

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

Executive summary

Intel Corporation (Intel) commissioned Principled Technologies (PT) to measure the SPECjbb2005 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

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).

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

KEY FINDINGS

- The Dual-Core Intel Xeon Processor 5160-based server delivered 98 percent more 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 72 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 over 13 percent lower average power usage while delivering its peak performance on the benchmark than the Dual-Core AMD Opteron 285-based server (see Figures 3 and 8).

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

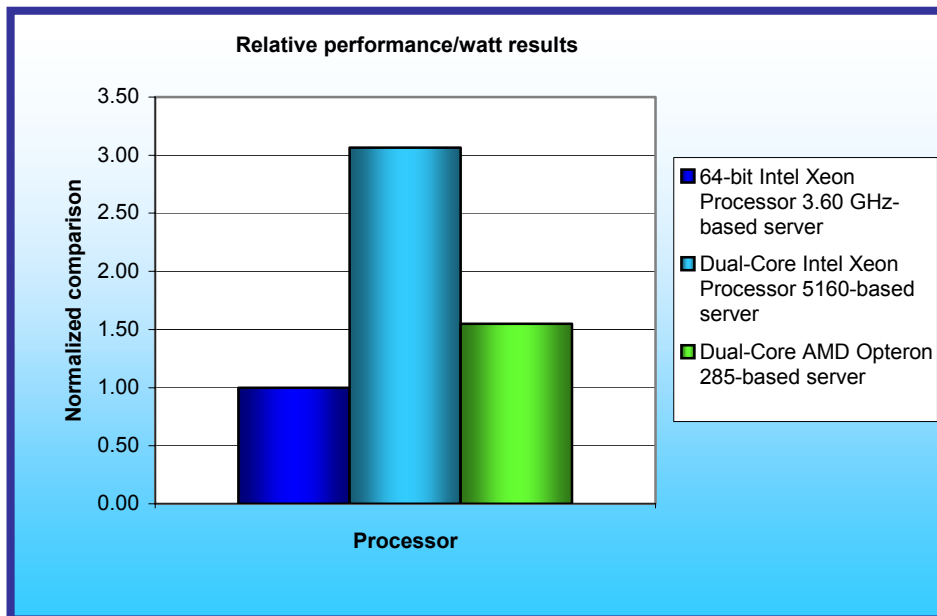


Figure 1: Performance/watt (dual-processor) results of the test servers running SPECjbb2005. Higher numbers indicate better performance/watt.

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 98 percent more performance/watt than the Dual-Core AMD Opteron 285-based server and 206.6 percent more performance/watt than the 64-bit Intel Xeon Processor 3.60 GHz-based server.

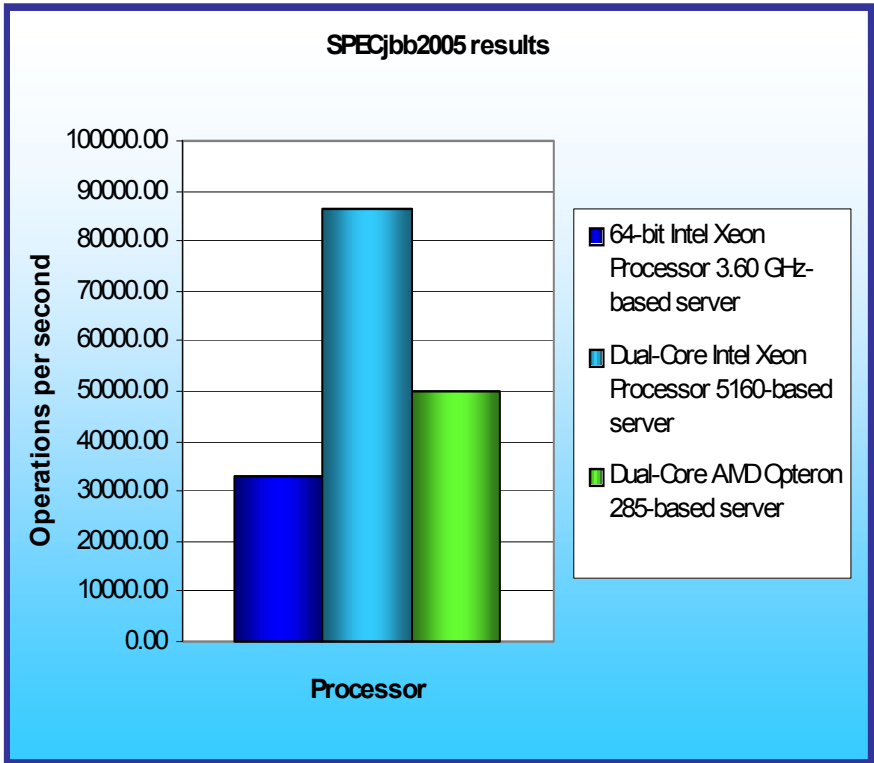


Figure 2: SPECjbb2005 business operations per second (dual-processor) results for the test servers. Higher numbers of operations per second are better.

