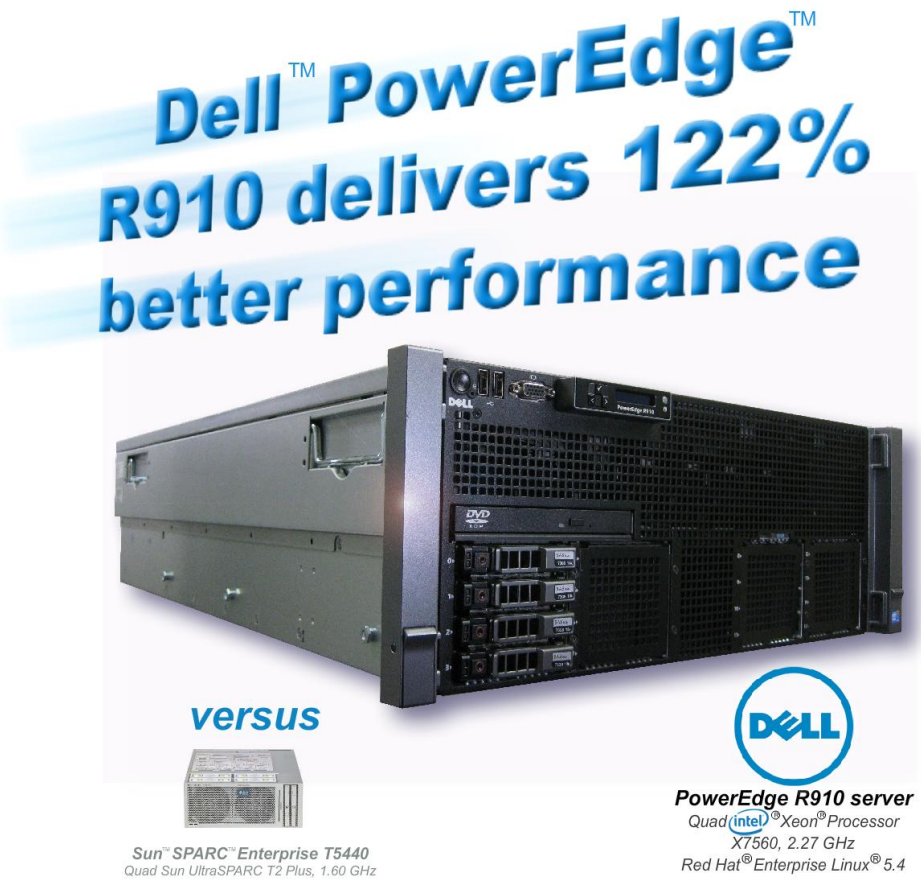
# DELL VS. SUN SERVERS: R910 JAVA PERFORMANCE COMPARISON SPECjbb2005




***On the SPECjbb®2005 benchmark***

## OUR FINDINGS

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

## OUR PROCESS

We used the industry-standard SPECjbb2005 benchmark to focus on and measure the Java performance of the Dell PowerEdge R910 server. We then compared our results to publicly available SPECjbb2005 results of the Sun SPARC Enterprise T5440 server.

FEBRUARY 2010

A PRINCIPLED TECHNOLOGIES TEST REPORT

Commissioned by Dell Corp.

# PROJECT OVERVIEW

The Dell PowerEdge R910 server achieved a SPECjbb2005 score of 1,868,708, a 122.1 percent increase over the Sun SPARC Enterprise T5440 server.[1] (See Figure 1.)

SPECjbb2005 is an industry-standard benchmark created by the Standard Performance Evaluation Corp. (SPEC) to measure a server's Java performance. (Note: SPEC and 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.)

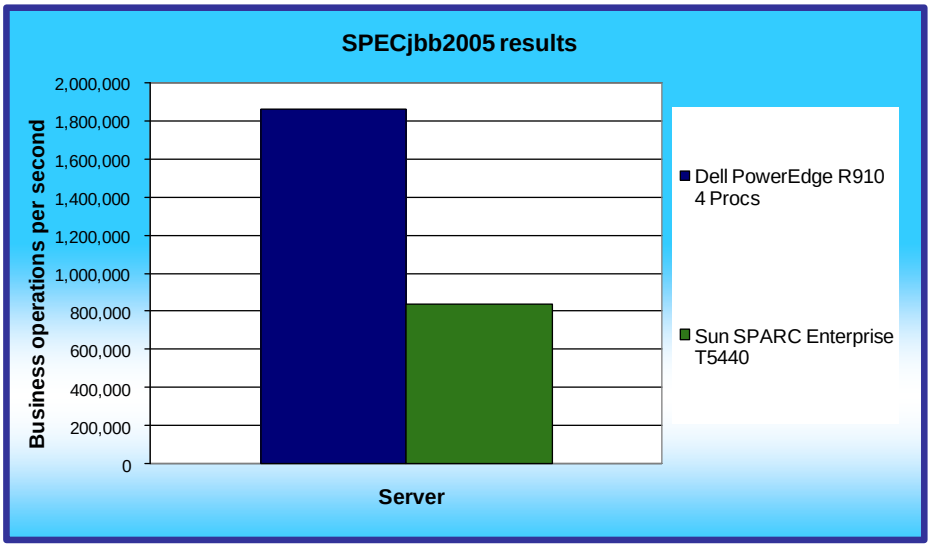



**Figure 1: SPECjbb 2005 performance results. Higher numbers are better.**

Due to licensing issues, we did not actually test SPECjbb2005 on the Sun SPARC Enterprise T5440. Instead, we used the highest posted result for the Sun system on SPEC's site (http://www.spec.org/osg/jbb2005/results/res2009q3/jbb2005-20090720-00753.html).

[1] Source: Principled Technologies®, Inc., "Dell vs. Sun servers: R910 Java performance comparison SPECjbb2005," a February 2010 report commissioned by Dell. For the latest SPECjbb2005benchmarks, visit www.spec.org.

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

| Servers | Dell PowerEdge R910 | Sun SPARC Enterprise T5440 |
|---|---|---|
| Processors | Quad Intel Xeon Processor X7560, 2.27 GHz | Quad Sun UltraSPARC T2 Plus, 1.60 GHz |
| Memory | 32 x 4GB PC3-8500 DDR3 | 64 x 4GB DDR2 |
| Hard disks | 2 x 73GB, SAS 6.0 GB/s | 1 x 146GB, SCSI |
| Operating system | Red Hat Enterprise Linux 5.4 (2.6.18-164.9.1.el5) | OpenSolaris 2009.06 |
| JVM | IBM® J9 VM (build 2.4, JRE 1.6.0 IBM J9 2.4 Linux amd64-64 jvmxa6460sr7-20091214_49398 (JIT enabled, AOT enabled)) | Java HotSpot™ 32-Bit Server VM on Solaris™, version 1.6.0_14 Performance Release |

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

# WHAT WE FOUND

Figure 3 shows the median SPECjbb2005 results for both servers. In our test, we ran multiple Java Virtual Machines (JVMs) at the same time, a common practice on servers with many processors.

| | Dell PowerEdge R910 | Sun SPARC Enterprise T5440 |
|---|---|---|
| JVM 1 | 115,706 | 26,294 |
| JVM 2 | 115,588 | 26,336 |
| JVM 3 | 116,435 | 26,291 |
| JVM 4 | 117,235 | 26,345 |
| JVM 5 | 117,624 | 26,259 |
| JVM 6 | 116,219 | 26,276 |
| JVM 7 | 117,915 | 26,251 |
| JVM 8 | 116,675 | 26,192 |
| JVM 9 | 118,547 | 26,321 |
| JVM 10 | 116,634 | 26,454 |
| JVM 11 | 114,852 | 26,344 |
| JVM 12 | 116,665 | 26,207 |
| JVM 13 | 118,572 | 26,321 |
| JVM 14 | 117,205 | 26,357 |
| JVM 15 | 116,639 | 26,314 |
| JVM 16 | 116,197 | 26,372 |
| JVM 17 | N/A | 26,404 |
| JVM 18 | N/A | 26,445 |
| JVM 19 | N/A | 26,389 |

| | Dell PowerEdge R910 | Sun SPARC Enterprise T5440 |
|---|---|---|
| JVM 20 | N/A | 26,272 |
| JVM 21 | N/A | 26,281 |
| JVM 22 | N/A | 26,334 |
| JVM 23 | N/A | 26,363 |
| JVM 24 | N/A | 26,329 |
| JVM 25 | N/A | 26,292 |
| JVM 26 | N/A | 25,501 |
| JVM 27 | N/A | 26,340 |
| JVM 28 | N/A | 26,274 |
| JVM 29 | N/A | 26,369 |
| JVM 30 | N/A | 26,219 |
| JVM 31 | N/A | 26,409 |
| JVM 32 | N/A | 26,225 |
| SPECjbb2005 bops/JVM | 116,794 | 26,293 |
| **Total score** | **1,868,708** | **841,380** |

**Figure 3: SPECjbb2005 results for each server by JVM. Higher numbers are better.**

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.)

Figure 4 shows the results by warehouse for the Dell PowerEdge R910 server for all three runs. Run 1 produced the median results.

| Dell PowerEdge R910 | | | |
|---|---|---|---|
| | **Run 1** | **Run 2** | **Run 3** |
| Warehouse | **JVM 1** | | |
| 1 | 41,493 | 40,738 | 42,663 |
| 2 | 91,790 | 92,973 | 95,548 |
| 3 | 103,602 | 107,105 | 107,728 |
| 4 | 116,662 | 117,034 | 117,897 |
| 5 | 116,209 | 116,002 | 117,824 |
| 6 | 115,699 | 115,725 | 116,567 |
| 7 | 115,200 | 114,346 | 115,837 |
| 8 | 114,759 | 114,124 | 115,107 |
| **Score** | **115,706** | **115,446** | **116,647** |
| Warehouse | **JVM 2** | | |
| 1 | 42,062 | 40,312 | 39,722 |
| 2 | 91,200 | 93,644 | 94,740 |
| 3 | 108,532 | 106,428 | 105,297 |
| 4 | 116,612 | 119,005 | 119,111 |
| 5 | 116,502 | 117,655 | 118,366 |
| 6 | 115,543 | 117,043 | 117,652 |
| 7 | 115,046 | 117,226 | 117,209 |
| 8 | 114,235 | 116,357 | 116,816 |
| **Score** | **115,588** | **117,457** | **117,831** |
| Warehouse | **JVM 3** | | |
| 1 | 41,439 | 43,090 | 40,248 |
| 2 | 92,121 | 92,222 | 92,777 |
| 3 | 108,116 | 107,444 | 103,222 |
| 4 | 118,156 | 118,167 | 116,551 |
| 5 | 116,902 | 117,343 | 115,375 |
| 6 | 116,418 | 116,843 | 114,044 |
| 7 | 115,349 | 116,076 | 114,101 |
| 8 | 115,348 | 115,790 | 113,311 |
| **Score** | **116,435** | **116,843** | **114,677** |
| Warehouse | **JVM 4** | | |
| 1 | 40,886 | 41,606 | 41,157 |
| 2 | 93,401 | 94,399 | 95,115 |
| 3 | 104,011 | 108,115 | 107,107 |
| 4 | 117,997 | 118,757 | 118,371 |
| 5 | 118,339 | 116,577 | 117,421 |
| 6 | 116,968 | 116,208 | 116,108 |
| 7 | 116,869 | 115,879 | 115,455 |
| 8 | 116,002 | 114,993 | 115,386 |
| **Score** | **117,235** | **116,483** | **116,548** |
| Warehouse | **JVM 5** | | |

| Dell PowerEdge R910 | | | |
|---|---|---|---|
| 1 | 42,378 | 39,726 | 41,458 |
| 2 | 92,704 | 91,083 | 96,281 |
| 3 | 104,367 | 107,635 | 108,218 |
| 4 | 119,380 | 117,695 | 119,395 |
| 5 | 118,635 | 116,988 | 118,297 |
| 6 | 117,093 | 115,919 | 117,439 |
| 7 | 116,743 | 115,097 | 117,649 |
| 8 | 116,268 | 115,331 | 116,675 |
| **Score** | **117,624** | **116,206** | **117,891** |
| Warehouse | **JVM 6** | | |
| 1 | 41,388 | 41,923 | 39,784 |
| 2 | 92,679 | 90,438 | 92,479 |
| 3 | 108,336 | 106,313 | 105,770 |
| 4 | 117,536 | 116,329 | 115,702 |
| 5 | 117,485 | 116,393 | 115,863 |
| 6 | 115,329 | 115,501 | 115,155 |
| 7 | 115,789 | 114,943 | 115,134 |
| 8 | 114,958 | 114,677 | 113,887 |
| **Score** | **116,219** | **115,568** | **115,148** |
| Warehouse | **JVM 7** | | |
| 1 | 40,439 | 41,055 | 40,323 |
| 2 | 94,622 | 92,191 | 70,184 |
| 3 | 108,480 | 104,872 | 109,153 |
| 4 | 119,099 | 116,531 | 118,157 |
| 5 | 118,601 | 115,954 | 117,212 |
| 6 | 117,669 | 114,938 | 116,480 |
| 7 | 117,516 | 114,956 | 116,157 |
| 8 | 116,691 | 113,919 | 115,735 |
| **Score** | **117,915** | **115,260** | **116,748** |
| Warehouse | **JVM 8** | | |
| 1 | 40,848 | 41,800 | 40,283 |
| 2 | 93,112 | 93,769 | 93,826 |
| 3 | 103,854 | 108,838 | 109,278 |
| 4 | 118,406 | 117,658 | 119,554 |
| 5 | 117,323 | 116,648 | 118,174 |
| 6 | 116,284 | 115,831 | 117,498 |
| 7 | 115,818 | 115,315 | 116,803 |
| 8 | 115,545 | 114,663 | 116,265 |
| **Score** | **116,675** | **116,023** | **117,659** |
| Warehouse | **JVM 9** | | |
| 1 | 41,022 | 40,808 | 43,318 |
| 2 | 93,339 | 93,515 | 94,944 |

| Dell PowerEdge R910 | | | |
|---|---|---|---|
| 3 | 104,279 | 103,283 | 107,092 |
| 4 | 120,469 | 117,820 | 115,781 |
| 5 | 118,732 | 116,267 | 115,878 |
| 6 | 118,745 | 115,460 | 115,373 |
| 7 | 117,653 | 115,404 | 114,928 |
| 8 | 117,135 | 113,663 | 114,321 |
| **Score** | **118,547** | **115,723** | **115,256** |
| Warehouse | **JVM 10** | | |
| 1 | 42,025 | 38,654 | 39,614 |
| 2 | 92,670 | 91,384 | 92,411 |
| 3 | 104,156 | 107,681 | 109,356 |
| 4 | 117,935 | 118,544 | 118,901 |
| 5 | 117,500 | 117,727 | 119,040 |
| 6 | 116,532 | 116,510 | 117,845 |
| 7 | 115,951 | 115,932 | 117,093 |
| 8 | 115,251 | 115,238 | 116,149 |
| **Score** | **116,634** | **116,790** | **117,806** |
| Warehouse | **JVM 11** | | |
| 1 | 43,435 | 40,487 | 40,690 |
| 2 | 90,404 | 94,367 | 78,871 |
| 3 | 105,441 | 104,550 | 108,545 |
| 4 | 115,651 | 117,277 | 118,044 |
| 5 | 115,281 | 116,871 | 116,666 |
| 6 | 114,706 | 115,885 | 116,428 |
| 7 | 114,510 | 115,326 | 115,927 |
| 8 | 114,112 | 114,607 | 115,471 |
| **Score** | **114,852** | **115,993** | **116,507** |
| Warehouse | **JVM 12** | | |
| 1 | 40,675 | 41,302 | 40,263 |
| 2 | 92,480 | 93,229 | 93,688 |
| 3 | 104,385 | 105,338 | 105,173 |
| 4 | 118,176 | 118,995 | 119,938 |
| 5 | 117,228 | 117,850 | 118,615 |
| 6 | 116,560 | 116,564 | 117,556 |
| 7 | 116,047 | 116,601 | 117,377 |
| 8 | 115,313 | 114,440 | 116,466 |
| **Score** | **116,665** | **116,890** | **117,990** |
| Warehouse | **JVM 13** | | |
| 1 | 39,612 | 42,292 | 40,063 |
| 2 | 94,658 | 92,715 | 94,215 |
| 3 | 109,458 | 108,980 | 106,910 |
| 4 | 119,627 | 118,577 | 119,096 |

| Dell PowerEdge R910 | | | |
|---|---|---|---|
| 5 | 118,809 | 117,215 | 118,870 |
| 6 | 118,222 | 116,162 | 117,921 |
| 7 | 118,286 | 115,477 | 117,862 |
| 8 | 117,918 | 114,914 | 116,608 |
| **Score** | **118,572** | **116,469** | **118,071** |
| Warehouse | **JVM 14** | | |
| 1 | 40,932 | 40,297 | 39,979 |
| 2 | 94,115 | 90,867 | 70,216 |
| 3 | 104,636 | 104,096 | 109,405 |
| 4 | 118,757 | 118,608 | 118,625 |
| 5 | 117,821 | 116,659 | 117,621 |
| 6 | 116,928 | 116,525 | 116,653 |
| 7 | 116,186 | 115,778 | 115,159 |
| 8 | 116,334 | 114,886 | 115,059 |
| **Score** | 117,205 | 116,491 | **116,623** |
| Warehouse | **JVM 15** | | |
| 1 | 41,436 | 40,649 | 42,817 |
| 2 | 92,587 | 93,425 | 91,958 |
| 3 | 106,195 | 106,350 | 107,088 |
| 4 | 118,568 | 119,166 | 117,896 |
| 5 | 117,289 | 118,120 | 116,748 |
| 6 | 116,306 | 117,207 | 115,134 |
| 7 | 115,806 | 116,885 | 114,587 |
| 8 | 115,224 | 116,441 | 114,341 |
| **Score** | **116,639** | **117,564** | **115,741** |
| Warehouse | **JVM 16** | | |
| 1 | 40,407 | 42,069 | 40,486 |
| 2 | 94,367 | 93,708 | 73,311 |
| 3 | 108,745 | 109,325 | 109,635 |
| 4 | 117,245 | 117,393 | 120,043 |
| 5 | 116,519 | 116,180 | 119,042 |
| 6 | 116,183 | 115,522 | 117,300 |
| 7 | 115,676 | 115,090 | 117,129 |
| 8 | 115,361 | 114,352 | 116,466 |
| **Score** | **116,197** | **115,707** | **117,996** |
| **SPECjbb2005 bops/JVM** | **116,794** | **116,307** | **116,821** |
| **Total score** | **1,868,708** | **1,860,913** | **1,869,139** |

**Figure 4: SPECjbb2005 results for the Dell PowerEdge R910 server. Higher numbers are better.**

# HOW WE TESTED

## Adjusting BIOS settings

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

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

## Setting up and configuring the Dell PowerEdge R910

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

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

In addition to installing the Nehalem-EX Red Hat Enterprise Linux, we created hugepages by adding the following text to the /etc/sysctl.conf file:

```
vm.nr_hugepages=32000
```

## 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 /SPECjbb2005 on the server's hard disk.

SPECjbb2005 requires a Java Virtual Machine on the system under test. We used the IBM J9 VM (build 2.4, JRE 1.6.0 IBM J9 2.4 Linux amd64-64 jvmxa6460sr7-20091214_49398 (JIT enabled, AOT enabled)) 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 16 for the Dell PowerEdge R910 server. This change allows a server to run 16 JVM instances during testing, depending on the server.

We created a shell file, which we placed in the root SPECjbb2005 directory, to issue the Java run command to launch the benchmark. We used the shell file to begin the SPECjbb2005 test.

The following is the contents of the shell file that we used for the Dell PowerEdge R910 server:

```
#!/bin/sh

echo
date

echo
echo Setting OS tuning options...

sleep 2

echo
PATH=/ibm-java-x86_64-60/jre/bin:$PATH
echo PATH="$PATH"

echo
java -version

sleep 1
echo
date

JVM_OPTIONS="-Xaggressive -Xcompressedrefs -Xgcpolicy:gencon -Xmn1400m -
Xms1875m -Xmx1875m -XlockReservation -Xnoloa -XtlhPrefetch -Xlp"

echo
echo Starting Controller
java -cp jbb.jar:check.jar -Xms256m -Xmx256m spec.jbb.Controller -propfile
SPECjbb.props &
sleep 5

echo "Starting instance 1"
numactl --physcpubind=0,32,4,36 --localalloc java -cp jbb.jar:check.jar
$JVM_OPTIONS spec.jbb.JBBmain -propfile SPECjbb.props -id 1 > multi.1 &

sleep 10

echo "Starting instance 2"
```

```
numactl --physcpubind=8,40,12,44 --localalloc java -cp jbb.jar:check.jar
$JVM_OPTIONS spec.jbb.JBBmain -propfile SPECjbb.props -id 2 > multi.2 &

sleep 10

echo "Starting instance 3"
numactl --physcpubind=16,48,20,52 --localalloc java -cp jbb.jar:check.jar
$JVM_OPTIONS spec.jbb.JBBmain -propfile SPECjbb.props -id 3 > multi.3 &

sleep 10

echo "Starting instance 4"
numactl --physcpubind=24,56,28,60 --localalloc java -cp jbb.jar:check.jar
$JVM_OPTIONS spec.jbb.JBBmain -propfile SPECjbb.props -id 4 > multi.4 &

sleep 10

echo "Starting instance 5"
numactl --physcpubind=1,33,5,37 --localalloc java -cp jbb.jar:check.jar
$JVM_OPTIONS spec.jbb.JBBmain -propfile SPECjbb.props -id 5 > multi.5 &

sleep 10

echo "Starting instance 6"
numactl --physcpubind=9,41,13,45 --localalloc java -cp jbb.jar:check.jar
$JVM_OPTIONS spec.jbb.JBBmain -propfile SPECjbb.props -id 6 > multi.6 &

sleep 10

echo "Starting instance 7"
numactl --physcpubind=17,49,21,53 --localalloc java -cp jbb.jar:check.jar
$JVM_OPTIONS spec.jbb.JBBmain -propfile SPECjbb.props -id 7 > multi.7 &

sleep 10

echo "Starting instance 8"
numactl --physcpubind=25,57,29,61 --localalloc java -cp jbb.jar:check.jar
$JVM_OPTIONS spec.jbb.JBBmain -propfile SPECjbb.props -id 8 > multi.8 &

sleep 10

echo "Starting instance 9"
numactl --physcpubind=2,34,6,38 --localalloc java -cp jbb.jar:check.jar
$JVM_OPTIONS spec.jbb.JBBmain -propfile SPECjbb.props -id 9 > multi.9 &

sleep 10
```

```
echo "Starting instance 10"
numactl --physcpubind=10,42,14,46 --localalloc java -cp jbb.jar:check.jar
$JVM_OPTIONS spec.jbb.JBBmain -propfile SPECjbb.props -id 10 > multi.10 &

sleep 10

echo "Starting instance 11"
numactl --physcpubind=18,50,22,54 --localalloc java -cp jbb.jar:check.jar
$JVM_OPTIONS spec.jbb.JBBmain -propfile SPECjbb.props -id 11 > multi.11 &

sleep 10

echo "Starting instance 12"
numactl --physcpubind=26,58,30,62 --localalloc java -cp jbb.jar:check.jar
$JVM_OPTIONS spec.jbb.JBBmain -propfile SPECjbb.props -id 12 > multi.12 &

sleep 10

echo "Starting instance 13"
numactl --physcpubind=3,35,7,39 --localalloc java -cp jbb.jar:check.jar
$JVM_OPTIONS spec.jbb.JBBmain -propfile SPECjbb.props -id 13 > multi.13 &

sleep 10

echo "Starting instance 14"
numactl --physcpubind=11,43,15,47 --localalloc java -cp jbb.jar:check.jar
$JVM_OPTIONS spec.jbb.JBBmain -propfile SPECjbb.props -id 14 > multi.14 &

sleep 10

echo "Starting instance 15"
numactl --physcpubind=19,51,23,55 --localalloc java -cp jbb.jar:check.jar
$JVM_OPTIONS spec.jbb.JBBmain -propfile SPECjbb.props -id 15 > multi.15 &

sleep 10

echo "Starting instance 16"
numactl --physcpubind=27,59,31,63 --localalloc java -cp jbb.jar:check.jar
$JVM_OPTIONS spec.jbb.JBBmain -propfile SPECjbb.props -id 16 > multi.16 &

date
```

To improve Java performance, we set Java options. The following list gives a brief description of all options we used for testing.[2]

- *-Xaggressive* turns on extra JVM performance optimizations.
- *-Xcompressedrefs* changes the JVM to use 32-bit reference values over 64-bit reference values.
- *-Xgcpolicy:gencon* sets the garbage collector policy to use both the combined and generational gcs to minimize gc time.
- *-Xmn1400m* sets the JVM nursery size.
- *-Xms1875m* 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 1875MB.
- *-Xmx1875m* sets the maximum heap size.
- *-XlockReservation* turns on optimizations that presume a monitor is owned by the thread that last acquired it.
- *-Xnoloa* prevents allocation of large object areas.
- *-XtlhPrefetch* prefetches bytes in the thread local heap.
- *-Xlp* enables the use of hugepages for the IBM JVM.

