



SPECjbb2005 performance and power consumption on Sun Solaris 10 multi-processor AMD-based blade servers from Dell, HP, and IBM

Executive summary

Dell™ Inc. (Dell) commissioned Principled Technologies® (PT) to measure the SPECjbb®2005 performance of three quad-socket blade servers running Sun* Solaris* 10. We tested the following single blades in their respective enclosures:

- Dell PowerEdge™ M905
- HP* ProLiant* BL685c G5
- IBM* BladeCenter* LS42

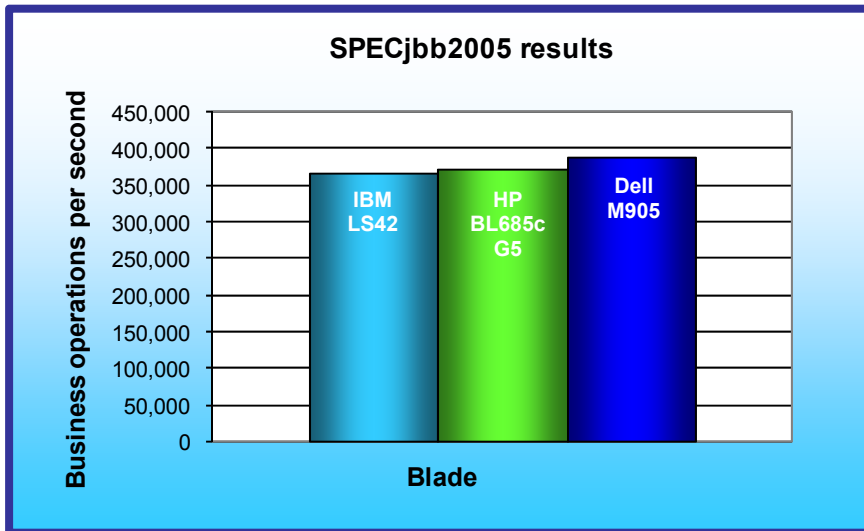
Each blade used the same processors: Quad-Core AMD Opteron processor 8356, a 2.30-GHz, 75-watt part. Dell provided the Dell PowerEdge M905 and its enclosure. PT received the remainder of the equipment directly from third-party hardware resellers.

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.

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.

KEY FINDINGS

- The Dell PowerEdge M905 blade server delivered a 4.3 percent performance increase over the HP ProLiant BL685c G5 and a 5.5 percent performance increase over the IBM BladeCenter LS42. (See Figure 1.)
- The Dell PowerEdge M905 blade server delivered 37.6 percent more performance/watt than the HP ProLiant BL685c G5 and 46.7 percent more performance/watt than the IBM BladeCenter LS42. (See Figure 2.)



The Dell PowerEdge M905 blade server produced the highest results: 388,373 bops (business operations per second). It delivered a 4.3 percent performance increase over the HP ProLiant BL685c G5 server, which achieved 372,351 bops, and a 5.5 percent increase over the IBM BladeCenter LS42, which achieved 368,113 bops.

Figure 2 illustrates the performance/watt for each of the three blade servers. In this chart, we have normalized the results for each workload to those of the blade server with the lowest performance/watt result.

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

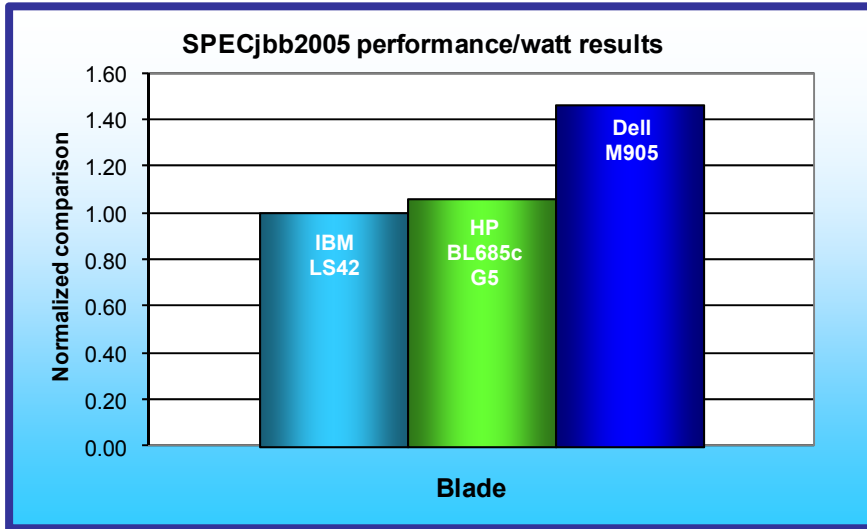


Figure 2: Performance/watt results for the test blade servers normalized to that of the IBM LS42. Higher numbers are better.

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 2 illustrates, the Dell PowerEdge M905 blade server delivered 37.6 percent more performance/watt than the HP ProLiant BL685c G5 and 46.7 percent more performance/watt than the IBM BladeCenter LS42.

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.

Figure 5 shows the median SPECjbb2005 results for all three 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	HP ProLiant BL685c G5	IBM BladeCenter LS42
JVM 1	101,453	94,186	90,957
JVM 2	102,010	94,081	92,262
JVM 3	92,936	92,834	91,671
JVM 4	91,974	91,250	93,223
Total score	388,373	372,351	368,113

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

Figure 6 shows the results by warehouse for the Dell PowerEdge M905 blade server for all three runs. Run 3 produced the median results.

Dell PowerEdge M905			
	Run 1	Run 2	Run 3
Warehouse	JVM 1		
1	29,773	29,399	29,508
2	60,941	59,397	59,855
3	86,437	84,412	85,475
4	105,565	102,769	103,712
5	103,236	100,617	101,372
6	102,855	101,059	101,066
7	102,971	101,180	100,560
8	102,139	100,877	100,557
Score	103,353	101,300	101,453
Warehouse	JVM 2		
1	29,590	29,533	29,323
2	59,515	59,743	59,587
3	85,061	85,334	85,514
4	103,331	103,458	104,108
5	100,881	101,223	101,759
6	100,096	100,527	101,715
7	191,736	101,619	102,635
8	100,970	101,224	99,832
Score	101,403	101,610	102,010
Warehouse	JVM 3		
1	27,820	27,460	27,694
2	55,630	55,132	55,839
3	78,277	78,710	78,530
4	93,922	94,185	94,734
5	91,746	92,052	92,416
6	90,910	91,535	92,133
7	92,553	91,432	92,842
8	91,774	91,439	92,558
Score	92,181	92,129	92,936
Warehouse	JVM 4		
1	27,938	27,775	27,597
2	55,527	55,986	55,728
3	78,283	78,382	78,485
4	93,910	94,756	94,238
5	91,799	92,285	91,746
6	91,245	91,505	91,178
7	91,560	92,000	91,878
8	91,561	91,796	90,830
Score	92,015	92,468	91,974
Total score	388,952	387,507	388,373

