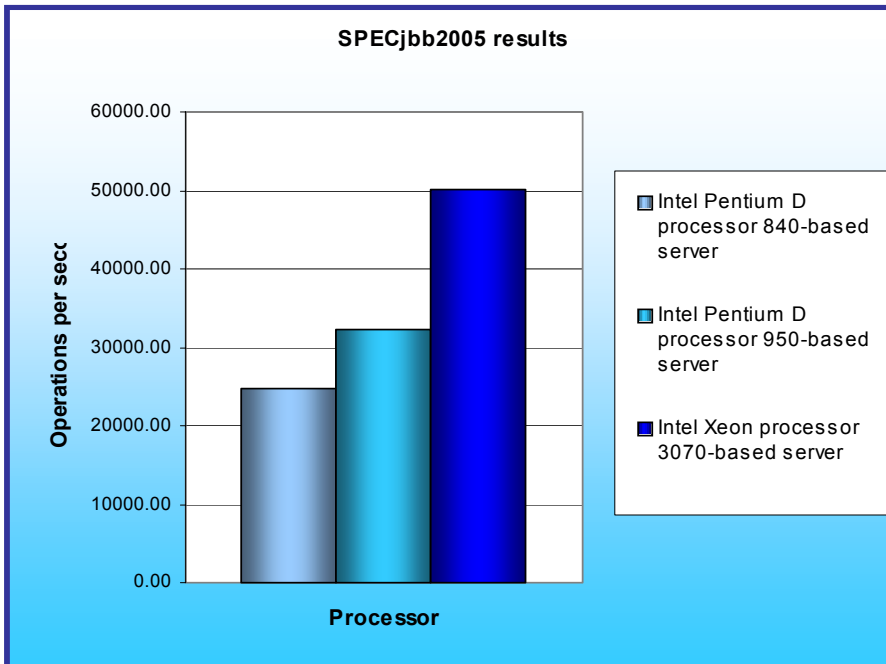

Figure 2: SPECjbb2005 business operations per second results for the test servers. Higher numbers of operations per second are better.

The Intel Xeon processor 3070-based server produced the highest results: 50,065 bops. The Intel Pentium D processor 950-based server achieved 32,365 bops, while the Intel Pentium D processor 840-based server produced a score of 24,825 bops. The Intel Xeon processor 3070-based server thus delivered a 54.7 percent performance increase over the Intel Pentium D processor 950-based server and a 101.7 percent increase over the Intel Pentium D processor 840-based server.

Figure 3 shows a plot of the power usage of the three servers as they were running the benchmark. 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 Intel Xeon processor 3070-based server achieved its peak performance while drawing less power—about 26.4 percent less—than the Intel Pentium D processor 840-based server.

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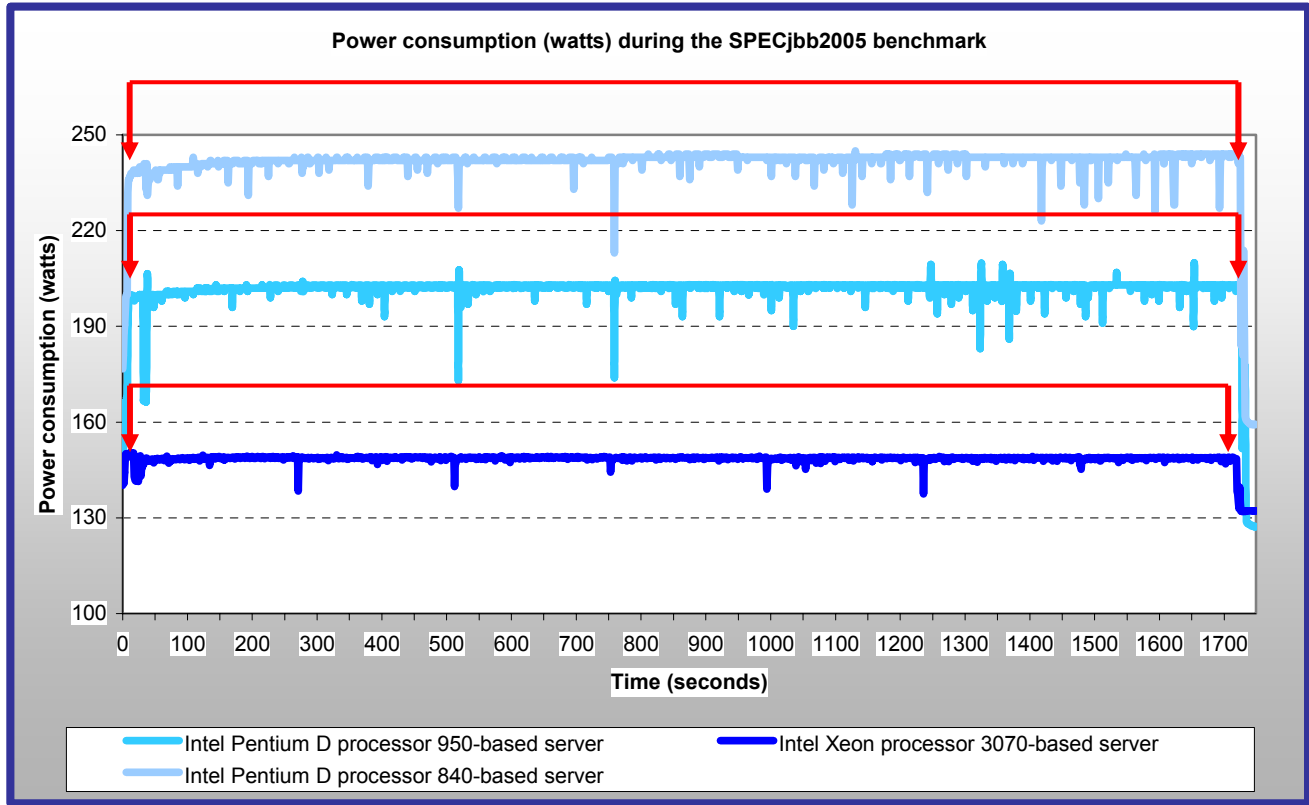
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Figure 3: Power consumption (in watts) of each of the servers throughout the course of executing the SPECjbb2005 benchmark. Lower power consumption is better.

Test results

Figure 4 shows the median SPECjbb2005 results for all three servers. SPECjbb2005 computes its score by taking the average of the results during mixes when the server is running at peak performance. In our testing, all servers achieved peak performance during mixes four through eight. (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.)

