TEST REPORT AUGUST 2008



SPECjbb performance and power consumption on multi-processor Intel- and AMD-based blade servers

Executive summary

Dell Inc. (Dell) commissioned Principled Technologies® (PT) to measure the SPECjbb®2005 performance of quad-socket blade servers for the purpose of demonstrating real-world performance and power differences using basic memory configurations. We tested the following single blades in their respective enclosures:

- Dell PowerEdge[™] M905 (Quad-Core AMD* Opteron* processor 8354 [2.20 GHz, 75W])
- HP* ProLiant* BL680c G5 (Quad-Core Intel* Xeon* processor E7310 [1.60 GHz, 80W])
- HP ProLiant BL685c G5 (Quad-Core AMD Opteron processor 8354 [2.20 GHz, 75W])
- IBM* BladeCenter* LS41 (Dual-Core AMD Opteron processor 8222 [3.00 GHz, 95W])

Dell provided the Dell PowerEdge M905 and its enclosure. PT received the remainder of the equipment directly from third-party hardware resellers. Note: At the time we tested, IBM did not offer a Quad-Core AMD Opteron 8354 option nor an Intel based Quad-Core option for blade servers.

In this section, we present the best results for each server. For complete details of the performance of each Java Virtual Machine (JVM) by warehouse for each server, see the Test results section.

KEY FINDINGS

- The Dell PowerEdge M905 blade server delivered a 3.8 percent performance increase over the HP ProLiant BL685c G5, a 44.6 percent performance increase over the HP ProLiant BL680c G5, and a 70.0 percent performance increase over the IBM BladeCenter LS41 (See Figure 1).
- The Dell PowerEdge M905 blade server delivered 11.5 percent lower average power than the HP ProLiant BL685c G5, 8.5 percent lower average power than the HP ProLiant BL680c G5, and 13.9 percent lower average power than the IBM BladeCenter LS41 (See Figure 2).
- The Dell PowerEdge M905 blade server delivered 17.2 percent more performance/watt than the HP ProLiant BL685c G5, 58.1 percent more performance/watt than the HP ProLiant BL680c G5, and 97.4 percent more performance/watt than the IBM BladeCenter LS41 (See Figure 3).
- The Dell PowerEdge M905 blade server delivered 48.9 percent better price-performance than the HP ProLiant BL685c G5, 97.8 percent better price-performance than the HP ProLiant BL680c G5, and 225.9 percent better price-performance than the IBM BladeCenter LS41 (See Figure 4).



Figure 1: SPECjbb2005 results of the blade servers in business operations per second. Higher numbers are better.

Figure 1 shows the peak performance of each blade server plus its enclosure. Each result is the median 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 Dell PowerEdge M905 blade server produced the highest results, 375,195 bops (business operations per second), while the HP ProLiant BL685c G5 server achieved 361,646 bops. The Dell PowerEdge M905 thus delivered a 3.7 percent performance increase over the HP ProLiant BL685c G5. The Dell PowerEdge M905 delivered a 44.6 percent increase over the HP ProLiant BL680c G5, which achieved 259,489 bops and a 70.0 percent increase over the IBM BladeCenter LS41, which achieved 220,666 bops.

Figure 3 illustrates the performance/watt for each of the four blade servers. In this chart, we have normalized the



Figure 2 illustrates the relative average power consumption in watts for each of the four blade servers during the period of peak performance. In this chart, we have normalized the results for each workload to the lowest average power. Note: The power measurements we used in this calculation are for the blade enclosure and one blade. A full blade enclosure would have much higher wattage.

The Dell M905 blade server delivered 11.5 percent lower average power than the HP ProLiant BL685c G5, 8.5 percent lower average power than the HP ProLiant BL680c G5, and 13.9 percent lower average power than the IBM BladeCenter LS41.

Figure 2: Average power results for the test blade servers normalized to that of the IBM BladeCenter LS41. Higher numbers are better.



Figure 3: Performance/watt results for the test blade servers normalized to that of the IBM BladeCenter LS41. Higher numbers are better.

Performance/watt equals the benchmark's score divided by the average power consumption in watts during the period the benchmark was delivering peak performance.

As Figure 3 illustrates, the Dell PowerEdge M905 blade server delivered 17.2 percent more performance/watt than the HP ProLiant BL685c G5, 58.1 percent more performance/watt than the HP ProLiant BL680c G5, and 97.4 percent more performance/watt than the IBM BladeCenter LS41.

Figure 4 shows the priceperformance of each system. The price-performance metric takes the SPECjbb2005 result in bops and divides that number by the perblade cost of the blade and enclosure. We calculated the "per

blade cost" by taking the actual blade cost and then adding the cost of the enclosure divided by the total capacity. For the Dell and HP enclosures, the enclosure cost was divided by 8, for the IBM enclosure the cost was divided by 7. Higher price-performance scores, indicating more cost-effective servers, are better.



Figure 4: Price-performance of the blade servers with the SPECjbb2005 workload normalized to that of the IBM BladeCenter LS41. Higher numbers are better.

The Dell PowerEdge M905 had a perblade cost of \$12.345.00 and the highest price-performance. The Dell PowerEdge M905 delivered 48.9 percent higher price-performance than the HP ProLiant BL685c G5, which had a per-blade price of \$17,718.75. The Dell PowerEdge M905 also delivered 97.8 percent higher priceperformance than the HP ProLiant BL680c G5, which had a per-blade price of \$16,888.75. The Dell PowerEdge M905 delivered 225.9 percent higher price-performance than the IBM BladeCenter LS41, which had a perblade price of \$23,659.01.

Workload

SPECjbb2005 is an industry-standard benchmark created by the Standard Performance Evaluation Corp. (SPEC)

to measure a server's Java performance. (Note: SPEC and the SPECjbb2005 are trademarks of the Standard Performance Evaluation Corporation.) SPEC modeled SPECjbb2005 on the three-tier client/server architecture, with the middle layer as the primary focus. According to 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," 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 business operations per second or SPECjbb2005 bops. A higher number of SPECjbb2005 bops is better. (For more information on SPECjbb2005, go to www.spec.org.)

Test results

Before we started the SPECjbb2005 benchmark, we logged into the system and allowed the servers to sit idle for 8 minutes. We then started recording power for 2 minutes. This process meant that all systems were idle for 10 minutes before we began the benchmark.

	Dell PowerEdge M905	HP ProLiant BL680c G5	HP ProLiant BL685c G5	IBM BladeCenter LS41
JVM 1	87,662	65,282	89,762	54,850
JVM 2	99,885	64,590	90,937	55,369
JVM 3	99,103	64,848	90,164	55,153
JVM 4	88,545	64,769	90,783	55,294
Total score	375,195	259,489	361,646	220,666

Figure 5: SPECjbb2005 results for each blade server by JVM. Higher numbers are better.