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

Figure 7 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	28,190	28,142	28,189
2	56,330	56,500	56,939
3	79,122	79,179	80,125
4	95,556	95,309	96,663
5	93,289	94,388	94,128
6	92,505	93,540	93,484
7	92,464	92,748	93,838
8	93,080	93,109	92,818
Score	93,379	93,819	94,186
Warehouse	JVM 2		
1	27,936	28,051	27,858
2	56,162	57,117	56,751
3	78,713	80,236	79,899
4	95,069	96,895	96,341
5	92,925	94,390	93,761
6	92,532	93,919	94,264
7	92,266	92,752	93,246
8	92,601	93,360	92,793
Score	93,078	94,263	94,081
Warehouse	JVM 3		
1	27,734	27,849	27,810
2	55,489	55,736	56,248
3	78,056	78,218	78,597
4	93,882	94,093	95,263
5	91,623	91,771	92,546
6	91,433	91,297	91,995
7	91,183	91,152	92,734
8	91,839	90,836	91,629
Score	91,992	91,830	92,834
Warehouse	JVM 4		
1	27,936	27,855	27,826
2	55,646	55,893	55,640
3	78,109	78,380	77,588
4	93,618	94,168	93,418
5	91,258	93,316	91,021
6	90,316	91,691	90,697
7	90,442	93,046	90,641
8	90,572	92,217	90,474
Score	91,241	92,888	91,250
Total score	369,690	372,800	372,351

Figure 7: SPECjbb2005 results for the HP ProLiant BL685c G5blade server. Higher numbers are better.

Figure 8 shows the results by warehouse for the IBM BladeCenter LS42 blade server for all three runs. Run 3 produced the median results.

IBM BladeCenter LS42			
	Run 1	Run 2	Run 3
Warehouse	JVM 1		
1	27,674	27,228	27,517
2	55,860	54,780	54,887
3	78,165	77,527	77,554
4	94,142	93,089	93,220
5	92,026	90,950	90,803
6	91,643	90,352	90,358
7	91,459	90,064	90,096
8	91,859	90,416	90,308
Score	92,226	90,974	90,957
Warehouse	JVM 2		
1	27,611	27,663	27,748
2	55,619	56,097	55,426
3	78,356	78,663	78,273
4	94,641	95,046	94,052
5	92,366	92,378	93,161
6	91,986	91,712	91,301
7	91,816	92,450	91,232
8	92,370	91,179	91,566
Score	92,636	92,553	92,262
Warehouse	JVM 3		
1	27,447	27,238	27,559
2	55,401	54,158	55,134
3	78,916	76,875	78,155
4	95,099	92,612	94,116
5	92,993	90,350	91,852
6	92,257	89,234	91,523
7	92,394	89,523	90,261
8	92,419	88,973	90,602
Score	93,033	90,140	91,671
Warehouse	JVM 4		
1	27,485	27,407	27,739
2	55,157	55,123	56,204
3	78,152	77,647	78,844
4	94,132	92,926	95,435
5	93,535	90,826	93,381
6	91,805	90,227	92,563
7	91,813	91,322	92,619
8	92,331	90,765	92,116
Score	92,723	91,213	93,223
Total score	370,618	364,880	368,113

Figure 8: SPECjbb2005 results for the IBM BladeCenter LS42 blade server. Higher numbers are better.

Figure 9 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	484.1	716.2
HP ProLiant BL685c G5	707.1	945.0
IBM BladeCenter LS42	856.2	995.9

Figure 9: 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 10 summarizes some key aspects of the configurations of the three server systems; Appendix A provides detailed configuration information.

Server	Dell PowerEdge M905	HP ProLiant BL685c G5	IBM BladeCenter LS42
Enclosure	Dell PowerEdge M1000e	HP BladeSystem c-Class	IBM BladeCenter H Type 8852
Processor frequency	2.3 GHz	2.3 GHz	2.3 GHz
Front-side bus frequency	2,000 MHz HyperTransport	2,000 MHz HyperTransport	2,000 MHz HyperTransport
Number of processor packages	4	4	4
Number of cores per processor package	4	4	4
Number of hardware threads per core	1	1	1
Motherboard	Dell 0D413F	HP ProLiant BL685c	IBM BladeCenter LS42 7902EDU
Chipset	NVIDIA* nForce Pro 3600	NVIDIA nForce Pro 2050	ServerWorks* HT2000
RAM (32 GB in each)	32 GB (16 x 2 GB) PC2-5300	32 GB (16 x 2 GB) PC2-5300	32 GB (8 x 4 GB) PC2-5300
Hard drive	Seagate* ST973451SS	HP DH072BB978	Seagate ST973451SS

Figure 10: Key aspects of the configurations of the three server systems.

We began by installing a fresh copy of Sun Solaris 10 10/08 on the blade servers, using default for all options, except language, which we chose English, and location, which we chose America (Eastern). For testing, to provide better performance, we did not use the graphical user interface (GUI).

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 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 /export/home/root on the server's hard disk.

SPECjbb2005 requires a Java Virtual Machine on the system under test. We used the Sun Java SE 6 Run Environment (Build 1.6.0_06-p-b04), Java HotSpot Server VM (Build 13.0-b04, mixed mode) for this testing and left the default installation settings. We installed Java in /export/home/root directory.

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 shell script, which we placed in the root SPECjbb2005 directory, to issue the Java run command to launch the benchmark. We changed to the SPECjbb2005 root directory and executed the shell script from that directory to start testing. Figure 11 shows the contents of the file used on all servers.

We used the Solaris command `psrinfo -pv` to get system processor information prior to starting testing. This showed us the processor assignments, which we used to set the processor affinity properly. We did this on each system and then set the `psrset` to assign grouping of cores to VMs. The core numbers differed among the systems, so the `psrset -c` commands differ slightly among the three blade servers; we set it to provide maximum performance on all servers.

```
File Edit View Insert Format Help
[Icons]
date
parset -d 1 2 3 4 5 6 7 8
parset -r 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
parset -c 1 5 9 13
parset -c 2 6 10 14
parset -c 3 7 11 15

/export/home/root/jdk1.6.0_06/jre/bin/java -fullversion

JVM=4

echo Starting Controller
/export/home/root/jdk1.6.0_06/jre/bin/java -cp jbb.jar:check.jar -
Xms256m -Xmx256m spec.jbb.Controller -propfile SPECjbb.props &
sleep 5

I=1
echo Starting instance $I
parset -e $I prioctl -c FX -t 250 -e /export/home/root/jdk1.6.0_
06/jre/bin/java -Xmx3350m -Xms3350m -Xmn2600m -XX:+UseParallelOldGC -
XX:+AggressiveOpts -XX:AllocatePrefetchStyle=2 -XX:ParallelGCThreads=2
-cp jbb.jar:check.jar spec.jbb.JBBmain -propfile SPECjbb.props -id $I >
multi.$I &
sleep 5

I=2
echo Starting instance $I
parset -e $I prioctl -c FX -t 250 -e /export/home/root/jdk1.6.0_
06/jre/bin/java -Xmx3350m -Xms3350m -Xmn2600m -XX:+UseParallelOldGC -
XX:+AggressiveOpts -XX:AllocatePrefetchStyle=2 -XX:ParallelGCThreads=2
-cp jbb.jar:check.jar spec.jbb.JBBmain -propfile SPECjbb.props -id $I >
multi.$I &
sleep 5

I=3
echo Starting instance $I
parset -e $I prioctl -c FX -t 250 -e /export/home/root/jdk1.6.0_
06/jre/bin/java -Xmx3350m -Xms3350m -Xmn2600m -XX:+UseParallelOldGC -
XX:+AggressiveOpts -XX:AllocatePrefetchStyle=2 -XX:ParallelGCThreads=2
-cp jbb.jar:check.jar spec.jbb.JBBmain -propfile SPECjbb.props -id $I >
multi.$I &
sleep 5

I=4
echo Starting instance $I
prioctl -c FX -t 250 -e /export/home/root/jdk1.6.0_06/jre/bin/java -
Xmx3350m -Xms3350m -Xmn2600m -XX:+UseParallelOldGC -XX:+AggressiveOpts
-XX:AllocatePrefetchStyle=2 -XX:ParallelGCThreads=2 -cp
jbb.jar:check.jar spec.jbb.JBBmain -propfile SPECjbb.props -id $I >
multi.$I &
sleep 5

date

For Help, press F1
```