## Conducting the test

To run the SPECjbb2005 test, we first mounted hugepages on our server using the following commands:

```
mkdir -p  /mnt/hugepages
mount none /mnt/hugepages -t hugetlbfs
chmod 777 /mnt/hugepages
```

After we mounted hugepages, we ran the run shell script and the run took approximately 30 minutes to complete.

[2] Source: http://publib.boulder.ibm.com/infocenter/javasdk/v6r0/index.jsp?topic=/com.ibm.java.doc.user.lnx.60/diag/appendixes/cmdline/commands_jvm.html

# APPENDIX A – TEST SERVER INFORMATION

Figure 5 presents detailed information for the Dell PowerEdge R910.

| Servers | Dell PowerEdge R910 |
|---|---|
| **General dimension information** | |
| Height (inches) | 7.00 |
| Width (inches) | 17.25 |
| Depth (inches) | 29.00 |
| U size in server rack (U) | 4 |
| **Power supplies** | |
| Total number | 4 |
| Brand and model | Dell Z1100P-00 |
| Wattage (W) | 1,023 |
| **Cooling fans** | |
| Total number | 6 |
| Dimensions (h x w) | 5” x 5” |
| Voltage (V) | 12 |
| Amps (A) | 4.80 |
| **General processor setup** | |
| Number of processor packages | 4 |
| Number of cores per processor package | 8 |
| Number of hardware threads per core | 2 |
| **CPU** | |
| Vendor | Intel |
| Name | Xeon X7560 |
| Stepping | D0 |
| Socket type | LGA1567 |
| Core frequency (GHz) | 2.27 |
| L1 cache | 32 KB + 32 KB |
| L2 cache | 256 KB (per core) |
| L3 cache (MB) | 24 |
| **Platform** | |
| Vendor and model number | Dell PowerEdge R910 |
| Motherboard model number | 0P658H |
| Motherboard revision number | X23 |
| BIOS name and version | Dell 1.0.1 (02/19/2010) |
| BIOS settings | Power Management set to Maximum Performance |
| **Memory modules** | |
| Total RAM in system (GB) | 128 |
| Vendor and model number | Hynix HMT151R7BFR8C-G7 |
| Type | PC3-8500 DDR3 |
| Speed (MHz) | 1,066 |

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

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

# APPENDIX B – SPECJBB2005 OUTPUT

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

## Red Hat Enterprise Linux 5.4 server: Dell PowerEdge R910

SPECjbb2005

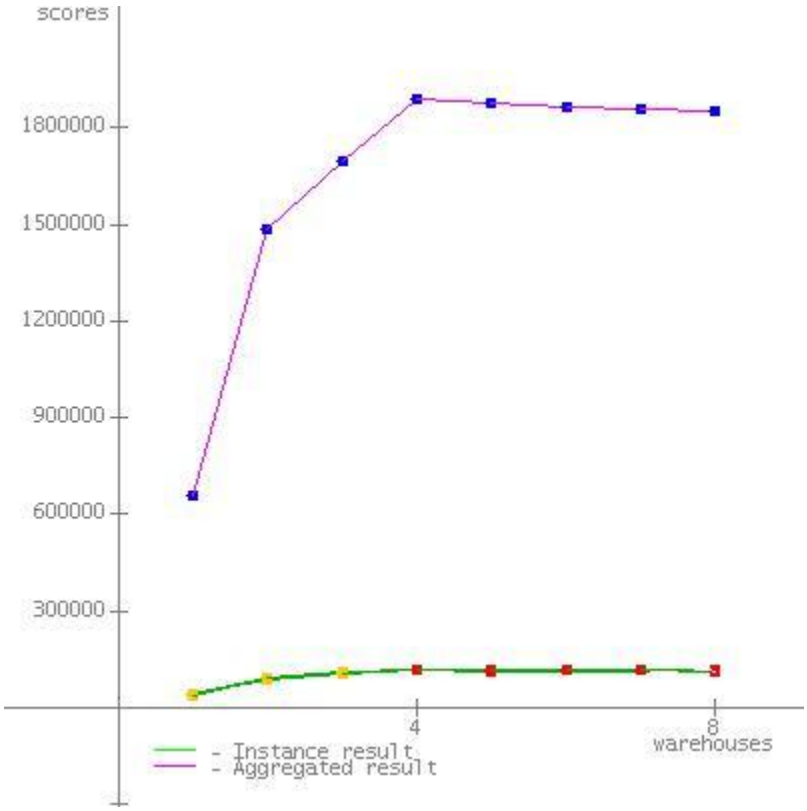
**SPECjbb2005 bops = 1868708, SPECjbb2005 bops/JVM = 116794**

Dell PowerEdge

R910

IBM J9 1.6.0 SR7

| JVM run | JVM Scores |
|---|---|
| 1 | 115706 |
| 2 | 115588 |
| 3 | 116435 |
| 4 | 117235 |
| 5 | 117624 |
| 6 | 116219 |
| 7 | 117915 |
| 8 | 116675 |
| 9 | 118547 |
| 10 | 116634 |
| 11 | 114852 |
| 12 | 116665 |
| 13 | 118572 |
| 14 | 117205 |



| | |
|---|---|
| 15 | 116639 |
| 16 | 116197 |
| **SPECjbb2005 bops = 1868708, SPECjbb2005 bops/JVM = 116794** | |

| Hardware | |
|---|---|
| **Hardware Vendor** | Dell |
| **Vendor URL** | http://www.dell.com |
| **Model** | PowerEdge R910 |
| **Processor** | Intel Xeon X7560 |
| **MHz** | 2270 |
| **# of Chips** | 4 |
| **# of Cores** | 32 |
| **# of Cores/Chip** | 2 |
| **HW Threading Enabled?** | Yes |
| **Procs Avail to Java** | 64 |
| **Memory (MB)** | 131072 |
| **Memory Details** | Hynix HMT151R7BFR8C-G7 |
| **Primary cache** | |
| **Secondary cache** | |
| **Other cache** | 24 MB L3 |

| Software | |
|---|---|
| **Software Vendor** | IBM |
| **Vendor URL** | http://www.ibm.com |
| **JVM Version** | IBM J9 VM (build 2.4, JRE 1.6.0 IBM J9 2.4 Linux amd64-64 jvmxa6460sr7-20091214_49398 (JIT enabled, AOT enabled)) JVM |
| **JVM Command Line** | java - Xaggressive -Xcompressedrefs -Xgcpolicy:gencon -Xmn1400m -Xms1875m -Xmx1875m -XlockReservation -Xnoloa -XtlhPrefetch -Xlp |
| **JVM Initial Heap Memory (MB)** | 1875 |
| **JVM Maximum Heap Memory (MB)** | 1875 |
| **JVM Address bits** | 64 |
| **JVM CLASSPATH** | jbb.jar:<br>check.jar |
| **JVM BOOTCLASSPATH** | /ibm-java-x86_64-60/jre/lib/amd64/compressedrefs/jclSC160/vm.jar:<br>/ibm-java-x86_64-60/jre/lib/annotation.jar:<br>/ibm-java-x86_64-60/jre/lib/beans.jar:<br>/ibm-java-x86_64-60/jre/lib/java.util.jar:<br>/ibm-java-x86_64-60/jre/lib/jndi.jar:<br>/ibm-java-x86_64-60/jre/lib/logging.jar: |

| | |
|---|---|
| **Filesystem** | Ext3 |
| **Disks** | 2 x 73 GB SAS |
| **Other hardware** | |

| | |
|---|---|
| | /ibm-java-x86_64-60/jre/lib/security.jar:<br>/ibm-java-x86_64-60/jre/lib/sql.jar:<br>/ibm-java-x86_64-60/jre/lib/ibmorb.jar:<br>/ibm-java-x86_64-60/jre/lib/ibmorbapi.jar:<br>/ibm-java-x86_64-60/jre/lib/ibmcfw.jar:<br>/ibm-java-x86_64-60/jre/lib/rt.jar:<br>/ibm-java-x86_64-60/jre/lib/charsets.jar:<br>/ibm-java-x86_64-60/jre/lib/resources.jar:<br>/ibm-java-x86_64-60/jre/lib/ibmpkcs.jar:<br>/ibm-java-x86_64-60/jre/lib/ibmcertpathfw.jar:<br>/ibm-java-x86_64-60/jre/lib/ibmjgssfw.jar:<br>/ibm-java-x86_64-60/jre/lib/ibmjssefw.jar:<br>/ibm-java-x86_64-60/jre/lib/ibmsaslfw.jar:<br>/ibm-java-x86_64-60/jre/lib/ibmjcefw.jar:<br>/ibm-java-x86_64-60/jre/lib/ibmjgssprovider.jar:<br>/ibm-java-x86_64-60/jre/lib/ibmjsseprovider2.jar:<br>/ibm-java-x86_64-60/jre/lib/ibmcertpathprovider.jar:<br>/ibm-java-x86_64-60/jre/lib/ibmxmlcrypto.jar:<br>/ibm-java-x86_64-60/jre/lib/management-agent.jar:<br>/ibm-java-x86_64-60/jre/lib/xml.jar:<br>/ibm-java-x86_64-60/jre/lib/jlm.jar:<br>/ibm-java-x86_64-60/jre/lib/javascript.jar |
| **OS Version** | Red Hat Enterprise Linux 5.4 |
| **Other software** | |

| **Test Information** | |
|---|---|
| **Tested by** | Principled Technologies, Inc. |

| **AOT Compilation** |
|---|
| |

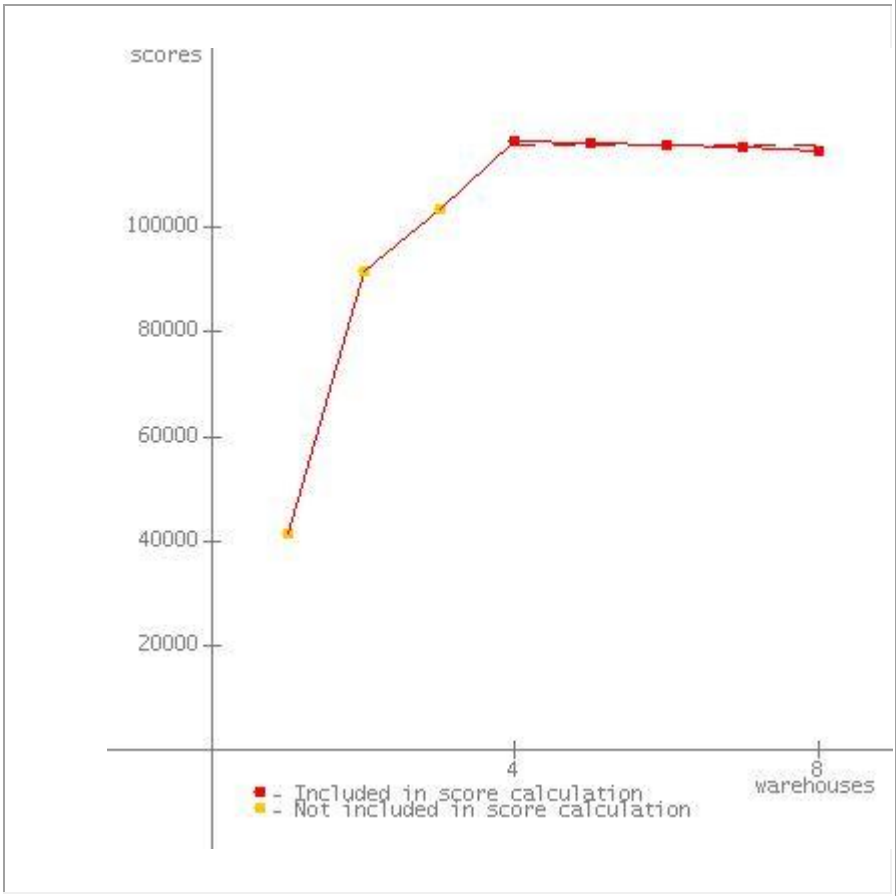
| | |
|---|---|
| **SPEC license #** | 3184 |
| **Test location** | Durham, NC |
| **Test date** | Feb 9, 2010 |
| **H/w available** | |
| **JVM available** | |
| **OS available** | Sept-2009 |
| **Other s/w available** | |

| **Tuning** |
|---|
| Operating system tunings<br>• vm.nr_hugepages=32000 |
| **Notes** |

## JVM 1 Scores:

## NO ERRORS. VALID RUN.

| Warehouses | SPECjbb2005 bops | Incl. in metric |
|---|---|---|
| 1 | 41493 | |
| 2 | 91790 | |
| 3 | 103602 | |
| 4 | 116662 | * |
| 5 | 116209 | * |
| 6 | 115699 | * |
| 7 | 115200 | * |
| 8 | 114759 | * |
| **SPECjbb2005** | **(from 4 to 8)** | **115706 SPECjbb2005 bops** |



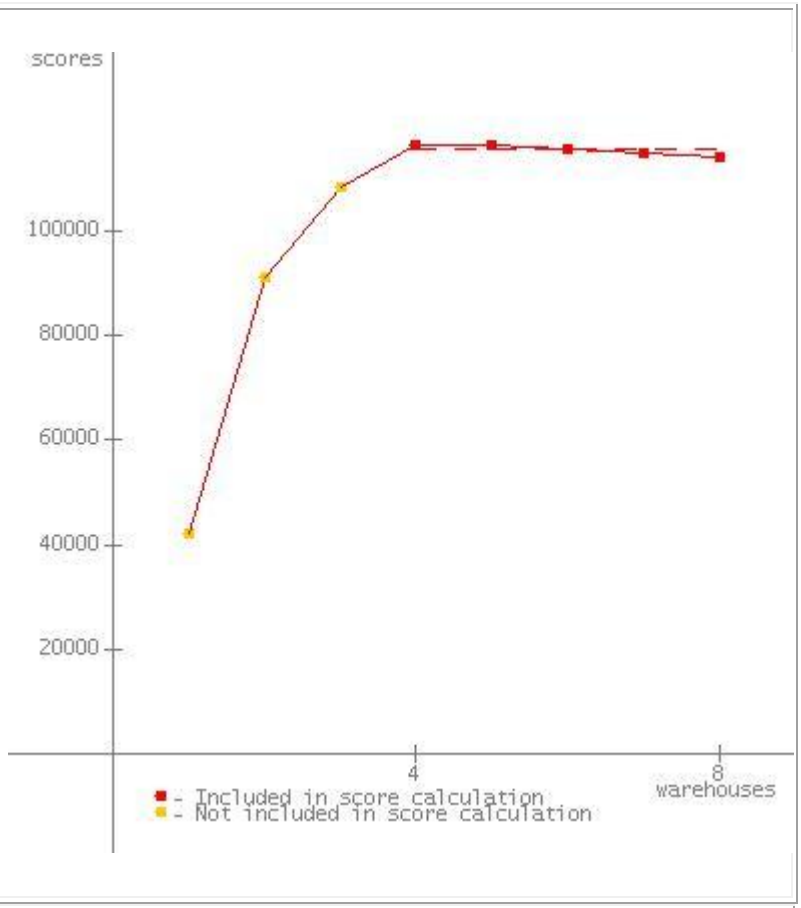

| | | |
|---|---|---|
| **SPEC license #** 3184 | **Tested by:** Principled Technologies, | **Test date:** Mar 11, 2010 |

| | | |
|---|---|---|
| | Inc. | |

## JVM 2 Scores:

## NO ERRORS. VALID RUN.

| Warehouses | SPECjbb2005 bops | Incl. in metric |
|---|---|---|
| 1 | 42062 | |
| 2 | 91200 | |
| 3 | 108532 | |
| 4 | 116612 | * |
| 5 | 116502 | * |
| 6 | 115543 | * |
| 7 | 115046 | * |
| 8 | 114235 | * |
| **SPECjbb2005** | **(from 4 to 8)** | **115588 SPECjbb2005 bops** |

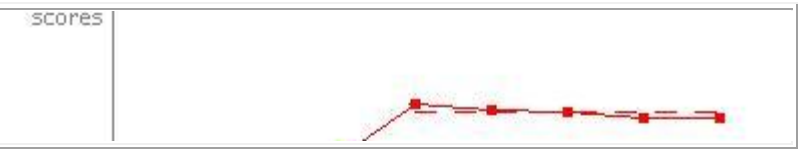



| | | |
|---|---|---|
| **SPEC license #** 3184 | **Tested by:** Principled Technologies, Inc. | **Test date:** Mar 11, 2010 |

## JVM 3 Scores:

## NO ERRORS. VALID RUN.

| Warehouses | SPECjbb2005 bops | Incl. in metric |
|---|---|---|



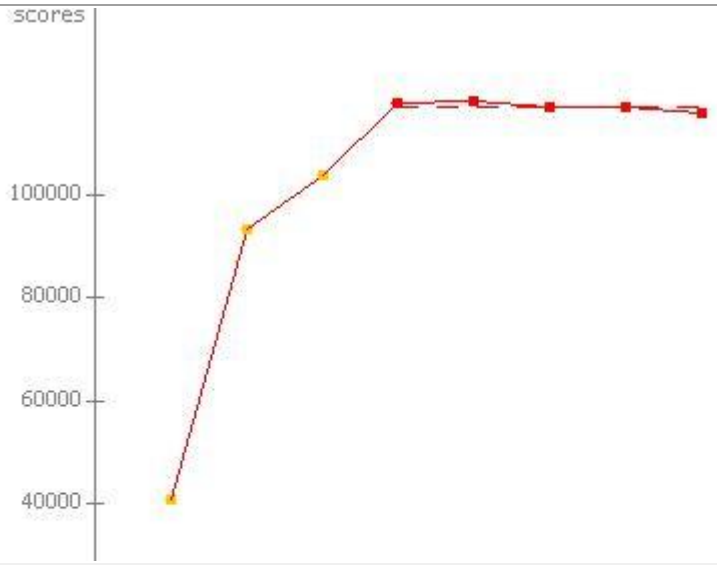
| | | |
|---|---|---|
| 1 | 41439 | |
| 2 | 92121 | |
| 3 | 108116 | |
| 4 | 118156 | * |
| 5 | 116902 | * |
| 6 | 116418 | * |
| 7 | 115349 | * |
| 8 | 115348 | * |
| **SPECjbb2005** | **(from 4 to 8)** | **116435 SPECjbb2005 bops** |

| | | |
|---|---|---|
| **SPEC license #** 3184 | **Tested by:** Principled Technologies, Inc. | **Test date:** Mar 11, 2010 |

## JVM 4 Scores:

## NO ERRORS. VALID RUN.

| Warehouses | SPECjbb2005 bops | Incl. in metric |
|---|---|---|
| 1 | 40886 | |
| 2 | 93401 | |
| 3 | 104011 | |
| 4 | 117997 | * |
| 5 | 118339 | * |
| 6 | 116968 | * |



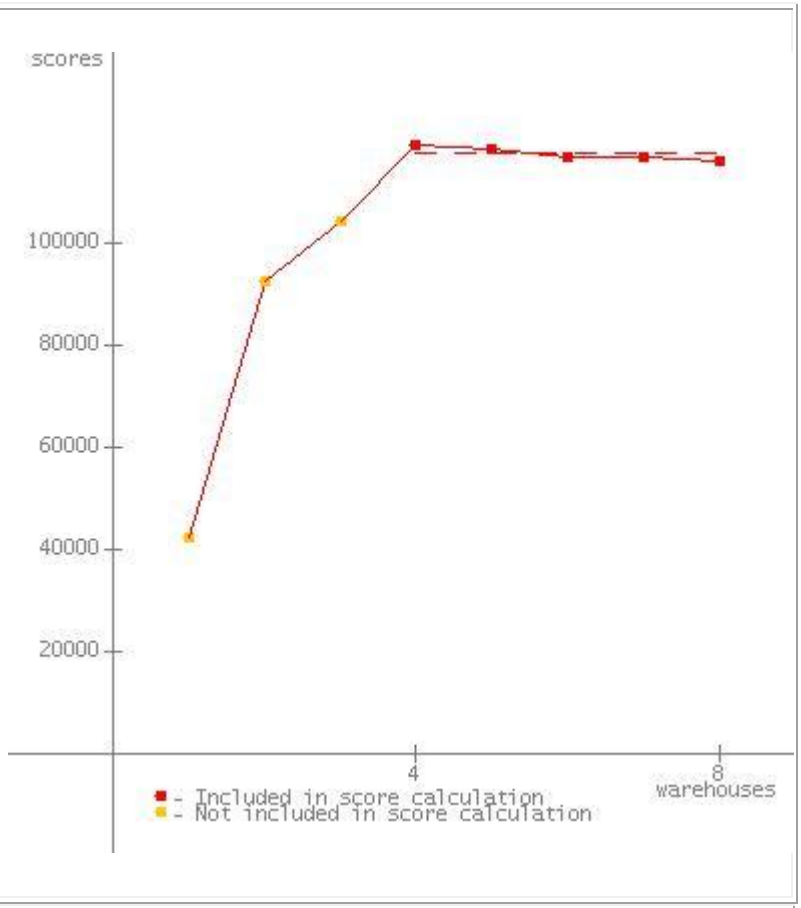
| | | |
|---|---|---|
| 7 | 116869 | * |
| 8 | 116002 | * |
| **SPECjbb2005** | **(from 4 to 8)** | **117235 SPECjbb2005 bops** |

| | | |
|---|---|---|
| **SPEC license #** 3184 | **Tested by:** Principled Technologies, Inc. | **Test date:** Mar 11, 2010 |