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.

The Dual-Core Intel Xeon Processor 5160-based server produced the highest results: 86,255 bops. The Dual-Core AMD Opteron 285-based server achieved 50,237 bops, while the 64-bit Intel Xeon Processor 3.60 GHz-based server produced a score of 33,070 bops. The Dual-Core Intel Xeon Processor 5160-based server thus delivered a 71.7 percent performance increase over the AMD Opteron 285-based server and a 160.8 percent increase over the 64-bit Intel Xeon Processor 3.60 GHz-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 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—about 13 percent less—than the AMD Opteron 285-based server.

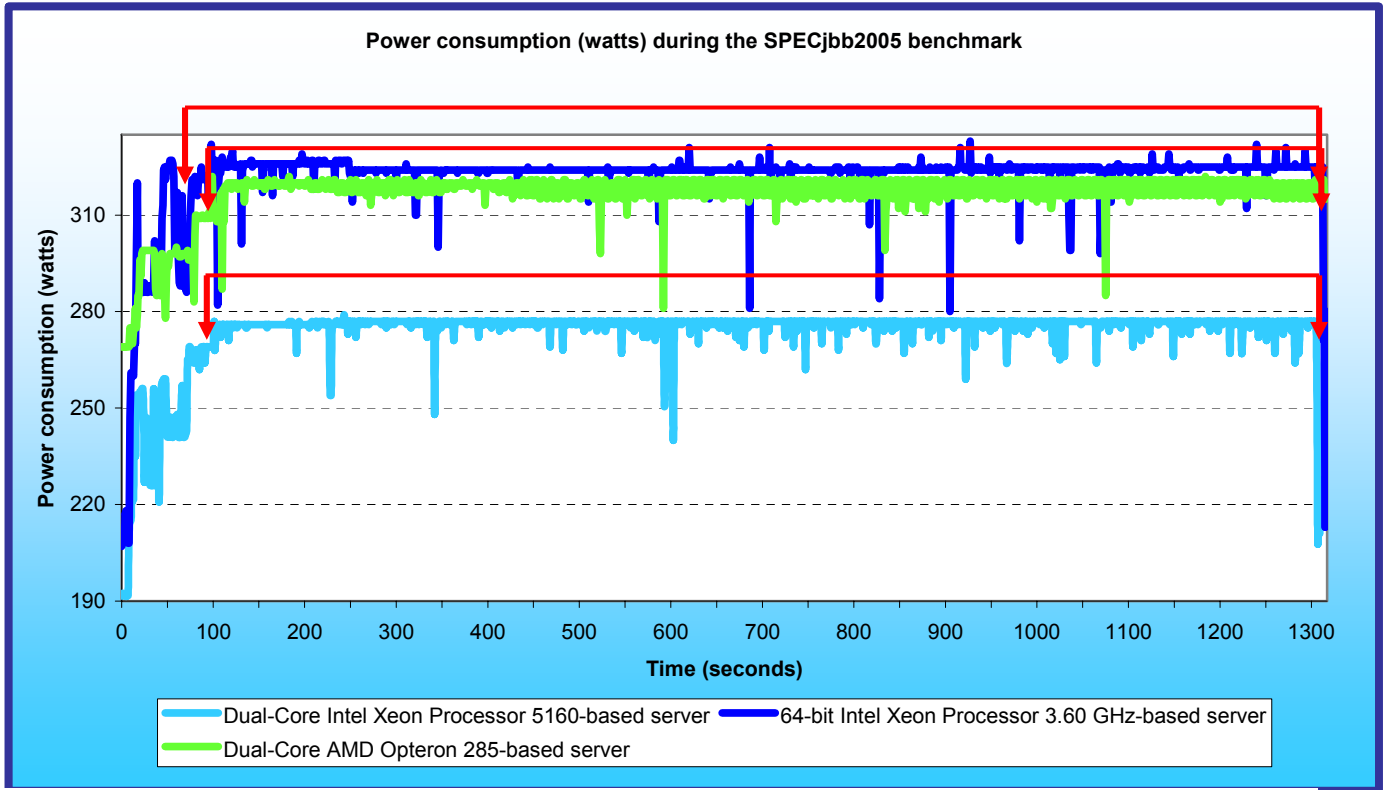


Figure 3: Power consumption (in watts) of each of the servers throughout the course of executing the SPECjbb2005 benchmark. Lower power consumption is better.