Figure 11: The text of the script file we used to execute the SPECjbb2005 benchmark on all blade servers.

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

- `-Xms3350m` 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 3,350 MB.
- `-Xmn2600m` sets the JVM nursery size.
- `-Xmx3350m` sets the maximum heap size.
- `-XX:+UseParallelOldGC` tells Java to use parallel garbage collection
- `-XX:+AggressiveOpts` enables performance compiler optimizations
- `-XX:AllocatePrefetchStyle=2` sets code style prefetch instructions
- `-XX:ParallelGCThreads=2` sets number of GC threads

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 12: 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 BL685c	IBM BladeCenter LS42
Enclosure			
Enclosure	Dell PowerEdge M1000e	HP BladeSystem c-Class	IBM BladeCenter H Type 8852
General processor setup			
Number of processor packages	4	4	4
Number of cores per processor package	4	4	4
Number of hardware threads per core	1	1	1
System Power Management Policy	Always on	Always on	Always on
CPU			
Vendor	AMD	AMD	AMD
Name	Opteron 8356	Opteron 8356	Opteron 8356
Stepping	3	3	3
Socket type	Socket F (1207)	Socket F (1207)	Socket F (1207)
Core frequency (GHz)	2.3	2.3	2.3
Front-side bus frequency	2,000 MHz HyperTransport Technology	2,000 MHz HyperTransport Technology	2,000 MHz HyperTransport Technology
L1 cache	64 KB + 64 KB (per core)	64 KB + 64 KB (per core)	64 KB + 64 KB (per core)
L2 cache	2 MB (512 KB per core)	2 MB (512 KB per core)	2 MB (512 KB per core)
Thermal design power (TDP, in watts)	75W	75W	75W
Platform			
Vendor and model no.	Dell 0D413F	HP ProLiant BL685c	IBM BladeCenter LS42 7902EDU
Motherboard model no.	800VTG1	PU84MK0642	44X1607 LYR1
Motherboard chipset	NVIDIA nForce Pro 3600	NVIDIA CK8-04,IO-04	ServerWorks HT2000
BIOS name and version	Dell 0.2.1 (6/20/2008)	HP A08 (5/29/2008)	IBM L8E123AUS-1.00 (8/15/2008)
BIOS settings	Default	Default	Default
Memory modules			
Total RAM in system	32 GB	32 GB	32 GB

Servers	Dell PowerEdge M905	HP ProLiant BL685c	IBM BladeCenter LS42
Vendor and model no.	Samsung* M393T5750EZA-CE6	2 x Hynix* HYMP525P72CP4-Y5 AB-A; 2 x Hynix HYMP525P72CP4-Y5 AB-C 10 x Samsung M393T5750CZA-CE6Q0; 2 x Nanya NT2GT72U4NA2BV-3C	ELPIDA* EBE41AF4A1QB-6E-E
Type	PC2-5300 DDR2	PC2-5300 DDR2	PC2-5300 DDR2
Speed (MHz)	667	667	667
Speed in the system currently running @ (MHz)	667	667	667
Timing/Latency (tCL-tRCD-iRP-tRASmin)	5-5-5-15	5-5-5-15	5-5-5-15
Size	32 GB	32 GB	32 GB
Number of RAM modules	16 x 2 GB	16 x 2 GB	8 x 4 GB
Chip organization	Double-sided	Double-sided	Double-sided
Hard disk			
Vendor and model no.	Seagate ST973451SS	HP DH072BB978	Seagate ST973451SS
Number of disks in system	2	2	2
Size	73 GB	72 GB	73 GB
Buffer size	16 MB	16 MB	16 MB
RPM	15,000	15,000	15,000
Type	SAS	SAS	SAS
Controller	Dell CERC 6/I Integrated RAID	HP Smart Array E200I	LSI SAS 3000 Series
Driver version	Dell 2.14.0.64 (6/6/2007)	HP 6.8.0.64 (6/21/2007)	LSI 1.27.3.0 (4/8/2008)
Operating system			
Name	Sun Solaris 10 10/08	Sun Solaris 10 10/08	Sun Solaris 10 10/08
File system	UFS	UFS	UFS
Kernel	SunOS 5.10 Generic_137138-09	SunOS 5.10 Generic_137138-09	SunOS 5.10 Generic_137138-09
Language	English	English	English
Graphics			
Vendor and model no.	ATI ES1000	Standard VGA Graphics Adapter	Standard VGA Graphics Adapter
Type	Integrated	Integrated	Integrated
Memory size	32 MB	32 MB	32 MB
Network card/ subsystem			
Vendor and model no.	4 x Broadcom* BCM57095 NetXtreme* II GigE	2 x HP NC326i PCIe Dual Port Gigabit; 2 x HP NC373i Multifunction Gigabit	4 x Broadcom BCM5709S NetXtreme II GigE
Type	Integrated	Integrated	Integrated

Figure 13: Detailed configuration information about the test server systems.