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Figure 5 shows the median SPECjbb2005 results for all four blade servers. In each test, we ran four JVMs at the same time, a common practice on servers with many processors. To compute the overall score for the system, SPECjbb2005 sums the scores of all the JVMs. SPECjbb2005 computes the score of each JVM by taking the average of the results during mixes when the server is running at peak performance. (In SPEC's terms, these results are from "compliant" runs, which means we can disclose them publicly though we are not posting them on the SPEC Web site with all the files SPEC requires. We do present here all the data necessary to reproduce these results.)

Dell PowerEdge M905				
	Run 1	Run 2	Run 3	
Warehouse		JVM 1		
1	24,664	24,510	24,700	
2	57,410	57,093	57,277	
3	75,854	75,487	74,765	
4	89,232	88,470	88,162	
5	89,312	88,164	87,618	
6	89,182	87,864	87,429	
7	88,331	87,181	86,699	
8	87,683	86,629	86,340	
Score	88,748	87,662	87,250	
Warehouse		JVM 2		
1	26,705	26,314	36,331	
2	61,907	61,683	62,018	
3	84,097	84,629	84,086	
4	100,656	100,549	99,632	
5	100,430	100,600	99,719	
6	99,993	100,215	99,157	
7	99,055	99,534	98,219	
8	98,549	98,526	97,932	
Score	99,737	99,885	98,932	
Warehouse		JVM 3		
1	26,711	26,634	26,524	
2	62,056	61,234	61,852	
3	83,885	83,875	85,196	
4	100,179	99,499	100,219	
5	100,412	99,699	100,331	
6	100,133	99,375	99,959	
7	99,810	98,957	98,840	
8	98,738	97,985	99,083	
Score	99,854	99,103	99,686	
Warehouse		JVM 4		
1	24,380	24,790	24,242	
2	56,527	56,957	56,856	
3	76,636	76,451	76,475	
4	88,680	89,704	88,774	
5	88,580	89,216	88,355	
6	88,490	88,479	87,740	
7	87,624	87,959	87,208	
8	86,832	87,368	86,952	
Score	88,041	88,545	87,806	
Total score	376,380	375,195	373,674	

Figure 6: SPECjbb2005 results for the Dell PowerEdge M905 blade server. Higher numbers are better.

Figure 6 shows the results by warehouse for the Dell PowerEdge M905 blade server for all three runs. Run 2 produced the median results.

HP ProLiant BL680c G5				
	Run 1	Run 2	Run 3	
Warehouse		JVM 1		
1	18,756	19,221	18,958	
2	38,371	38,345	38,712	
3	57,169	58,321	56,524	
4	65,846	66,421	64,952	
5	65,855	66,320	65,578	
6	65,528	65,336	64,686	
7	64,917	64,747	64,045	
8	64,264	64,578	63,524	
Score	65,282	65,480	64,557	
Warehouse		JVM 2	·	
1	19,563	19,316	19,248	
2	39,406	38,144	40,275	
3	57,402	57,080	56,723	
4	65,205	65,474	65,908	
5	65,379	65,139	65,592	
6	64,808	64,539	64,783	
7	64,224	63,950	64,307	
8	63,331	63,719	63,893	
Score	64,590	64,564	64,897	
Warehouse		JVM 3		
1	19,312	19,274	19,591	
2	38,860	38,097	40,585	
3	57,655	56,997	58,171	
4	65,757	65,339	66,548	
5	65,618	65,098	66,192	
6	64,933	64,988	65,821	
7	64,328	64,087	65,050	
8	63,607	63,689	64,576	
Score	64,848	64,640	65,637	
Warehouse		JVM 4		
1	19,201	19,189	19,467	
2	38,021	38,813	39,028	
3	56,951	56,917	57,416	
4	65,542	65,285	65,378	
5	65,555	65,305	65,393	
6	64,803	64,677	64,808	
7	64,156	63,724	64,089	
8	63,787	62,879	63,716	
Score	64,769	64,374	64,677	
Total score	259,489	259,058	259,768	

Figure 7: SPECjbb2005 results for the HP ProLiant BL680c G5 blade server. Higher numbers are better.

Figure 7 shows the results by warehouse for the HP ProLiant BL680c G5 blade server for all three runs. Run 1 produced the median results.

Figure 8 shows the results by warehouse for the HP ProLiant BL685c G5 blade server for all three runs. Run 3 produced the median results.

HP ProLiant BL685c G5				
	Run 1	Run 2	Run 3	
Warehouse		JVM 1		
1	22,927	22,313	21,895	
2	55,375	55,102	54,544	
3	70,457	71,932	69,305	
4	91,194	91,980	90,738	
5	90,843	91,213	90,846	
6	90,332	91,013	89,880	
7	89,706	90,231	88,834	
8	89,028	89,487	88,510	
Score	90,221	90,785	89,762	
Warehouse		JVM 2		
1	24,427	23,043	23,543	
2	54,874	54,573	55,832	
3	73,418	73,037	74,265	
4	90,846	90,257	91,368	
5	90,672	89,835	91,755	
6	90,167	89,419	91,348	
7	89,427	88,475	90,279	
8	88,847	88,275	89,935	
Score	89,992	89,252	90,937	
Warehouse		JVM 3	•	
1	23,499	21,932	22,907	
2	55,526	54,803	55,465	
3	74,680	73,788	72,881	
4	92,152	90,652	91,010	
5	92,132	90,405	90,657	
6	91,365	89,655	90,277	
7	90,360	89,124	89,531	
8	90,178	88,625	89,346	
Score	91,237	89,692	90,164	
Warehouse		JVM 4		
1	22,295	22,758	23,883	
2	56,324	55,783	54,077	
3	72,391	73,711	72,942	
4	91,818	9,193	91,550	
5	91,463	91,458	91,294	
6	90,655	90,728	90,923	
7	90,148	89,966	90,207	
8	89,774	89,591	89,941	
Score	90,772	90,731	90,783	
Total score	362,222	360,460	361,646	

Figure 8: SPECjbb2005 results for the HP ProLiant BL685c G5blade server. Higher numbers are better.

Figure 9 shows the results by warehouse for the IBM BladeCenter LS41 blade server for all three runs. Run 2 produced the median results.