	Operations per second		
Warehouse	Intel Pentium D processor 840-based server	Intel Pentium D processor 950-based server	Intel Xeon processor 3070-based server
1	11201	14336	23753
2	24381	31740	50006
3	25036	32604	50356
4	25059	32751	49833
5	24877	32389	49024
6	24760	32686	48753
7	24630	32017	48509
8	24512	32451	48241
Score	**24825**	**32365**	**50065**

Figure 4: SPECjbb2005 results for each server by warehouse. Higher numbers are better.

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Figure 5 shows the results by warehouse for the Intel Pentium D processor 840-based server for all three runs. Run 2 produced the median results.

Intel Pentium D processor 840-based server - operations per second			
Warehouse	Run 1	Run 2	Run 3
1	10919	11201	11315
2	24365	24381	24513
3	24999	25036	25135
4	25039	25059	25154
5	24921	24877	24973
6	24919	24760	24924
7	24646	24630	24628
8	24407	24512	24573
Score	**24801**	**24825**	**24934**

Figure 5: SPECjbb2005 results for the Intel Pentium D processor 840-based server. Higher numbers are better.

Figure 6 shows the results by warehouse for the Intel Pentium D processor 950-based server for all three runs. Run 2 produced the median results.

Intel Pentium D processor 950-based server - operations per second			
Warehouse	Run 1	Run 2	Run 3
1	14381	14336	13143
2	31990	31740	31707
3	32464	32604	33111
4	32596	32751	32949
5	32533	32389	32721
6	32139	32686	32591
7	31767	32017	31935
8	32114	32451	32395
Score	**32350**	**32365**	**32589**

Figure 6: SPECjbb2005 results for the Intel Pentium D processor 950-based server. Higher numbers are better.

Figure 7 shows the results by warehouse for the Intel Xeon processor 3070-based server for all three runs. Run 3 produced the median results.

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Intel Xeon processor 3070-based server - operations per second			
Warehouse	Run 1	Run 2	Run 3
1	24135	23537	23753
2	49267	49955	50006
3	49290	50435	50356
4	49179	50013	49833
5	48556	49324	49024
6	48114	48974	48753
7	48472	49038	48509
8	47809	48167	48241
Score	**49245**	**50134**	**50065**

Figure 7: SPECjbb2005 results for the Intel Xeon processor 3070-based server. Higher numbers are better.

Figure 8 details the power consumption, in watts, of the test servers while idle and during the median peak runs of the benchmark. The Intel Xeon processor 3070-based server had over 26 percent lower average power usage during the workload than the Intel Pentium D processor 950-based server.

Server	Idle power (watts)	Average power (watts)
Intel Pentium D processor 840-based server	132.1	241.6
Intel Pentium D processor 950-based server	124.6	201.9
Intel Xeon processor 3070-based server	127.8	148.6

Figure 8: Average power usage (in watts) of the test servers during the median peak runs of SPECjbb2005. Lower numbers are better.

Test methodology

Figure 9 summarizes some key aspects of the configurations of the three server systems; Appendix A provides detailed configuration information.

Server	Intel Pentium D processor 840-based server	Intel Pentium D processor 950-based server	Intel Xeon processor 3070-based server
Processor frequency (GHz)	3.20GHz	3.40GHz	2.66GHz
Front-side bus frequency (MHz)	800MHz	800MHz	1066MHz
Single/Dual-Core processors	Dual	Dual	Dual
Motherboard	Intel 3000 Chipset-based internal reference board	Intel 3000 Chipset-based internal reference board	Intel 3000 Chipset-based internal reference board
Chipset	Intel 3010 Chipset	Intel 3010 Chipset	Intel 3010 Chipset
RAM (8GB in each)	4 x 2GB PC2-4200	4 x 2GB PC2-4200	4 x 2GB PC2-4200
Hard Drive	Western Digital WD1600YD	Western Digital WD1600YD	Western Digital WD1600YD

Figure 9: Summary of some key aspects of the server configurations.

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Intel configured and provided all three servers.

The difference in front-side bus reflects the capabilities of the three processors: The Intel Xeon processor 3070 uses a front-side bus speed of 1066 MHz. The Intel Pentium D processor 950 and Intel Pentium D processor 840 each have a front-side bus speed of 800 MHz.

With the following exception, we used the default BIOS settings on each server: we disabled the HW Prefetcher on all servers.

We began by installing a fresh copy of Microsoft Windows 2003 Server, x64 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 x64 Edition (KB908531)
- Cumulative Security Update for Internet Explorer for Windows Server 2003 x64 Edition (KB912812)
- Security Update for Windows Server 2003 x64 Edition (KB911562)
- Cumulative Security Update for Internet Explorer for Windows Server 2003 x64 Edition (KB911567)
- Security Update for Windows Media Player Plug-in (KB911564)
- Security Update for Windows Server 2003 x64 Edition (KB911927)
- Security Update for Windows Server 2003 x64 Edition (KB913446)
- Security Update for Windows Server 2003 x64 Edition (KB908519)
- Security Update for Windows Server 2003 x64 Edition (KB912919)
- Security Update for Windows Server 2003 x64 Edition (KB896424)
- Security Update for Windows Server 2003 x64 Edition (KB900725)
- Security Update for Windows Server 2003 x64 Edition (KB902400)
- Security Update for Windows Server 2003 x64 Edition (KB904706)
- Security Update for Windows Server 2003 x64 Edition (KB901017)
- Security Update for Windows Server 2003 x64 Edition (KB890046)
- Security Update for Windows Server 2003 x64 Edition (KB899587)
- Security Update for Windows Server 2003 x64 Edition (KB899591)
- Security Update for Windows Server 2003 x64 Edition (KB893756)
- Security Update for Windows Server 2003 x64 Edition (KB899588)
- Security Update for Windows Server 2003 x64 Edition (KB901214)
- Security Update for Windows Server 2003 x64 Edition (KB896422)
- Security Update for Windows Server 2003 x64 Edition (KB896358)
- Security Update for Windows Server 2003 x64 Edition (KB896428)
- Update for Windows Server 2003 x64 Edition (KB910437)
- Update for Windows Server 2003 x64 Edition (KB898715)

To improve Java performance, we enabled large pages in memory on all servers. To enable this service, the administrator must first assign additional privileges to the user who will be running the application. We assigned this privilege only to the administrator, because we used that account for our tests. To enable large pages, we did the following:

- Select Control Panel -> Administrative Tools -> Local Security Policy.
- Select Local Policies -> User Rights Assignment.
- Select "Lock pages in memory", add users and/or groups.