## JVM 5 Scores:

## NO ERRORS. VALID RUN.

| Warehouses | SPECjbb2005 bops | Incl. in metric |
|---|---|---|
| 1 | 42378 | |
| 2 | 92704 | |
| 3 | 104367 | |
| 4 | 119380 | * |
| 5 | 118635 | * |
| 6 | 117093 | * |
| 7 | 116743 | * |
| 8 | 116268 | * |
| **SPECjbb2005** | **(from 4 to 8)** | **117624 SPECjbb2005 bops** |

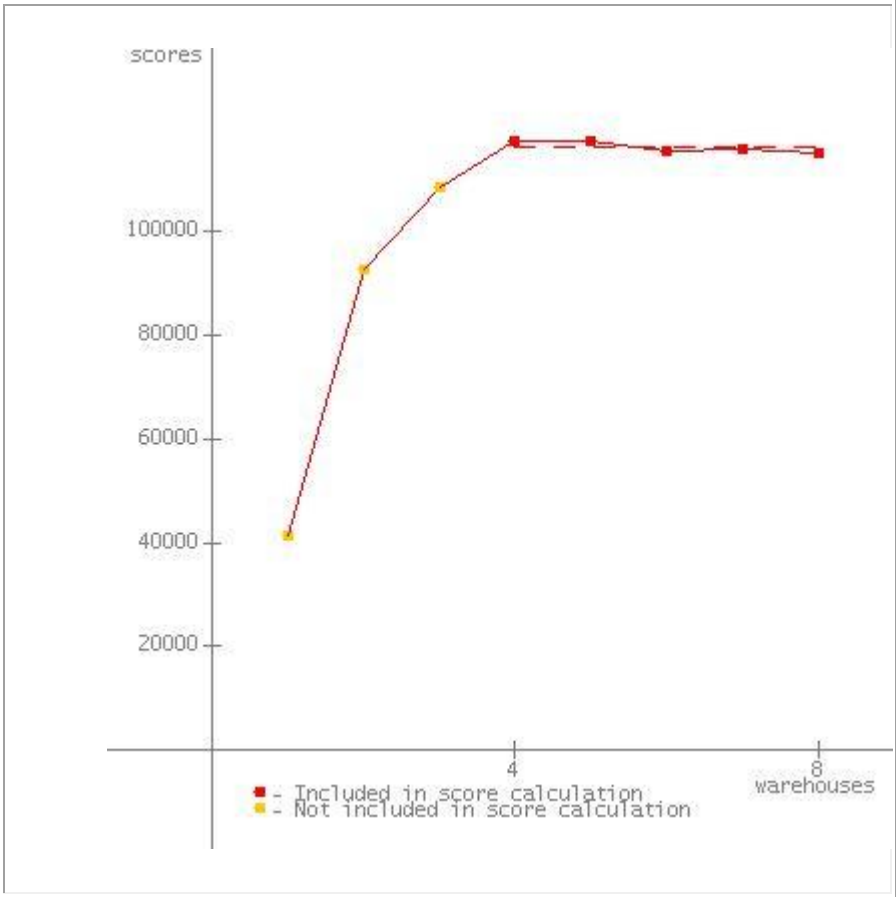



| | | |
|---|---|---|
| **SPEC license #** 3184 | **Tested by:** Principled Technologies, Inc. | **Test date:** Mar 11, 2010 |

## JVM 6 Scores:

## NO ERRORS. VALID RUN.

| Warehouses | SPECjbb2005 bops | Incl. in metric |
|---|---|---|
| 1 | 41388 | |
| 2 | 92679 | |
| 3 | 108336 | |
| 4 | 117536 | * |
| 5 | 117485 | * |
| 6 | 115329 | * |
| 7 | 115789 | * |
| 8 | 114958 | * |
| **SPECjbb2005** | **(from 4 to 8)** | **116219 SPECjbb2005 bops** |

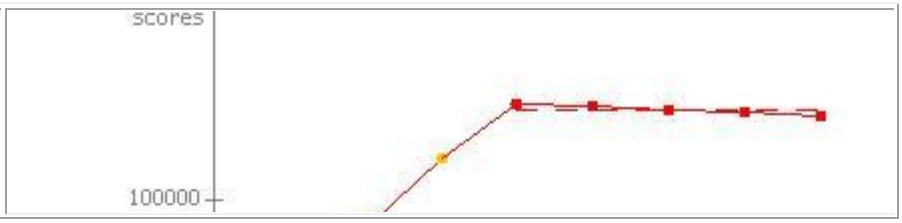



| | | |
|---|---|---|
| **SPEC license #** 3184 | **Tested by:** Principled Technologies, Inc. | **Test date:** Mar 11, 2010 |

## JVM 7 Scores:

## NO ERRORS. VALID RUN.

| Warehouses | SPECjbb2005 bops | Incl. in metric |
|---|---|---|
| 1 | 40439 | |



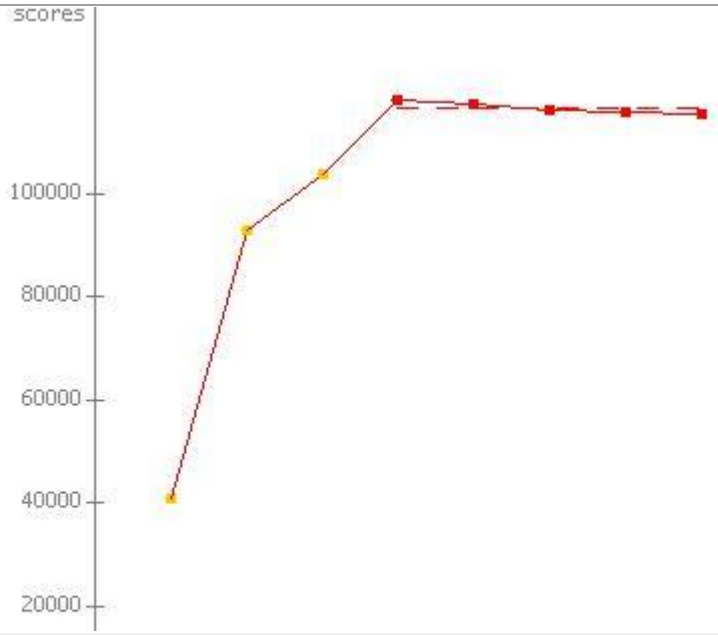
| | | |
|---|---|---|
| 2 | 94622 | |
| 3 | 108480 | |
| 4 | 119099 | * |
| 5 | 118601 | * |
| 6 | 117669 | * |
| 7 | 117516 | * |
| 8 | 116691 | * |
| **SPECjbb2005** | **(from 4 to 8)** | **117915 SPECjbb2005 bops** |

| | | |
|---|---|---|
| **SPEC license #** 3184 | **Tested by:** Principled Technologies, Inc. | **Test date:** Mar 11, 2010 |

## JVM 8 Scores:

## NO ERRORS. VALID RUN.

| Warehouses | SPECjbb2005 bops | Incl. in metric |
|---|---|---|
| 1 | 40848 | |
| 2 | 93112 | |
| 3 | 103854 | |
| 4 | 118406 | * |
| 5 | 117323 | * |
| 6 | 116284 | * |
| 7 | 115818 | * |



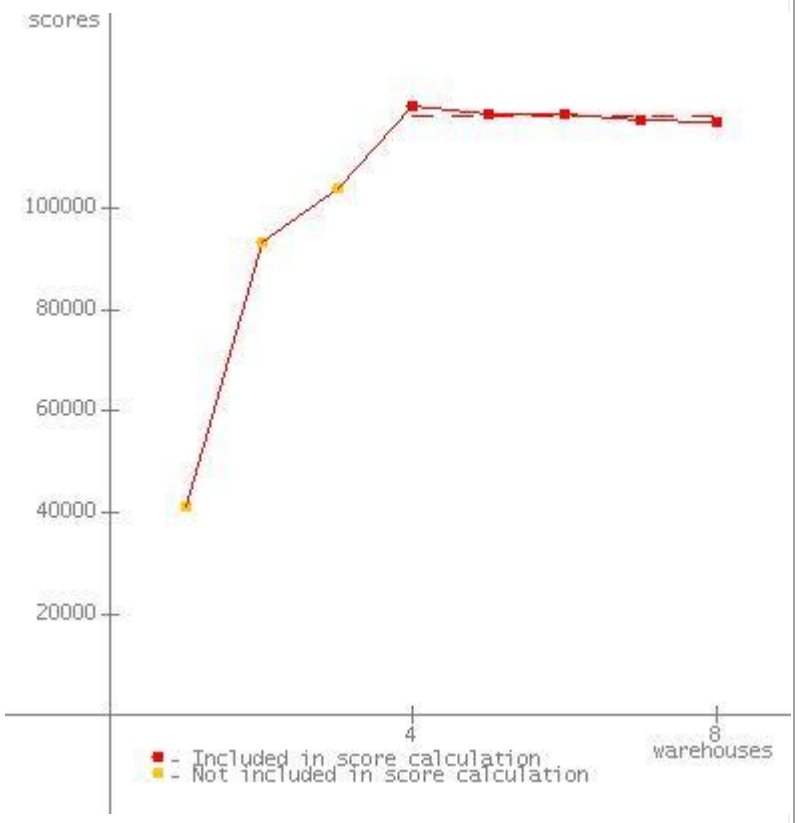
| | | |
|---|---|---|
| 8 | 115545 | * |
| **SPECjbb2005** | **(from 4 to 8)** | **116675 SPECjbb2005 bops** |

| | | |
|---|---|---|
| **SPEC license #** 3184 | **Tested by:** Principled Technologies, Inc. | **Test date:** Mar 11, 2010 |

## JVM 9 Scores:

## NO ERRORS. VALID RUN.

| Warehouses | SPECjbb2005 bops | Incl. in metric |
|---|---|---|
| 1 | 41022 | |
| 2 | 93339 | |
| 3 | 104279 | |
| 4 | 120469 | * |
| 5 | 118732 | * |
| 6 | 118745 | * |
| 7 | 117653 | * |
| 8 | 117135 | * |
| **SPECjbb2005** | **(from 4 to 8)** | **118547 SPECjbb2005 bops** |

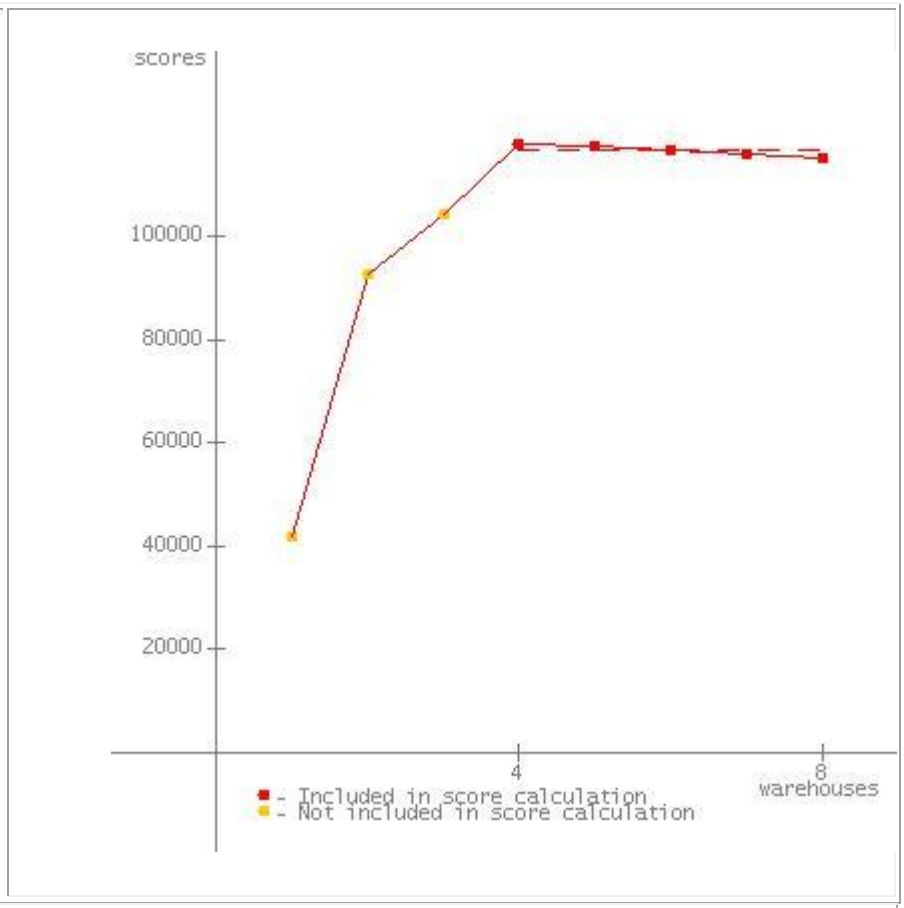



| | | |
|---|---|---|
| **SPEC license #** 3184 | **Tested by:** Principled Technologies, Inc. | **Test date:** Mar 11, 2010 |

## JVM 10 Scores:

## NO ERRORS. VALID RUN.

| Warehouses | SPECjbb2005 bops | Incl. in metric |
|---|---|---|
| 1 | 42025 | |
| 2 | 92670 | |
| 3 | 104156 | |
| 4 | 117935 | * |
| 5 | 117500 | * |
| 6 | 116532 | * |
| 7 | 115951 | * |
| 8 | 115251 | * |
| **SPECjbb2005** | **(from 4 to 8)** | **116634 SPECjbb2005 bops** |

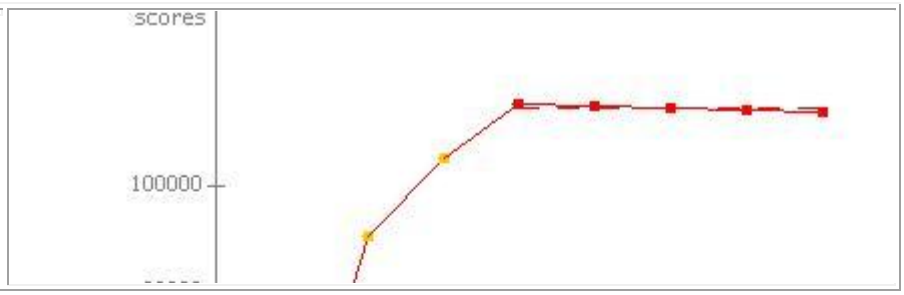



| | | |
|---|---|---|
| **SPEC license #** 3184 | **Tested by:** Principled Technologies, Inc. | **Test date:** Mar 11, 2010 |

## JVM 11 Scores:

## NO ERRORS. VALID RUN.

| Warehouses | SPECjbb2005 bops | Incl. in metric |
|---|---|---|
| 1 | 43435 | |
| 2 | 90404 | |



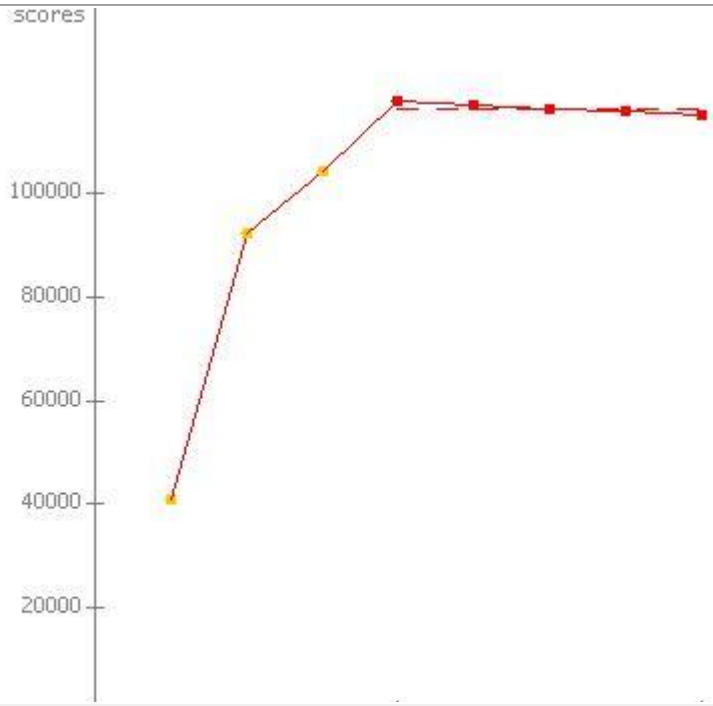
| | | |
|---|---|---|
| 3 | 105441 | |
| 4 | 115651 | * |
| 5 | 115281 | * |
| 6 | 114706 | * |
| 7 | 114510 | * |
| 8 | 114112 | * |
| **SPECjbb2005** | **(from 4 to 8)** | **114852 SPECjbb2005 bops** |

| | | |
|---|---|---|
| **SPEC license #** 3184 | **Tested by:** Principled Technologies, Inc. | **Test date:** Mar 11, 2010 |

## JVM 12 Scores:

## NO ERRORS. VALID RUN.

| Warehouses | SPECjbb2005 bops | Incl. in metric |
|---|---|---|
| 1 | 40675 | |
| 2 | 92480 | |
| 3 | 104385 | |
| 4 | 118176 | * |
| 5 | 117228 | * |
| 6 | 116560 | * |
| 7 | 116047 | * |
| 8 | 115313 | * |



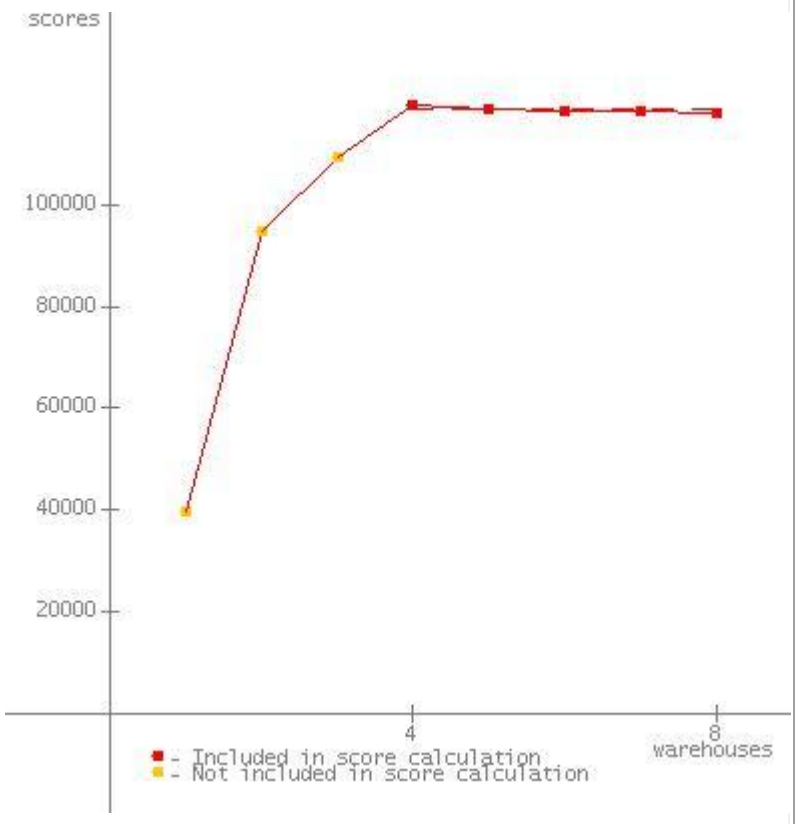
| | | | |
|---|---|---|---|
| **SPECjbb2005** | **(from 4 to 8)** | **116665 SPECjbb2005 bops** | |

| | | |
|---|---|---|
| **SPEC license #** 3184 | **Tested by:** Principled Technologies, Inc. | **Test date:** Mar 11, 2010 |

## JVM 13 Scores:

## NO ERRORS. VALID RUN.

| Warehouses | SPECjbb2005 bops | Incl. in metric |
|---|---|---|
| 1 | 39612 | |
| 2 | 94658 | |
| 3 | 109458 | |
| 4 | 119627 | * |
| 5 | 118809 | * |
| 6 | 118222 | * |
| 7 | 118286 | * |
| 8 | 117918 | * |
| **SPECjbb2005** | **(from 4 to 8)** | **118572 SPECjbb2005 bops** |

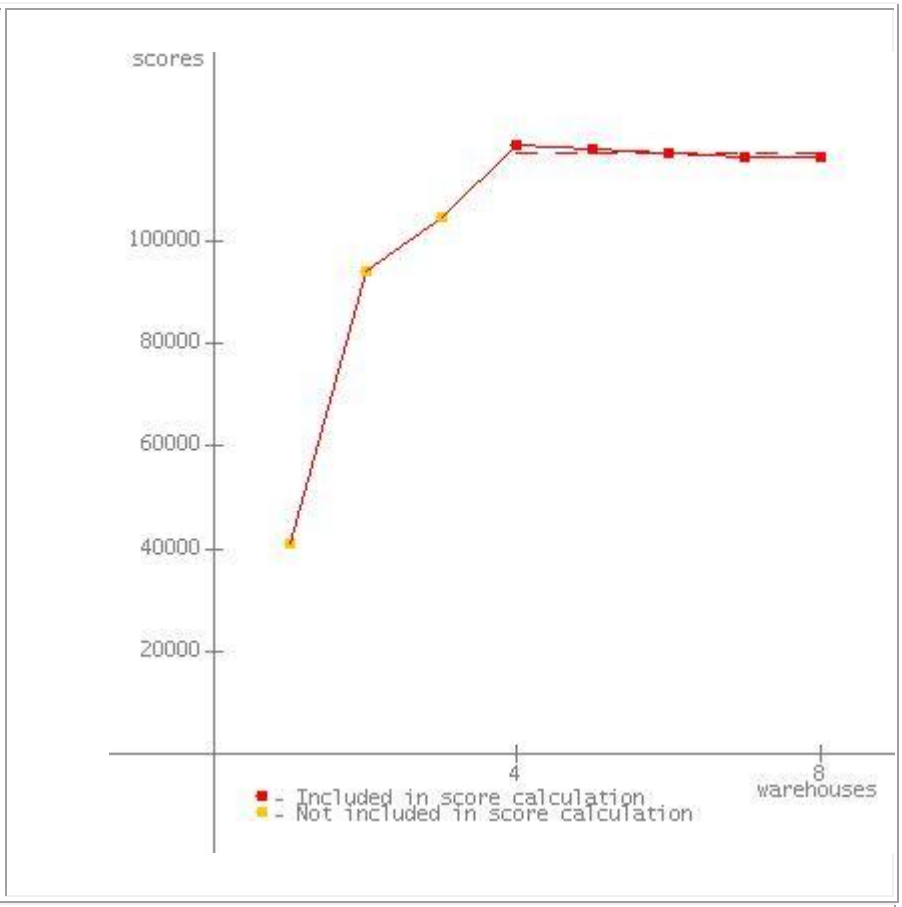



| | | |
|---|---|---|
| **SPEC license #** 3184 | **Tested by:** Principled Technologies, Inc. | **Test date:** Mar 11, 2010 |