IBM BladeCenter LS41					
	Run 1	Run 2	Run 3		
Warehouse		JVM 1	•		
1	21,523	22,271	21,970		
2	54,707	54,946	55,381		
3	54,817	54,926	55,605		
4	54,690	54.687	55,306		
5	54.578	54,499	55.079		
6	54,318	54,424	54,713		
7	53,863	54,112	54,414		
8	53,153	54,022	54,342		
Score	54,738	54,850	55,430		
Warehouse		JVM 2			
1	21.593	22.220	22,186		
2	55.316	55,152	55.219		
3	55,720	55,495	55,749		
4	55.359	55,461	55.751		
5	55.217	54,693	55.382		
6	55,123	54,241	55.388		
7	54,501	54.034	54.857		
8	54.109	53,901	54,469		
Score	55,465	55,369	55,573		
Warehouse	,	JVM 3	, ,		
1	21,672	21,338	21,029		
2	54,369	55,197	54,600		
3	54,925	55,224	54,983		
4	54,936	55,038	54,889		
5	54,495	54,497	54,501		
6	54,235	54,445	54,070		
7	54,060	54,262	53,843		
8	53,927	53,790	53,709		
Score	54,743	55,153	54,824		
Warehouse		JVM 4			
1	22,034	22,269	21,872		
2	54,649	55,310	54,948		
3	54,613	55,339	55,391		
4	54,679	55,232	54,691		
5	54,670	55,076	54,692		
6	54,035	54,446	54,521		
7	53,724	54,336	54,257		
8	53,271	51,901	53,467		
Score	54,647	55,294	55,010		
Total score	219.593	220.666	220.837		

Figure 9: SPECjbb2005 results for the IBM BladeCenter LS41 blade server. Higher numbers are better.

Figure 10 details the power consumption, in watts, of the test servers while idle and during the median run of the SPECjbb2005 benchmark.

Server	Idle power (watts)	Average power (watts)
Dell PowerEdge M905	535.4	823.4
HP ProLiant BL680c G5	751.9	900.0
HP ProLiant BL685c G5	672.8	930.1
IBM BladeCenter LS41	832.1	955.8

Figure 10: Average power usage (in watts) of the test servers while idle and during the median run of SPECjbb2005. Lower numbers are better.

Test methodology

Figure 11 summarizes some key aspects of the configurations of the four server systems; Appendix A provides detailed configuration information.

Server	Dell PowerEdge M905	HP ProLiant BL680c G5	HP ProLiant BL685c G5	IBM BladeCenter LS41
Enclosure	Dell PowerEdge M1000e	HP BladeSystem c-Class	HP BladeSystem c-Class	IBM BladeCenter H Type 8852
Processor frequency	2.2 GHz	1.6 GHz	2.2 GHz	3.0 GHz
Front-side bus frequency	2,000 MHz HyperTransport	1,066 MHz	2,000 MHz HyperTransport	2,000 MHz HyperTransport
Number of processor packages	4	4	4	4
Number of cores per processor package	4	4	4	2
Number of hardware threads per core	1	1	1	1
Motherboard	Dell 0D413F	HP ProLiant BL680c	HP ProLiant BL685c	IBM Server Blade
Chipset	NVIDIA nForce Pro 3600	Intel 7300	NVIDIA* nForce Pro 2050	ServerWorks* HT2000
RAM (48 GB in each)	48 GB (24 x 2 GB) PC2-5300	48 GB (8 x 2 GB, 8 x 4 GB) PC2- 5300 FB-DDR2	48 GB (8 x 2 GB, 8 x 4 GB) PC2- 5300	48 GB (8 x 2 GB, 8 x 4 GB) PC2- 5300
Hard drive	Seagate* ST973451SS	HP DH072BB978	HP DH072BB978	Seagate ST973451SS

Figure 11: Summary of some key aspects of the server configurations.

We began our testing by installing a fresh copy of Microsoft* Windows 2003 Server* x64 Enterprise Edition Service Pack 2 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 logon.
- 4. Select Eastern Time Zone.
- 5. Use typical settings for the Network installation.
- 6. Use "Testbed" for the workgroup.

With the exception of disabling HW Prefetcher and Adjacent Cache Line Prefetcher on the HP ProLiant BL680c G5, we used the default BIOS settings on all servers.

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 to only the administrator, because we used that account for our tests. To enable large pages, we selected the following:

- Control Panel → Administrative Tools → Local Security Policy
- Local Policies→User Rights Assignment
- "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 (<u>www.extech.com</u>) 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 for 2 minutes while each server was running the operating system but otherwise idle.

We then recorded the power usage (in watts) for each server during the testing at 1-second intervals. To compute the average power usage, we averaged the power usage during the time the server was producing its peak performance results. We call this time the power measurement interval. See Figure 10 (idle and average peak power) for the results of these measurements.

SPECjbb2005 configuration

We used SPECjbb2005 version 1.07, dated March 15, 2006. 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:\SPECjbb2005v1.07 on the server's hard disk.

SPECjbb2005 requires a Java Virtual Machine on the system under test. We used the JRockit 1.6.0_03 (build P27.5.0-5-_o_CR371811_CR374296-100684-1.6.0_03-20080702-1651-windows-x86_64, compiled mode) 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 also modified the SPECjbb.props file to change the number of JVM instances to four. This change allows a server to run four JVM instances during testing.

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. Figures 11 and 12 show the contents of the files used on all Intel servers and the AMD server, respectively.

📋 runit-affinity.bat - Notepad
<u>File Edit Fo</u> rmat <u>V</u> iew <u>H</u> elp
aecho off
set JVM=4
:: Set JAVA_HOME to Java.exe path. set JAVA_HOME="C:\jrockit-jdk1.6.0_03\bin"
set path=%JAVA_HOME%;%path%
:stage1 set PROPFILE=SPECjbb.props set JAVAOPTIONS= -Xms256m -Xmx256m rem set JBBJARS=.\jbb.jar;.\check.jar set JBBJARS=.\jbb.jar;.\jbb_no_precompile.jar;.\check.jar;.\reporter.jar
set CLASSPATH=%JBBJAR5%;%CLASSPATH%
:stage2
echo Using CLASSPATH entries: for %%c in (%CLASSPATH%) do echo %%c @echo on start /b java %JAVAOPTIONS% spec.jbb.Controller -propfile %PROPFILE% @echo off
set I=0 set J=F :LOOP set /a I=%I + 1 echo
echo Starting JVM Number %I% with Affinity to CPU %J% echo.
<pre>@echo on start /AFFINITY %J% /B java -xms3700m -xns3200m -xmx3700m -xxaggressive -xxlargepages - xxcallprofiling -xgc:genpar -xxthroughputCompaction -xxlazyUnlocking -xxtlasize:min=4k,preferred=128k spec.jbb.JBBmain -propfile %PROPFILE% -id %I% > multi.%I% @echo off set J=%J%0 st %ZLM% COTO FND</pre>
GOTO LOOP :END
:egress

Figure 12: The text of the batch file we used to execute the SPECjbb2005 benchmark on all blade servers with 16 cores.