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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) and 8 (idle and average peak power) for the results of these measurements.
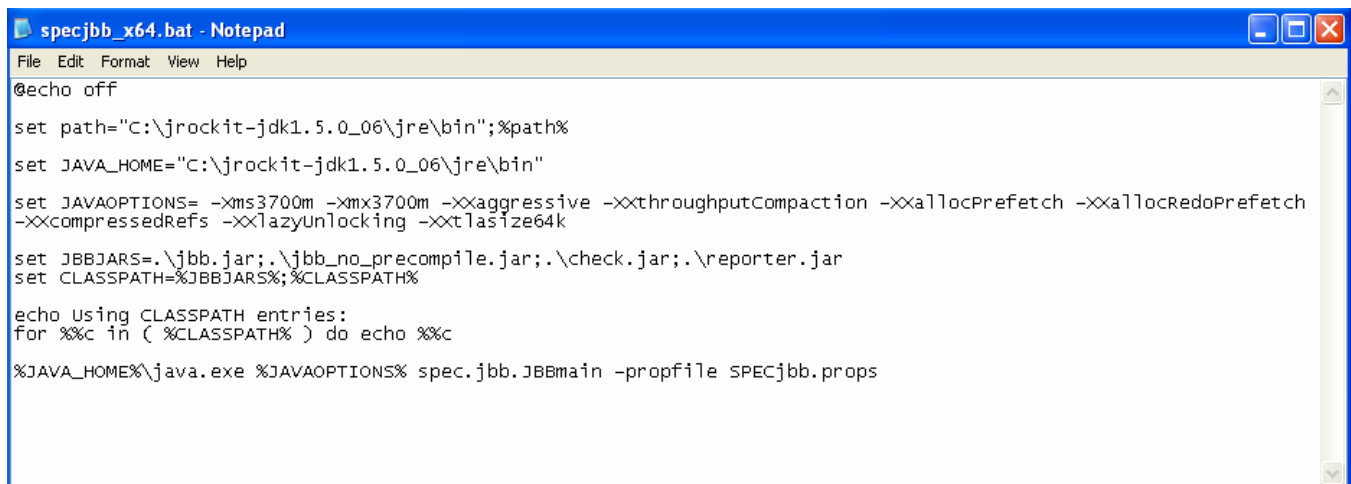
SPECjbb2005 configuration

We used SPECjbb2005 version 1.04, dated June 13, 2005. We followed SPEC's run rules. (For more information about SPECjbb2005 and its run rules, see www.spec.org/jbb2005/docs/RunRules.html.) We installed SPECjbb2005 by copying the contents of the SPECjbb2005 CD to the directory C:\Documents and Setting\Administrator\SPECjbb2005v1.04 on the server's hard disk.

SPECjbb2005 requires a Java Virtual Machine (JVM) on the system under test. We used the BEA JRockit 5.0 (P26.0.0 JDK for Microsoft Windows) JVM for this testing and left the default installation settings.

After installation, as per the run rules we edited the SPECjbb_config.props file in the root SPECjbb2005 directory to include disclosure information about the server and our license information. SPECjbb2005 uses this file when generating the results output for each run.

We created a batch file, which we placed in the root SPECjbb2005 directory, to issue the Java run command to launch the benchmark. During testing, we used the command prompt window within Microsoft Windows Server 2003 x64 Edition to run this batch file. Figure 10 shows the contents of this file.


```
specjbb_x64.bat - Notepad
File  Edit  Format  View  Help
@echo off

set path="C:\jrockit-jdk1.5.0_06\jre\bin";%path%

set JAVA_HOME="C:\jrockit-jdk1.5.0_06\jre\bin"

set JAVAOPTIONS= –Xms3700m –Xmx3700m –XXaggressive –XXthroughputCompaction –XXallocPrefetch –XXallocRedoPrefetch
–XXcompressedRefs –XXlazyUnlocking –XXtlasize64k

set JBBJARS=.\jbb.jar;.\jbb_no_precompile.jar;.\check.jar;.\reporter.jar
set CLASSPATH=%JBBJARS%;%CLASSPATH%

echo Using CLASSPATH entries:
for %%c in ( %CLASSPATH% ) do echo %%c

%JAVA_HOME%\java.exe %JAVAOPTIONS% spec.jbb.JBBmain –propfile SPECjbb.props
```

Figure 10: The text of the batch file we used to execute the SPECjbb2005 benchmark on all servers.

In the batch file we used the "set JAVAOPTIONS" command to set the Java options that control the performance of the JVM. Intel specified the following Java option settings:

- *-Xms3700m*   This option sets the minimum heap size. We set the minimum and maximum heap sizes to be the same, so the heap size would stay a constant 3700MB.
- *-Xmx3700m*   This option sets the minimum heap size.
- *-XXaggressive*   This option basically tells the JVM to perform at maximum speed.
- *-XXthroughputCompaction*   This option adjusts the compaction ratio dynamically based on live data in the heap.
- *-XXallocPrefetch*   This option tells the JVM to prefetch a chunk of data when it uses a related, earlier bit of data.
- *-XXallocRedoPrefetch*   This option also affects JVM prefetch behavior.
- *-XXcompressedRefs*   This option turns on compressed references.
- *-XXlazyUnlocking*   This option affects when the JVM releases locks.
- *-XXtlasize64k*   This option sets the thread-local area size the JVM uses.