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	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
1	8530	24225	14113
2	20270	48740	29289
3	29899	69178	40459
4	33011	87190	50968
5	33494	86876	50616
6	33170	86715	49920
7	32777	86233	49835
8	32897	84260	49846
Score	33070	86255	50237

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

Figure 5 shows the results by warehouse for the 64-bit Intel Xeon Processor 3.60 GHz-based server for all three runs. Run 2 produced the median results.

64-bit Intel Xeon Processor 3.60 GHz-based server - operations per second			
Warehouse	Run 1	Run 2	Run 3
1	11275	8530	8608
2	21543	20270	19560
3	29395	29899	29890
4	33211	33011	32743
5	33383	33494	33386
6	33214	33170	33074
7	32933	32777	32756
8	32829	32897	32746
Score	33114	33070	32941

Figure 5: SPECjbb2005 results for the 64-bit Intel Xeon Processor 3.60 GHz-based server. Higher numbers are better.

Figure 6 shows the results by warehouse for the Dual-Core Intel Xeon Processor 5160-based server for all three runs. Run 3 produced the median results.

Dual-Core Intel Xeon Processor 5160-based server - operations per second			
Warehouse	Run 1	Run 2	Run 3
1	24302	24225	24002
2	48881	48740	48994
3	68637	69178	68508
4	87005	87190	87300
5	86354	86876	86508
6	85994	86715	86307
7	84662	86233	86113
8	84716	84260	85591
Score	85746	86255	86364

Figure 6: SPECjbb2005 results for the Dual-Core Intel Xeon Processor 5160-based server. Higher numbers are better.

Figure 7 shows the results by warehouse for the Dual-Core AMD Opteron 285 -based server for all three runs. Run 3 produced the median results.

Dual-Core AMD Opteron 285-based server - operations per second			
Warehouse	Run 1	Run 2	Run 3
1	14716	12834	14113
2	29642	28152	29289
3	41430	41257	40459
4	50639	51599	50968
5	49655	51875	50616
6	48993	51685	49920
7	49226	51557	49835
8	49473	51139	49846
Score	49597	51571	50237

Figure 7: SPECjbb2005 results for the Dual-Core AMD Opteron 285-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 Dual-Core Intel Xeon Processor 5160-based server had over 13 percent lower average power usage during the workload than the Dual-Core AMD Opteron 285-based server. Its power consumption while idle was almost 29 percent lower than that of the Dual-Core AMD Opteron 285-based server.

Server / # of threads	Idle power (watts)	Average power (watts)
64-bit Intel Xeon Processor 3.60 GHz-based server – 2 processors	207.5	323.4
Dual-Core Intel Xeon Processor 5160-based server – 2 processors	191.8	276.0
Dual-Core AMD Opteron 285-based server – 2 processors	269.0	318.3

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	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	UNIWIIDE 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 9: 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, 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.

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.