In the batch file we set the Java options that control the performance of the JVM:

- *-Xms3700m* 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 3,700 MB.
- -Xns3200m sets the JVM nursery size.
- -*Xmx*3700*m* sets the maximum heap size.
- -XXaggressive basically tells the JVM to perform at maximum speed.
- -XXlargepages tells the JVM to use large pages.
- -XXcallprofiling uses call profiling for code optimization.
- -Xgc:genpar sets generational parallel garbage collection.
- -XXthroughputCompaction adjusts the compaction ratio dynamically based on live data in the heap.
- -XXlazyUnlocking affects when the JVM releases locks.
- -XXtlasize sets the thread-local area size the JVM uses.

🔲 runit-affinity - Copy.bat - Notepad
<u>File Edit Fo</u> rmat <u>V</u> iew <u>H</u> elp
@echo off
set JVM=4
:: Set JAVA_HOME to Java.exe path. set JAVA_HOME="C:\jrockit-jdk1.6.0_03\bin"
set path=%JAVA_HOME%;%path%
:stage1 set PROPFILE=SPECjbb.props set JAVAOPTIONS= -Xms256m -Xmx256m rem set JBBJARS=.\jbb.jar;.\check.jar set JBBJARS=.\jbb.jar;.\jbb_no_precompile.jar;.\check.jar;.\reporter.jar
set CLASSPATH=%JBBJAR5%;%CLASSPATH%
:stage2
echo Using CLASSPATH entries: for %%c in (%CLASSPATH%) do echo %%c @echo on start /b java %JAVAOPTIONS% spec.jbb.Controller -propfile %PROPFILE% @echo off
@echo on start /AFFINITY 3 /B java -xms3700m -xns3200m -xmx3700m -xxaggressive -xxlargepages -xxcallprofiling -xgc:genpar -xxthroughputCompaction -xxlazyUnlocking -xxtlasize:min=4k,preferred=128k spec.jbb.JBBmain -propfile %PROPFILE% -id 1 > multi.1 @echo off
@echo on start /AFFINITY C /B java -xms3700m -xns3200m -xmx3700m -xxaggressive -xxlargepages -xxcallprofiling -xgc:genpar -xxthroughputCompaction -xxlazyUnlocking -xxtlasize:min=4k,preferred=128k spec.jbb.JBBmain -propfile %PROPFILE% -id 2 > multi.2 @echo off
@echo on start /AFFINITY 30 /B java -Xms3700m -Xns3200m -Xmx3700m -XXaggressive -XXlargepages -XXcallprofiling -Xgc:genpar -XXthroughputCompaction -XXlazyUnlocking -XXtlasize:min=4k,preferred=128k spec.jbb.JBBmain -propfile %PROPFILE% -id 3 > multi.3 @echo off
<pre>@echo on start /AFFINITY C0 /B java -Xms3700m -Xns3200m -Xmx3700m -XXaggressive -XXlargepages -XXcallprofiling -Xgc:genpar -XXthroughputCompaction -XXlazyUnlocking -XXtlasize:min=4k,preferred=128k spec.jbb.JBBmain -propfile %PROPFILE% -id 4 > multi.4 @echo off</pre>
:END
:egress

Figure 13: The text of the batch file we used to execute the SPECjbb2005 benchmark on the IBM BladeCenter LS41 blade server.

Due to differences in the number of available execution units in the systems, we had to use a different batch file for the IBM BladeCenter LS41 blade server. Setting processor affinity maps an active process to an assigned execution unit. The IBM BladeCenter LS41 has four physical processors with two cores per processor, or eight total execution units. All other four-way blade servers we used in testing have 16 total execution units.

Appendix A – Enclosure configuration information This appendix provides detailed configuration information about the enclosures, which we present in alphabetical

order.

Enclosure	Dell PowerEdge M1000e	IBM BladeCenter H Type 8852	HP BladeSystem c-Class	
General dimension information				
Height (inches)	17.5	15.75	17.5	
Width (inches)	19	19	19	
Depth (inches)	30.5	28.0	31.0	
U size in server rack	10	9	10	
Number of blades	16	14	16	
Power supplies				
Total number	6	4	6	
Wattage of each	2,360	2,880	2,250	
Cooling fans				
Total number	9	2 blowers	10	
Dimensions (H x W) of each	3.5" x 3"	4.5" x 11.5"	3.5" x 3"	
Voltage	12V	200–240V	12V	
Amps	7A	5.5A	16.5A	

Figure 14: Detailed configuration information about the enclosures.

Appendix B – Test system configuration information This appendix provides detailed configuration information about each of the test server systems, which we list in

alphabetical order.

Servers	Dell PowerEdge M905	HP ProLiant BL680c G5	HP ProLiant BL685c	IBM BladeCenter LS41	
Enclosure					
Enclosure	Dell PowerEdge M1000e	HP BladeSystem c-Class	HP BladeSystem c-Class	IBM BladeCenter H Type 8852	
General processor setup					
Number of processor packages	4	4	4	4	
Number of cores per processor package	4	4	4	2	
Number of hardware threads per core	1	1	1	1	
System Power Management Policy	Always on	Always on	Always on	Always on	
CPU		•	-	•	
Vendor	AMD	Intel	AMD	AMD	
Name	Opteron 8354	Xeon E7310	Opteron 8354	Opteron 8222	
Stepping	3	B	3	3	
Socket type	Socket F (1207)	Socket 604 mPGA	Socket F (1207)	Socket F (1207)	
Core frequency (GHz)	2.2	1.60	2.2	3.0	
Front-side bus frequency	2,000 MHz HyperTransport Technology	1,066 MHz	2,000 MHz HyperTransport Technology	2,000 MHz HyperTransport Technology	
L1 cache	64 KB + 64 KB (per core)	32 KB + 32 KB (per core)	64 KB + 64 KB (per core)	64 KB + 64 KB (per core)	
L2 cache	2 MB (512 KB per core)	4 MB (2 x 2 MB)	2 MB (512 KB per core)	2 MB (1MB per core)	
Thermal design power (TDP, in watts)	75W	80W	75W	95W	
Platform					
Vendor and model number	Dell 0D413F	HP ProLiant BL680c	HP ProLiant BL685c	IBM Server Blade	
Motherboard model number	800VTG1	N382 MK0416	PU84MK0642	43X0990	
Motherboard chipset	NVIDIA nForce Pro 3600	Intel 7300	NVIDIA CK8- 04,IO-04	ServerWorks HT2000	
Motherboard revision number	A2	01	A4	NA	
BIOS name and version	Dell 0.2.1 (6/20/2008)	HP I17 (2/13/2008)	HP A08 (5/29/2008)	IBM BAE146AUS- 1.07 (6/13/2008)	
BIOS settings	Default	Hardware Prefetcher Disabled Adjacent Cache Line Prefetcher Disabled	Default	Default	