Appendix A – Test server configuration information

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

Processors	Intel Pentium D processor 840	Intel Pentium D processor 950	Intel Xeon processor 3070
System configuration information			
General			
Processor and OS kernel: (physical, core, logical) / (UP, MP)	1P2C2L / UP	1P2C2L / UP	1P2C2L / UP
Number of physical processors	1	1	1
Single/Dual-Core processors	Dual	Dual	Dual
System Power Management Policy	Always On	Always On	Always On
CPU			
Vendor	Intel	Intel	Intel
Name	Intel Pentium D processor 840	Intel Pentium D processor 950	Intel Xeon processor 3070
Stepping	7	4	4
Socket type	LGA775	LGA 775	LGA775
Core frequency (GHz)	3.20 GHz	3.40 GHz	2.66 GHz
Front-side bus frequency (MHz)	800 MHz	800 MHz	1066 MHz
L1 Cache	16KB + 12KB	16KB + 12KB	32KB + 32KB
L2 Cache	2MB (1MB per core)	4MB (2MB per core)	4MB (Shared)
Platform			
Vendor and model number	Intel Pentium D processor 840 server	Intel Pentium D processor 950 server	Intel Xeon processor 3070 server
Motherboard model number	Intel 3000 Chipset-based internal reference board	Intel 3000 Chipset-based internal reference board	Intel 3000 Chipset-based internal reference board
Motherboard chipset	Intel 3010 Chipset	Intel 3010 Chipset	Intel 3010 Chipset
Motherboard revision number	C0	C0	C0
Motherboard serial number	8MWH61400065	8MWH61400065	8MWH61400139
BIOS name and version	American Megatrends Inc. EXTWM210.86P, 5/23/2006	American Megatrends Inc. EXTWM210.86P, 5/23/2006	American Megatrends Inc. EXTWM210.86P, 5/23/2006
BIOS settings	Default	Default	Default
Chipset INF driver	8.1.1.1001	8.1.1.1001	8.1.1.1001
Memory module(s)			
Vendor and model number	Kingston KVR533D2E4/2G	Kingston KVR533D2E4/2G	Kingston KVR533D2E4/2G
Type	PC2-4200	PC2-4200	PC2-4200
Speed (MHz)	533 MHz	533 MHz	533 MHz
Speed in the system currently running @ (MHz)	400 MHz	400 MHz	533 MHz
Timing/Latency (tCL-tRCD-iRP-tRASmin)	3-3-3-9	3-3-3-9	4-4-4-12
Size	8192MB	8192MB	8192MB
Number of RAM modules	4	4	4
Chip organization	Double-sided	Double-sided	Double-sided
Channel	Dual	Dual	Dual

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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 82801GB Serial ATA	Intel 82801GB Serial ATA	Intel 82801GB Serial ATA
Controller driver	Intel 7.0.0.1020	Intel 7.0.0.1020	Intel 7.0.0.1020
Operating system			
Name	Microsoft Windows 2003 Server, x64 Enterprise Edition	Microsoft Windows 2003 Server, x64 Enterprise Edition	Microsoft Windows 2003 Server, x64 Enterprise Edition
Build number	3790	3790	3790
Service Pack	SP1	SP1	SP1
Microsoft Windows update date	6/7/2006	6/7/2006	6/7/2006
File system	NTFS	NTFS	NTFS
Kernel	ACPI Multiprocessor x64-based PC	ACPI Multiprocessor x64-based PC	ACPI Multiprocessor x64-based PC
Language	English	English	English
Microsoft DirectX version	DirectX 9.0c	DirectX 9.0c	DirectX 9.0c
Graphics			
Vendor and model number	ATI ES1000	ATI ES1000	ATI ES1000
Chipset	ATI ES1000 PCI	ATI ES1000 PCI	ATI ES1000 PCI
BIOS version	01.00	01.00	01.00
Type	Integrated	Integrated	Integrated
Memory size	32MB	32MB	32MB
Resolution	1024 x 768	1024 x 768	1024 x 768
Driver	Microsoft 5.2.3790.1830	Microsoft 5.2.3790.1830	Microsoft 5.2.3790.1830
Network card/subsystem			
Vendor and model number	Intel PRO/1000 PM Dual Port Network adapter	Intel PRO/1000 PM Dual Port Network adapter	Intel PRO/1000 PM Dual Port Network adapter
Type	Integrated	Integrated	Integrated
Driver	Intel 9.3.28.0	Intel 9.3.28.0	Intel 9.3.28.0
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	Sony DDU1615	Sony DDU1615	Sony DDU1615
Type	DVD-ROM	DVD-ROM	DVD-ROM
Interface	Internal	Internal	Internal
USB ports			
# of ports	4	4	4
Type of ports (USB 1.1, USB 2.0)	USB 2.0	USB 2.0	USB 2.0

Figure 11: Detailed configuration information for the three test servers.

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Appendix B – SPECjbb2005 output

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

Intel Pentium D processor 840-based server

SPECjbb2005

<mark>**SPECjbb2005 = 24825 bops**</mark>

Intel Pentium D 840 based server (3.20 GHz)

BEA jrockit-5.0, jrockit-jdk1.5.0_06-win_x86_64

No errors. Valid run.

Warehouses	bops	Incl. in metric
1	11201	
2	24381	*
3	25036	*
4	25059	*
5	24877	
6	24760	
7	24630	
8	24512	
SPECjbb2005	(from 2 to 4)	24825 bops

● - Included in score calculation
● - Not included in score calculation
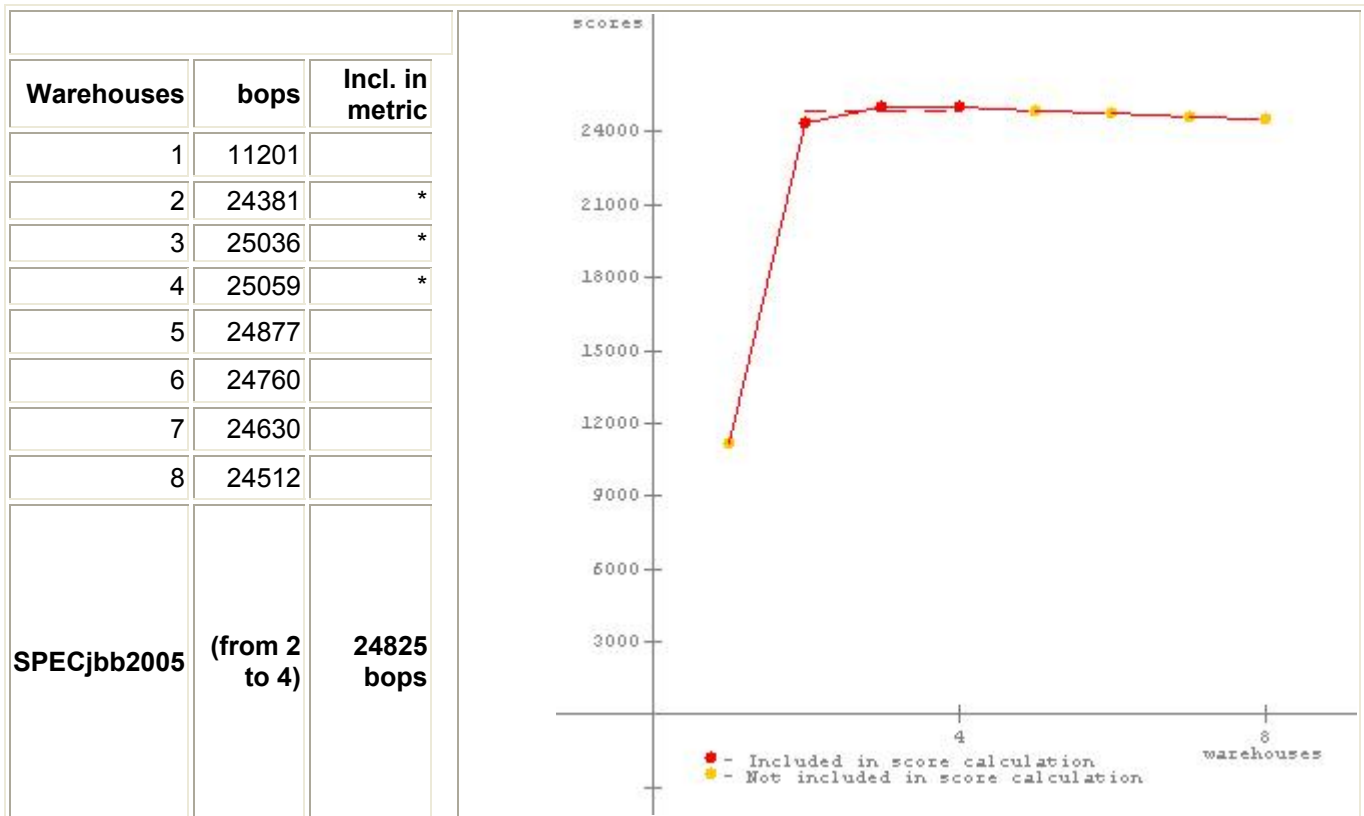
SPEC license # 3184	Tested by: Principled Technologies	Test date: Jun 24, 2006

