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IBM x3755 AMD Opteron Server CPU Performance and Xcelerated Memory Technology ™ Study

Test report prepared under contract from IBM System x

Executive Summary

IBM Corporation commissioned VeriTest, the testing service of Lionbridge Technologies, Inc., to perform competitive testing on their IBM System x3755, a 4-socket AMD Opteron server, against a comparative product from Hewlett Packard ("HP") in order to quantify the performance advantages of the x3755 when leveraging their Pass Thru card and Xcelerated Memory Technology™.

The IBM System x3755 and equally configured HP DL585 G2 were evaluated by Veritest to determine which system provided the best processor and memory utilization performance.

Key Findings

- The IBM System x3755 out performed the HP DL585 G2 by 10.4% using SPECjbb2005 with identical CPU and Memory configurations. This exemplifies the Xcelerated Memory Technology™ and its ability to deliver a performance advantage.
- The IBM System x3755 when configured with three processors and IBM's CPU Pass Thru card out performed the HP DL585 G2 configured with four processors by 27.7%. This illustrates the System x3755 CPU utilization advantage
- The IBM CPU Pass Thru card provides a solution for potential savings with ISVs who have a licensing fee structure based on CPUs. The x3755 with Pass Thru card would provide equal or better system performance for a lower software licensing fee.

This test was conducted to highlight the innovation of the x3755 with the IBM CPU Pass Thru card as well as the Xcelerated Memory Technology™. The CPU Pass Thru card is an option that allows for flexible configurations of the x3755 and is needed when one or three CPUs are installed. It allows for direct connection to additional I/O slots and faster access to processors for optimal performance. Xcelerated Memory Technology™ is the ability to run maximum memory at maximum speed. IBM has designed the x3755 to allow all 8 memory DIMMs per CPU to run at 667MHz. Competitive platforms are forced to run the first 4 DIMMs at 667MHz, but when more memory is populated the speed clocks down to 533MHz.

Testing was conducted using the SPECjbb2005 benchmark tool. This benchmark exercises the implementations of the JVM (Java Virtual Machine), JIT (Just-In-Time) compiler, garbage collection, threads and some aspects of the operating system. It also measures the performance of CPUs, caches, memory hierarchy and the scalability of shared memory processors (SMPs). SPECjbb2005 simulates a wholesaling operation receiving orders, managing deliveries, and generating reports of various sorts. The database is replaced by in-memory Java Collection objects and transaction logging is implemented using XML. The purpose of this test was to compare under different scenarios how the IBM x3755 performed when leveraging the Pass Thru card and the Xcelerated Memory Technology™. Complete details of the system configurations can be found in Appendix A of this report.

The high level findings of the testing showed that the SPECjbb2005 results demonstrated a significant advantage of the IBM CPU Pass Thru card and memory performance on the IBM System x3755 with Xcelerated Memory Technology™ over the HP DL585 G2. In our tests, the IBM System x3755 configured with three processors and the IBM CPU Pass Thru card performed 27.7% better than the HP DL585 G2 with four processors. This reinforces the measurable difference in performance using IBM's innovative Pass Thru card. Additionally, testing showed that the IBM System x3755 configured with four processors, and no Pass Thru card, performed 10.4% faster than the HP DL585 G2 configured with 4 processors due to the Xcelerated Memory Technology™. This reinforces the measurable difference in IBM System x3755 memory performance of Xcelerated Memory Technology™ running all DIMM slots at the faster 667MHz speed.

Testing Methodology

The test environment consisted of IBM System x3755 and HP DL585G2 server. Both servers ran Windows 2003 Server Enterprise Edition SP1. The IBM System x3755 specifications included 4 dual-core AMD Opteron 2.8GHz processors, 32GB(DDR2 PC5300) RAM, and a 273GB SAS hard drive. The HP DL585 G2 specifications included 4 dual-core AMD Opteron 2.8GHz processors, 32GB (DDR2 PC5300) RAM, and a 204GB SAS hard drive. Due to the nature of the benchmark tool utilized, hard drive size was not a determining factor in performance. Additional description and details can be found in Appendix A.

SPECjbb2005 was installed on both servers. SPECjbb2005 is a benchmark for evaluating the performance of servers running typical Java business applications. The same test methodology and configurations of SPECjbb2005 were executed on both servers, and scores from SPECjbb2005 were used to compare IBM CPU Pass Thru card and Xcelerated Memory Technology™ memory performance.