Appendix C – SPECjbb2005 output

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

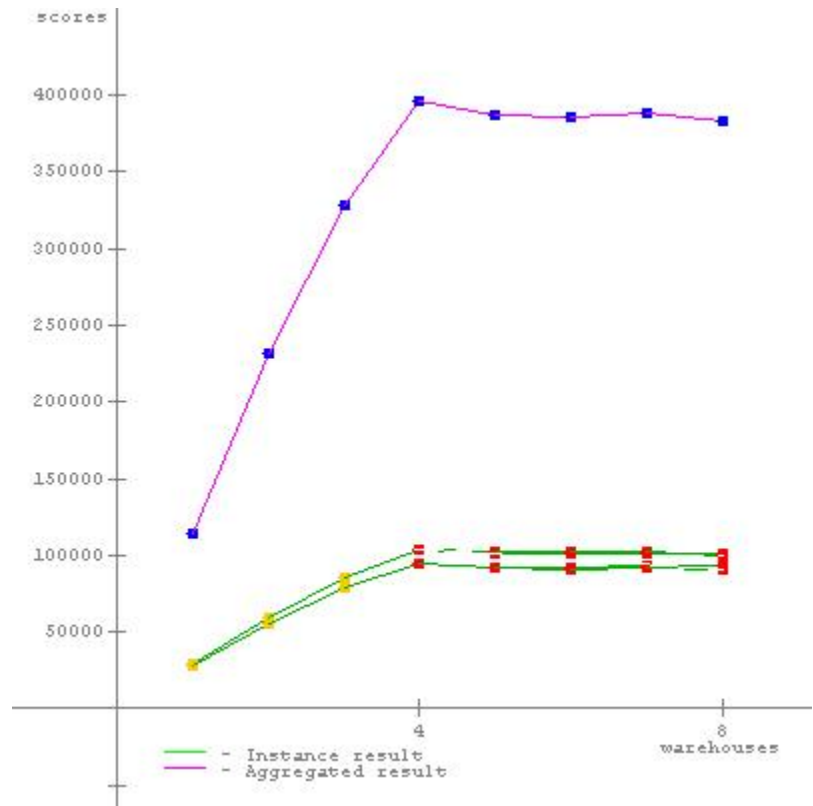
Dell PowerEdge M905 blade server

SPECjbb2005

SPECjbb2005 bops = 388373, SPECjbb2005 bops/JVM = 97093

Dell PowerEdge
M905
Sun Java SE 6

JVM run	JVM Scores
1	101453
2	102010
3	92936
4	91974
SPECjbb2005 bops = 388373, SPECjbb2005 bops/JVM = 97093	



Hardware	
Hardware Vendor	Dell
Vendor URL	http://www.dell.com
Model	PowerEdge M905
Processor	AMD Opteron 8356
MHz	2300
# of Chips	4
# of Cores	16
# of Cores/Chip	4

Software	
Software Vendor	Sun
Vendor URL	http://www.sun.com
JVM Version	Java SE 6
JVM Command Line	<pre>psrset -e \$I priocntl -c FX -t 250 -e /export/home/root/jdk1.6.0_06/jre/bin/java -Xmx3350m -Xms3350m -Xmn2600m - XX:+UseParallelOldGC -XX:+AggressiveOpts - XX:AllocatePrefetchStyle=2 - XX:ParallelGCThreads=2 -cp jbb.jar:check.jar spec.jbb.JBBmain - propfile SPECjbb.props</pre>

HW Threading Enabled?	No
Procs Avail to Java	16
Memory (MB)	32768
Memory Details	(16 x 2GB)
Primary cache	64KB + 64KB (per core)
Secondary cache	2MB (512KB per core)
Other cache	
Filesystem	UFS
Disks	2 x 73GB SAS
Other hardware	

JVM Initial Heap Memory (MB)	3350
JVM Maximum Heap Memory (MB)	3350
JVM Address bits	32
JVM CLASSPATH	jbb.jar: check.jar
JVM BOOTCLASSPATH	/export/home/root/jdk1.6.0_06/jre/lib/resources.jar: /export/home/root/jdk1.6.0_06/jre/lib/rt.jar: /export/home/root/jdk1.6.0_06/jre/lib/sunrsasign.jar: /export/home/root/jdk1.6.0_06/jre/lib/jsse.jar: /export/home/root/jdk1.6.0_06/jre/lib/jce.jar: /export/home/root/jdk1.6.0_06/jre/lib/charsets.jar: /export/home/root/jdk1.6.0_06/jre/classes
OS Version	Solaris 10 10/08
Other software	

Test Information	
Tested by	Principled Technologies
SPEC license #	3184
Test location	RTP, NC
Test date	Jan 14, 2009
H/w available	
JVM available	
OS available	
Other s/w available	

AOT Compilation
Tuning
Notes

JVM 1 Scores:

No errors. Valid run.

Warehouses	SPECjbb2005 bops	Incl. in metric
1	29508	
2	59855	
3	85475	
4	103712	*
5	101372	*
6	101066	*
7	100560	*



8	100557	*
SPECjbb2005	(from 4 to 8)	101453 SPECjbb2005 bops
SPEC license # 3184		Tested by: Principled Technologies Test date: Jan 14, 2009

JVM 2 Scores:

No errors. Valid run.

Warehouses	SPECjbb2005 bops	Incl. in metric
1	29323	
2	59587	
3	85514	
4	104108	*
5	101759	*
6	101715	*
7	102635	*
8	99832	*
SPECjbb2005	(from 4 to 8)	102010 SPECjbb2005 bops

Warehouse	Score	Included in score calculation
1	29323	No
2	59587	No
3	85514	No
4	104108	Yes
5	101759	Yes
6	101715	Yes
7	102635	Yes
8	99832	Yes

SPEC license # 3184	Tested by: Principled Technologies	Test date: Jan 14, 2009
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JVM 3 Scores:

No errors. Valid run.

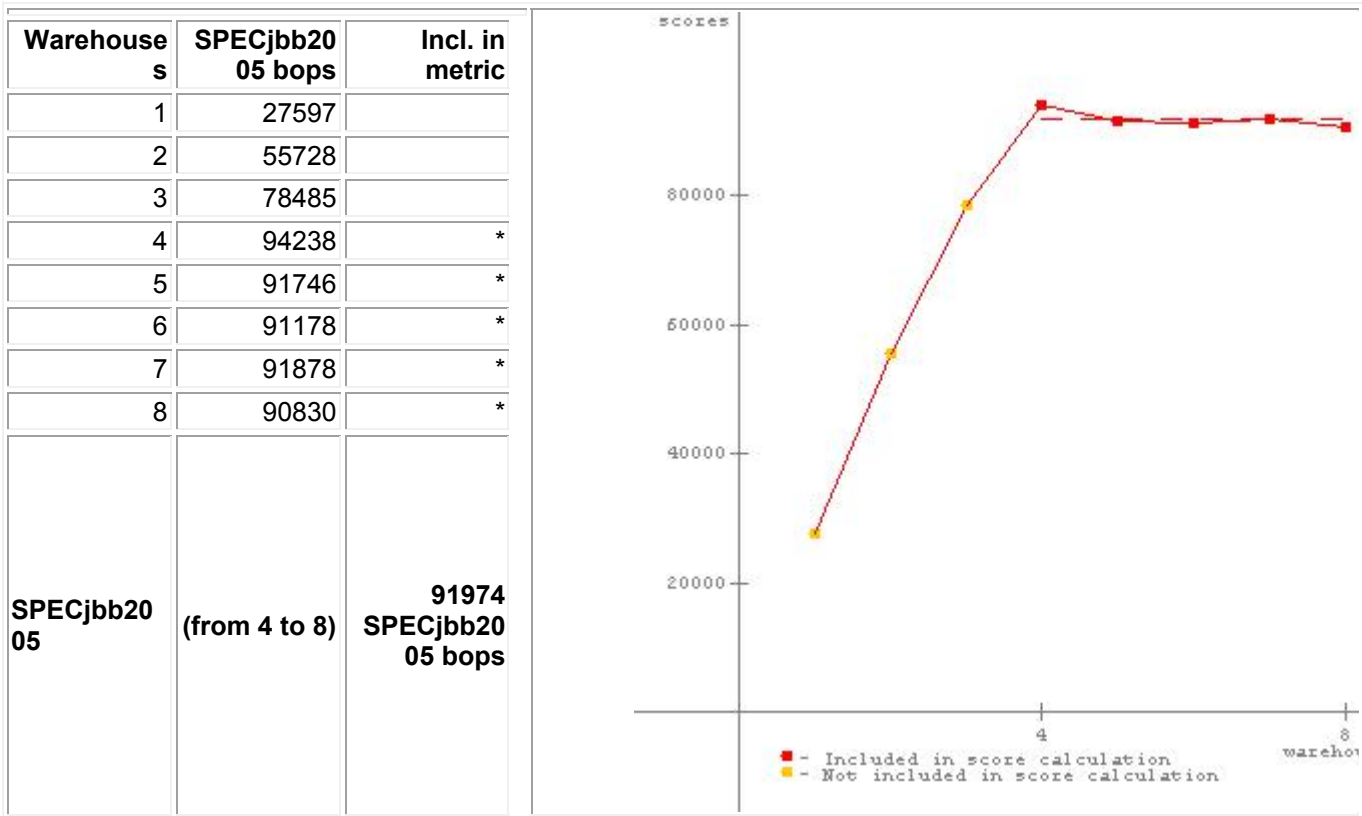
Warehouses	SPECjbb2005 bops	Incl. in metric
1	27694	
2	55839	
3	78530	
4	94734	*
5	92416	*
6	92133	*