Hardware	
Hardware Vendor	Intel
Vendor URL	www.intel.com
Model	Intel Pentium D 840 based server (3.20 GHz)
Processor	Intel Pentium D 840 (3.2 GHz, 800MHz bus)
MHz	3200
# of Chips	1

Software	
Software Vendor	BEA
Vendor URL	http://www.bea.com
JVM Version	jrockit-5.0, jrockit-jdk1.5.0_06-win_x86_64
JVM Command Line	java -Xms3700m -Xmx3700m -XXaggressive -XXthroughputCompaction -XallocPrefetch -XXallocRedoPrefetch -XXcompressedRefs -XXlazyUnlocking -XXtlasize64k
JVM Initial Heap Memory (MB)	3700

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# of Cores	2	
# of Cores/Chip	2	
HW Threading Enabled?	N/A	
Procs Avail to Java	2	
Memory (MB)	8192	
Memory Details	8 x 1GB DDR2-SDRAM PC2-4300 ECC registered	
Primary cache	12KBI+16KBD	
Secondary cache	2x1MB(I+D) off chip	
Other cache		
Filesystem	NTFS	
Disks	1 x 160GB SATA	
Other hardware		

JVM Maximum Heap Memory (MB)	3700
JVM Address bits	64
JVM CLASSPATH	.\jbb.jar; .\jbb_no_precompile.jar; .\check.jar; .\reporter.jar;
JVM BOOTCLASSPATH	C:\jrockit-jdk1.5.0_06\jre\bin\jrockit\jrockit.jar; C:\jrockit-jdk1.5.0_06\jre\bin\jrockit\managementapi.jar; C:\jrockit-jdk1.5.0_06\jre\lib\managementapi.jar; C:\jrockit-jdk1.5.0_06\jre\lib\rt.jar; C:\jrockit-jdk1.5.0_06\jre\lib\i18n.jar; C:\jrockit-jdk1.5.0_06\jre\lib\sunrsasign.jar; C:\jrockit-jdk1.5.0_06\jre\lib\jsse.jar; C:\jrockit-jdk1.5.0_06\jre\lib\jce.jar; C:\jrockit-jdk1.5.0_06\jre\lib\charsets.jar; C:\jrockit-jdk1.5.0_06\jre\classes
OS Version	Windows 2003 Server Enterprise Edition
Other software	

Test Information	
Tested by	Principled Technologies
SPEC license #	3184
Test location	Durham, NC
Test date	Jun 24, 2006
H/w available	Jun-2006
JVM available	
OS available	
Other s/w available	

AOT Compilation

Tuning

Notes
In the Local security settings, "lock pages in memory" was enabled.

No errors. Valid run.

Details of Runs

Warehouses	Thrput	Total heap (MB)		Thread spread %	% > 120s	transaction type	Count	Time (in seconds)	
		Size	Used					total	max
1	11201	3700	3420	<0.01%	<0.01	new_order	147793	9.68	.016
						payment	101938	3.55	.016
						order_status	10194	.434	.016
						delivery	10194	9.73	.016
						stock_level	10194	.929	.016
						cust_report	56079	5.31	.016

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2	24381	3700	1402	.189%	.013	new_order	2571534	137	.500
						payment	1773430	56.1	.468
						order_status	177343	7.28	.016
						delivery	177342	179	1.77
						stock_level	177344	12.8	.172
						cust_report	975319	77.5	1.17
3	25036	3700	558	53.4%	.013	new_order	2639673	202	.765
						payment	1820999	87.3	.578
						order_status	182100	13.1	.578
						delivery	182101	263	.766
						stock_level	182099	19.8	.578
						cust_report	1002325	119	.766
4	25059	3700	921	20.5%	.013	new_order	2642097	279	.875
						payment	1822697	131	.750
						order_status	182270	15.7	.547
						delivery	182270	336	1.20
						stock_level	182270	23.5	.578
						cust_report	1003305	160	.672
5	24877	3700	1926	27.2%	<0.01	new_order	2623649	338	1.22
						payment	1809358	171	.922
						order_status	180937	18.7	1.16
						delivery	180934	427	9.73
						stock_level	180935	32.7	.766
						cust_report	995074	188	1.22
6	24760	3700	3382	19.4%	.013	new_order	2611128	395	1.36
						payment	1800938	230	1.41
						order_status	180093	18.8	.766
						delivery	180093	485	14.4
						stock_level	180093	43.1	6.25
						cust_report	990752	245	2.53
7	24630	3700	1978	36.9%	.026	new_order	2597939	445	2.09
						payment	1791730	290	1.67
						order_status	179171	26.1	1.31
						delivery	179175	570	11.5
						stock_level	179174	33.9	1.33
						cust_report	985528	278	8.59
8	24512	3700	1353	16.2%	<0.01	new_order	2585557	520	1.69
						payment	1782778	342	1.78
						order_status	178273	25.5	.766