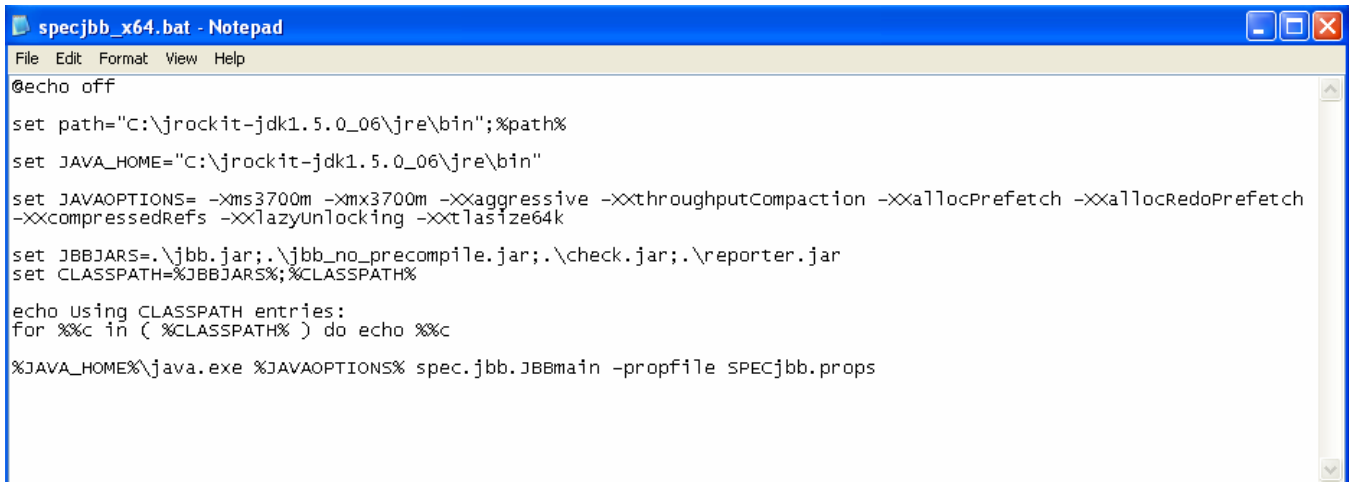
SPECjbb2005 configuration

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 JAVA_OPTIONS= -Xms3700m -Xmx3700m -XXaggressive -XXthroughputCompaction -XXallocPrefetch -XXallocRedoPrefetch
-XXcompressedRefs -XXlazyUnlocking -XXtlsize64k
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 %JAVA_OPTIONS% 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 JAVA_OPTIONS” 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 maximum 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.
- *-XXtlsize64k* 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 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	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	QTFMHN61400072	WTOPHTSA01020
BIOS name and version	American Megatrends Inc. SE7520AF20.86B.P.10.00.0109.02082006139	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 MT18HTF12872FD Y	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, 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	5/5/2006	5/5/2006	5/5/2006
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 Rage XL	ATI ES1000	ATI Rage XL
Chipset	ATI Rage XL PCI	ATI ES1000 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 6.14.10.6024	ATI 6.14.10.6553	ATI 6.14.10.6025
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 8.6.17.0	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 11: Detailed configuration information for the three test servers.