Warehouse	Score	Included in score calculation
1	27694	No
2	55839	No
3	78530	No
4	94734	Yes
5	92416	Yes
6	92133	Yes

7	92842	*	
8	92558	*	
SPECjbb2005	(from 4 to 8)	92936 SPECjbb2005 bops	
SPEC license # 3184		Tested by: Principled Technologies	Test date: Jan 14, 2009

JVM 4 Scores:

No errors. Valid run.



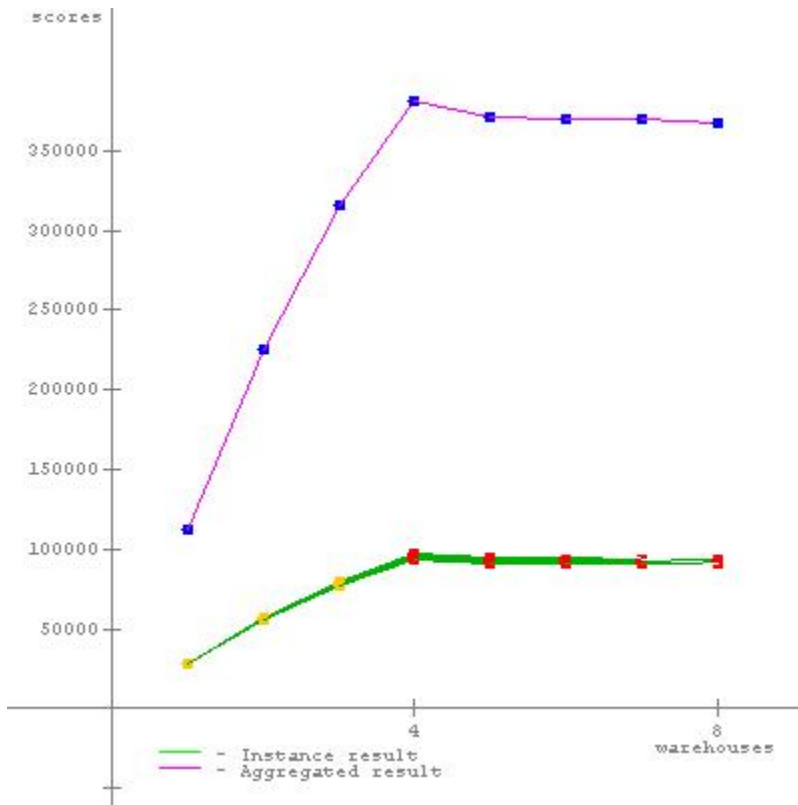
SPEC license # 3184	Tested by: Principled Technologies	Test date: Jan 14, 2009
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*SPECjbb2005 Version: [SPECjbb2005 1.07, March 15, 2006]
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SPECjbb2005 **SPECjbb2005 bops = 372351, SPECjbb2005 bops/JVM = 93088**

HP ProLiant
BL685c
Sun Java SE 6

JVM run	JVM Scores
1	94186
2	94081
3	92834
4	91250
SPECjbb2005 bops = 372351, SPECjbb2005 bops/JVM = 93088	



Hardware	
Hardware Vendor	HP
Vendor URL	http://www.hp.com
Model	ProLiant BL685c
Processor	AMD Opteron 8356
MHz	2300
# of Chips	4
# of Cores	16
# of Cores/Chip	4
HW Threading	No

Software	
Software Vendor	Sun
Vendor URL	http://www.sun.com
JVM Version	Java SE 6
JVM Command Line	<pre> psrset -e \$I priocntl -c FX -t 250 -e /export/home/root/jdk1.6.0_06/jre/bin/java -Xmx3350m -Xms3350m -Xmn2600m - XX:+UseParallelOldGC -XX:+AggressiveOpts - XX:AllocatePrefetchStyle=2 - XX:ParallelGCThreads=2 -cp jbb.jar:check.jar spec.jbb.JBBmain - propfile SPECjbb.props </pre>
JVM Initial Heap Memory (MB)	3350
JVM Maximum	3350

Enabled?	
Procs Avail to Java	16
Memory (MB)	32768
Memory Details	(16 x 2GB)
Primary cache	64KB + 64KB (per core)
Secondary cache	2MB (512KB per core)
Other cache	
Filesystem	UFS
Disks	2 x 72GB SAS
Other hardware	

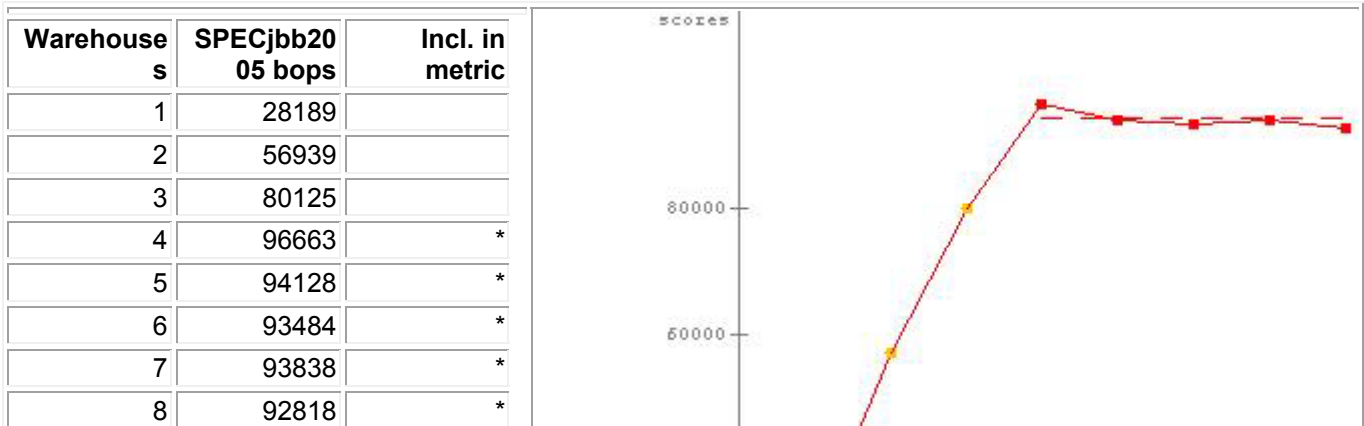
Heap Memory (MB)	
JVM Address bits	32
JVM CLASSPATH	jbb.jar: check.jar
JVM BOOTCLASSPATH	/export/home/root/jdk1.6.0_06/jre/lib/resources.jar: /export/home/root/jdk1.6.0_06/jre/lib/rt.jar: /export/home/root/jdk1.6.0_06/jre/lib/sunrsasign.jar: /export/home/root/jdk1.6.0_06/jre/lib/jsse.jar: /export/home/root/jdk1.6.0_06/jre/lib/jce.jar: /export/home/root/jdk1.6.0_06/jre/lib/charsets.jar: /export/home/root/jdk1.6.0_06/jre/classes
OS Version	Solaris 10 10/08
Other software	