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consumption on uniprocessor Intel-processor-based servers

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						delivery	178276	609	3.22
						stock_level	178276	50.3	3.67
						cust_report	979999	339	13.4

SPECjbb2005 Version: [SPECjbb2005 1.04, June 13, 2005]
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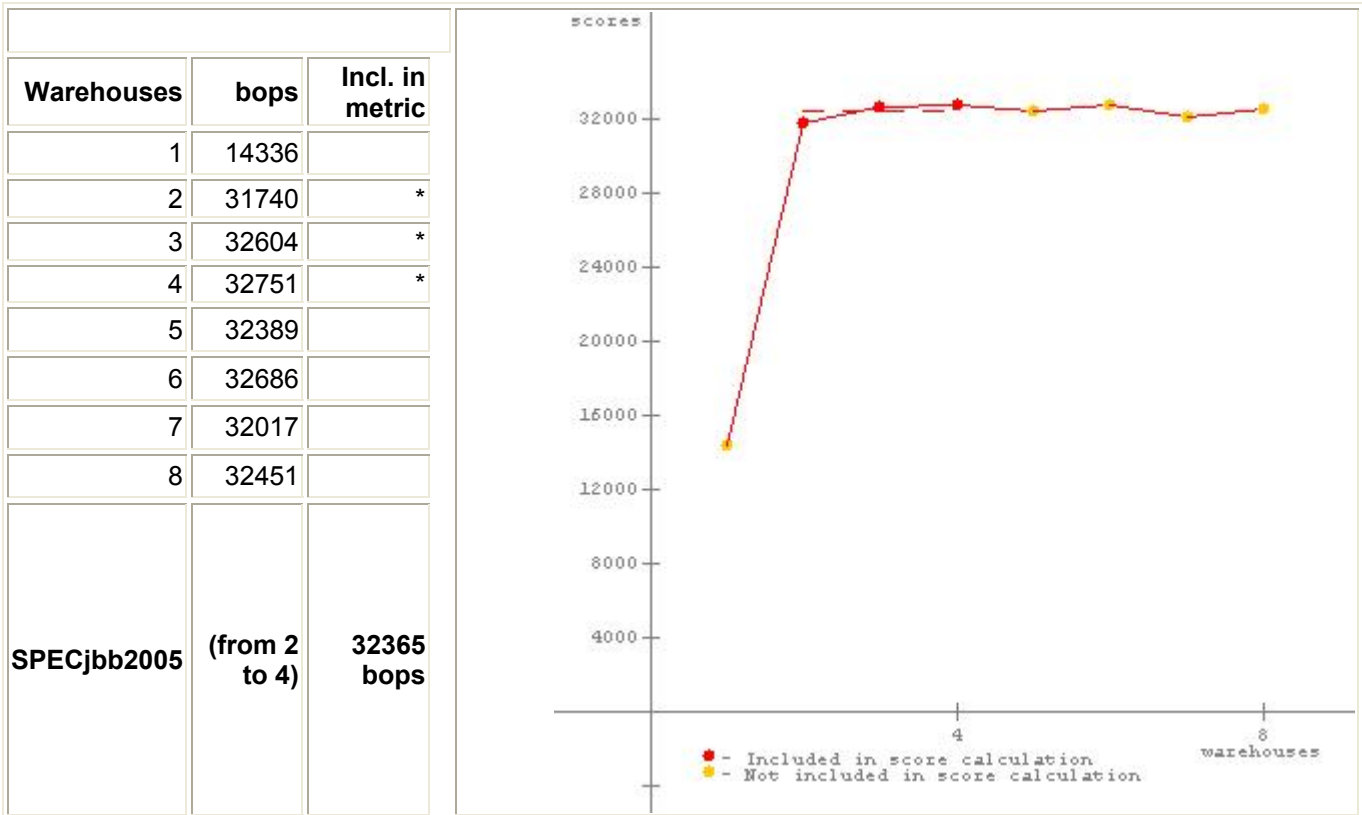**Intel Pentium D processor 950-based server**

SPECjbb2005

SPECjbb2005 = 32365 bops

Intel Pentium D Processor 950 based server(3.40 GHz, processor)

BEA Jrockit 5.0, jrockit-P26.0.0-jdk1.5.0_06-win-x86_64

No errors. Valid run.

Warehouses	bops	Incl. in metric
1	14336	
2	31740	*
3	32604	*
4	32751	*
5	32389	
6	32686	
7	32017	
8	32451	
SPECjbb2005	(from 2 to 4)	32365 bops

* - Included in score calculation
* - Not included in score calculation

SPEC license # 3184	**Tested by:** Principled Technologies	**Test date:** Jun 15, 2006

Hardware	
Hardware Vendor	Intel
Vendor URL	http://www.Intel.com
Model	Intel Pentium D Processor 950 based server(3.40

Software	
Software Vendor	BEA
Vendor URL	http://www.bea.com
JVM Version	Jrockit 5.0, jrockit-P26.0.0-jdk1.5.0_06-win-x86_64
JVM Command	java -Xms3700m -Xmx3700m -XXaggressive

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	GHz, processor)		**Line**	-XXthroughputCompaction -XXallocPrefetch -XXallocRedoPrefetch -XXcompressedRefs -XXlazyUnlocking -XXtlasize64k
Processor	Pentium D processor (3.40 GHz, 800 MHz bus)			

Processor	Pentium D processor (3.40 GHz, 800 MHz bus)
MHz	3400
# of Chips	1
# of Cores	2
# of Cores/Chip	2
HW Threading Enabled?	N/A
Procs Avail to Java	2
Memory (MB)	8192
Memory Details	4 x 2GB DDR2-SDRAM PC2-4200 ECC registered
Primary cache	16KBD + 12KBI
Secondary cache	2x2MB
Other cache	NA
Filesystem	NTFS
Disks	1 x 160GB SATA
Other hardware	