Appendix B – SPECjbb2005 output

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

64-bit Intel Xeon Processor 3.60 GHz-based server

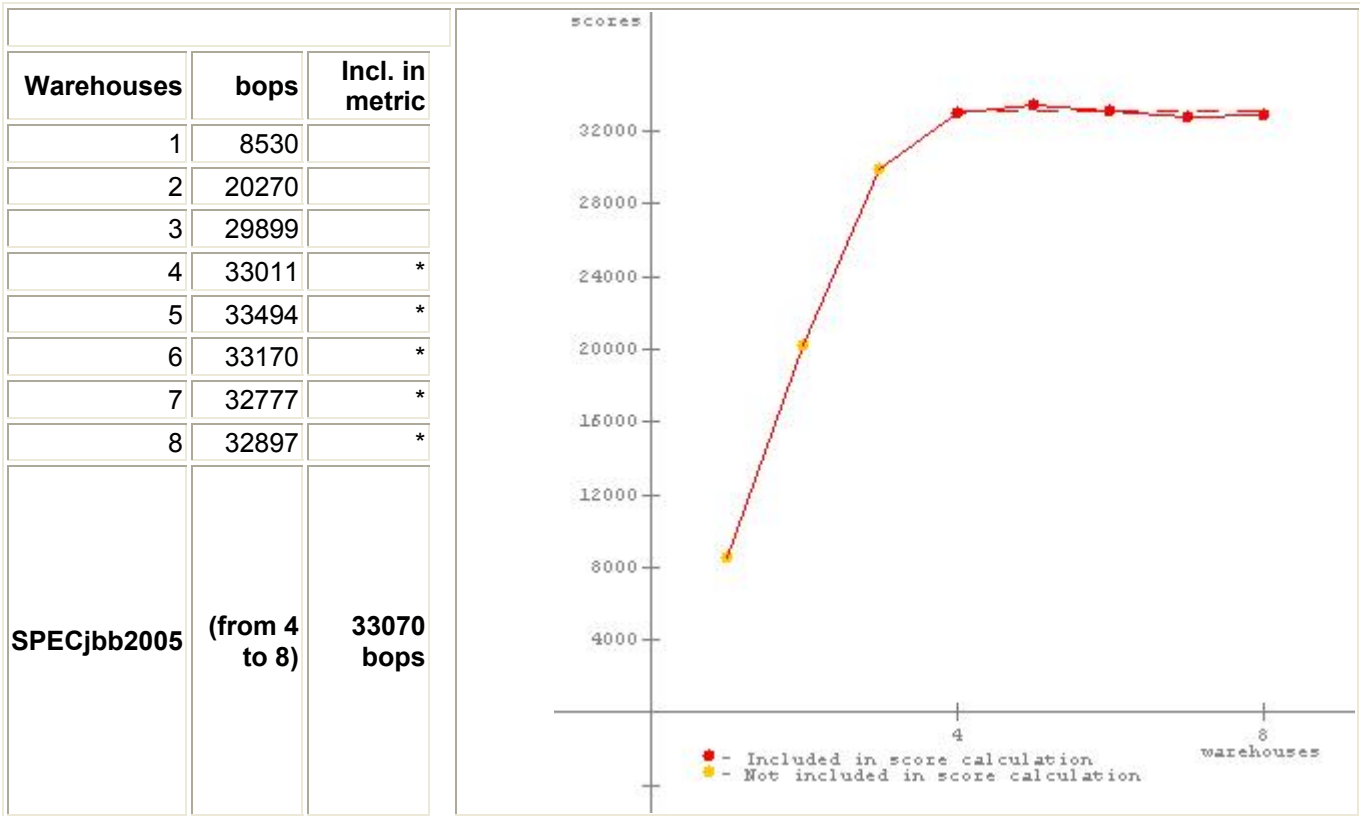
SPECjbb2005

SPECjbb2005 = 33070 bops

Intel Intel Server Board SE7520AF2

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

No errors. Valid run.



SPEC license # 3184

Tested by: Principled Technologies

Test date: May 14, 2006

Hardware		Software	
Hardware Vendor	Intel	Software Vendor	BEA
Vendor URL	http://www.intel.com	Vendor URL	http://www.bea.com
Model	Intel Server Board SE7520AF2	JVM Version	BEA Jrockit 5.0, jrockit-P26.0.0-jdk1.5.0_06-win-x86_64
Processor	Intel Xeon	JVM Command Line	java -Xms3700m -Xmx3700m -XXaggressive -XXthroughputCompaction -XXallocPrefetch -XXallocRedoPrefetch -XXcompressedRefs -XXlazyUnlocking -XXtlasize64k
MHz	3600	JVM Initial Heap Memory (MB)	3700
# of Chips	2		
# of Cores	2		

# of Cores/Chip	1
HW Threading Enabled?	Yes
Procs Avail to Java	4
Memory (MB)	8192
Memory Details	4 x 1GB DDR2-SDRAM PC2-3200 ECC registered
Primary cache	16KBI + 12KBD
Secondary cache	2MB
Other cache	NA
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\jse.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	May 14, 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	8530	3700	2748	<0.01%	<0.01	new_order	112539	9.72	.016
						payment	77629	4.47	.016
						order_status	7762	.671	.016
						delivery	7762	8.97	.016
						stock_level	7763	.992	.016

						cust_report	42711	4.56	.016
2	20270	3700	1709	1.15%	<0.01	new_order	267131	19.6	.016
						payment	184363	8.47	.281
						order_status	18437	1.21	.172
						delivery	18436	18.9	.016
						stock_level	18436	1.47	.016
						cust_report	101593	9.48	.265
3	29899	3700	2973	12.5%	<0.01	new_order	394369	27.6	.218
						payment	272086	11.6	.218
						order_status	27209	1.54	.016
						delivery	27208	32.0	.203
						stock_level	27209	2.51	.016
						cust_report	149810	13.6	.218
4	33011	3700	935	2.61%	.039	new_order	3482959	285	.828
						payment	2401723	121	.375
						order_status	240172	15.0	.094
						delivery	240172	345	.828
						stock_level	240173	27.7	.265
						cust_report	1320476	149	.391
5	33494	3700	3623	30.3%	.058	new_order	3533936	346	.469
						payment	2437321	150	.579
						order_status	243732	18.8	.515
						delivery	243732	446	.406
						stock_level	243733	34.8	.391
						cust_report	1340701	186	.391
6	33170	3700	3568	45.0%	.020	new_order	3498590	422	1.09
						payment	2412825	191	.953
						order_status	241282	25.6	.953
						delivery	241281	517	1.09
						stock_level	241282	41.4	.594
						cust_report	1327051	222	1.28
7	32777	3700	1068	34.3%	.078	new_order	3459854	489	1.47
						payment	2385628	234	1.06
						order_status	238562	27.1	1.59
						delivery	238564	594	3.44
						stock_level	238563	52.1	1.91
						cust_report	1311409	258	1.14
8	32897	3700	2984	22.9%	.065	new_order	3470919	553	1.31
						payment	2394060	282	1.14

					order_status	239402	26.6	2.03
					delivery	239401	666	5.63
					stock_level	239403	54.4	.953
					cust_report	1317190	307	6.83