## JVM 14 Scores:

## NO ERRORS. VALID RUN.

| Warehouses | SPECjbb2005 bops | Incl. in metric |
|---|---|---|
| 1 | 40932 | |
| 2 | 94115 | |
| 3 | 104636 | |
| 4 | 118757 | * |
| 5 | 117821 | * |
| 6 | 116928 | * |
| 7 | 116186 | * |
| 8 | 116334 | * |
| **SPECjbb2005** | **(from 4 to 8)** | **117205 SPECjbb2005 bops** |

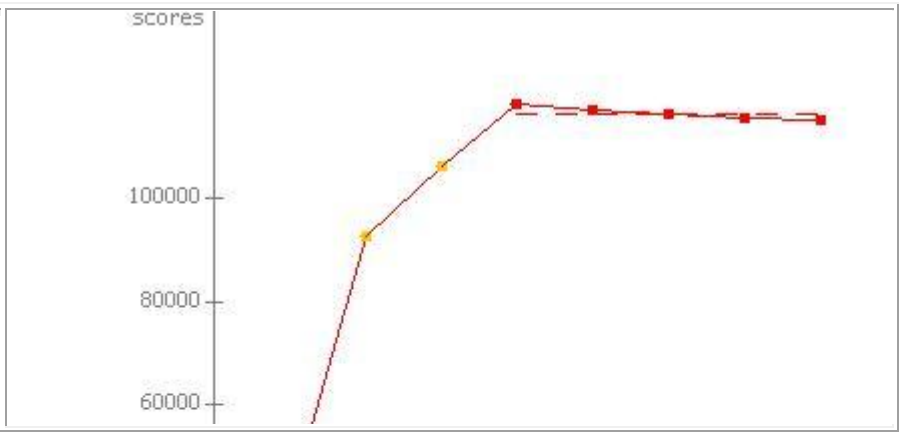



| | | |
|---|---|---|
| **SPEC license #** 3184 | **Tested by:** Principled Technologies, Inc. | **Test date:** Mar 11, 2010 |

## JVM 15 Scores:

## NO ERRORS. VALID RUN.

| Warehouses | SPECjbb2005 bops | Incl. in metric |
|---|---|---|
| 1 | 41436 | |
| 2 | 92587 | |
| 3 | 106195 | |
| 4 | 118568 | * |



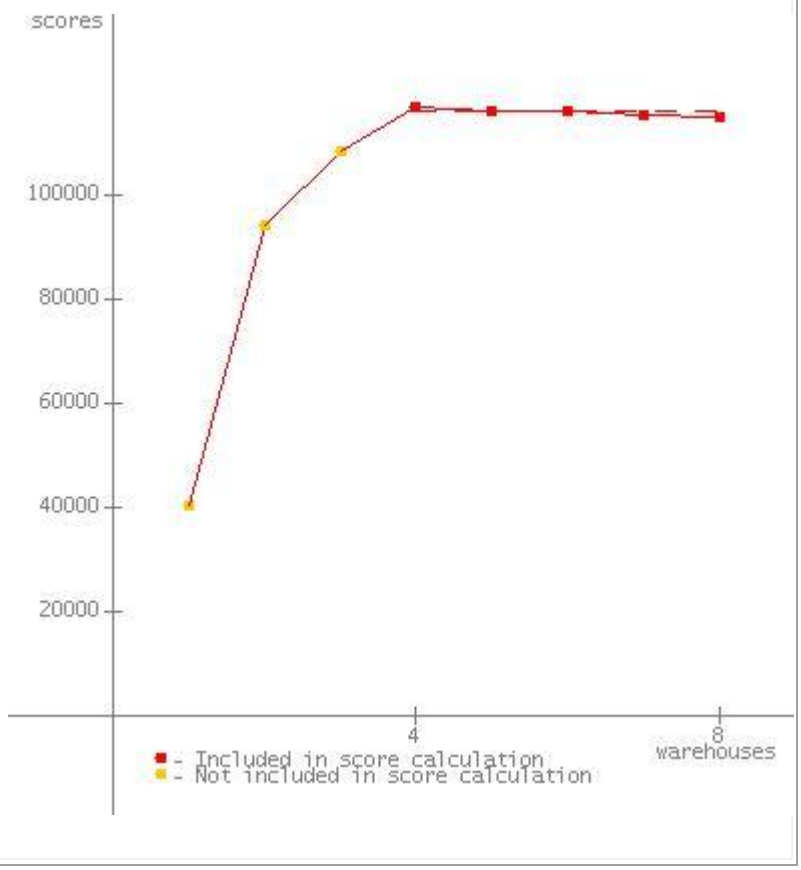
| | | |
|---|---|---|
| 5 | 117289 | * |
| 6 | 116306 | * |
| 7 | 115806 | * |
| 8 | 115224 | * |
| **SPECjbb2005** | **(from 4 to 8)** | **116639 SPECjbb2005 bops** |

| | | |
|---|---|---|
| **SPEC license #** 3184 | **Tested by:** Principled Technologies, Inc. | **Test date:** Mar 11, 2010 |

## JVM 16 Scores:

## NO ERRORS. VALID RUN.

| Warehouses | SPECjbb2005 bops | Incl. in metric |
|---|---|---|
| 1 | 40407 | |
| 2 | 94367 | |
| 3 | 108745 | |
| 4 | 117245 | * |
| 5 | 116519 | * |
| 6 | 116183 | * |
| 7 | 115676 | * |
| 8 | 115361 | * |
| **SPECjbb2005** | **(from 4 to 8)** | **116197 SPECjbb2005 bops** |



| | | |
|---|---|---|
| **SPEC license #** 3184 | **Tested by:** Principled Technologies, Inc. | **Test date:** Mar 11, 2010 |

SPECjbb2005 Version: [SPECjbb2005 1.07, March 15, 2006]

## OpenSolaris 2009.06 server: Sun SPARC Enterprise T5440

**(http://www.spec.org/osg/jbb2005/results/res2009q3/jbb2005-20090720-00753.html)**

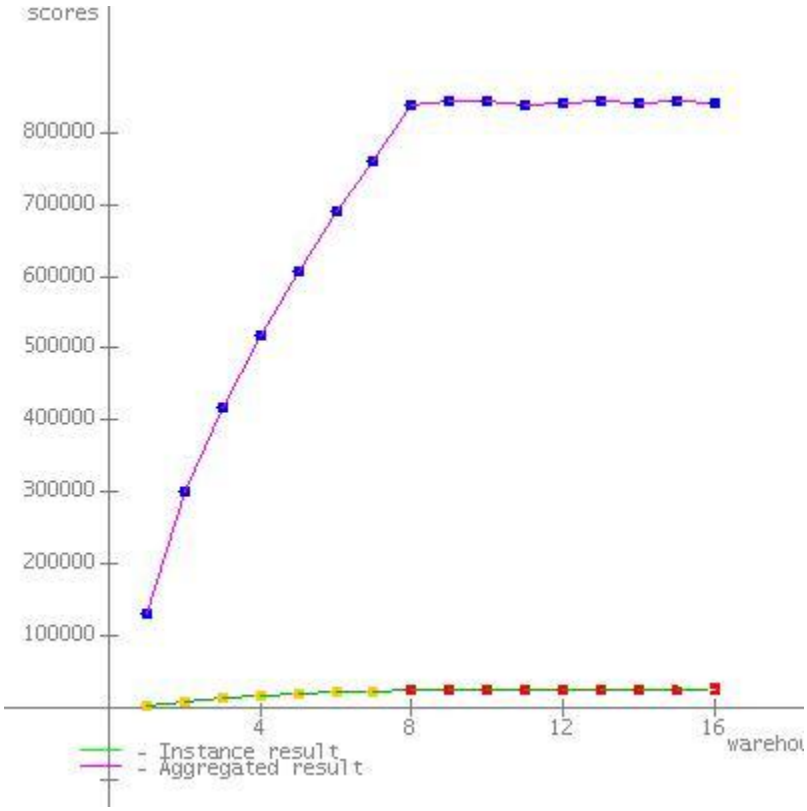
SPECjbb2005

**SPECjbb2005 bops = 841380,**
**SPECjbb2005 bops/JVM = 26293**

Sun Microsystems, Inc. Sun SPARC Enterprise T5440

Sun Microsystems, Inc. Java HotSpot(TM) 32-Bit Server VM on Solaris, version 1.6.0_14 Performance Release

| JVM run | JVM Scores |
|---|---|
| 1 | 26294 |
| 2 | 26336 |
| 3 | 26291 |
| 4 | 26345 |
| 5 | 26259 |
| 6 | 26276 |
| 7 | 26251 |
| 8 | 26192 |
| 9 | 26321 |
| 10 | 26454 |
| 11 | 26344 |
| 12 | 26207 |
| 13 | 26321 |
| 14 | 26357 |
| 15 | 26314 |
| 16 | 26372 |
| 17 | 26404 |
| 18 | 26445 |
| 19 | 26389 |
| 20 | 26272 |
| 21 | 26281 |



| | |
|---|---|
| 22 | 26334 |
| 23 | 26363 |
| 24 | 26329 |
| 25 | 26292 |
| 26 | 25501 |
| 27 | 26340 |
| 28 | 26274 |
| 29 | 26369 |
| 30 | 26219 |
| 31 | 26409 |
| 32 | 26225 |
| **SPECjbb2005 bops = 841380, SPECjbb2005 bops/JVM = 26293** | |

| Hardware | |
|---|---|
| **Hardware Vendor** | Sun Microsystems, Inc. |
| **Vendor URL** | http://www.sun.com |
| **Model** | Sun SPARC Enterprise T5440 |
| **Processor** | UltraSPARC T2 Plus |
| **MHz** | 1596 |
| **# of Chips** | 4 |
| **# of Cores** | 32 |
| **# of Cores/Chip** | 8 |
| **HW Threading Enabled?** | Yes |
| **Procs Avail to Java** | 256 |
| **Memory (MB)** | 262144 |
| **Memory Details** | 64x 4GB DDR2-800 FBDIMMS |

| Software | |
|---|---|
| **Software Vendor** | Sun Microsystems, Inc. |
| **Vendor URL** | http://www.sun.com |
| **JVM Version** | Java HotSpot(TM) 32-Bit Server VM on Solaris, version 1.6.0_14 Performance Release |
| **JVM Command Line** | psrset -e processor set number priocntl -c FX -t 150 -e java -Xmx3g -Xms3g -Xmn2560m -XX:TargetSurvivorRatio=90 -XX:-UseAdaptiveSizePolicy -XX:InitialTenuringThreshold=1 -XX:MaxTenuringThreshold=15 -XX:SurvivorRatio=12 -Xss96k -XX:LargePageSizeInBytes=256m -XX:+UseParallelOldGC -XX:+AggressiveOpts -XX:ParallelGCThreads=8 -classpath jbb.jar:check.jar spec.jbb.JBBmain -propfile SPECjbb.props -id JVM id |
| **JVM Initial Heap Memory (MB)** | 3072 |
| **JVM Maximum Heap Memory (MB)** | 3072 |
| **JVM Address bits** | 32 |
| **JVM CLASSPATH** | jbb.jar: check.jar |

| | |
|---|---|
| **Primary cache** | 16KB(I)+8KB(D) per core |
| **Secondary cache** | 4MB per chip |
| **Other cache** | |
| **Filesystem** | ZFS |
| **Disks** | 1x 146GB SCSI Disk |
| **Other hardware** | |

| | |
|---|---|
| **JVM BOOTCLASSPATH** | /export/home/dagastin/VMs/jdk1.6.0_14/jre/lib/alt-rt.jar:<br>/export/home/dagastin/VMs/jdk1.6.0_14/jre/lib/resources.jar:<br>/export/home/dagastin/VMs/jdk1.6.0_14/jre/lib/rt.jar:<br>/export/home/dagastin/VMs/jdk1.6.0_14/jre/lib/sunrsasign.jar:<br>/export/home/dagastin/VMs/jdk1.6.0_14/jre/lib/jsse.jar:<br>/export/home/dagastin/VMs/jdk1.6.0_14/jre/lib/jce.jar:<br>/export/home/dagastin/VMs/jdk1.6.0_14/jre/lib/charsets.jar:<br>/export/home/dagastin/VMs/jdk1.6.0_14/jre/classes |
| **OS Version** | OpenSolaris 2009.06 |
| **Other software** | |

| Test Information | |
|---|---|
| **Tested by** | Sun Microsystems, Inc. |
| **SPEC license #** | 6 |
| **Test location** | Burlington, MA. |
| **Test date** | Jun 9, 2009 |
| **H/w available** | Jul-2009 |
| **JVM available** | May-2009 |
| **OS available** | Jun-2009 |
| **Other s/w available** | |

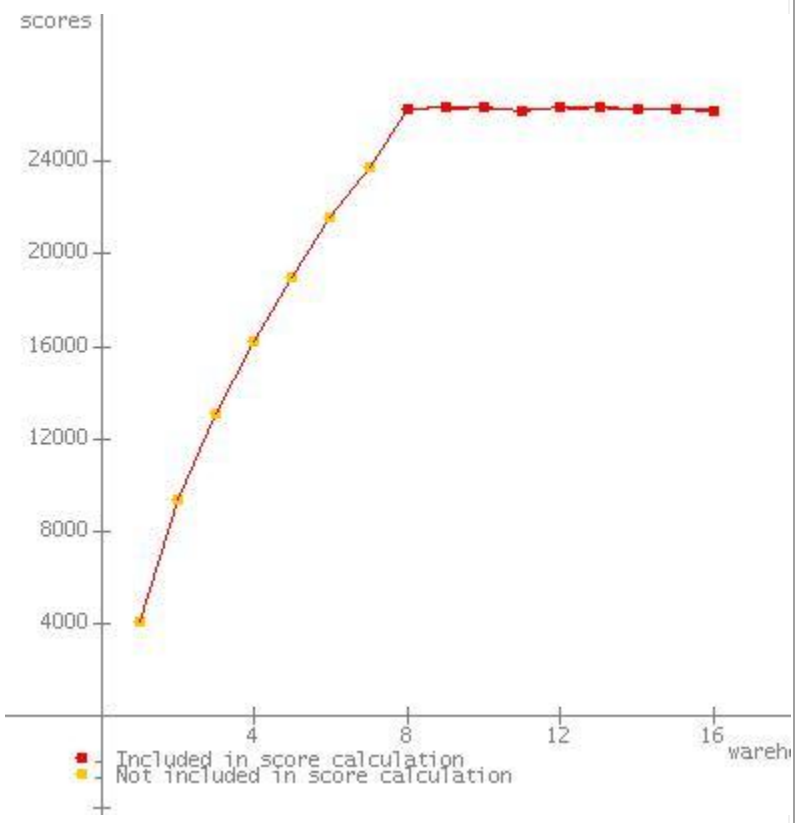
| AOT Compilation |
|---|
| |

| Tuning |
|---|
| |

| Notes |
|---|
| Each JVM was placed in the FX priority class with the priocntl command.<br>31 JVMs were run in processor sets each containing one core.<br>One JVM was run in the default processor set<br>The parameter expected_peak_warehouse was set to 8<br>This result was measured on the Sun SPARC Enterprise T5440.<br>The Sun SPARC Enterprise T5440 and the Fujitsu SPARC Enterprise T5440 are electronically equivalent. |

## JVM 1 Scores:

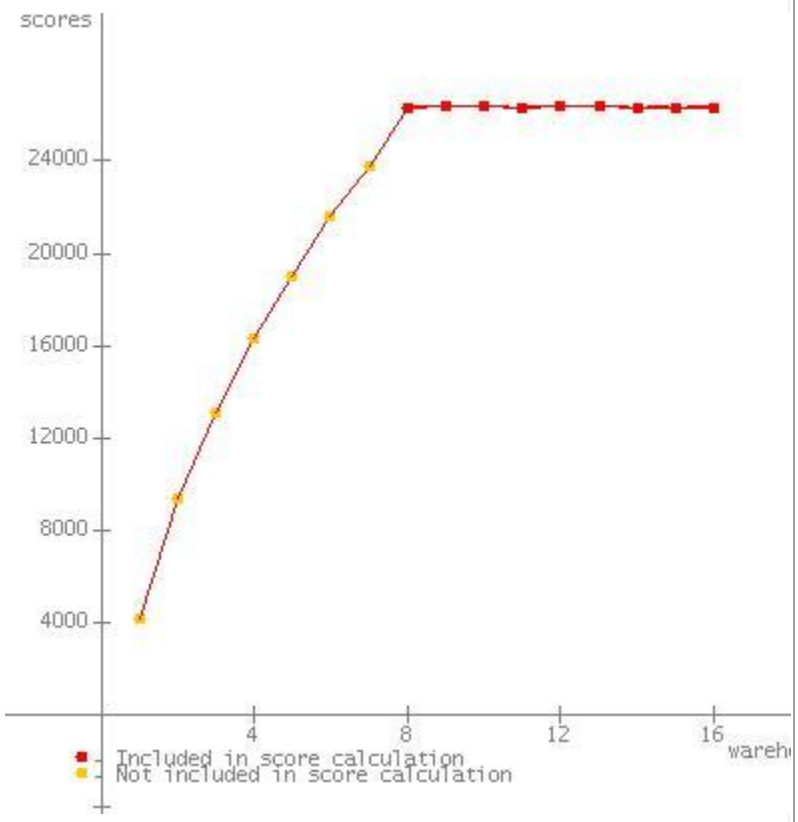
| Warehouses | SPECjbb2005 bops | Incl. in metric |
|---|---|---|
| 1 | 4104 | |
| 2 | 9389 | |
| 3 | 13059 | |
| 4 | 16234 | |
| 5 | 18990 | |
| 6 | 21592 | |
| 7 | 23732 | |
| 8 | 26249 | * |
| 9 | 26387 | * |
| 10 | 26327 | * |
| 11 | 26222 | * |
| 12 | 26344 | * |
| 13 | 26363 | * |
| 14 | 26259 | * |
| 15 | 26272 | * |
| 16 | 26224 | * |
| **SPECjbb2005** | **(from 8 to 16)** | **26294 SPECjbb2005 bops** |




| | | |
|---|---|---|
| **SPEC license #** 6 | **Tested by:** Sun Microsystems, Inc. | **Test date:** Jun 9, 2009 |

## JVM 2 Scores:

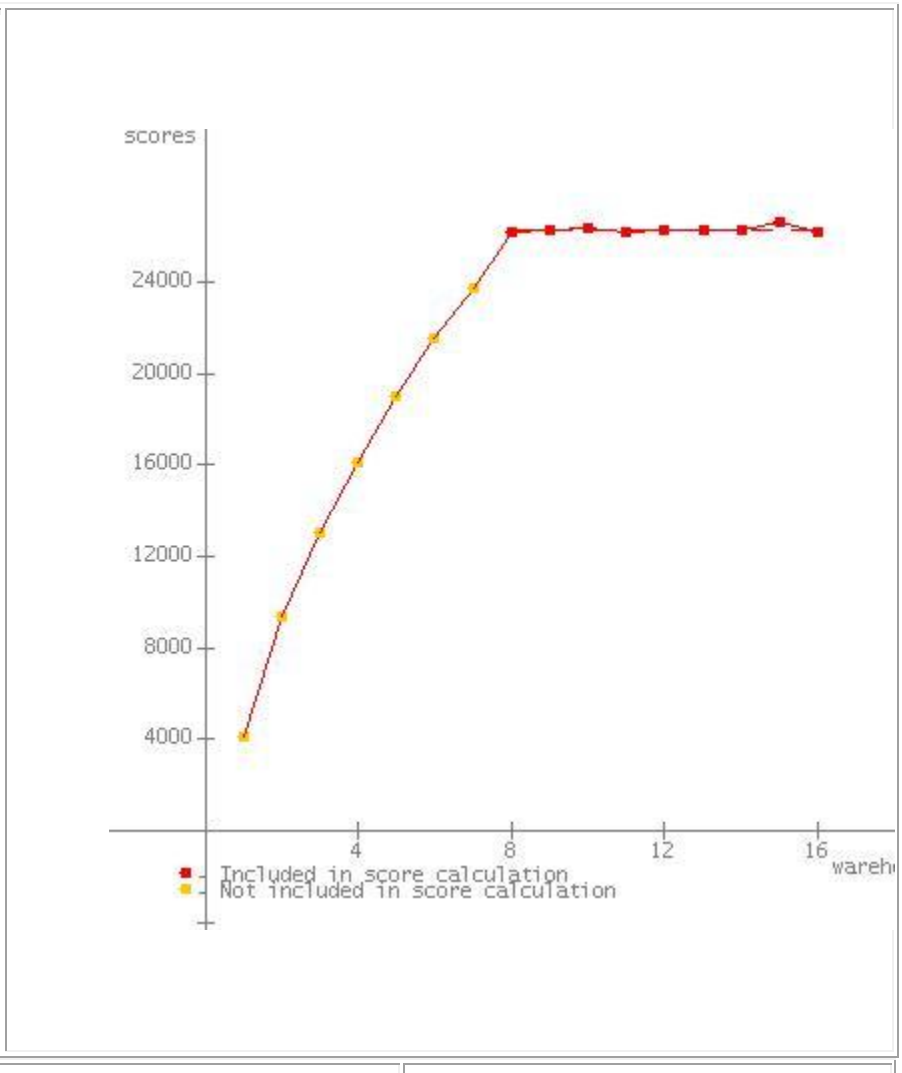
| Warehouses | SPECjbb2005 bops | Incl. in metric |
|---|---|---|
| 1 | 4149 | |
| 2 | 9419 | |
| 3 | 13108 | |
| 4 | 16318 | |
| 5 | 19034 | |
| 6 | 21622 | |
| 7 | 23791 | |
| 8 | 26285 | * |
| 9 | 26405 | * |
| 10 | 26383 | * |
| 11 | 26288 | * |
| 12 | 26390 | * |
| 13 | 26372 | * |
| 14 | 26321 | * |
| 15 | 26310 | * |
| 16 | 26269 | * |
| **SPECjbb2005** | **(from 8 to 16)** | **26336 SPECjbb2005 bops** |




| | | |
|---|---|---|
| **SPEC license #** 6 | **Tested by:** Sun Microsystems, Inc. | **Test date:** Jun 9, 2009 |