Line	-XXthroughputCompaction -XXallocPrefetch -XXallocRedoPrefetch -XXcompressedRefs -XXlazyUnlocking -XXtlasize64k
JVM Initial Heap Memory (MB)	3700
JVM Maximum Heap Memory (MB)	3700
JVM Address bits	64
JVM CLASSPATH	.\jbb.jar; .\jbb_no_precompile.jar; .\check.jar; .\reporter.jar;
JVM BOOTCLASSPATH	C:\jrockit-jdk1.5.0_06\jre\bin\jrockit\jrockit.jar; C:\jrockit-jdk1.5.0_06\jre\bin\jrockit\managementapi.jar; C:\jrockit-jdk1.5.0_06\jre\lib\managementapi.jar; C:\jrockit-jdk1.5.0_06\jre\lib\rt.jar; C:\jrockit-jdk1.5.0_06\jre\lib\i18n.jar; C:\jrockit-jdk1.5.0_06\jre\lib\sunrsasign.jar; C:\jrockit-jdk1.5.0_06\jre\lib\jsse.jar; C:\jrockit-jdk1.5.0_06\jre\lib\jce.jar; C:\jrockit-jdk1.5.0_06\jre\lib\charsets.jar; C:\jrockit-jdk1.5.0_06\jre\classes
OS Version	Microsoft Enterprise Server 2003, Service Pack 1
Other software	

Test Information	
Tested by	Principled Technologies
SPEC license #	3184
Test location	Durham, NC
Test date	Jun 15, 2006
H/w available	
JVM available	
OS available	April-2005 (for Service pack 1)
Other s/w available	

AOT Compilation

Tuning
In the local security settings, "lock pages in memory" was enabled

Notes

No errors. Valid run.

Details of Runs

Warehouses	Thrput	Total heap (MB)		Thread spread %	% > 120s	transaction type	Count	Time (in seconds)	
		Size	Used					total	max
1	14336	3700	894	<0.01%	<0.01	new_order	189280	10.7	.016
						payment	130460	4.99	.016

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						order_status	13046	.533	.016
						delivery	13046	7.66	.141
						stock_level	13046	.784	.016
						cust_report	71640	4.51	.016
2	31740	3700	503	.564%	.052	new_order	3349208	163	.844
						payment	2309587	66.1	.266
						order_status	230960	8.27	.047
						delivery	230959	146	.984
						stock_level	230959	12.8	.266
						cust_report	1269968	73.0	.172
3	32604	3700	2876	54.0%	.026	new_order	3439537	243	.579
						payment	2371778	104	.719
						order_status	237176	12.0	.375
						delivery	237176	218	.765
						stock_level	237178	19.3	.578
						cust_report	1304028	109	1.13
4	32751	3700	2959	27.0%	.065	new_order	3456153	321	.953
						payment	2383447	146	.766
						order_status	238345	15.4	.578
						delivery	238344	286	.766
						stock_level	238346	24.6	.578
						cust_report	1310742	149	.766
5	32389	3700	3671	33.9%	.026	new_order	3416160	396	1.30
						payment	2356213	184	1.13
						order_status	235621	20.5	.766
						delivery	235620	351	1.45
						stock_level	235621	32.1	2.70
						cust_report	1296260	192	5.52
6	32686	3700	2975	18.7%	.026	new_order	3447769	464	1.58
						payment	2377751	243	1.27
						order_status	237775	23.4	.782
						delivery	237773	427	.953
						stock_level	237775	32.8	6.25
						cust_report	1307718	226	10.6
7	32017	3700	2599	39.5%	.026	new_order	3376771	549	1.92
						payment	2329119	280	1.67
						order_status	232912	29.1	1.20
						delivery	232909	485	10.7
						stock_level	232912	37.0	1.11

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consumption on uniprocessor Intel-processor-based servers

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							cust_report	1281477	276	5.14
8	32451	3700	3319	15.2%	.026	new_order	3422760	634	3.03
						payment	2360722	323	1.31
						order_status	236075	31.3	1.13
						delivery	236070	561	2.72
						stock_level	236072	48.9	8.47
						cust_report	1298664	286	2.95

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Intel Xeon processor 3070-based server

SPECjbb2005

<mark>**SPECjbb2005 = 50065 bops**</mark>

Intel Xeon processor 3070-based server(2.66 GHz, Xeon processor 3070)

BEA Jrockit 5.0, jrockit-P26.0.0-jdk1.5.0_06-win-x86_64
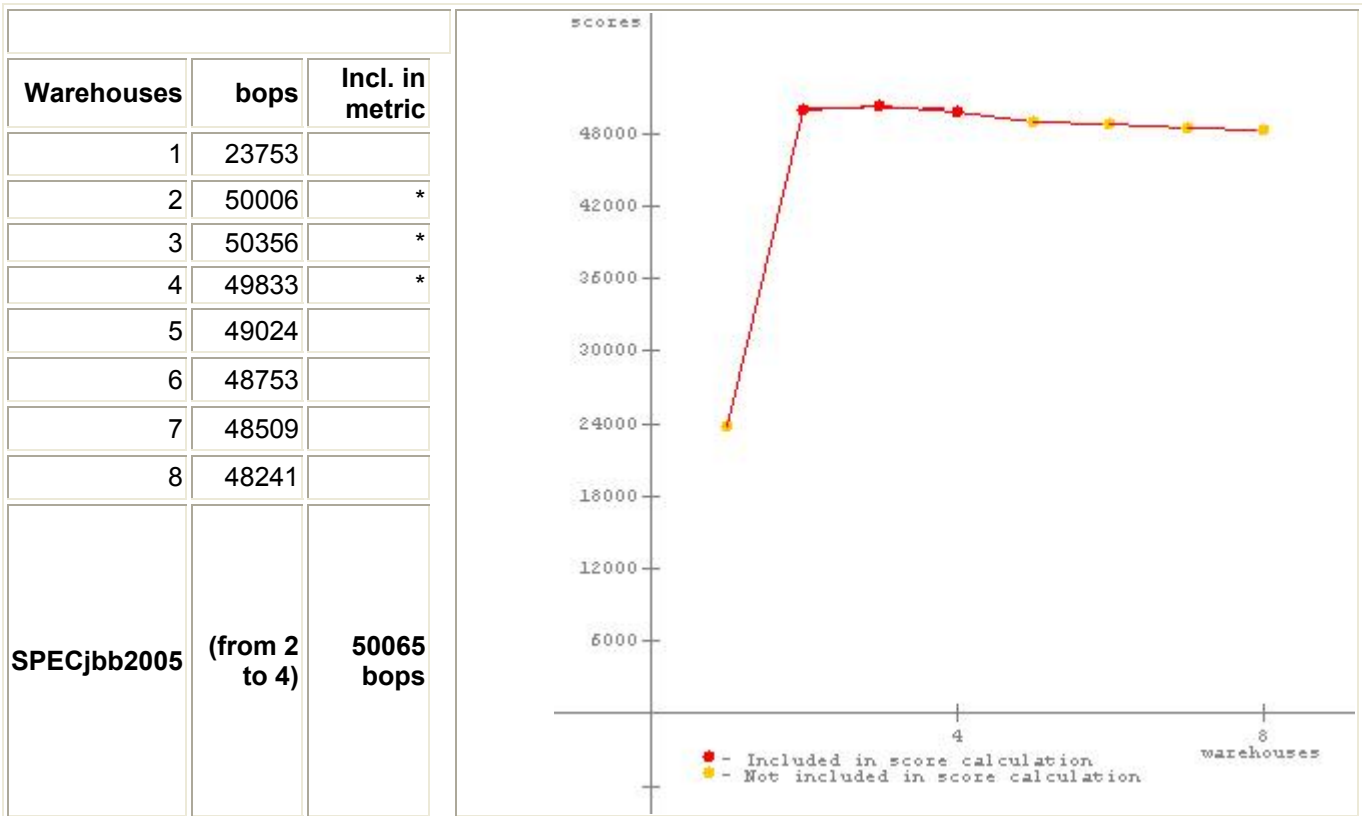
No errors. Valid run.