Servers	Dell PowerEdge M905	HP ProLiant BL680c G5	HP ProLiant BL685c	IBM BladeCenter LS41
Chipset driver	Dell 1.3.2.0	HP 1.3.0.0	HP 1.3.0.0	Microsoft 5.2.3790.1830
Memory modules				
Total RAM in system	48 GB	48 GB	48 GB	48 GB
Number of types of memory modules	1	2	2	2
First type of module in system				
Vendor and model number	Samsung* M393T5750EZA- CE6	Micron* MT36HTF51272F Y-667E141D4	ELPIDA* EBE41AE4ACFA- 6E-E	Hynix* HYMP351P72CM P4L-Y5
Туре	PC2-5300 DDR2	PC2-5300 FB- DDR2	PC2-5300 DDR2	PC2-5300 DDR2
Speed (MHz)	667	667	667	667
Speed in the system currently running @ (MHz)	667	667	667	667
Timing/Latency (tCL- tRCD-iRP-tRASmin)	5-5-5-15	5-5-5-15	5-5-5-15	5-5-5-15
Size	48 GB	32 GB	32 GB	32 GB
Number of RAM modules	24 x 2 GB	8 x 4 GB	8 x 4 GB	8 x 4 GB
Chip organization	Double-sided	Double-sided	Double-sided	Double-sided
Second type of				
Vendor and model number	N/A	Hynix HYMP525F72CP 4N3-Y5	2 x Hynix HYMP525P72CP 4-Y5 AB-A 2 x Hynix HYMP525P72CP 4-Y5 AB-C 2 x Samsung M393T5750CZA- CE6Q0 2 x Nanya NT2GT72U4NA2 BV-3C	HYMP125P72CM P4L-Y5
Туре	N/A	DDR2	PC2-5300	PC2-5300
Speed (MHz)	N/A	667	667	667
Speed in the system currently running @ (MHz)	N/A	667	667	667
Timing/Latency (tCL- tRCD-iRP-tRASmin)	N/A	5-5-5-15	5-5-5-15	5-5-5-15
Size	N/A	16 GB	16 GB	16 GB
Number of RAM modules	N/A	8 x 2 GB	8 x 2 GB	8 x 2 GB

Servers	Dell PowerEdge M905	HP ProLiant BL680c G5	HP ProLiant BL685c	IBM BladeCenter LS41	
Chip organization	nization N/A Double-sig		Double-sided	Double-sided	
Hard disk					
Vendor and model number	Seagate ST973451SS	HP DH072BB978	HP DH072BB978	Seagate ST973451SS	
Number of disks in system	2	2	2	2	
Size	73 GB	72 GB	72 GB	73 GB	
Buffer size	16 MB	16 MB	16 MB	16 MB	
RPM	15,000	15,000	15,000	15,000	
Туре	SAS	SAS	SAS	SAS	
Controller	Dell CERC 6/I Integrated RAID	HP Smart Array P400I	HP Smart Array E200I	LSI SAS 3000 Series	
Driver version	Dell 2.14.0.64 (6/6/2007)	HP 6.12.4.64 (3/31/2008)	HP 6.8.0.64 (6/21/2007)	LSI 1.27.3.0 (4/8/2008)	
Operating system		•••••	•••••		
Name	Windows Server 2003 Enterprise x64 Edition	Windows Server 2003 Enterprise x64 Edition	Windows Server 2003 Enterprise x64 Edition	Windows Server 2003 Enterprise x64 Edition	
Build number	3790	3790	3790	3790	
Service Pack	2	2	2	2	
File system	NTFS	NTFS	NTFS	NTFS	
Kernel	ACPI Multiprocessor x64-based PC	ACPI Multiprocessor x64-based PC	ACPI Multiprocessor x64-based PC	ACPI Multiprocessor x64-based PC	
Language	English	English	English	English	
Microsoft DirectX version	9.0c	9.0c	9.0c	9.0c	
Graphics		-	-		
Vendor and model number	ATI ES1000	ATI ES1000	Standard VGA Graphics Adapter	Standard VGA Graphics Adapter	
Chipset	ATI ES1000	ATI ES1000	ATI ES1000	ATI ES1000	
BIOS version	BK-ATI VER008.005.031. 000	BK-ATI VER008.005.028. 001	01.00	01.00	
Туре	Integrated	Integrated	Integrated	Integrated	
Memory size	32 MB	64 MB	32 MB	16 MB	
Resolution	1,024 x 768 x 32- bit	1,024 x 768 x 32- bit	1,024 x 768 x 32- bit	1,024 x 768 x 32- bit	
Driver version	ATI 8.240.50.2000 (10/25/2007)	ATI 8.240.50.2000 (10/25/2007)	Microsoft 5.2.3790.1830 (10/1/2002)	Microsoft 5.2.3790.1830 (10/1/2002)	
Network card/					
Vendor and model number	4 x Broadcom BCM57095 NetXtreme II GigE	2 x HP NC326i PCIe Dual Port Gigabit, 2 x HP NC373i Multifunction Gigabit	2 x HP NC326i PCIe Dual Port Gigabit, 2 x HP NC373i Multifunction Gigabit	4 x Broadcom BCM5706S NetXtreme II GigE	
Туре	Integrated	Integrated	Integrated	Integrated	

Servers	Dell PowerEdge M905	HP ProLiant BL680c G5	HP ProLiant BL685c	IBM BladeCenter LS41		
Driver version	Broadcom 4.4.15.0 (5/14/2008)	NC326i HP 10.85.0.0 (6/19/2008), NC373i HP 4.5.2.0 (7/18/2008)	NC326i HP 10.78.0.0 (3/19/2008), NC373i HP 4.4.15.0 (5/14/2008)	Broadcom 4.4.11.0 (4/17/2008)		
Optical drive						
Vendor and model number	N/A	N/A	N/A	LG GSA-T20N		
USB ports						
Number	3 on the blade, 2 on the chassis	2 with attachment	2 with attachment	2 on the chassis		
Туре	USB 2.0	USB 2.0	USB 2.0	USB 2.0		

Figure 15: Detailed system configuration information for the four test servers.

Appendix C – Pricing Figure 16 provides the pricing breakdown for all four blade servers on June 16, 2008.

Server	Dell PowerEdge M905 (48 GB RAM)	HP ProLiant BL680c G5 (48 GB RAM)	HP ProLiant BL685c G5 (48 GB RAM)	IBM BladeCenter LS41 (48 GB RAM)
Enclosure	\$11,207.98	\$18,086.00	\$18,086.00	\$15,836.00
Blade server, processor, memory, and hard drives	\$10,944.00	\$14,628.00	\$15,458.00	\$21,396.72
Total	\$22,151.98	\$32,714.00	\$33,544.00	\$37,232.72

Figure 16: Pricing breakdown for blade servers.