## JVM 3 Scores:

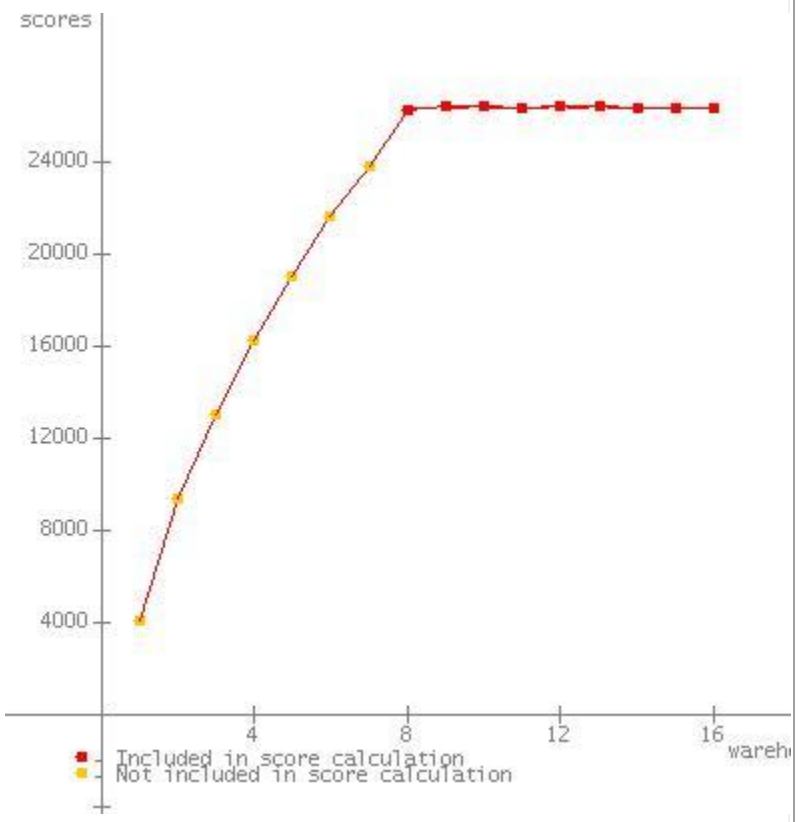
| Warehouses | SPECjbb2005 bops | Incl. in metric |
|---|---|---|
| 1 | 4093 | |
| 2 | 9383 | |
| 3 | 13034 | |
| 4 | 16111 | |
| 5 | 18967 | |
| 6 | 21521 | |
| 7 | 23698 | |
| 8 | 26175 | * |
| 9 | 26309 | * |
| 10 | 26313 | * |
| 11 | 26160 | * |
| 12 | 26298 | * |
| 13 | 26292 | * |
| 14 | 26262 | * |
| 15 | 26647 | * |
| 16 | 26165 | * |
| **SPECjbb2005** | **(from 8 to 16)** | **26291 SPECjbb2005 bops** |




| | | |
|---|---|---|
| **SPEC license #** 6 | **Tested by:** Sun Microsystems, Inc. | **Test date:** Jun 9, 2009 |

## JVM 4 Scores:

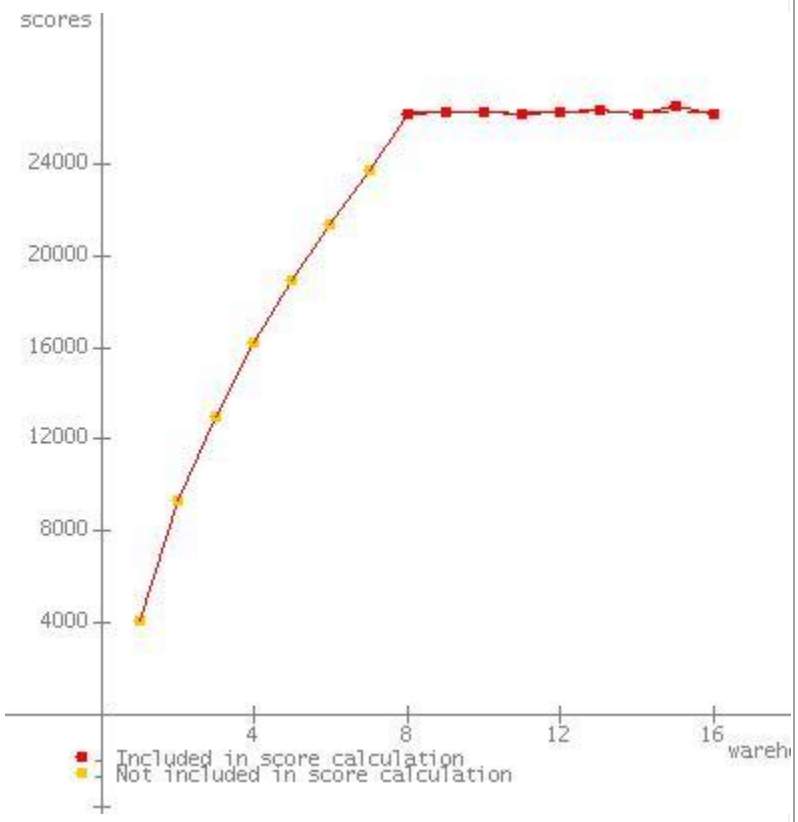
| Warehouses | SPECjbb2005 bops | Incl. in metric |
|---|---|---|
| 1 | 4100 | |
| 2 | 9390 | |
| 3 | 13061 | |
| 4 | 16284 | |
| 5 | 19024 | |
| 6 | 21653 | |
| 7 | 23762 | |
| 8 | 26276 | * |
| 9 | 26438 | * |
| 10 | 26414 | * |
| 11 | 26312 | * |
| 12 | 26384 | * |
| 13 | 26372 | * |
| 14 | 26321 | * |
| 15 | 26290 | * |
| 16 | 26295 | * |
| **SPECjbb2005** | **(from 8 to 16)** | **26345 SPECjbb2005 bops** |




| | | |
|---|---|---|
| **SPEC license #** 6 | **Tested by:** Sun Microsystems, Inc. | **Test date:** Jun 9, 2009 |

## JVM 5 Scores:

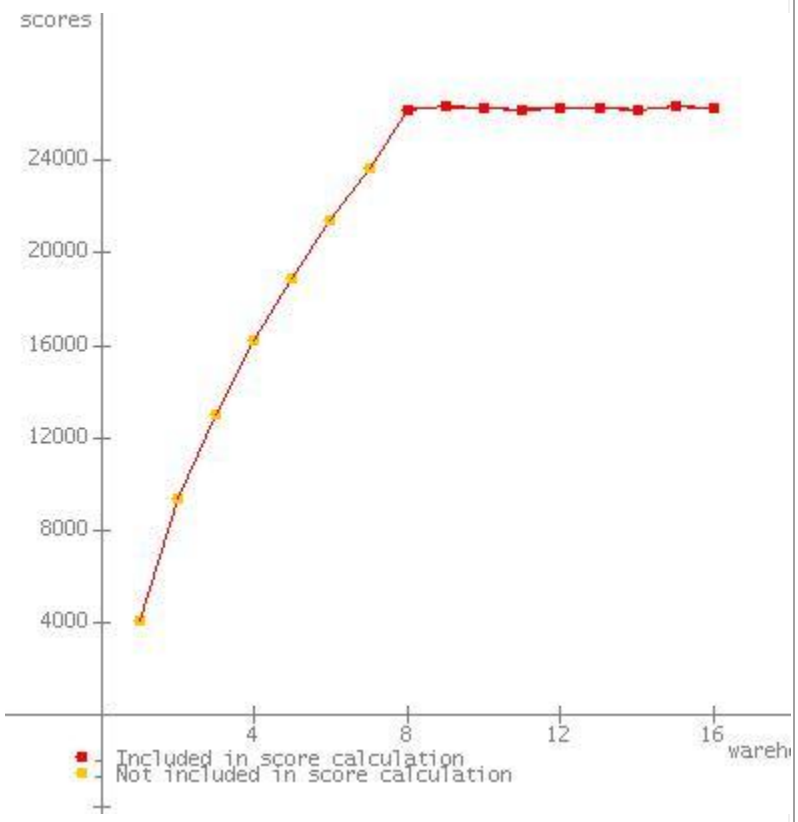
| Warehouses | SPECjbb2005 bops | Incl. in metric |
|---|---|---|
| 1 | 4066 | |
| 2 | 9346 | |
| 3 | 13020 | |
| 4 | 16211 | |
| 5 | 18907 | |
| 6 | 21389 | |
| 7 | 23696 | |
| 8 | 26159 | * |
| 9 | 26284 | * |
| 10 | 26272 | * |
| 11 | 26144 | * |
| 12 | 26260 | * |
| 13 | 26358 | * |
| 14 | 26186 | * |
| 15 | 26537 | * |
| 16 | 26127 | * |
| **SPECjbb2005** | **(from 8 to 16)** | **26259 SPECjbb2005 bops** |




| | | |
|---|---|---|
| **SPEC license #** 6 | **Tested by:** Sun Microsystems, Inc. | **Test date:** Jun 9, 2009 |

## JVM 6 Scores:

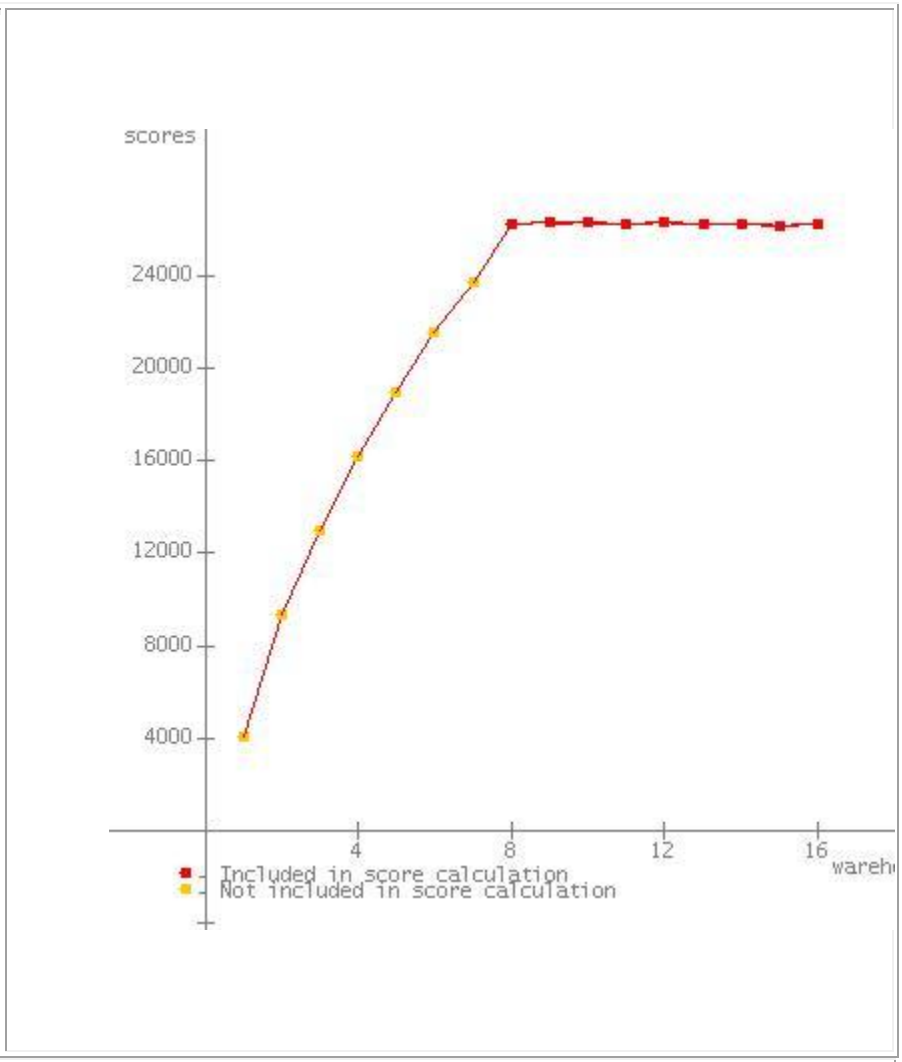
| Warehouses | SPECjbb2005 bops | Incl. in metric |
|---|---|---|
| 1 | 4110 | |
| 2 | 9336 | |
| 3 | 13031 | |
| 4 | 16228 | |
| 5 | 18940 | |
| 6 | 21398 | |
| 7 | 23698 | |
| 8 | 26188 | * |
| 9 | 26344 | * |
| 10 | 26315 | * |
| 11 | 26187 | * |
| 12 | 26306 | * |
| 13 | 26310 | * |
| 14 | 26207 | * |
| 15 | 26390 | * |
| 16 | 26238 | * |
| **SPECjbb2005** | **(from 8 to 16)** | **26276 SPECjbb2005 bops** |




| | | |
|---|---|---|
| **SPEC license #** 6 | **Tested by:** Sun Microsystems, Inc. | **Test date:** Jun 9, 2009 |

## JVM 7 Scores:

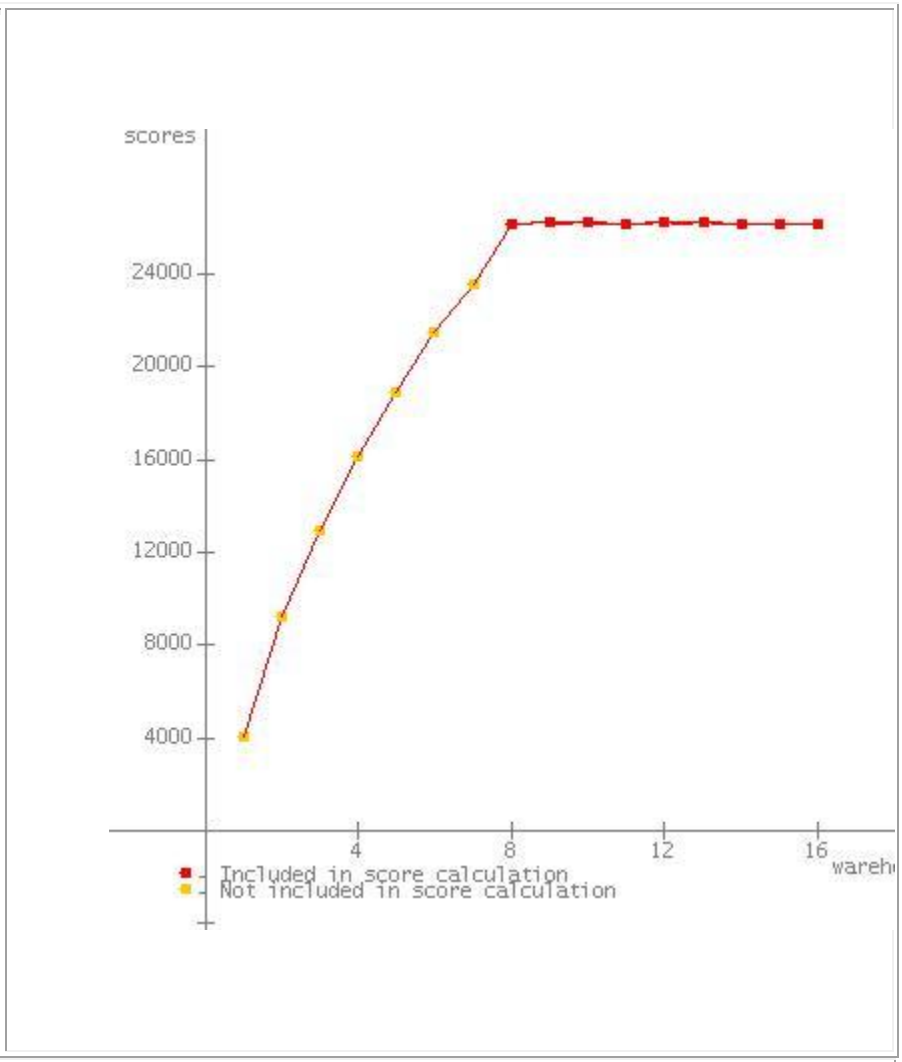
| Warehouses | SPECjbb2005 bops | Incl. in metric |
|---|---|---|
| 1 | 4104 | |
| 2 | 9386 | |
| 3 | 12993 | |
| 4 | 16215 | |
| 5 | 18990 | |
| 6 | 21528 | |
| 7 | 23715 | |
| 8 | 26214 | * |
| 9 | 26354 | * |
| 10 | 26316 | * |
| 11 | 26205 | * |
| 12 | 26304 | * |
| 13 | 26257 | * |
| 14 | 26226 | * |
| 15 | 26182 | * |
| 16 | 26198 | * |
| **SPECjbb2005** | **(from 8 to 16)** | **26251 SPECjbb2005 bops** |




| | | |
|---|---|---|
| **SPEC license #** 6 | **Tested by:** Sun Microsystems, Inc. | **Test date:** Jun 9, 2009 |

## JVM 8 Scores:

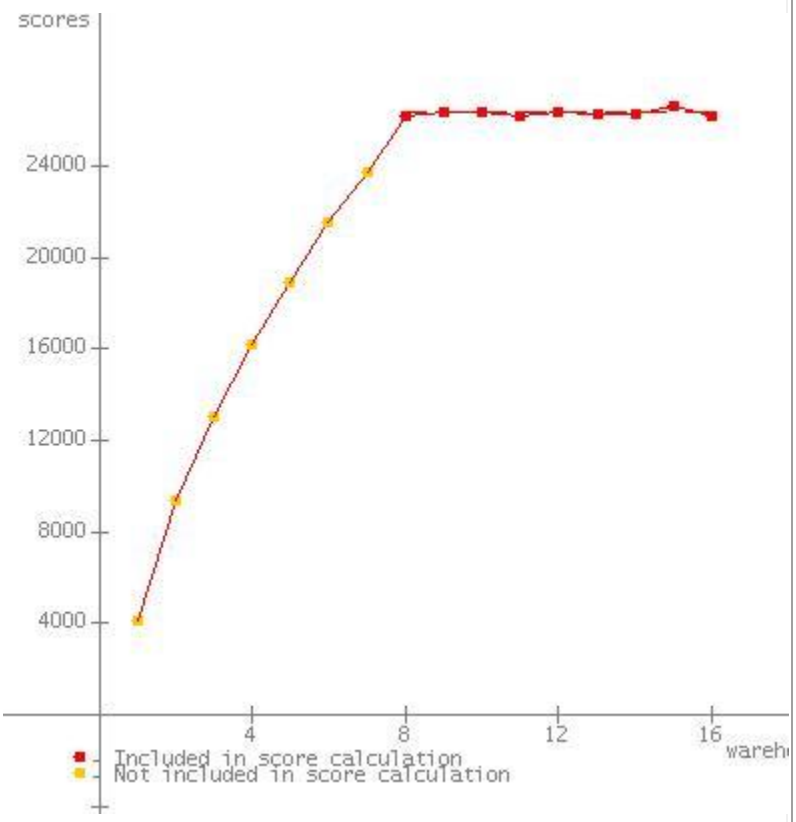
| Warehouses | SPECjbb2005 bops | Incl. in metric |
|---|---|---|
| 1 | 4083 | |
| 2 | 9274 | |
| 3 | 12984 | |
| 4 | 16158 | |
| 5 | 18878 | |
| 6 | 21483 | |
| 7 | 23545 | |
| 8 | 26151 | * |
| 9 | 26268 | * |
| 10 | 26232 | * |
| 11 | 26140 | * |
| 12 | 26220 | * |
| 13 | 26204 | * |
| 14 | 26175 | * |
| 15 | 26183 | * |
| 16 | 26150 | * |
| **SPECjbb2005** | **(from 8 to 16)** | **26192 SPECjbb2005 bops** |




| | | |
|---|---|---|
| **SPEC license #** 6 | **Tested by:** Sun Microsystems, Inc. | **Test date:** Jun 9, 2009 |

## JVM 9 Scores:

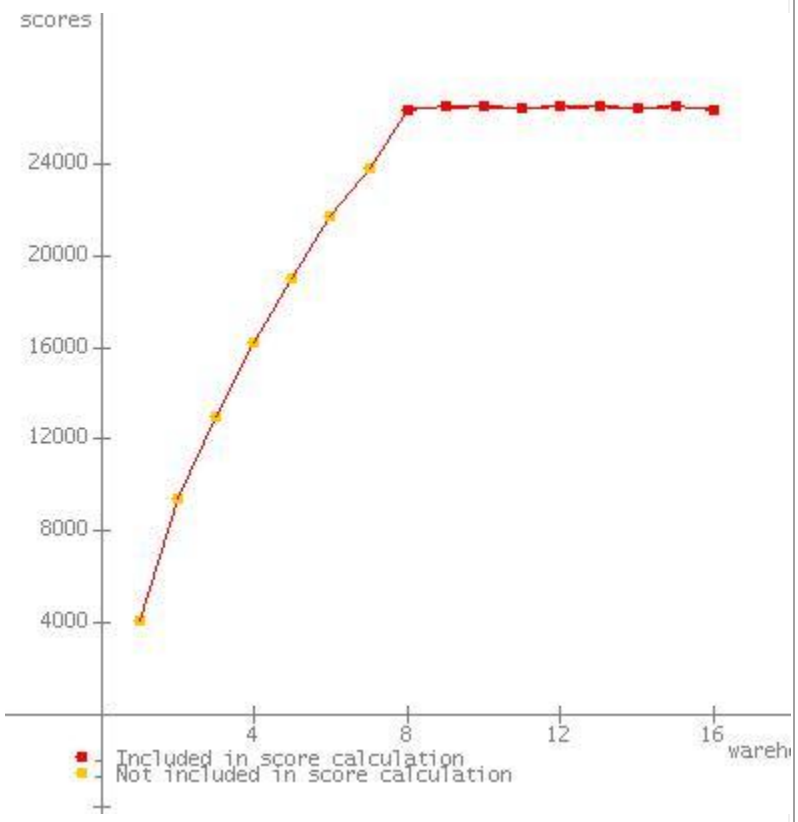
| Warehouses | SPECjbb2005 bops | Incl. in metric |
|---|---|---|
| 1 | 4090 | |
| 2 | 9351 | |
| 3 | 13050 | |
| 4 | 16180 | |
| 5 | 18955 | |
| 6 | 21531 | |
| 7 | 23720 | |
| 8 | 26215 | * |
| 9 | 26365 | * |
| 10 | 26360 | * |
| 11 | 26209 | * |
| 12 | 26331 | * |
| 13 | 26284 | * |
| 14 | 26267 | * |
| 15 | 26652 | * |
| 16 | 26204 | * |
| **SPECjbb2005** | **(from 8 to 16)** | **26321 SPECjbb2005 bops** |




| | | |
|---|---|---|
| **SPEC license #** 6 | **Tested by:** Sun Microsystems, Inc. | **Test date:** Jun 9, 2009 |