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Dual-Core Intel Xeon Processor 5160-based server

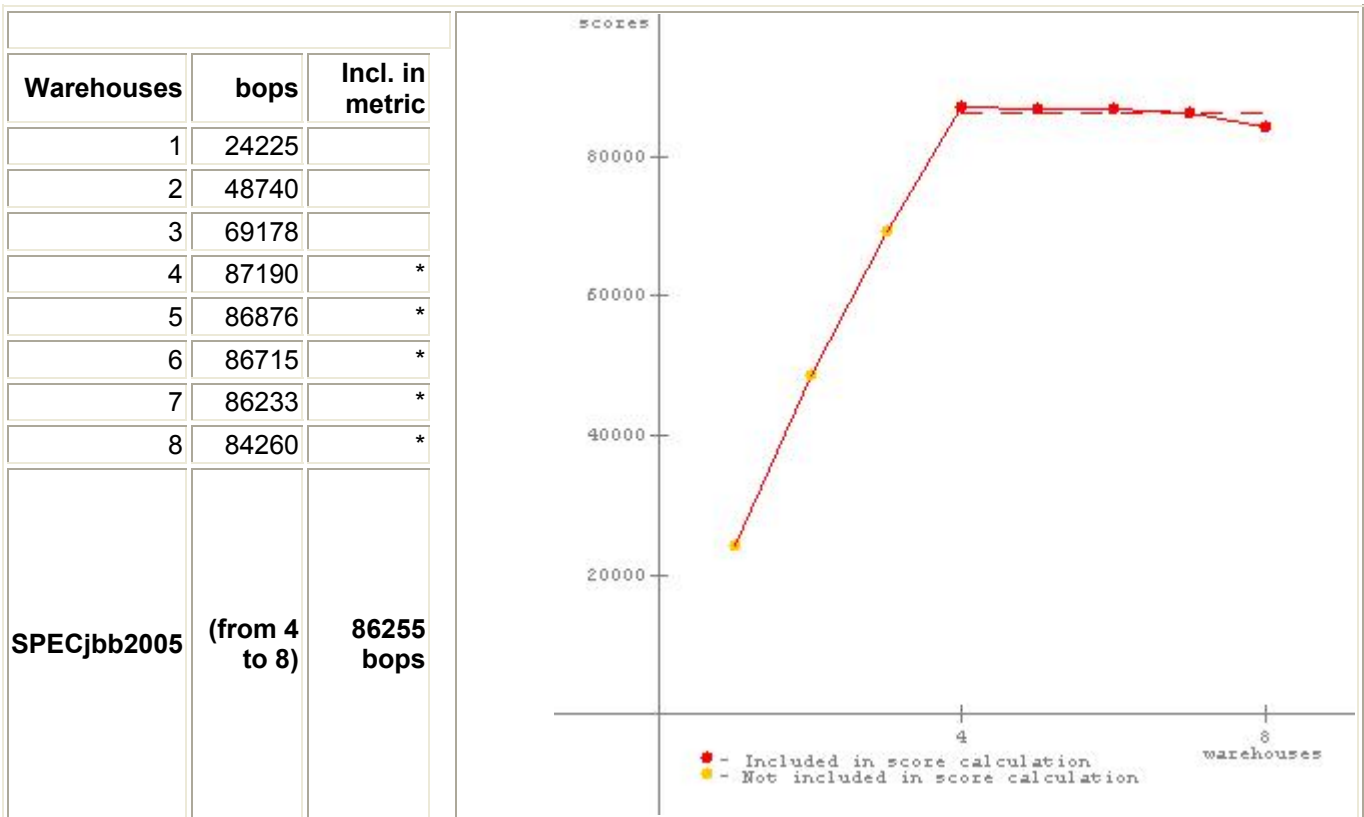
SPECjbb2005

SPECjbb2005 = 86255 bops

Intel Intel Server board (3.0 GHz, Dual-Core "Woodcrest" processor)

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

No errors. Valid run.