Appendix D – SPECjbb2005 output

This appendix provides the SPECjbb2005 output files from the median run for all test servers.

Dell PowerEdge M905 blade server

SPECjbb2005

SPECjbb2005 bops = 375195, SPECjbb2005 bops/JVM = 93799

Dell PowerEdge M905 BEA JRockit 1.6.0_03 (build P27.5.0-5-_o_CR371811_CR374296-100684-1.6.0_03-20080702-1651windows-x86_64, compiled mode)

JVM run	JVM Scores			
1	87662			
2	99885			
3	99103			
4 88545				
SPECibb2005 bops = 375195.				

SPECjbb2005 bops – 375195, SPECjbb2005 bops/JVM = 93799



Hardware		Software	
Hardware Vendo	r Dell	Software Vendor	BEA
Vendor URL	http://www.dell.com	Vendor URL	http://www.bea.com
Model	m905		JRockit 1.6.0_03 (build P27.5.0-5-
Processor	Quad-core AMD Opteron processor 8354	JVM Version	_o_CR371811_CR374296-100684- 1.6.0_03-20080702-1651-windows-
MHz	2200		start /AFFINITY /B java -Xms3700m -
# of Chips	4	IVM Command	
# of Cores	16	Line	XXIargepages -XXcallprofiling -
# of Cores/Chip	4		Xgc:genpar -XXthroughputCompaction -

HW Threading Enabled?	No		XXIazyUnlocking - XXtlasize:min=4k,preferred=128k
Procs Avail to Java	16	JVM Initial Heap	spec.jbb.jbbmain
Memory (MB)	49152	Memory (MB)	5700
Memory Details	24 x 2GB DDR2-667 DIMM	JVM Maximum	
Primary cache	64KBI+64KBD (per core)	Heap Memory	3700
Secondary cache	2MB (512 KB per core)	IVM Address bits	64
Other cache			\ibb iar:
Filesystem	NTFS		.\jbb no precompile.jar;
Disks	2 x 73GB SAS	JVWI CLASSPATH	.\check.jar;
Other hardware]	l.\reporter.jar;
		JVM BOOTCLASSPATH	jdk1.6.0_03\jre\bin\jrockit\jrockit1.6.0.jar; C:\jrockit- jdk1.6.0_03\jre\bin\jrockit\jmapi.jar; C:\jrockit- jdk1.6.0_03\jre\bin\jrockit\jmxmapi.jar; C:\jrockit- jdk1.6.0_03\jre\bin\jrockit\rmp.jar; C:\jrockit- jdk1.6.0_03\jre\bin\jrockit\latency.jar; C:\jrockit- jdk1.6.0_03\jre\lib\resources.jar; C:\jrockit- jdk1.6.0_03\jre\lib\resources.jar; C:\jrockit-jdk1.6.0_03\jre\lib\rt.jar; C:\jrockit-jdk1.6.0_03\jre\lib\jsse.jar; C:\jrockit-jdk1.6.0_03\jre\lib\jsse.jar; C:\jrockit-jdk1.6.0_03\jre\lib\charsets.jar; C:\jrockit-jdk1.6.0_03\jre\lib\charsets.jar; C:\jrockit-jdk1.6.0_03\jre\lib\charsets.jar;
		OS Version	Microsoft Windows 2003 Server, x64 Enterprise Edition Service Pack 2
		Other software	
Taa	tInformation		AOT Compilation
Tested by			
SPEC license #			
Test location	Durham NC		Tuning
Test date		In the local security settings, "Lock pages in memory" was	
H/w available			
JVM available	2008		Notos
OS available	2003	<u> </u>	140(62
Other s/w available	8		
	•		

JVM 1 Scores:

No errors. Valid run.

Warehouse s	SPECjbb200 5 bops	Incl. in metric
1	24510	
2	57093	
3	75487	
4	88470	*
5	88164	*
6	87864	*
7	87181	*
8	86629	*
SPECjbb200 5	(from 4 to 8)	87662 SPECjbb200 5 bops
SPEC license	e # 3184	Test

JVM 2 Scores:

No errors. Valid run.

		In al. in	SCOIES
warenouse	SPECJDD200	Inci. In	
S	5 pops	metric	
1	26314		
2	61683		
3	84629		✓
4	100549	*	80000-
5	100600	*	
6	100215	*	50000
7	99534	*	50000-
8	98526	*	
SPECjbb200 5	(from 4 to 8)	99885 SPECjbb200 5 bops	40000- 20000- 4 * - Included in score calculation * Mot included in score calculation
SPEC license	e # 3184	Teste	d by: Principled Technologies Test date: Aug 19, 2008

JVM 3 Scores:



No errors. Valid run.

JVM 4 Scores:

scores Warehouse SPECjbb200 Incl. in 5 bops metric s 1 24790 2 56957 80000-3 76451 4 89704 * 5 89216 * 60000 88479 * 6 * 7 87959 8 87368 *

No errors. Valid run.

SPECjbb200 5	(from 4 to 8)	88545 SPECjbb200 5 bops			
SPEC license	e # 3184	Teste	ed by: Principled T	echnologies	Test date: Aug 19, 2008

SPECjbb2005 Version: [SPECjbb2005 1.07, March 15, 2006] Reporting page, Copyright © 2005 SPEC. All rights reserved

HP ProLiant BL680c blade server

SPECjbb2005

SPECjbb2005 bops = 259489, SPECjbb2005 bops/JVM = 64872

HP ProLiant BL680c

JRockit 1.6.0_03 (build P27.5.0-5-_o_CR371811_CR374296-100684-1.6.0_03-20080702-1651-windows-x86_64, compiled mode)



JVM run	JVM Scores			
1	65282			
2	64590			
3	64848			
4	64769			
SPECjbb2005 bops = 259489, SPECjbb2005 bops/JVM = 64872				

Hardware			Software	
Hardware	HP	Software Vendor	BEA	
Vendor		Vendor URL	http://www.bea.com	
Vendor URL	http://www.hp.com		JRockit 1.6.0 03 (build P27.5.0-5-	
Model	ProLiant BL680c	IVM Version	_o_CR371811_CR374296-100684-	
Processor	Quad-core Intel Xeon processor E7310		1.6.0_03-20080702-1651-windows- x86_64, compiled mode)	
MHz	1600		start /AFFINITY /B java -Xms3700m - Xns3200m -Xmx3700m -XXaggressive - XXlargepages -XXcallprofiling - Xgc:genpar -XXthroughputCompaction - XXlazyUnlocking -	
# of Chips	4			
# of Cores	16	JVM Command		
# of Cores/Chip	4	Line		
HW Threading Enabled?	No		XXtlasize:min=4k,preferred=128k spec.jbb.JBBmain	
1		JVM Initial Heap	3700	