Warehouses	bops	Incl. in metric
1	23753	
2	50006	*
3	50356	*
4	49833	*
5	49024	
6	48753	
7	48509	
8	48241	
SPECjbb2005	(from 2 to 4)	50065 bops

SPEC license # 3184	**Tested by:** Principled Technologies **Test date:** Jun 26, 2006

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Hardware	
Hardware Vendor	Intel
Vendor URL	http://www.Intel.com
Model	Intel Xeon processor 3070-based server(2.66 GHz, Xeon processor 3070)
Processor	Intel Xeon processor 3070 (2.66GHz, 1066MHz bus)
MHz	2666
# of Chips	1
# of Cores	2
# of Cores/Chip	2
HW Threading Enabled?	N/A
Procs Avail to Java	2
Memory (MB)	8192
Memory Details	8 x 1GB DDR2-SDRAM PC2-4200 ECC registered
Primary cache	32KBI + 32KBD
Secondary cache	4MB
Other cache	NA
Filesystem	NTFS
Disks	1 x 160GB SATA
Other hardware	

Software	
Software Vendor	BEA
Vendor URL	http://www.bea.com
JVM Version	BEA Jrockit 5.0, jrockit-P26.0.0-jdk1.5.0_06-win-x86_64
JVM Command Line	java -Xms3700m -Xmx3700m -XXaggressive -XXthroughputCompaction -XXallocPrefetch -XXallocRedoPrefetch -XXcompressedRefs -XXlazyUnlocking -XXtlasize64k
JVM Initial Heap Memory (MB)	3700
JVM Maximum Heap Memory (MB)	3700
JVM Address bits	64
JVM CLASSPATH	.\jbb.jar; .\jbb_no_precompile.jar; .\check.jar; .\reporter.jar;
JVM BOOTCLASSPATH	C:\jrockit-jdk1.5.0_06\jre\bin\jrockit\jrockit.jar; C:\jrockit-jdk1.5.0_06\jre\bin\jrockit\managementapi.jar; C:\jrockit-jdk1.5.0_06\jre\lib\managementapi.jar; C:\jrockit-jdk1.5.0_06\jre\lib\rt.jar; C:\jrockit-jdk1.5.0_06\jre\lib\i18n.jar; C:\jrockit-jdk1.5.0_06\jre\lib\sunrsasign.jar; C:\jrockit-jdk1.5.0_06\jre\lib\jsse.jar; C:\jrockit-jdk1.5.0_06\jre\lib\jce.jar; C:\jrockit-jdk1.5.0_06\jre\lib\charsets.jar; C:\jrockit-jdk1.5.0_06\jre\classes
OS Version	Microsoft Enterprise Server 2003, Service Pack 1
Other software	

Test Information	
Tested by	Principled Technologies
SPEC license #	3184
Test location	Durham, NC
Test date	Jun 26, 2006
H/w available	
JVM available	
OS available	April-2005 (for Service pack 1)
Other s/w available	

AOT Compilation

Tuning
In the local security settings, "lock pages in memory" was enabled

Notes

Principled Technologies, Inc.: SPECjbb2005 performance and power consumption on uniprocessor Intel-processor-based servers

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No errors. Valid run.

Details of Runs

Warehouses	Thrput	Total heap (MB)		Thread spread %	% > 120s	transaction type	Count	Time (in seconds)	
		Size	Used					total	max
1	23753	3700	3369	<0.01%	<0.01	new_order	313033	13.3	.016
						payment	216057	4.53	.016
						order_status	21605	.655	.016
						delivery	21606	5.55	.109
						stock_level	21606	.861	.016
						cust_report	119078	4.48	.016
2	50006	3700	3575	.554%	.026	new_order	5273911	194	.203
						payment	3637776	71.0	.282
						order_status	363777	8.67	.016
						delivery	363777	112	.735
						stock_level	363777	11.1	.110
						cust_report	2001641	71.2	.328
3	50356	3700	2660	48.8%	.033	new_order	5311689	292	.579
						payment	3663417	108	.766
						order_status	366341	13.7	.578
						delivery	366341	171	.579
						stock_level	366341	17.1	.532
						cust_report	2015144	102	.579
4	49833	3700	2776	15.8%	.078	new_order	5259036	395	4.67
						payment	3627055	150	.766
						order_status	362705	16.9	.813
						delivery	362704	218	1.08
						stock_level	362706	18.0	.391
						cust_report	1995068	139	.625
5	49024	3700	3667	22.6%	.020	new_order	5170621	479	5.16
						payment	3566048	200	1.44
						order_status	356605	21.8	.766
						delivery	356605	268	3.88
						stock_level	356605	26.3	1.08
						cust_report	1961470	178	5.61
6	48753	3700	2979	14.3%	.033	new_order	5142618	549	1.64
						payment	3546837	264	2.25
						order_status	354684	26.5	.812

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						delivery	354683	327	14.2
						stock_level	354683	25.5	.766
						cust_report	1951066	216	2.45
7	48509	3700	3118	31.1%	.013	new_order	5116567	633	1.56
						payment	3528418	322	2.55
						order_status	352841	30.6	3.17
						delivery	352842	369	7.61
						stock_level	352843	34.0	1.22
						cust_report	1940261	257	3.45
8	48241	3700	2206	25.5%	.013	new_order	5087275	716	1.61
						payment	3508872	403	2.25
						order_status	350888	33.5	1.59
						delivery	350886	414	13.0
						stock_level	350888	40.8	1.16
						cust_report	1930456	287	6.47

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