SPEC license # 3184

Tested by: Principled Technologies

Test date: May 18, 2006

Hardware		Software	
Hardware Vendor	Intel	Software Vendor	BEA
Vendor URL	http://www.intel.com	Vendor URL	http://www.bea.com
		JVM Version	BEA Jrockit 5.0, jrockit-P26.0.0-jdk1.5.0_06-

Model	Intel Server board (3.0 GHz, Dual-Core "Woodcrest" processor)
Processor	Woodcrest processor (3.0GHz, 1333 MHz bus)
MHz	3000
# of Chips	2
# of Cores	4
# of Cores/Chip	2
HW Threading Enabled?	No
Procs Avail to Java	4
Memory (MB)	8192
Memory Details	8 x 1GB DDR2-SDRAM PC2-5300 ECC registered
Primary cache	32KBI + 32KBD
Secondary cache	2MB
Other cache	NA
Filesystem	NTFS
Disks	1 x 160GB SATA
Other hardware	

	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	May 18, 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	24225	3700	3500	<0.01%	<0.01	new_order	319713	12.9	.016
						payment	220455	5.07	.109
						order_status	22046	.612	.016
						delivery	22045	5.80	.016
						stock_level	22045	.654	.016
						cust_report	121192	4.37	.016
2	48740	3700	3201	2.30%	<0.01	new_order	642850	24.8	.125
						payment	443552	9.43	.125
						order_status	44355	1.06	.016
						delivery	44355	13.3	.172
						stock_level	44355	1.50	.125
						cust_report	244254	8.86	.172
3	69178	3700	1678	8.18%	<0.01	new_order	913009	36.4	.360
						payment	629541	13.0	.360
						order_status	62955	1.40	.125
						delivery	62955	22.4	.360
						stock_level	62955	1.88	.140
						cust_report	346068	13.2	.140
4	87190	3700	1453	5.47%	.059	new_order	9200523	366	.454
						payment	6344827	125	.454
						order_status	634484	16.1	.031
						delivery	634483	272	.375
						stock_level	634483	24.5	.454
						cust_report	3489144	135	.297
5	86876	3700	2706	24.4%	.091	new_order	9170264	463	.594
						payment	6324013	159	.406
						order_status	632402	19.0	.265
						delivery	632402	328	.515
						stock_level	632401	28.3	.375
						cust_report	3477769	179	.422
6	86715	3700	695	38.8%	.033	new_order	9147250	547	.953
						payment	6308596	205	.953
						order_status	630861	23.6	.594
						delivery	630862	395	1.00
						stock_level	630860	35.3	.610
						cust_report	3469943	207	.750
7	86233	3700	3690	30.8%	.072	new_order	9100355	624	1.89
						payment	6276001	245	.953
						order_status	627603	30.8	.953

						delivery	627599	464	5.89
						stock_level	627600	40.4	1.13
						cust_report	3451649	243	1.16
8	84260	3700	2826	14.8%	.033	new_order	8888764	735	1.31
						payment	6129976	292	1.20
						order_status	612998	25.3	1.02
						delivery	612998	498	2.13
						stock_level	612999	48.1	6.02
						cust_report	3371189	285	3.91

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Dual-Core AMD Opteron 285-based server