Procs Avail to	10	Memory (MB)		
Java	16	JVM Maximum		
Memory (MB)	49152	Heap Memory	3700	
Memory Details	8 x 4GB DDR2-667 DIMM, 8 x 2GB DDR2-667 DIMM	(MB) JVM Address bits	64	
Primary cache	32 KB + 32 KB (per core)		.\jbb.jar;	
Secondary cache	4 MB (2 x 2 MB)	JVM CLASSPATH	.\jbb_no_precompile.jar; .\check.jar;	
Other cache			Neporter.jar,	
Filesystem	NTFS		U:\JFOCKIT- idk1 6 0, 03\ire\bin\irockit\irockit1 6 0 iar:	
Disks	2 x 72GB SAS		C:\irockit-	
Other hardware			jdk1.6.0_03\jre\bin\jrockit\jmapi.jar;	
		JVM BOOTCLASSPATH	jdk1.6.0_03\jre\bin\jrockit\jmxmapi.jar, C:\jrockit- jdk1.6.0_03\jre\bin\jrockit\rmp.jar; C:\jrockit- jdk1.6.0_03\jre\bin\jrockit\latency.jar; C:\jrockit- jdk1.6.0_03\jre\lib\resources.jar; C:\jrockit-jdk1.6.0_03\jre\lib\rt.jar; C:\jrockit-jdk1.6.0_03\jre\lib\jsse.jar; C:\jrockit-jdk1.6.0_03\jre\lib\jsse.jar; C:\jrockit-jdk1.6.0_03\jre\lib\charsets.jar C:\jrockit-jdk1.6.0_03\jre\lib\charsets.jar C:\jrockit-jdk1.6.0_03\jre\lib\charsets.jar	
		OS Version	Microsoft Windows 2003 Server, x64 Enterprise Edition Service Pack 2	
		Other software		
T	est Information		AOT Compilation	
Tested by	Principled Technologies			
SPEC license #	3184		Tuning	
Test location	Durham, NC	In the local security of	settings "Lock pages in memory" was	
Test date	August 19, 2008	enabled.		
H/w available				
JVM available	2008		Notes	
OS available	2003	Disabled "Herdware !	Drefetabled "Adjacent	
Other s/w available		Cache Line Prefetch" in the BIOS.		

JVM 1 Scores:

No errors. Valid run.

Warehouse s	SPECjbb200 5 bops	Incl. in metric	SCOIES	
1	18756		54000-	
2	38371		<1254.255.645715	

3	57169		
4	65846	*	
5	65855	*	
6	65528	*	
7	64917	*	
8	64264	*	
SPECjbb200 5	(from 4 to 8)	65282 SPECjbb200 5 bops	
SPEC license # 3184 Tested			

JVM 2 Scores:



JVM 3 Scores:

No errors. Valid run.

Warehouse s	SPECjbb200 5 bops	Incl. in metric	SCOIES	
1	19312		54000-	the state of the s

2	38860	
3	57655	
4	65757	*
5	65618	*
6	64933	*
7	64328	*
8	63607	*
SPECjbb200 5	(from 4 to 8)	64848 SPECjbb200 5 bops
SPEC license	; # 3184	Teste

JVM 4 Scores:



SPECjbb2005 Version: [SPECjbb2005 1.07, March 15, 2006] Reporting page, Copyright © 2005 SPEC. All rights reserved

Principled Technologies, Inc.: SPECjbb performance and power consumption on multiprocessor Intel- and AMD-based blade servers

HP ProLiant BL685c blade server

SPECjbb2005

SPECjbb2005 bops = 361646, SPECjbb2005 bops/JVM = 90412

HP ProLiant BL685c

BEA JRockit 1.6.0_03 (build P27.5.0-5-_o_CR371811_CR374296-100684-1.6.0_03-20080702-1651-

windows-x86_64, compiled mode)



JVM run	JVM Scores
1	89762
2	90937
3	90164
4	90783
SPECjbb20 SPECjbb200	005 bops = 361646, 95 bops/JVM = 90412

Hardware		Software		
Hardware	НР	Software Vendor	BEA	
Vendor	· · · ·	Vendor URL	http://www.bea.com	
Vendor URL	http://www.hp.com		JRockit 1.6.0 03 (build P27.5.0-5-	
Model	Proliant BL685c	IVM Version	_o_CR371811_CR374296-100684- 1.6.0_03-20080702-1651-windows- x86_64, compiled mode)	
Processor	Quad-core AMD Opteron processor 8354			
MHz	2200		start /AFFINITY /B java -Xms3700m -	
# of Chips 4			XNS3200m -Xmx3700m -XXaggressive -	
# of Cores	16	JVM Command Line	Xgc:genpar -XXthroughputCompaction - XXlazyUnlocking -	
# of Cores/Chip	4			
HW Threading Enabled?	No		XXtlasize:min=4k,preferred=128k spec.jbb.JBBmain	
1	1	JVM Initial Heap	3700	

Procs Avail to		Memory (MB)		
Java		JVM Maximum	3700	
Memory (MB)	49152	Heap Memory		
Memory Details 8 x 4GB DDR2-667 DIMM, 8 x 2GB DDR2-667 DIMM		JVM Address bits	64	
Primary cache 64KBI+64KBD (per core)		JVM CLASSPATH	.\jbb.jar;	
Secondary cache 2MB (512 KB per core)			.\jbb_no_precompile.jar; .\check.jar;	
Other cache			.vreporter.jar;	
Filesystem	NTFS		U:\JFOCKIT- idk1 6 0, 03\ire\bin\irockit\irockit1 6 0 iar:	
Disks	2 x 72GB SAS	-	C:\irockit-	
Other hardware			jdk1.6.0_03\jre\bin\jrockit\jmapi.jar;	
		JVM BOOTCLASSPATH OS Version	jdk1.6.0_03\jre\bin\jrockit\jmxmapi.jar; C:\jrockit- jdk1.6.0_03\jre\bin\jrockit\rmp.jar; C:\jrockit- jdk1.6.0_03\jre\bin\jrockit\latency.jar; C:\jrockit- jdk1.6.0_03\jre\lib\resources.jar; C:\jrockit-jdk1.6.0_03\jre\lib\rt.jar; C:\jrockit-jdk1.6.0_03\jre\lib\jsse.jar; C:\jrockit-jdk1.6.0_03\jre\lib\jsse.jar; C:\jrockit-jdk1.6.0_03\jre\lib\jce.jar; C:\jrockit-jdk1.6.0_03\jre\lib\charsets.jar; C:\jrockit-jdk1.6.0_03\jre\lib\charsets.jar; C:\jrockit-jdk1.6.0_03\jre\lib\charsets.jar; C:\jrockit-jdk1.6.0_03\jre\lib\charsets.jar; C:\jrockit-jdk1.6.0_03\jre\lib\charsets.jar; C:\jrockit-jdk1.6.0_03\jre\lib\charsets.jar; C:\jrockit-jdk1.6.0_03\jre\lib\charsets.jar;	
		Other software	•	
-	act Information	·	AOT Compilation	
Tostod by			AUT Compliation	
Principled Technologies				
SPEC license # 3184		Tuning		
		In the local security settings, "Lock pages in memory" was		
	August 20, 2000	enabled.		
	2008			
	2000	_	Notes	
OS avaliable	2003			
Other s/w availa	ble			

JVM 1 Scores:

No errors. Valid run.