Test Information	
Tested by	Principled Technologies
SPEC license #	3184
Test location	RTP, NC
Test date	Jan 14, 2009
H/w available	
JVM available	
OS available	
Other s/w available	

AOT Compilation
Tuning
Notes

JVM 1 Scores:

No errors. Valid run.

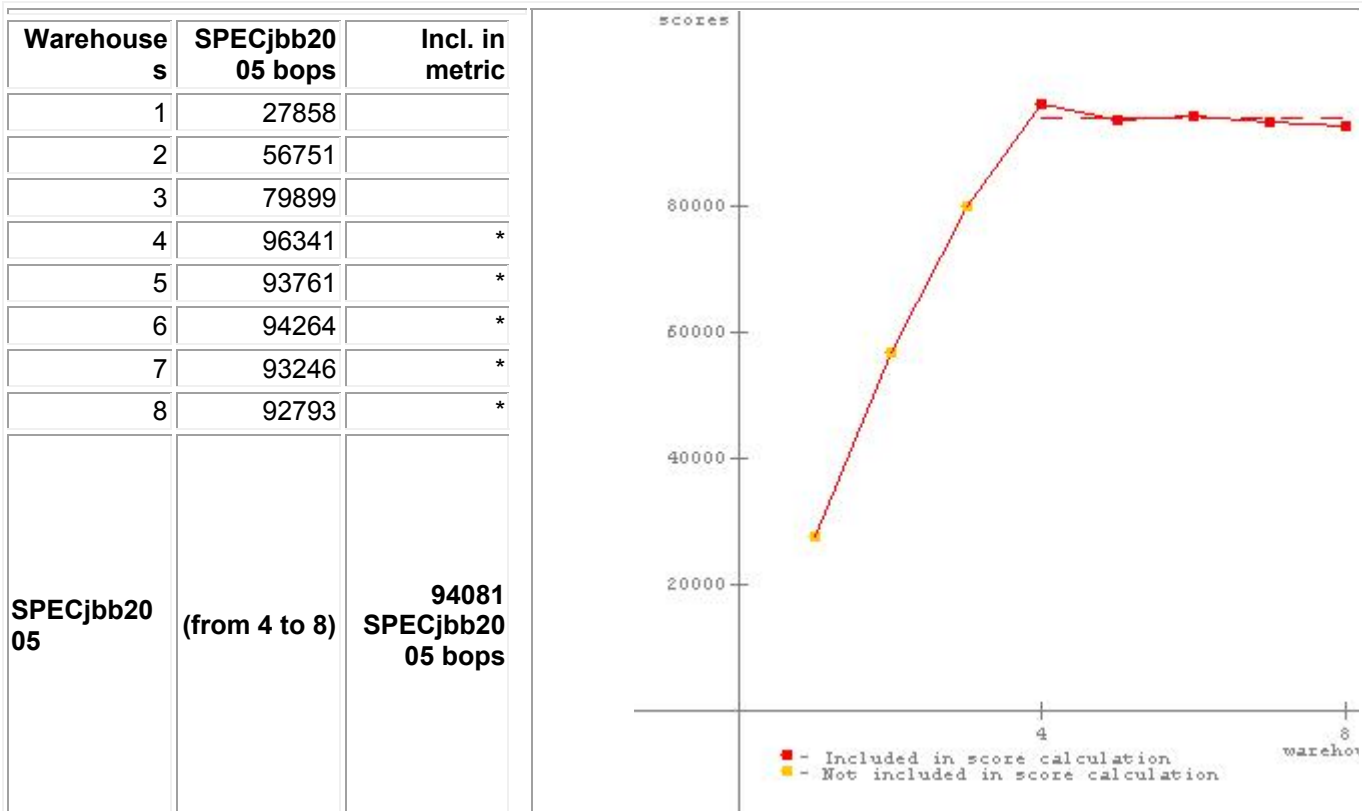


SPECjbb2005	(from 4 to 8)	94186 SPECjbb2005 bops
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SPEC license # 3184 Tested by: Principled Technologies Test date: Jan 14, 2009

JVM 2 Scores:

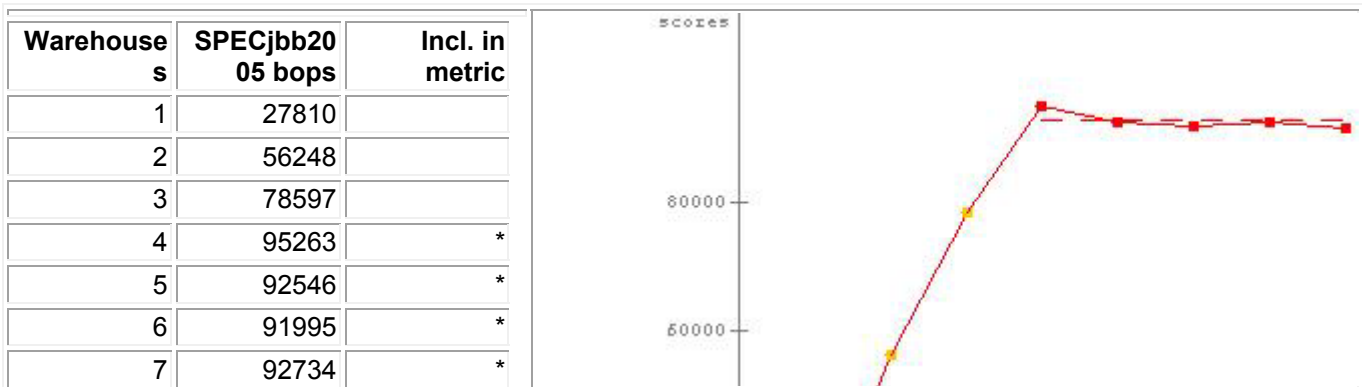
No errors. Valid run.