Testing Process

The testing process consisted of executing the same SPECjbb2005 configuration on the IBM System x3755 and the HP DL585 G2 with different CPU configurations as documented in the table below. The IBM x3755 was configured with 3 CPU cards and the IBM CPU Pass Thru card. The HP DL585 was configured with 4 CPUs.

To highlight the advantage of the Pass Thru card in the IBM x3755, three CPUs and a Pass Thru card were configured and compared to the HP DL585 with four CPUs. In both systems, 24GB of memory was utilized.

To highlight the advantages of IBM's Xcelerated Memory Technology™, the IBM machine was configured with four CPUs and no Pass Thru card. The HP system was also configured with four CPUs. Both systems were installed with 32GB of memory.

Table 1 below lists the two key test scenarios that were executed and evaluated in this study.

Test Configurations			
IBM System x3755	**HP DL585 G2**	**Memory (identical in both systems)**	**Purpose**
4 processors	4 Processors	32GB RAM	Demonstrate advantages of IBM's Xcelerated Memory Technology™
3 Processors Pass Thru card in the 4th slot	4 Processors	24GB RAM	Demonstrate the performance advantages of IBM's Pass Thru card

Table 1: Test Configurations

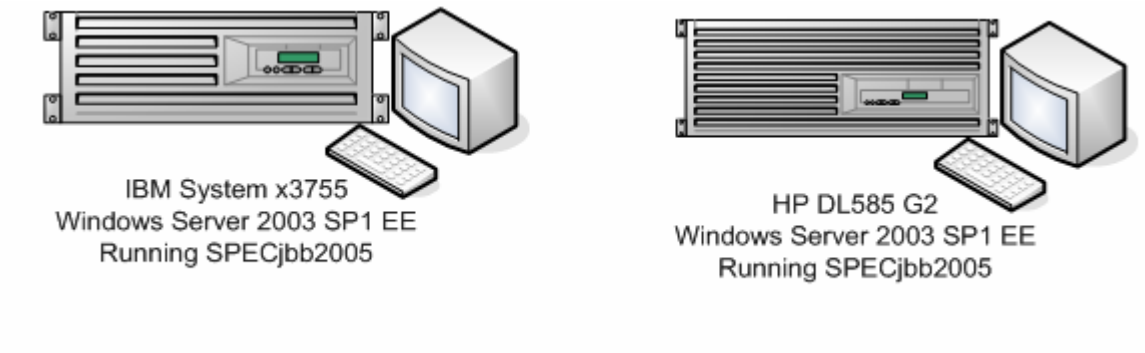

Figure 1: Test Bed Diagram

Test Results

All tests were executed running SPECjbb2005 in the different test scenarios described. Figure 2 below illustrates the results of the two scenarios tested. The chart shows the advantage the IBM System x3755 had in both the Xcelerated Memory Technology™ and Pass Thru Card tests.