Warehouse s	SPECjbb200 5 bops	Incl. in metric	SCOIES	
1	21895			F
2	54544		000000	/

3	69305	
4	90738	*
5	90846	*
6	89880	*
7	88834	*
8	88510	*
SPECjbb200 5	(from 4 to 8)	89762 SPECjbb200 5 bops
SPEC license	e # 3184	Teste

JVM 2 Scores:



JVM 3 Scores:

No errors. Valid run.

2	55465	
3	73881	
4	91010	*
5	90657	*
6	90277	*
7	89531	*
8	89346	*
SPECjbb200 5	(from 4 to 8)	90164 SPECjbb200 5 bops
SPEC license	e # 3184	Teste

JVM 4 Scores:



SPECjbb2005 Version: [SPECjbb2005 1.07, March 15, 2006] Reporting page, Copyright © 2005 SPEC. All rights reserved

Principled Technologies, Inc.: SPECjbb performance and power consumption on multiprocessor Intel- and AMD-based blade servers

IBM BladeCenter LS41 blade server

SPECjbb2005

SPECjbb2005 bops = 220666, SPECjbb2005 bops/JVM = 55167

IBM LS41

JRockit 1.6.0_03 (build P27.5.0-5-_o_CR371811_CR374296-100684-1.6.0_03-20080702-1651-windows-x86_64, compiled mode)



JVM run	JVM Scores		
1	54850		
2	55369		
3	55153		
4	55294		
SPECjbb2005 bops = 220666, SPECjbb2005 bops/JVM = 55167			

	Hardware		Software
Hardware	IBM	Software Vendor	BEA
Vendor		Vendor URL	http://www.bea.com
Vendor URL	http://www.IBM.com		JRockit 1.6.0 03 (build P27.5.0-5-
Model	LS41	IVM Version	_o_CR371811_CR374296-100684-
Processor	Dual-core AMD Opteron processor 8222		1.6.0_03-20080702-1651-windows- x86_64, compiled mode)
MHz	3000		start /AFFINITY /B java -Xms3700m -
# of Chips	4		XNS3200m -XMX3700m -XXaggressive -
# of Cores	8	JVM Command	Xqc:qenpar -XXthroughputCompaction -
# of Cores/Chip	2	Line	XXIazyUnlocking -
HW Threading Enabled?	No		XXtlasize:min=4k,preferred=128k spec.jbb.JBBmain
		JVM Initial Heap	3700

Procs Avail to	8	Memory (MB)	
Java		JVM Maximum	
Memory (MB)	49152	Heap Memory	3700
Memory Details	8 x 4GB DDR2-667 DIMM, 8 x 2GB DDR2-667 DIMM	JVM Address bits	64
Primary cache	64KBI+64KBD (per core)		.\jbb.jar;
Secondary cache	2 MB (1MB per core)	JVM CLASSPATH	.\jbb_no_precompile.jar; .\check.jar;
Other cache			Orbino alvit
Filesystem	NTFS		C:\JFOCKIT- idk1 6 0, 03\ire\bin\irockit\irockit1 6 0 iar:
Disks	2 x 73GB SAS		C:\irockit-
Other hardware			jdk1.6.0_03\jre\bin\jrockit\jmapi.jar;
		JVM BOOTCLASSPATH OS Version	jdk1.6.0_03\jre\bin\jrockit\jmxmapi.jar; C:\jrockit- jdk1.6.0_03\jre\bin\jrockit\rmp.jar; C:\jrockit- jdk1.6.0_03\jre\bin\jrockit\latency.jar; C:\jrockit- jdk1.6.0_03\jre\lib\resources.jar; C:\jrockit-jdk1.6.0_03\jre\lib\rt.jar; C:\jrockit- jdk1.6.0_03\jre\lib\sunrsasign.jar; C:\jrockit-jdk1.6.0_03\jre\lib\jsse.jar; C:\jrockit-jdk1.6.0_03\jre\lib\jsse.jar; C:\jrockit-jdk1.6.0_03\jre\lib\jse.jar; C:\jrockit-jdk1.6.0_03\jre\lib\charsets.jar; C:\jrockit-jdk1.6.0_03\jre\lib\charsets.jar; C:\jrockit-jdk1.6.0_03\jre\lib\charsets.jar; C:\jrockit-jdk1.6.0_03\jre\lib\charsets.jar; C:\jrockit-jdk1.6.0_03\jre\lib\charsets.jar; C:\jrockit-jdk1.6.0_03\jre\lib\charsets.jar;
		Other software	
T	est Information		AOT Compilation
Tested by	Principled Technologies	<u> </u>	
SPEC license #	3184		Tuning
Test location	Durham, NC	In the local security	settings, "Lock pages in memory" was
Test date	August 18, 2008	enabled.	
H/w available			
JVM available	2008		Notes
OS available	2003		
Other s/w availa	ble		

JVM 1 Scores:

No errors. Valid run.

Warehouse s	SPECjbb200 5 bops	Incl. in metric	SCOLES	
1	22271		55000-	
2	54936	*	49000	1

3	54926	*
4	54687	*
5	54499	
6	54424	
7	54112	
8	54022	
SPECjbb200 5	(from 2 to 4)	54850 SPECjbb200 5 bops
SPEC license # 3184		Teste

JVM 2 Scores:



JVM 3 Scores:

No errors. Valid run.

Warehouse s	SPECjbb200 5 bops	Incl. in metric	SCOIES	
1	21338		- 38000 T	

2	55197	*
3	55224	*
4	55038	*
5	54497	
6	54445	
7	54262	
8	53790	
SPECjbb200 5	(from 2 to 4)	55153 SPECjbb200 5 bops
SPEC license # 3184		Teste

JVM 4 Scores:



No errors. Valid run.

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Principled Technologies, Inc.: SPECjbb performance and power consumption on multiprocessor Intel- and AMD-based blade servers



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