## JVM 10 Scores:

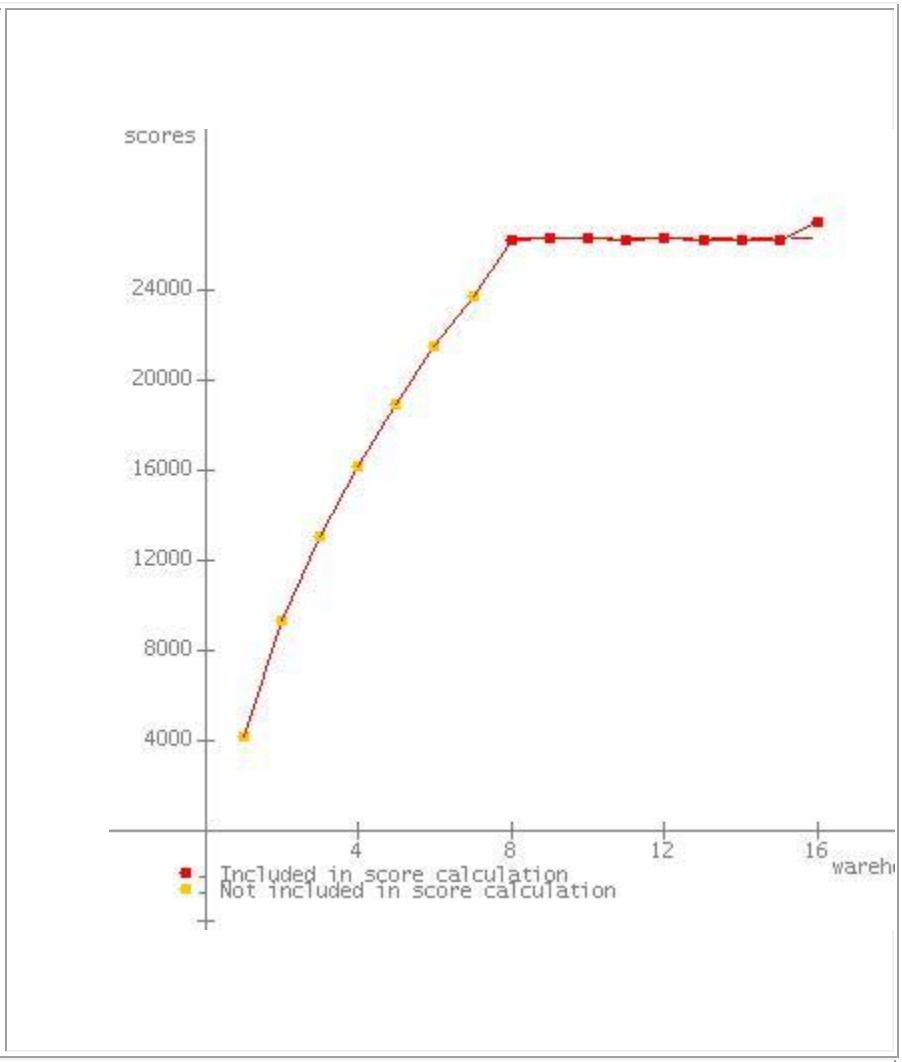
| Warehouses | SPECjbb2005 bops | Incl. in metric |
|---|---|---|
| 1 | 4106 | |
| 2 | 9408 | |
| 3 | 13034 | |
| 4 | 16269 | |
| 5 | 19050 | |
| 6 | 21676 | |
| 7 | 23816 | |
| 8 | 26366 | * |
| 9 | 26518 | * |
| 10 | 26498 | * |
| 11 | 26444 | * |
| 12 | 26480 | * |
| 13 | 26480 | * |
| 14 | 26398 | * |
| 15 | 26544 | * |
| 16 | 26358 | * |
| **SPECjbb2005** | **(from 8 to 16)** | **26454 SPECjbb2005 bops** |




| | | |
|---|---|---|
| **SPEC license #** 6 | **Tested by:** Sun Microsystems, Inc. | **Test date:** Jun 9, 2009 |

## JVM 11 Scores:

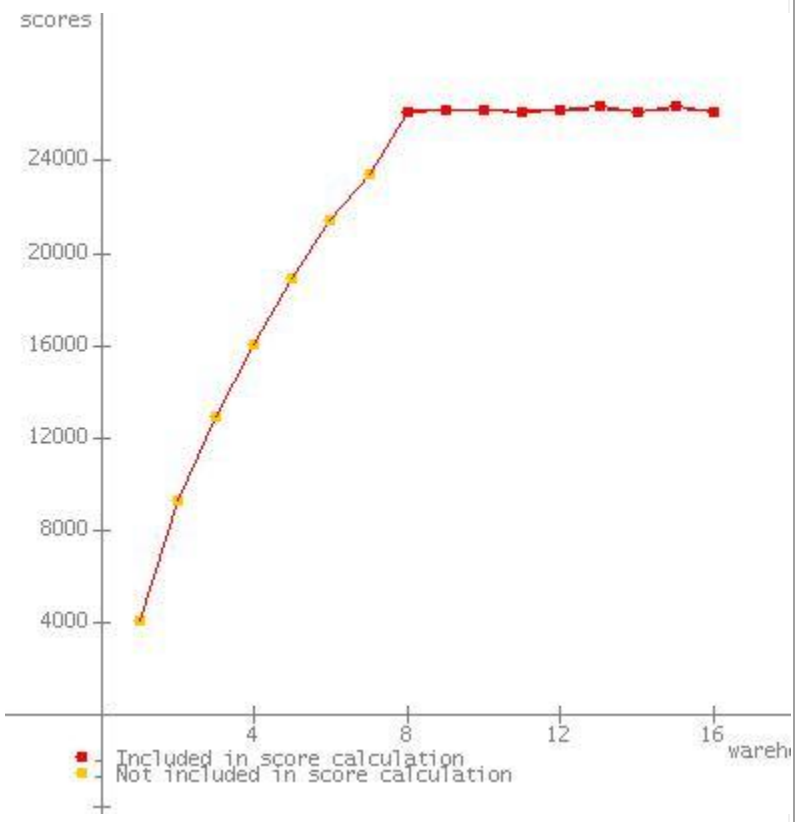
| Warehouses | SPECjbb2005 bops | Incl. in metric |
|---|---|---|
| 1 | 4149 | |
| 2 | 9383 | |
| 3 | 13057 | |
| 4 | 16216 | |
| 5 | 18907 | |
| 6 | 21564 | |
| 7 | 23723 | |
| 8 | 26190 | * |
| 9 | 26318 | * |
| 10 | 26300 | * |
| 11 | 26192 | * |
| 12 | 26307 | * |
| 13 | 26276 | * |
| 14 | 26244 | * |
| 15 | 26211 | * |
| 16 | 27062 | * |
| **SPECjbb2005** | **(from 8 to 16)** | **26344 SPECjbb2005 bops** |




| | | |
|---|---|---|
| **SPEC license #** 6 | **Tested by:** Sun Microsystems, Inc. | **Test date:** Jun 9, 2009 |

## JVM 12 Scores:

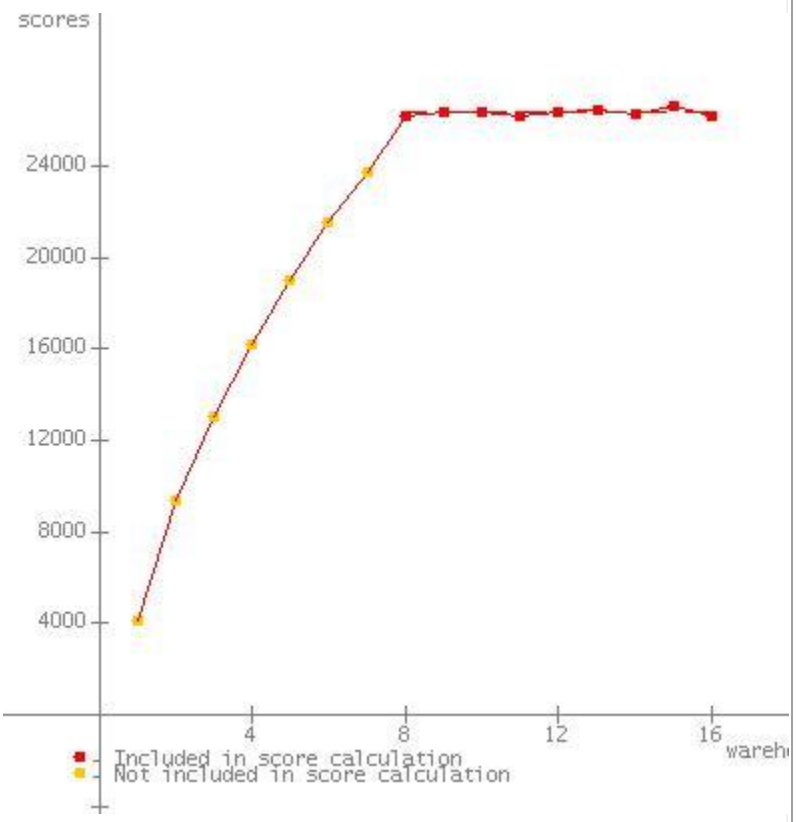
| Warehouses | SPECjbb2005 bops | Incl. in metric |
|---|---|---|
| 1 | 4075 | |
| 2 | 9285 | |
| 3 | 12970 | |
| 4 | 16082 | |
| 5 | 18888 | |
| 6 | 21467 | |
| 7 | 23447 | |
| 8 | 26082 | * |
| 9 | 26240 | * |
| 10 | 26212 | * |
| 11 | 26096 | * |
| 12 | 26203 | * |
| 13 | 26359 | * |
| 14 | 26138 | * |
| 15 | 26414 | * |
| 16 | 26120 | * |
| **SPECjbb2005** | **(from 8 to 16)** | **26207 SPECjbb2005 bops** |




| | | |
|---|---|---|
| **SPEC license #** 6 | **Tested by:** Sun Microsystems, Inc. | **Test date:** Jun 9, 2009 |

## JVM 13 Scores:

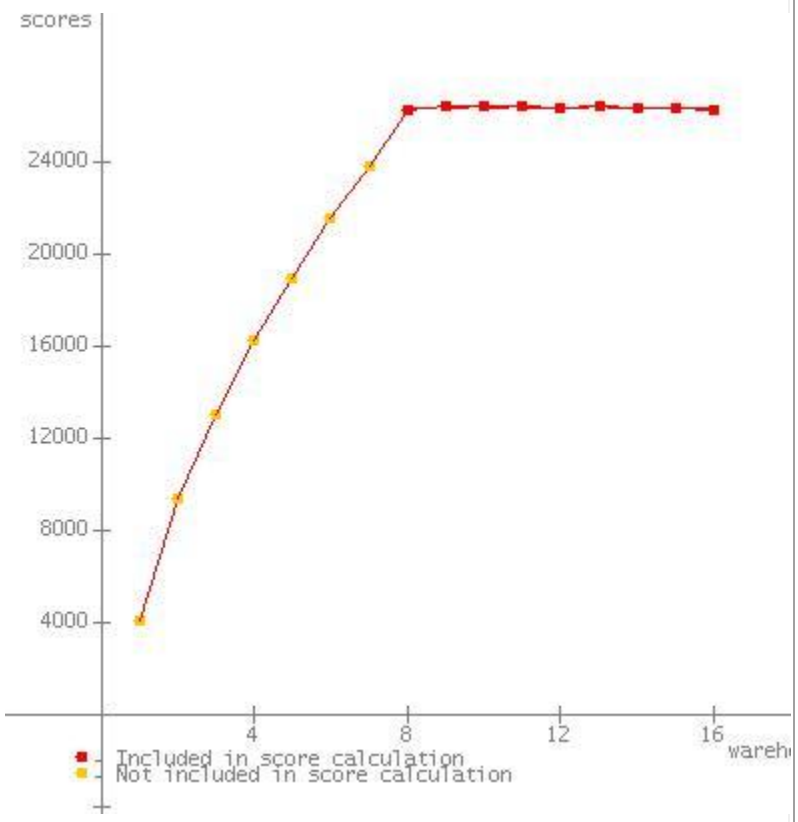
| Warehouses | SPECjbb2005 bops | Incl. in metric |
|---|---|---|
| 1 | 4133 | |
| 2 | 9375 | |
| 3 | 13026 | |
| 4 | 16225 | |
| 5 | 18975 | |
| 6 | 21575 | |
| 7 | 23740 | |
| 8 | 26212 | * |
| 9 | 26331 | * |
| 10 | 26344 | * |
| 11 | 26208 | * |
| 12 | 26313 | * |
| 13 | 26412 | * |
| 14 | 26236 | * |
| 15 | 26639 | * |
| 16 | 26190 | * |
| **SPECjbb2005** | **(from 8 to 16)** | **26321 SPECjbb2005 bops** |




| | | |
|---|---|---|
| **SPEC license #** 6 | **Tested by:** Sun Microsystems, Inc. | **Test date:** Jun 9, 2009 |

## JVM 14 Scores:

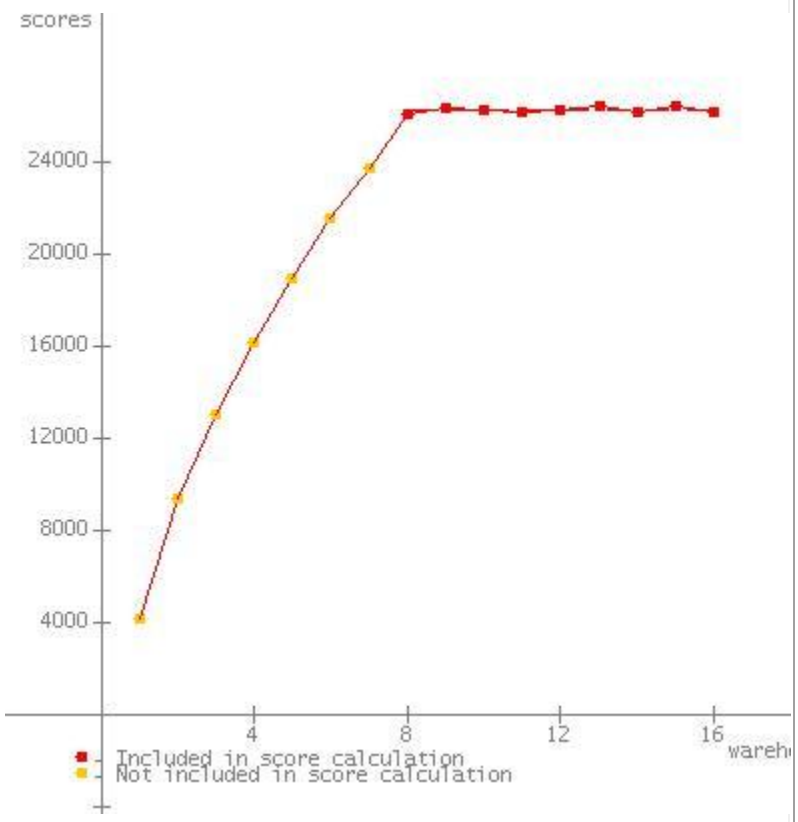
| Warehouses | SPECjbb2005 bops | Incl. in metric |
|---|---|---|
| 1 | 4093 | |
| 2 | 9352 | |
| 3 | 13059 | |
| 4 | 16222 | |
| 5 | 18960 | |
| 6 | 21522 | |
| 7 | 23784 | |
| 8 | 26286 | * |
| 9 | 26416 | * |
| 10 | 26418 | * |
| 11 | 26389 | * |
| 12 | 26369 | * |
| 13 | 26455 | * |
| 14 | 26319 | * |
| 15 | 26297 | * |
| 16 | 26265 | * |
| **SPECjbb2005** | **(from 8 to 16)** | **26357 SPECjbb2005 bops** |




| | | |
|---|---|---|
| **SPEC license #** 6 | **Tested by:** Sun Microsystems, Inc. | **Test date:** Jun 9, 2009 |

## JVM 15 Scores:

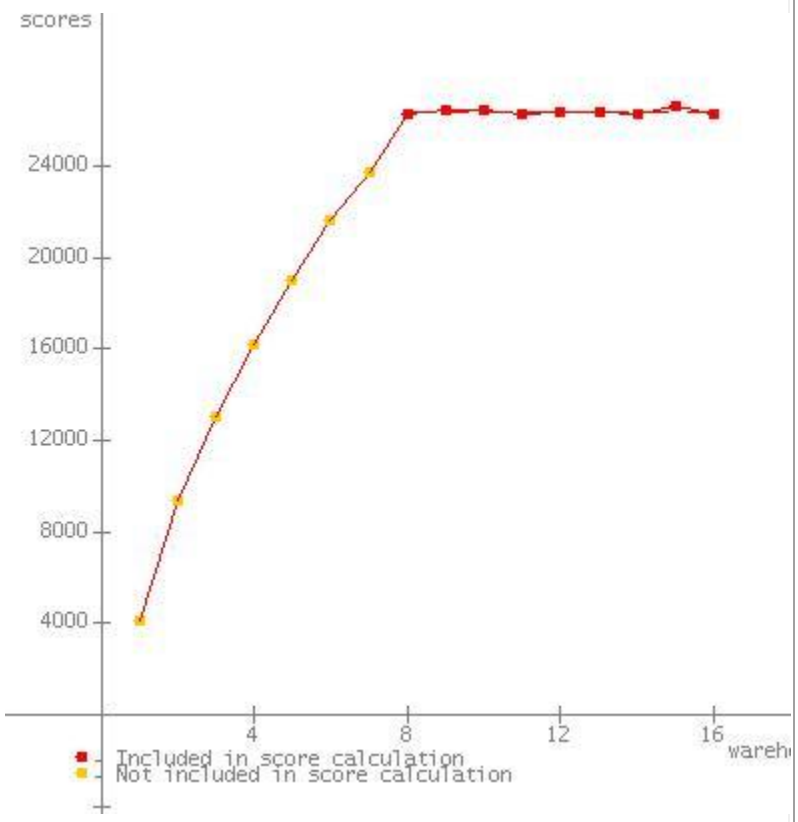
| Warehouses | SPECjbb2005 bops | Incl. in metric |
|---|---|---|
| 1 | 4191 | |
| 2 | 9394 | |
| 3 | 13074 | |
| 4 | 16233 | |
| 5 | 18999 | |
| 6 | 21594 | |
| 7 | 23735 | |
| 8 | 26157 | * |
| 9 | 26360 | * |
| 10 | 26334 | * |
| 11 | 26243 | * |
| 12 | 26310 | * |
| 13 | 26467 | * |
| 14 | 26255 | * |
| 15 | 26502 | * |
| 16 | 26194 | * |
| **SPECjbb2005** | **(from 8 to 16)** | **26314 SPECjbb2005 bops** |




| | | |
|---|---|---|
| **SPEC license #** 6 | **Tested by:** Sun Microsystems, Inc. | **Test date:** Jun 9, 2009 |

## JVM 16 Scores:

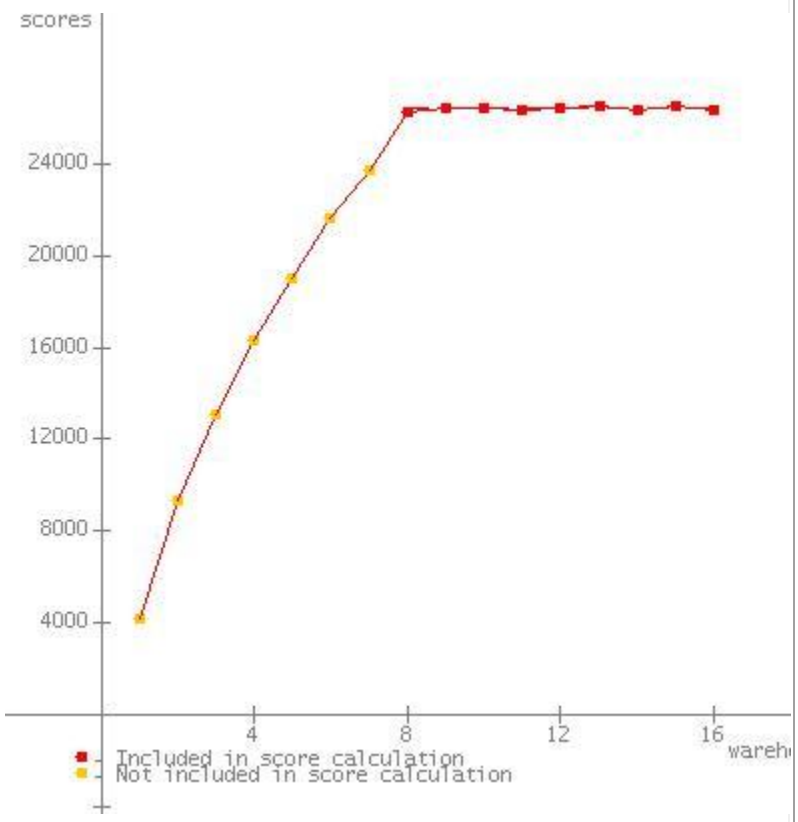
| Warehouses | SPECjbb2005 bops | Incl. in metric |
|---|---|---|
| 1 | 4110 | |
| 2 | 9380 | |
| 3 | 13085 | |
| 4 | 16245 | |
| 5 | 18973 | |
| 6 | 21586 | |
| 7 | 23763 | |
| 8 | 26274 | * |
| 9 | 26417 | * |
| 10 | 26402 | * |
| 11 | 26262 | * |
| 12 | 26382 | * |
| 13 | 26370 | * |
| 14 | 26306 | * |
| 15 | 26648 | * |
| 16 | 26285 | * |
| **SPECjbb2005** | **(from 8 to 16)** | **26372 SPECjbb2005 bops** |




| | | |
|---|---|---|
| **SPEC license #** 6 | **Tested by:** Sun Microsystems, Inc. | **Test date:** Jun 9, 2009 |

## JVM 17 Scores:

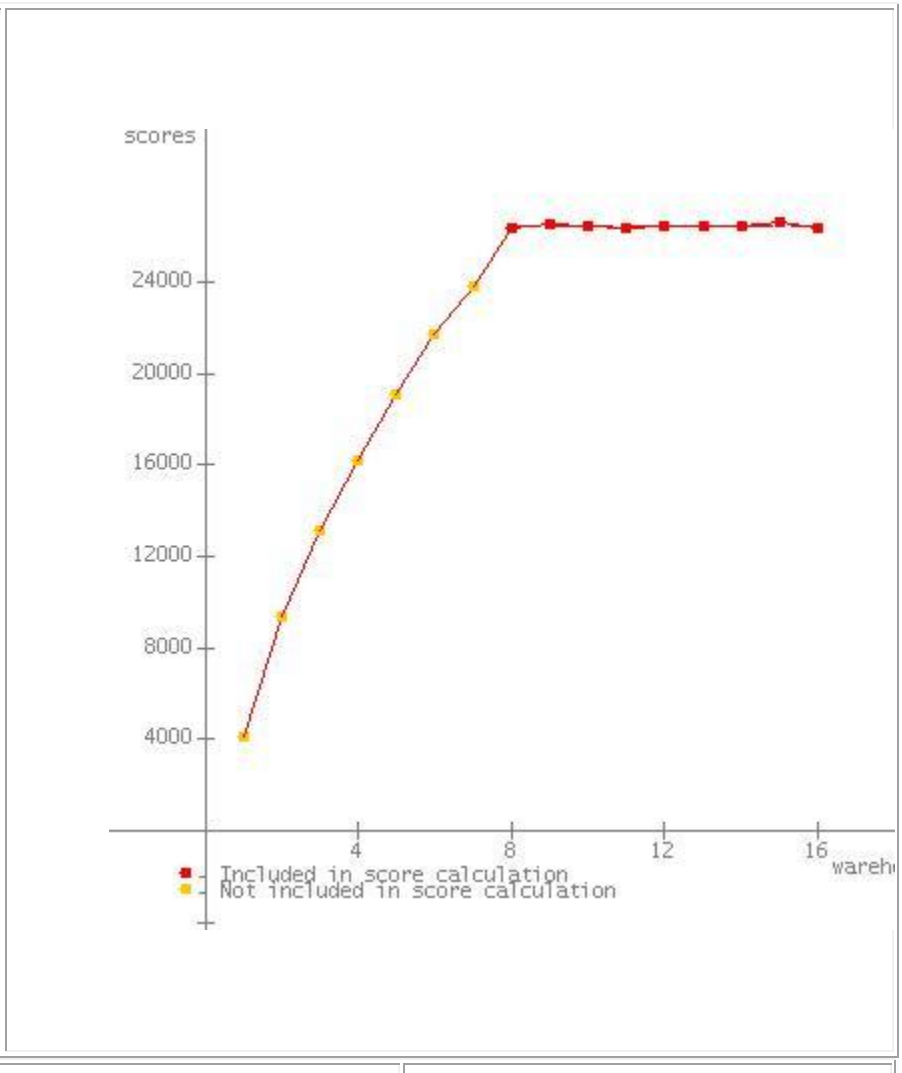
| Warehouses | SPECjbb2005 bops | Incl. in metric |
|---|---|---|
| 1 | 4171 | |
| 2 | 9373 | |
| 3 | 13114 | |
| 4 | 16325 | |
| 5 | 19047 | |
| 6 | 21671 | |
| 7 | 23689 | |
| 8 | 26291 | * |
| 9 | 26454 | * |
| 10 | 26411 | * |
| 11 | 26326 | * |
| 12 | 26426 | * |
| 13 | 26499 | * |
| 14 | 26363 | * |
| 15 | 26543 | * |
| 16 | 26322 | * |
| **SPECjbb2005** | **(from 8 to 16)** | **26404 SPECjbb2005 bops** |




| | | |
|---|---|---|
| **SPEC license #** 6 | **Tested by:** Sun Microsystems, Inc. | **Test date:** Jun 9, 2009 |