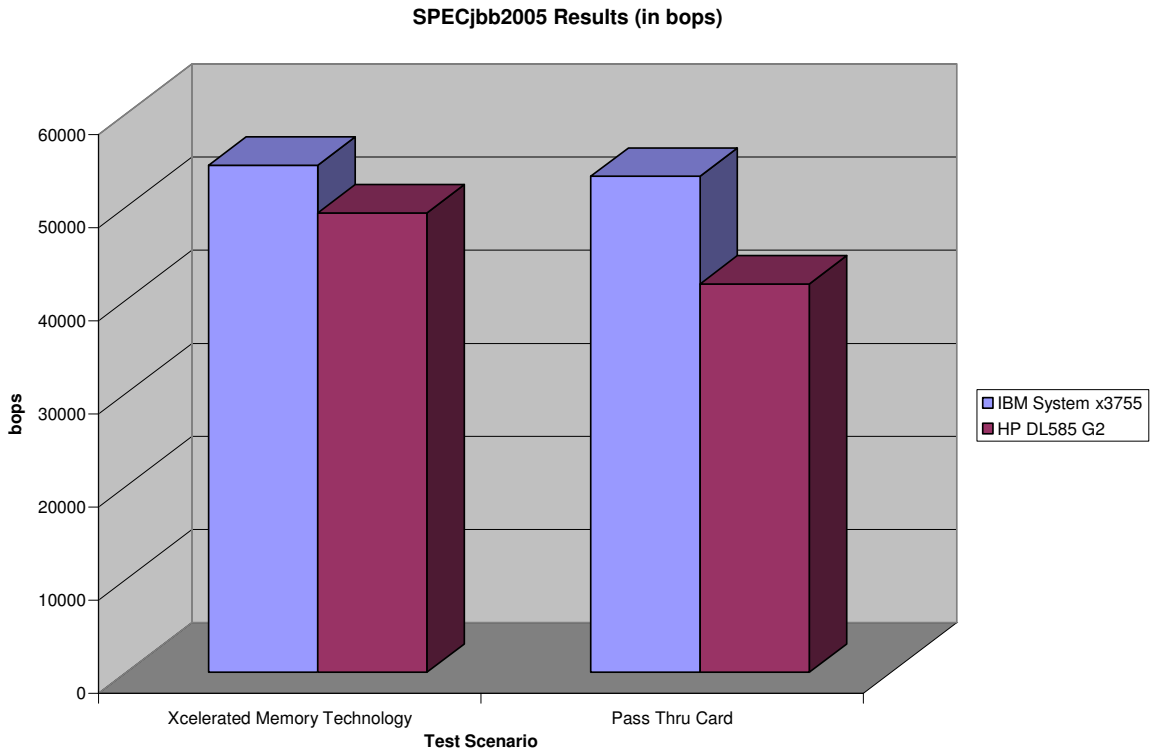

Figure 2: SPECjbb2005 Results

IBM CPU Pass Thru Card Performance Comparison Results					
Test Scenario	**System Under Test**	**Configuration**	**Memory**	**SPECjbb2005 Score (in bops)**	**IBM Advantage**
1	**IBM System x3755**	4 CPUs without Pass Thru card	32GB	54456	**10.4%**
	HP DL585 G2	4 CPUs	32GB	49322	
2	**IBM System x3755**	3 CPUs – with a Pass Thru Card	24GB	53257	**27.7%**
	HP DL585 G2	4 CPUs	24GB	41704	

Table 2: Test Scenario Comparative Results

The following tables show the raw results as tested within the VeriTest Storage Lab:

SPECjbb2005 bops Results				
Test Scenario	**System Under Test**	**Configuration**	**Memory**	**SPECjbb2005 Score (in bops)**
1	**IBM System x3755**	4 CPUs without Pass Thru card	32GB	54456
	HP DL585 G2	4 CPUs	32GB	49322
2	**IBM System x3755**	3 CPUs – with a Pass Thru Card	24GB	53257
	HP DL585 G2	4 CPUs	24GB	41704

Table 3: SPECjbb2005 Results

Conclusion

The SPECjbb2005 results above demonstrate the significant advantage of the IBM CPU Pass Thru card and memory performance on the IBM System x3755 with Xcelerated Memory Technology™ over the HP DL585 G2. The tables above shows that the IBM System x3755 configured with three processors and the IBM CPU Pass Thru card performed 27.7% better than the HP DL585 G2 with four processors. This reinforces the measurable difference in performance using IBM's innovative Pass Thru card. The tables above also shows that the IBM System x3755 configured with four processors performed 10.4% faster than the HP DL585 G2 configured with 4 processors. This reinforces the measurable difference in IBM System x3755 memory performance of Xcelerated Memory Technology™ running at the faster 667MHz speed.

Appendix A: Hardware and Software Configuration Details

1 – IBM System x3755(Windows 2003 Server SP1 EE)
4 Dual-Core AMD Opteron 2.8GHz) 8220SE Processor
32GB RAM (32X1GB) DDR2 PC5300
273GB SAS 15K RPM Hard Drive

1 – HP DL585 G2 (Windows 2003 Server SP1 EE)
4 Dual-Core AMD Opteron 2.8GHz) 8220SE Processor
32GB RAM (32X1GB) DDR2 PC5300
204GB SAS 10K RPM Hard drive

1 – IBM Pass Thru card

Software Configuration

Windows 2003 Server SP1 EE
SPECjbb2005

Configuration Exception

Due to backorder shipping delays from HP on the 144GB SAS 15K RPM hard drives the 72GB SAS drives were deemed an acceptable substitute. The SPECjbb2005 workload tool does nothing to exercise the hard drive and writes no data to it. As a result, this configuration exception was determined to be immaterial to the performance results addressed in this study.

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