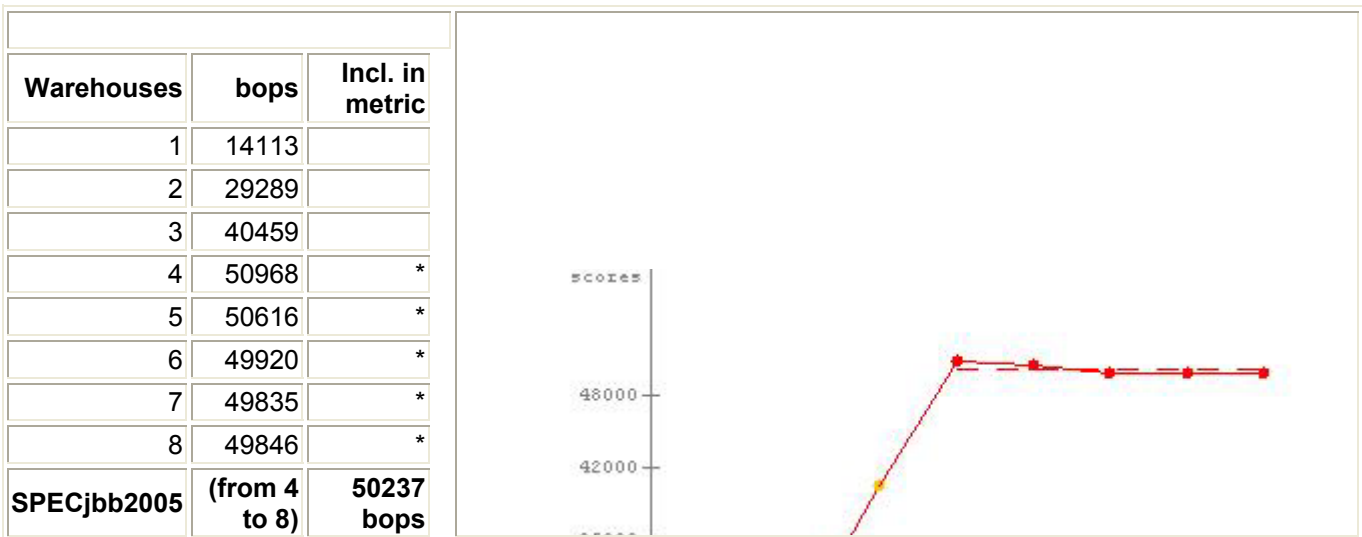
SPECjbb2005

SPECjbb2005 = 50237 bops

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

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

No errors. Valid run.



SPEC license # 3184 Tested by: Principled Technologies Test date: May 12, 2006

Hardware		Software	
Hardware Vendor	AMD	Software Vendor	BEA
Vendor URL	http://www.amd.com	Vendor URL	http://www.bea.com
Model	UNIWIDE Technologies	JVM Version	BEA Jrockit 5.0, jrockit-P26.0.0-jdk1.5.0_06-win-x86_64

	SS232-128-03, AMD Opteron (TM) 285
Processor	AMD Opteron (TM) 285
MHz	2600
# of Chips	2
# of Cores	4
# of Cores/Chip	2
HW Threading Enabled?	Yes
Procs Avail to Java	4
Memory (MB)	8192
Memory Details	8 x 1GB, DDR400 ECC registered
Primary cache	64KBI+64KBD
Secondary cache	1MB
Other cache	NA
Filesystem	NTFS
Disks	1 x 160GB SATA
Other hardware	AT&T Rotary Telephone

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	May 12, 2006
H/w available	Jan-2000
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	14113	3700	878	<0.01%	<0.01	new_order	186040	9.05	.093

						payment	128365	3.74	.016
						order_status	12837	.442	.016
						delivery	12835	9.84	.016
						stock_level	12836	1.12	.016
						cust_report	70690	5.28	.016
2	29289	3700	2091	2.67%	<0.01	new_order	386437	16.7	.125
						payment	266541	7.77	.125
						order_status	26654	.855	.078
						delivery	26654	22.4	.016
						stock_level	26655	1.51	.016
						cust_report	146646	9.81	.078
3	40459	3700	2971	2.48%	<0.01	new_order	534023	24.7	.125
						payment	368189	10.5	.109
						order_status	36818	1.45	.016
						delivery	36819	35.1	.125
						stock_level	36818	2.27	.016
						cust_report	202354	14.5	.125
4	50968	3700	2270	7.70%	.026	new_order	5376124	252	.390
						payment	3707693	104	.312
						order_status	370769	14.4	.141
						delivery	370770	390	.328
						stock_level	370773	26.3	.265
						cust_report	2039269	157	.219
5	50616	3700	1702	12.5%	.059	new_order	5341244	314	.610
						payment	3683335	132	.641
						order_status	368333	21.7	.391
						delivery	368334	484	.610
						stock_level	368332	32.2	.391
						cust_report	2025432	197	.688
6	49920	3700	986	43.2%	<0.01	new_order	5265678	385	1.19
						payment	3630797	174	.781
						order_status	363081	21.2	.594
						delivery	363078	562	1.34
						stock_level	363080	39.7	.953
						cust_report	1995926	237	1.16
7	49835	3700	1542	53.7%	.013	new_order	5255218	456	1.14
						payment	3624815	208	.969
						order_status	362483	24.0	.906
						delivery	362480	649	4.63

						stock_level	362482	49.3	7.23
						cust_report	1994419	263	1.27
8	49846	3700	1581	64.3%	<0.01	new_order	5256424	509	1.17
						payment	3625406	236	1.14
						order_status	362543	34.8	.953
						delivery	362544	736	3.42
						stock_level	362542	53.5	6.39
						cust_report	1994419	319	1.30

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