## JVM 18 Scores:

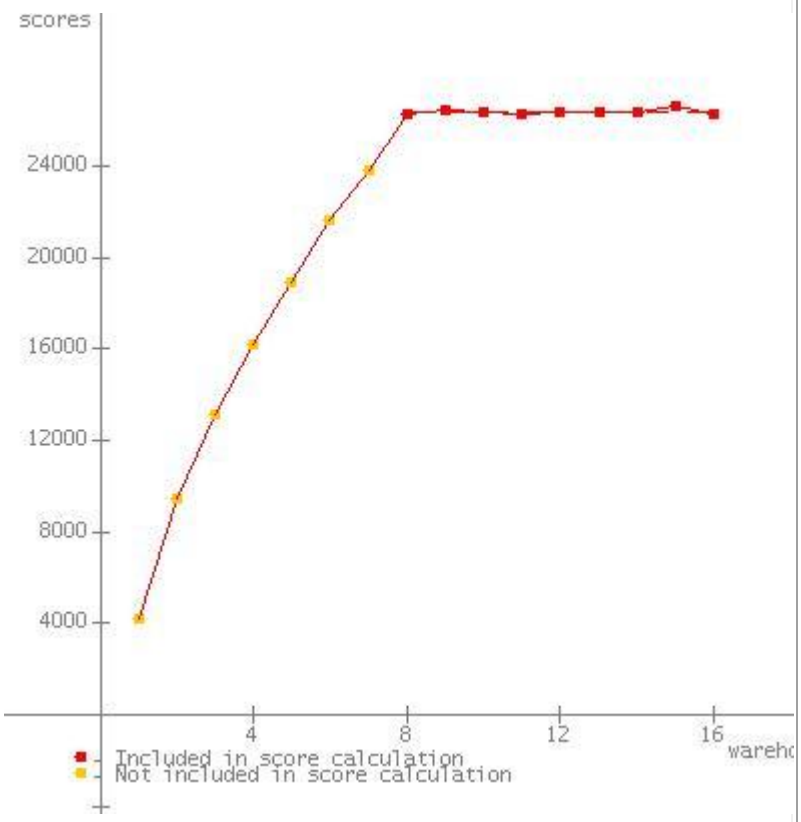
| Warehouses | SPECjbb2005 bops | Incl. in metric |
|---|---|---|
| 1 | 4121 | |
| 2 | 9393 | |
| 3 | 13145 | |
| 4 | 16238 | |
| 5 | 19100 | |
| 6 | 21718 | |
| 7 | 23823 | |
| 8 | 26349 | * |
| 9 | 26492 | * |
| 10 | 26461 | * |
| 11 | 26390 | * |
| 12 | 26454 | * |
| 13 | 26437 | * |
| 14 | 26427 | * |
| 15 | 26644 | * |
| 16 | 26349 | * |
| **SPECjbb2005** | **(from 8 to 16)** | **26445 SPECjbb2005 bops** |




| | | |
|---|---|---|
| **SPEC license #** 6 | **Tested by:** Sun Microsystems, Inc. | **Test date:** Jun 9, 2009 |

## JVM 19 Scores:

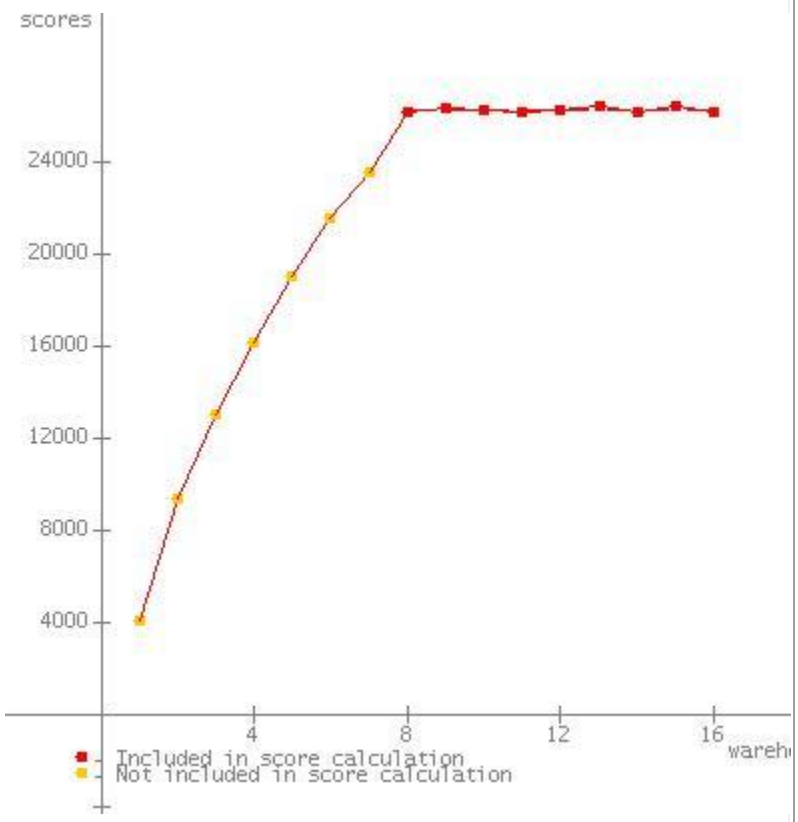
| Warehouses | SPECjbb2005 bops | Incl. in metric |
|---|---|---|
| 1 | 4248 | |
| 2 | 9430 | |
| 3 | 13133 | |
| 4 | 16242 | |
| 5 | 18935 | |
| 6 | 21672 | |
| 7 | 23809 | |
| 8 | 26281 | * |
| 9 | 26454 | * |
| 10 | 26391 | * |
| 11 | 26322 | * |
| 12 | 26395 | * |
| 13 | 26354 | * |
| 14 | 26361 | * |
| 15 | 26664 | * |
| 16 | 26281 | * |
| SPECjbb2005 | (from 8 to 16) | 26389 SPECjbb2005 bops |




| | | |
|---|---|---|
| **SPEC license #** 6 | **Tested by:** Sun Microsystems, Inc. | **Test date:** Jun 9, 2009 |

## JVM 20 Scores:

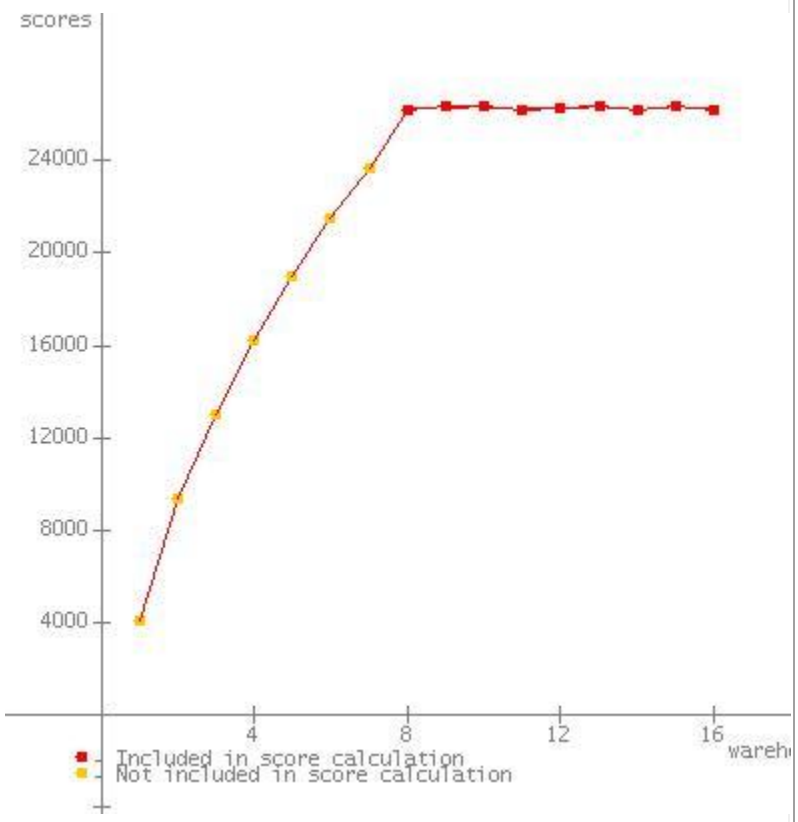
| Warehouses | SPECjbb2005 bops | Incl. in metric |
|---|---|---|
| 1 | 4085 | |
| 2 | 9399 | |
| 3 | 13060 | |
| 4 | 16189 | |
| 5 | 18999 | |
| 6 | 21515 | |
| 7 | 23552 | |
| 8 | 26168 | * |
| 9 | 26308 | * |
| 10 | 26284 | * |
| 11 | 26178 | * |
| 12 | 26285 | * |
| 13 | 26438 | * |
| 14 | 26189 | * |
| 15 | 26451 | * |
| 16 | 26147 | * |
| **SPECjbb2005** | **(from 8 to 16)** | **26272 SPECjbb2005 bops** |




| | | |
|---|---|---|
| **SPEC license #** 6 | **Tested by:** Sun Microsystems, Inc. | **Test date:** Jun 9, 2009 |

## JVM 21 Scores:

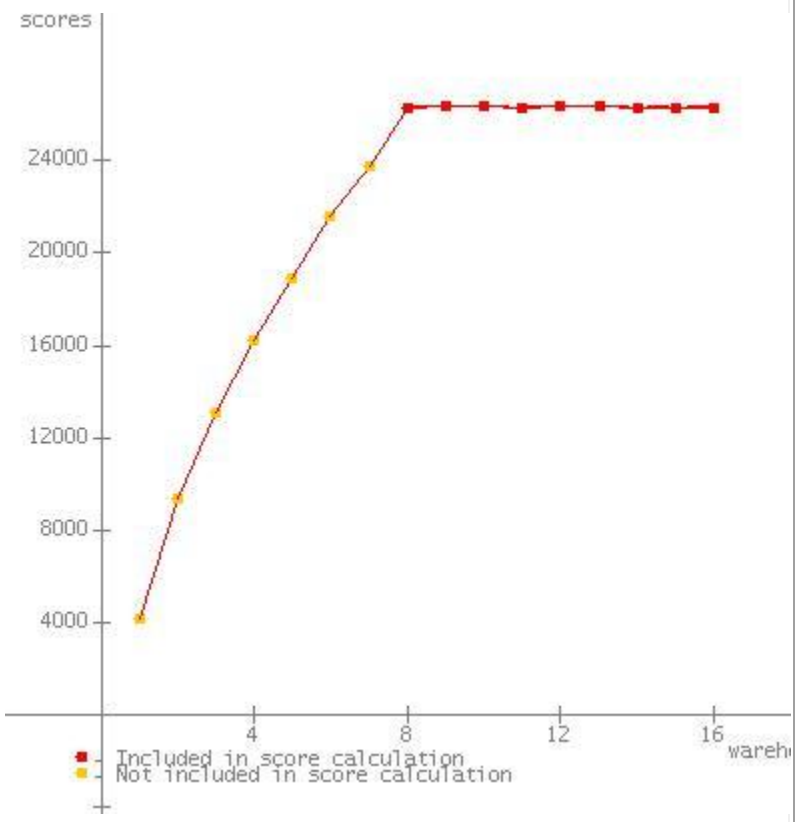
| Warehouses | SPECjbb2005 bops | Incl. in metric |
|---|---|---|
| 1 | 4125 | |
| 2 | 9395 | |
| 3 | 13026 | |
| 4 | 16232 | |
| 5 | 18977 | |
| 6 | 21543 | |
| 7 | 23713 | |
| 8 | 26191 | * |
| 9 | 26336 | * |
| 10 | 26327 | * |
| 11 | 26194 | * |
| 12 | 26301 | * |
| 13 | 26398 | * |
| 14 | 26232 | * |
| 15 | 26367 | * |
| 16 | 26181 | * |
| **SPECjbb2005** | **(from 8 to 16)** | **26281 SPECjbb2005 bops** |




| | | |
|---|---|---|
| **SPEC license #** 6 | **Tested by:** Sun Microsystems, Inc. | **Test date:** Jun 9, 2009 |

## JVM 22 Scores:

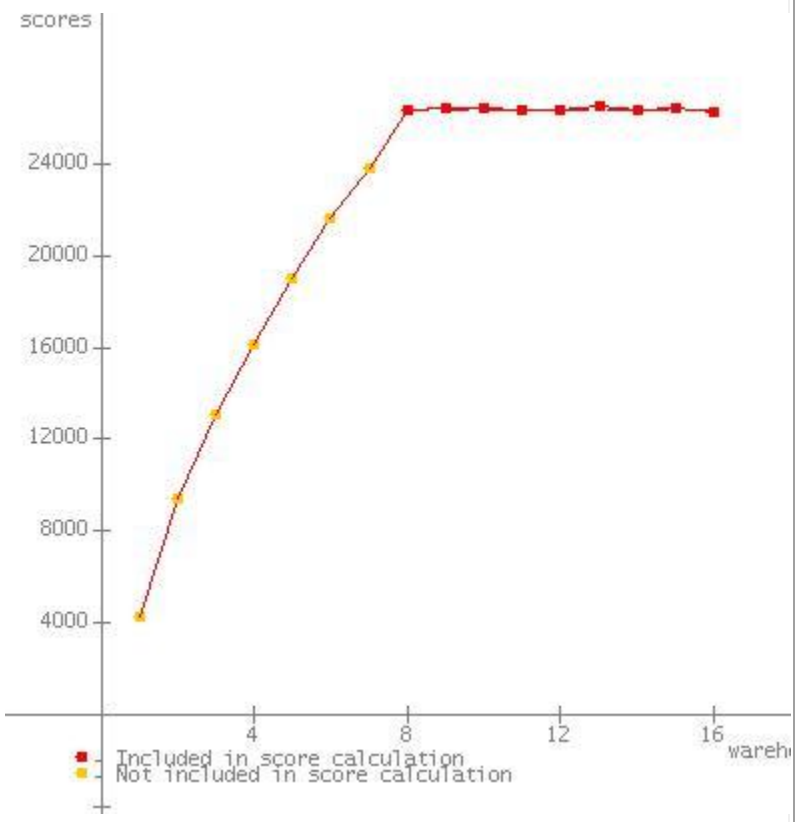
| Warehouses | SPECjbb2005 bops | Incl. in metric |
|---|---|---|
| 1 | 4199 | |
| 2 | 9404 | |
| 3 | 13079 | |
| 4 | 16263 | |
| 5 | 18884 | |
| 6 | 21571 | |
| 7 | 23782 | |
| 8 | 26266 | * |
| 9 | 26398 | * |
| 10 | 26392 | * |
| 11 | 26300 | * |
| 12 | 26376 | * |
| 13 | 26377 | * |
| 14 | 26318 | * |
| 15 | 26298 | * |
| 16 | 26286 | * |
| **SPECjbb2005** | **(from 8 to 16)** | **26334 SPECjbb2005 bops** |




| | | |
|---|---|---|
| **SPEC license #** 6 | **Tested by:** Sun Microsystems, Inc. | **Test date:** Jun 9, 2009 |

## JVM 23 Scores:

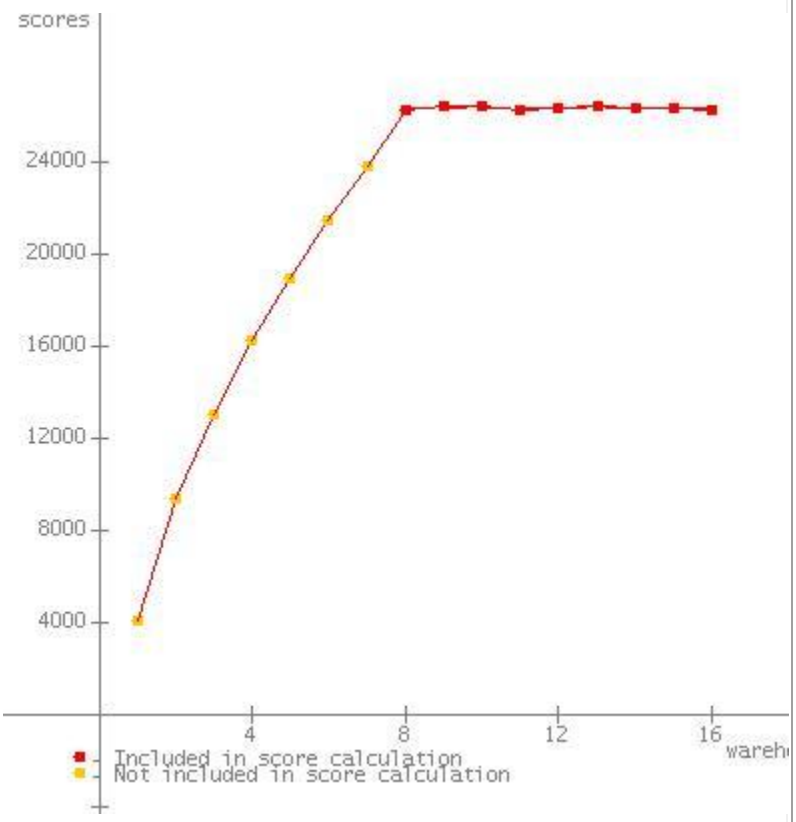
| Warehouses | SPECjbb2005 bops | Incl. in metric |
|---|---|---|
| 1 | 4244 | |
| 2 | 9408 | |
| 3 | 13082 | |
| 4 | 16166 | |
| 5 | 18989 | |
| 6 | 21614 | |
| 7 | 23772 | |
| 8 | 26288 | * |
| 9 | 26403 | * |
| 10 | 26384 | * |
| 11 | 26291 | * |
| 12 | 26355 | * |
| 13 | 26535 | * |
| 14 | 26303 | * |
| 15 | 26445 | * |
| 16 | 26265 | * |
| **SPECjbb2005** | **(from 8 to 16)** | **26363 SPECjbb2005 bops** |




| | | |
|---|---|---|
| **SPEC license #** 6 | **Tested by:** Sun Microsystems, Inc. | **Test date:** Jun 9, 2009 |

## JVM 24 Scores:

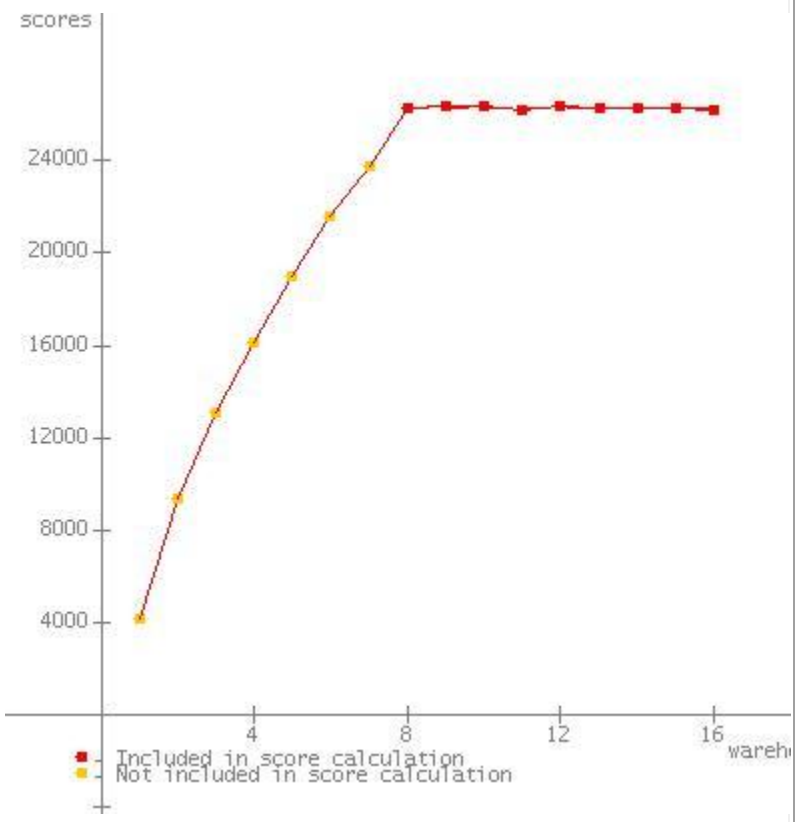
| Warehouses | SPECjbb2005 bops | Incl. in metric |
|---|---|---|
| 1 | 4084 | |
| 2 | 9346 | |
| 3 | 13018 | |
| 4 | 16233 | |
| 5 | 18977 | |
| 6 | 21448 | |
| 7 | 23759 | |
| 8 | 26277 | * |
| 9 | 26401 | * |
| 10 | 26371 | * |
| 11 | 26260 | * |
| 12 | 26358 | * |
| 13 | 26436 | * |
| 14 | 26312 | * |
| 15 | 26278 | * |
| 16 | 26267 | * |
| **SPECjbb2005** | **(from 8 to 16)** | **26329 SPECjbb2005 bops** |




| | | |
|---|---|---|
| **SPEC license #** 6 | **Tested by:** Sun Microsystems, Inc. | **Test date:** Jun 9, 2009 |