SPEC license # 3184 Tested by: Principled Technologies Test date: Jan 14, 2009

JVM 3 Scores:

No errors. Valid run.



8	91629	*	
SPECjbb2005	(from 4 to 8)	92834 SPECjbb2005 bops	
SPEC license # 3184		Tested by: Principled Technologies	Test date: Jan 14, 2009

JVM 4 Scores:

No errors. Valid run.

Warehouses	SPECjbb2005 bops	Incl. in metric
1	27826	
2	55640	
3	77588	
4	93418	*
5	91021	*
6	90697	*
7	90641	*
8	90474	*
SPECjbb2005	(from 4 to 8)	91250 SPECjbb2005 bops

Warehouse	Score	Included in Score Calculation
1	27826	No
2	55640	No
3	77588	No
4	93418	Yes
5	91021	Yes
6	90697	Yes
7	90641	Yes
8	90474	Yes

SPEC license # 3184	Tested by: Principled Technologies	Test date: Jan 14, 2009
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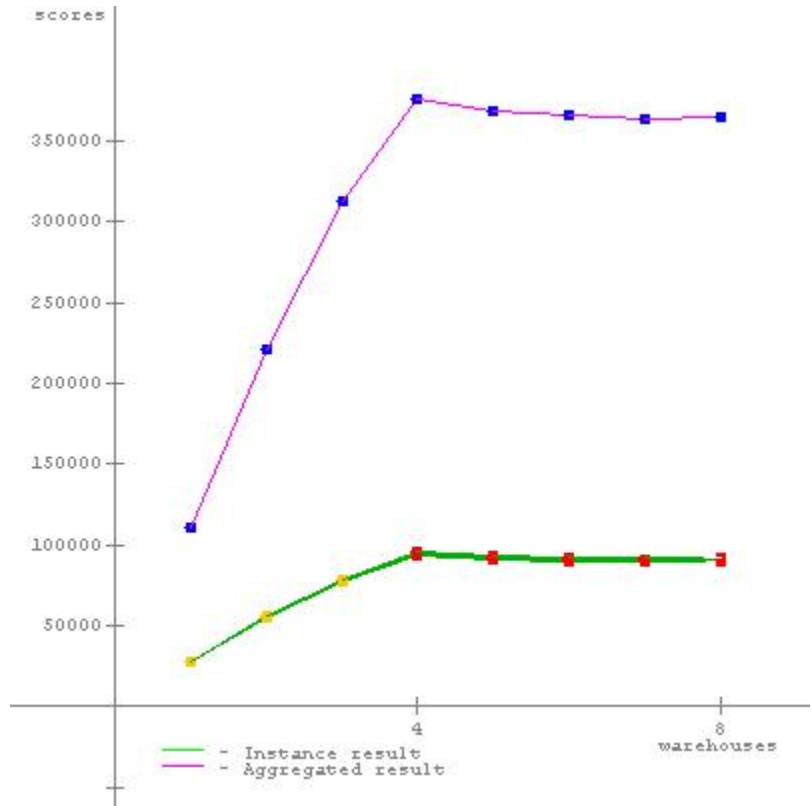
SPECjbb2005 Version: [SPECjbb2005 1.07, March 15, 2006]
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SPECjbb2005

SPECjbb2005 bops = 368113, SPECjbb2005 bops/JVM = 92028

IBM BladeCenter
LS42
Sun Java SE 6

JVM run	JVM Scores
1	90957
2	92262
3	91671
4	93223
SPECjbb2005 bops = 368113, SPECjbb2005 bops/JVM = 92028	



Hardware	
Hardware Vendor	IBM
Vendor URL	http://www.ibm.com
Model	BladeCenter LS42
Processor	AMD Opteron 8356
MHz	2300
# of Chips	4
# of Cores	16
# of Cores/Chip	4
HW Threading	No

Software	
Software Vendor	Sun
Vendor URL	http://www.sun.com
JVM Version	Java SE 6
JVM Command Line	psrset -e \$I priocntl -c FX -t 250 -e /export/home/root/jdk1.6.0_06/jre/bin/java -Xmx3350m -Xms3350m -Xmn2600m -XX:+UseParallelOldGC -XX:+AggressiveOpts -XX:AllocatePrefetchStyle=2 -XX:ParallelGCThreads=2 -cp jbb.jar:check.jar spec.jbb.JBBmain -profile SPECjbb.props
JVM Initial Heap Memory (MB)	3350
JVM Maximum	3350

Enabled?	
Procs Avail to Java	16
Memory (MB)	32768
Memory Details	(8 x 4GB)
Primary cache	64KB + 64KB (per core)
Secondary cache	2MB (512KB per core)
Other cache	
Filesystem	UFS
Disks	2 x 73GB SAS
Other hardware	

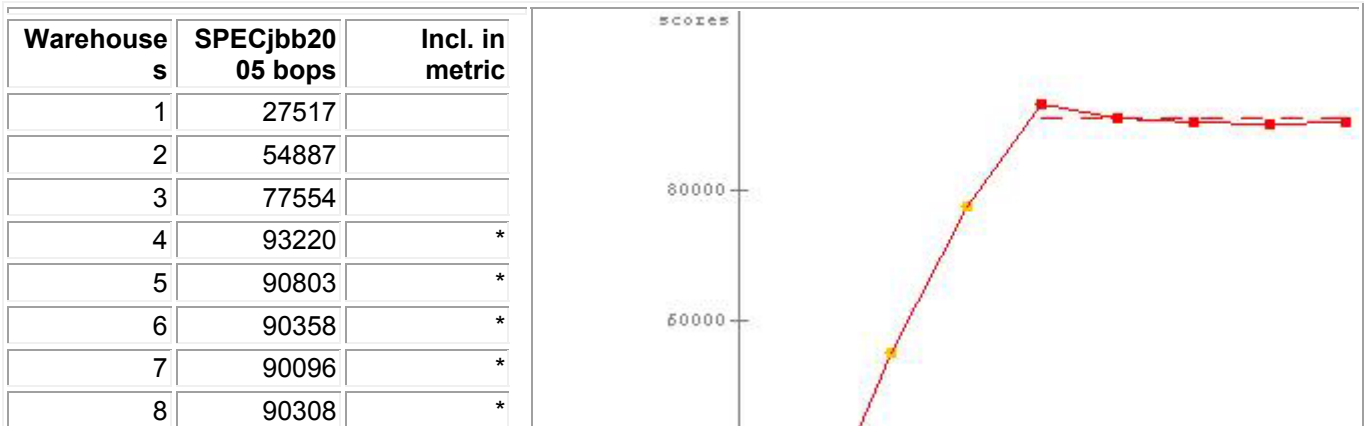
Heap Memory (MB)	
JVM Address bits	32
JVM CLASSPATH	jbb.jar: check.jar
JVM BOOTCLASSPATH	/export/home/root/jdk1.6.0_06/jre/lib/resources.jar: /export/home/root/jdk1.6.0_06/jre/lib/rt.jar: /export/home/root/jdk1.6.0_06/jre/lib/sunrsasign.jar: /export/home/root/jdk1.6.0_06/jre/lib/jsse.jar: /export/home/root/jdk1.6.0_06/jre/lib/jce.jar: /export/home/root/jdk1.6.0_06/jre/lib/charsets.jar: /export/home/root/jdk1.6.0_06/jre/classes
OS Version	Solaris 10 10/08
Other software	