## JVM 25 Scores:

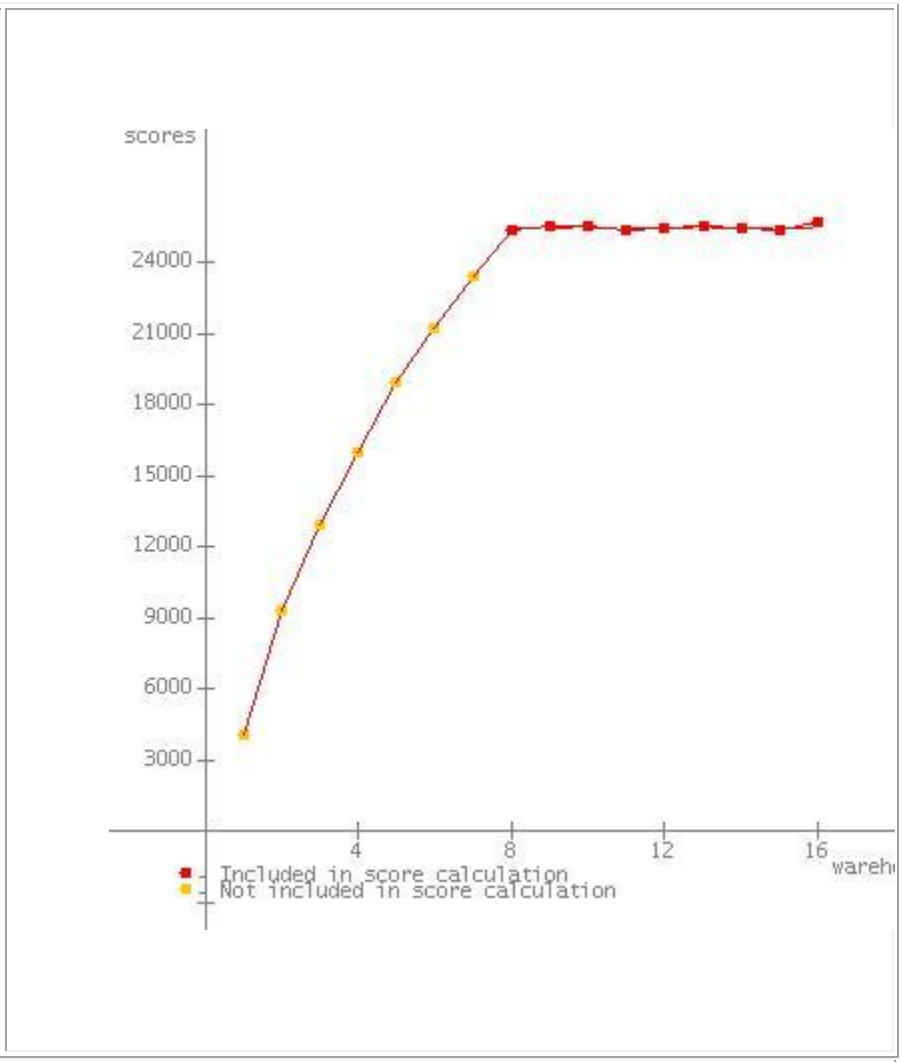
| Warehouses | SPECjbb2005 bops | Incl. in metric |
|---|---|---|
| 1 | 4177 | |
| 2 | 9393 | |
| 3 | 13073 | |
| 4 | 16155 | |
| 5 | 19009 | |
| 6 | 21551 | |
| 7 | 23732 | |
| 8 | 26249 | * |
| 9 | 26390 | * |
| 10 | 26384 | * |
| 11 | 26224 | * |
| 12 | 26323 | * |
| 13 | 26316 | * |
| 14 | 26262 | * |
| 15 | 26262 | * |
| 16 | 26216 | * |
| **SPECjbb2005** | **(from 8 to 16)** | **26292 SPECjbb2005 bops** |




| | | |
|---|---|---|
| **SPEC license #** 6 | **Tested by:** Sun Microsystems, Inc. | **Test date:** Jun 9, 2009 |

## JVM 26 Scores:

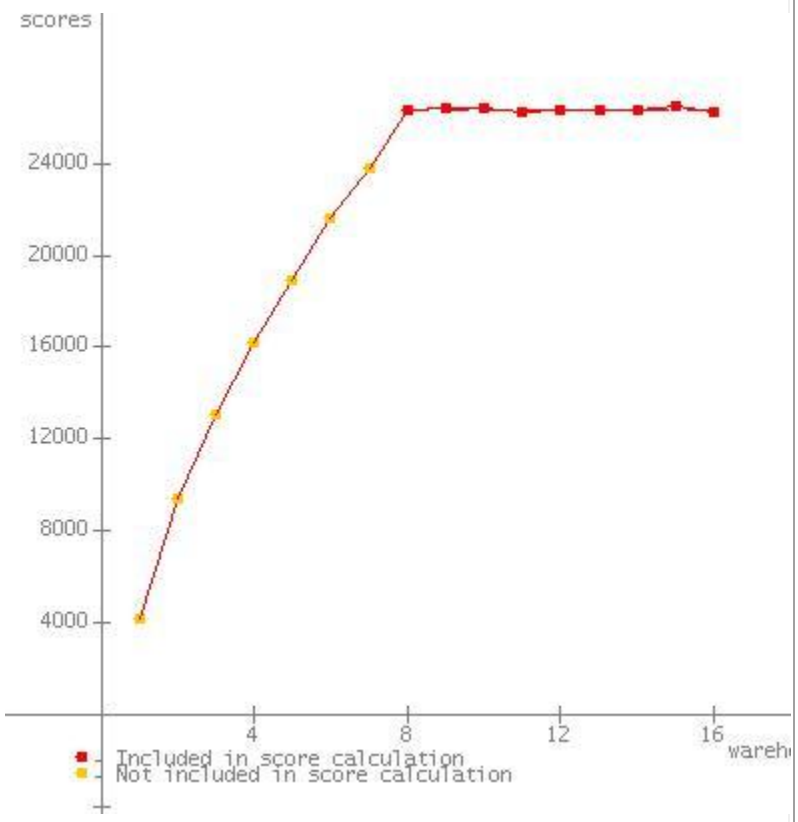
| Warehouses | SPECjbb2005 bops | Incl. in metric |
|---|---|---|
| 1 | 4082 | |
| 2 | 9350 | |
| 3 | 12936 | |
| 4 | 15983 | |
| 5 | 18921 | |
| 6 | 21277 | |
| 7 | 23482 | |
| 8 | 25359 | * |
| 9 | 25528 | * |
| 10 | 25525 | * |
| 11 | 25412 | * |
| 12 | 25493 | * |
| 13 | 25575 | * |
| 14 | 25437 | * |
| 15 | 25426 | * |
| 16 | 25753 | * |
| **SPECjbb2005** | **(from 8 to 16)** | **25501 SPECjbb2005 bops** |




| | | |
|---|---|---|
| **SPEC license #** 6 | **Tested by:** Sun Microsystems, Inc. | **Test date:** Jun 9, 2009 |

## JVM 27 Scores:

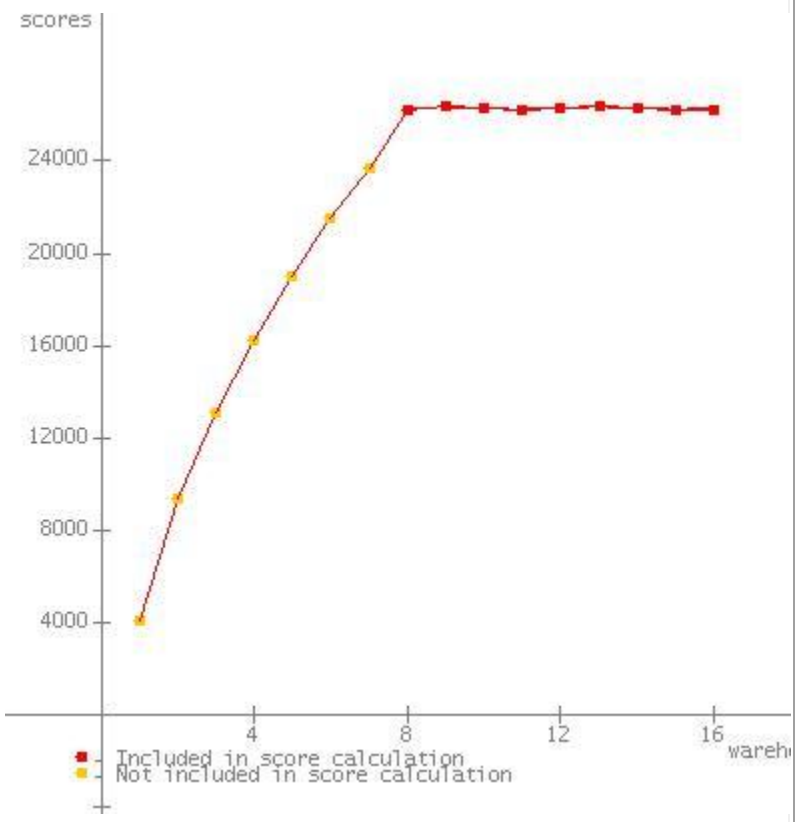
| Warehouses | SPECjbb2005 bops | Incl. in metric |
|---|---|---|
| 1 | 4182 | |
| 2 | 9415 | |
| 3 | 13091 | |
| 4 | 16248 | |
| 5 | 18918 | |
| 6 | 21615 | |
| 7 | 23752 | |
| 8 | 26275 | * |
| 9 | 26387 | * |
| 10 | 26372 | * |
| 11 | 26272 | * |
| 12 | 26350 | * |
| 13 | 26351 | * |
| 14 | 26299 | * |
| 15 | 26521 | * |
| 16 | 26234 | * |
| **SPECjbb2005** | **(from 8 to 16)** | **26340 SPECjbb2005 bops** |




| | | |
|---|---|---|
| **SPEC license #** 6 | **Tested by:** Sun Microsystems, Inc. | **Test date:** Jun 9, 2009 |

## JVM 28 Scores:

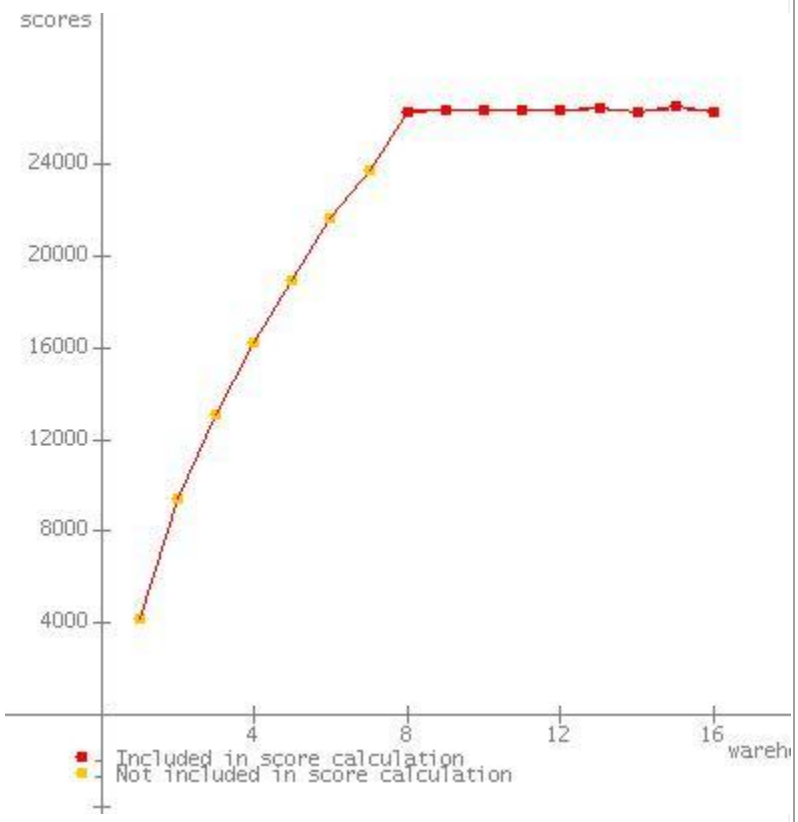
| Warehouses | SPECjbb2005 bops | Incl. in metric |
|---|---|---|
| 1 | 4101 | |
| 2 | 9397 | |
| 3 | 13102 | |
| 4 | 16238 | |
| 5 | 19002 | |
| 6 | 21557 | |
| 7 | 23692 | |
| 8 | 26202 | * |
| 9 | 26358 | * |
| 10 | 26312 | * |
| 11 | 26206 | * |
| 12 | 26318 | * |
| 13 | 26404 | * |
| 14 | 26253 | * |
| 15 | 26223 | * |
| 16 | 26187 | * |
| **SPECjbb2005** | **(from 8 to 16)** | **26274 SPECjbb2005 bops** |




| | | |
|---|---|---|
| **SPEC license #** 6 | **Tested by:** Sun Microsystems, Inc. | **Test date:** Jun 9, 2009 |

## JVM 29 Scores:

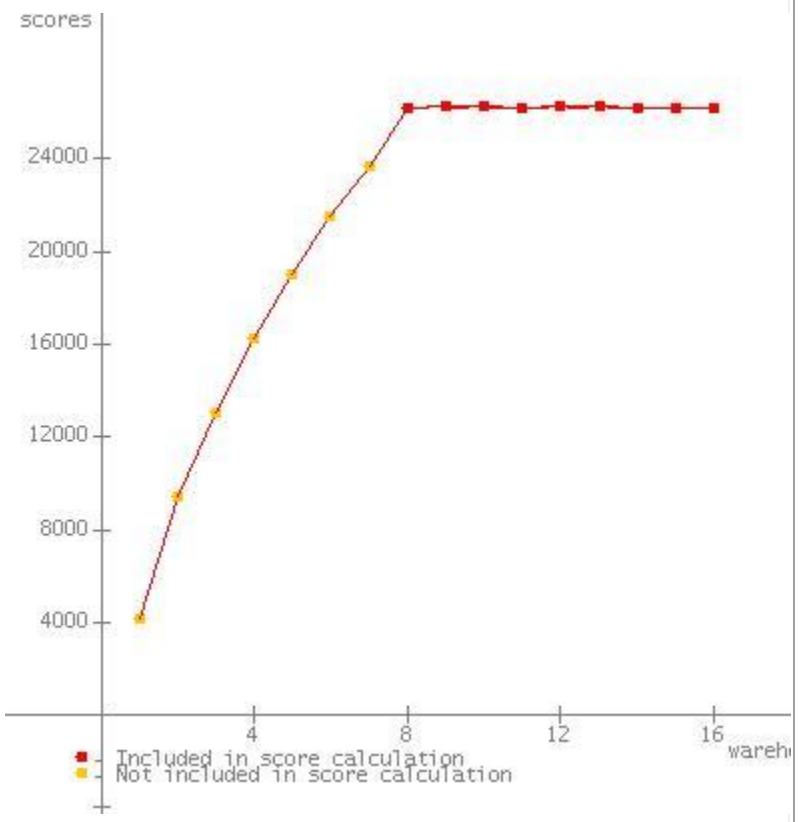
| Warehouses | SPECjbb2005 bops | Incl. in metric |
|---|---|---|
| 1 | 4188 | |
| 2 | 9407 | |
| 3 | 13102 | |
| 4 | 16249 | |
| 5 | 18987 | |
| 6 | 21625 | |
| 7 | 23789 | |
| 8 | 26249 | * |
| 9 | 26405 | * |
| 10 | 26365 | * |
| 11 | 26369 | * |
| 12 | 26355 | * |
| 13 | 26451 | * |
| 14 | 26306 | * |
| 15 | 26576 | * |
| 16 | 26247 | * |
| **SPECjbb2005** | **(from 8 to 16)** | **26369 SPECjbb2005 bops** |




| | | |
|---|---|---|
| **SPEC license #** 6 | **Tested by:** Sun Microsystems, Inc. | **Test date:** Jun 9, 2009 |

## JVM 30 Scores:

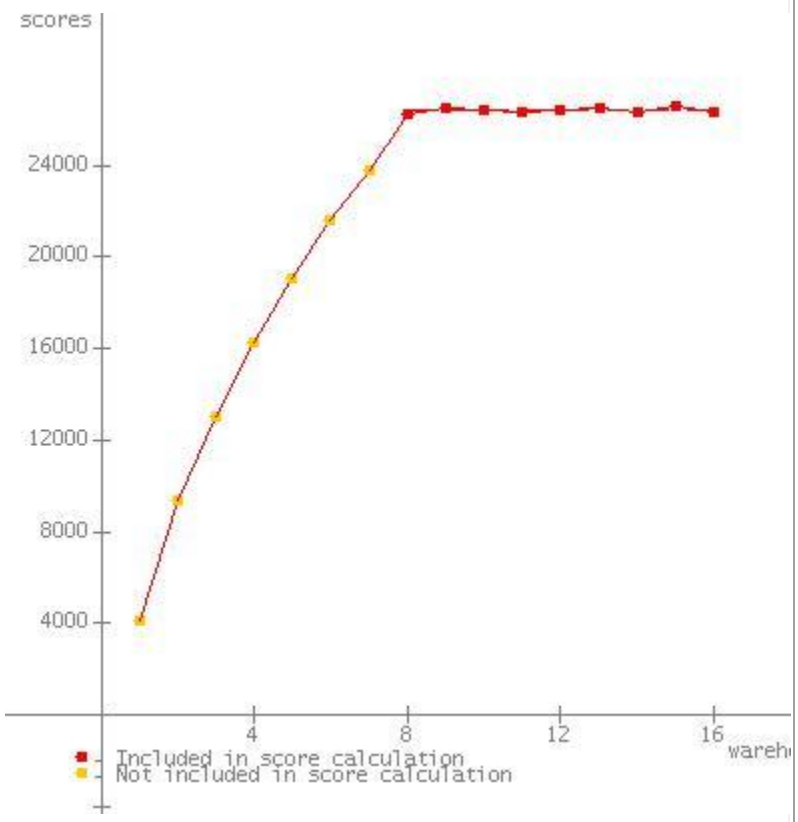
| Warehouses | SPECjbb2005 bops | Incl. in metric |
|---|---|---|
| 1 | 4123 | |
| 2 | 9405 | |
| 3 | 13068 | |
| 4 | 16226 | |
| 5 | 18977 | |
| 6 | 21554 | |
| 7 | 23676 | |
| 8 | 26182 | * |
| 9 | 26301 | * |
| 10 | 26275 | * |
| 11 | 26162 | * |
| 12 | 26268 | * |
| 13 | 26233 | * |
| 14 | 26196 | * |
| 15 | 26175 | * |
| 16 | 26175 | * |
| **SPECjbb2005** | **(from 8 to 16)** | **26219 SPECjbb2005 bops** |




| | | |
|---|---|---|
| **SPEC license #** 6 | **Tested by:** Sun Microsystems, Inc. | **Test date:** Jun 9, 2009 |

## JVM 31 Scores:

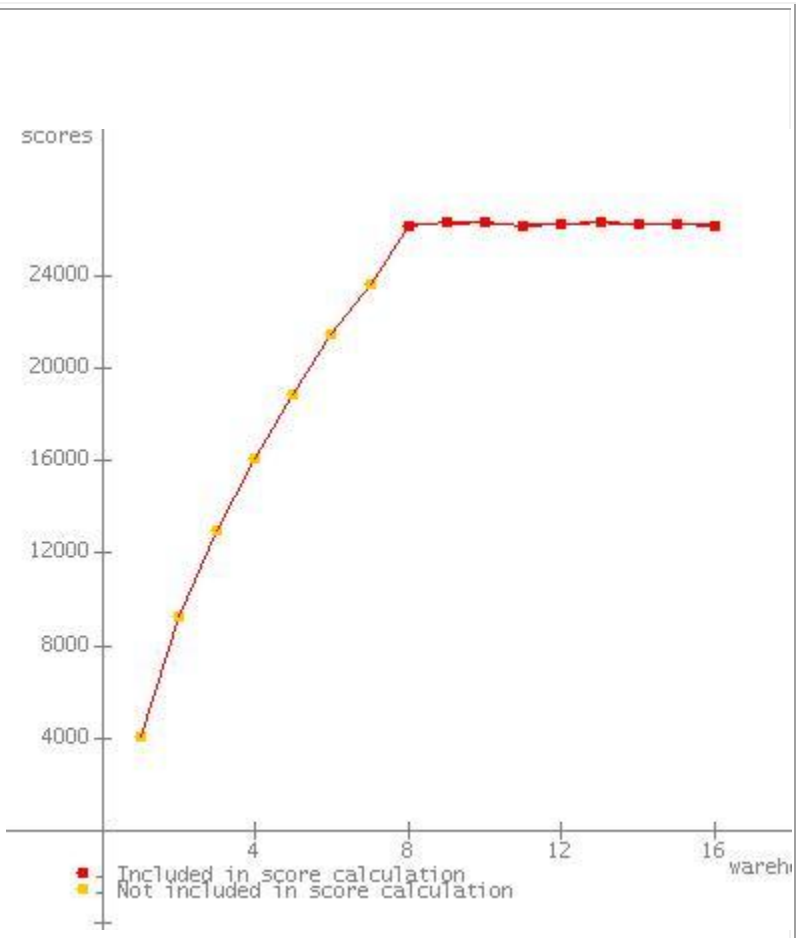
| Warehouses | SPECjbb2005 bops | Incl. in metric |
|---|---|---|
| 1 | 4128 | |
| 2 | 9405 | |
| 3 | 13039 | |
| 4 | 16275 | |
| 5 | 19058 | |
| 6 | 21643 | |
| 7 | 23831 | |
| 8 | 26279 | * |
| 9 | 26469 | * |
| 10 | 26417 | * |
| 11 | 26333 | * |
| 12 | 26406 | * |
| 13 | 26502 | * |
| 14 | 26352 | * |
| 15 | 26624 | * |
| 16 | 26304 | * |
| **SPECjbb2005** | **(from 8 to 16)** | **26409 SPECjbb2005 bops** |




| | | |
|---|---|---|
| **SPEC license #** 6 | **Tested by:** Sun Microsystems, Inc. | **Test date:** Jun 9, 2009 |

## JVM 32 Scores:

| Warehouses | SPECjbb2005 bops | Incl. in metric |
|---|---|---|
| 1 | 4085 | |
| 2 | 9274 | |
| 3 | 13002 | |
| 4 | 16137 | |
| 5 | 18897 | |
| 6 | 21485 | |
| 7 | 23638 | |
| 8 | 26126 | * |
| 9 | 26331 | * |
| 10 | 26278 | * |
| 11 | 26166 | * |
| 12 | 26255 | * |
| 13 | 26306 | * |
| 14 | 26232 | * |
| 15 | 26176 | * |
| 16 | 26157 | * |
| **SPECjbb2005** | **(from 8 to 16)** | **26225 SPECjbb2005 bops** |




| | | |
|---|---|---|
| **SPEC license #** 6 | **Tested by:** Sun Microsystems, Inc. | **Test date:** Jun 9, 2009 |

SPECjbb2005 Version: [SPECjbb2005 1.07, March 15, 2006]

# ABOUT PRINCIPLED TECHNOLOGIES


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

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

When the assessment is complete, we know how to present the results to a broad range of target audiences. We provide our clients with the materials they need, from market-focused data to use in their own collateral to custom sales aids, such as test reports, performance assessments, and white papers. Every document reflects the results of our trusted independent analysis.

We provide customized services that focus on our clients' individual requirements. Whether the technology involves hardware, software, Web sites, or services, we offer the experience, expertise, and tools to help our clients assess how it will fare against its competition, its performance, its market readiness, and its quality and reliability.

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