Test Information	
Tested by	Principled Technologies
SPEC license #	3184
Test location	RTP, NC
Test date	Jan 14, 2009
H/w available	
JVM available	
OS available	
Other s/w available	

AOT Compilation	
Tuning	
Notes	

JVM 1 Scores:

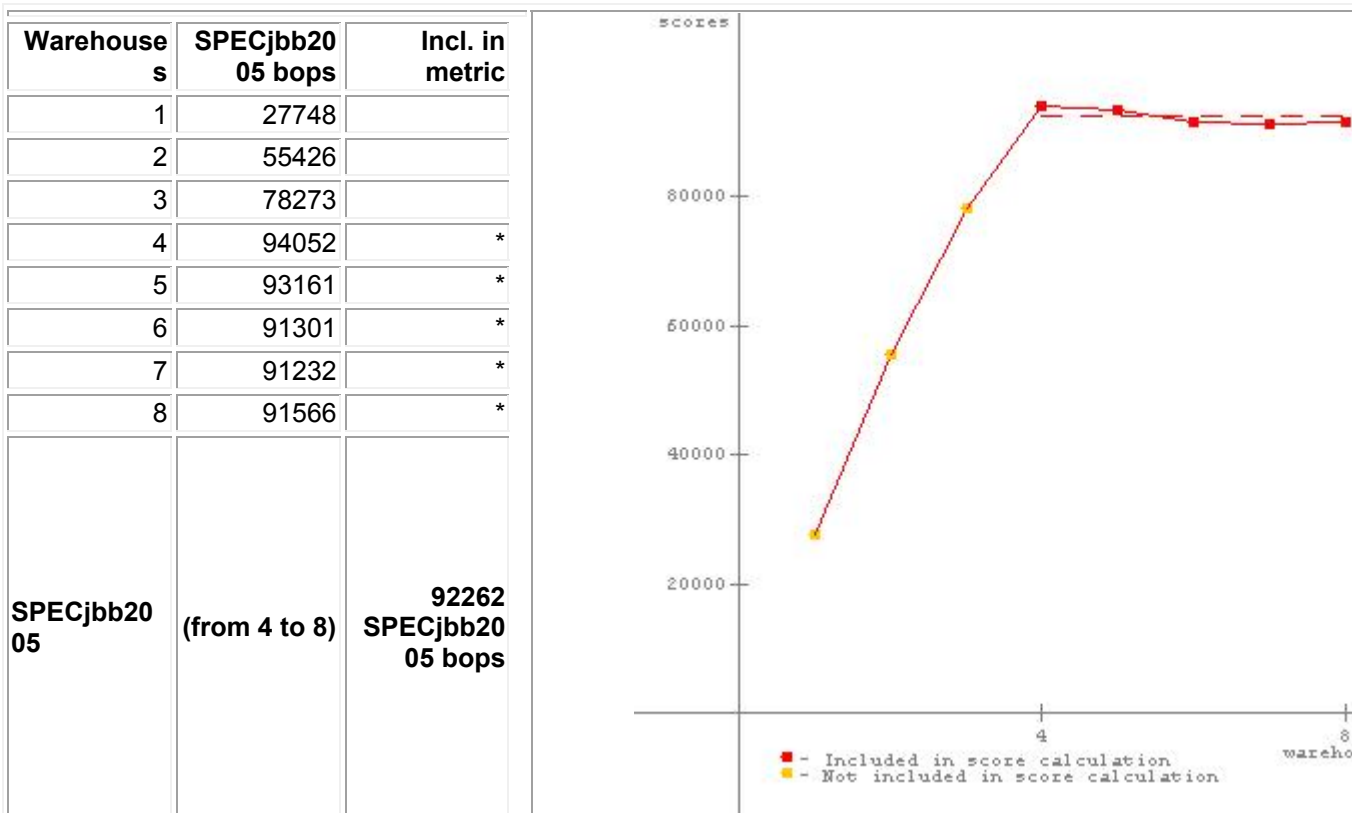
No errors. Valid run.



SPECjbb2005	(from 4 to 8)	90957 SPECjbb2005 bops	
SPEC license # 3184		Tested by: Principled Technologies	Test date: Jan 14, 2009

JVM 2 Scores:

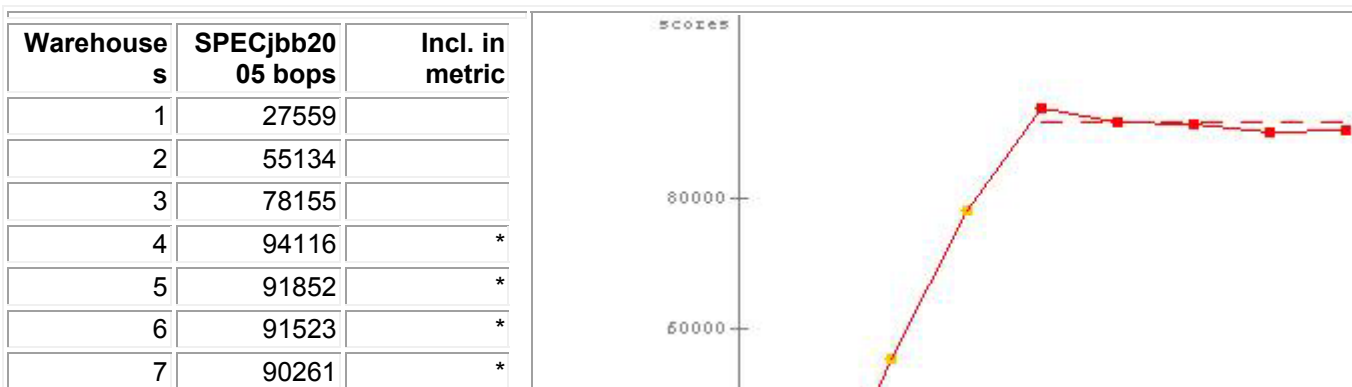
No errors. Valid run.



SPEC license # 3184	Tested by: Principled Technologies	Test date: Jan 14, 2009
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JVM 3 Scores:

No errors. Valid run.



8	90602	*	
SPECjbb2005	(from 4 to 8)	91671 SPECjbb2005 bops	
SPEC license # 3184		Tested by: Principled Technologies	Test date: Jan 14, 2009

JVM 4 Scores:

No errors. Valid run.

Warehouses	SPECjbb2005 bops	Incl. in metric
1	27739	
2	56204	
3	78844	
4	95435	*
5	93381	*
6	92563	*
7	92619	*
8	92116	*
SPECjbb2005	(from 4 to 8)	93223 SPECjbb2005 bops

Warehouse	Score (bops)	Included in Metric
1	27739	No
2	56204	No
3	78844	No
4	95435	Yes
5	93381	Yes
6	92563	Yes
7	92619	Yes
8	92116	Yes

SPEC license # 3184	Tested by: Principled Technologies	Test date: Jan 14, 2009
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