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Environmental Systems Research Institute, Inc.

HP AMD Server Performance Validation Testing

Enterprise Systems Lab Test Report

ESRI Implementation Services
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Test Objective

Evaluate performance and scalability of HP AMD based single and dual core servers relative to an established baseline and using SPEC benchmarks to predict capacity in a web application environment.

Test Hypothesis

Processor cores are essentially CPUs and therefore a dual processor/dual core server should perform in a similar manner as compared to an equivalent quad processor server. SPEC integer benchmarks have been shown to predict performance with ESRI applications fairly well and can be used to predict performance on a dual-core server relative to a single core server. For the comparison to follow, a single processor/single core 2.6 GHz AMD server will be established as a baseline and compared to two test server configurations, namely a dual processor/single core 2.6 GHz AMD and a dual processor/dual core 2.2 GHz AMD. Based on published SPECint_rate2000 benchmarks and referencing the single processor/single core 2.6 GHz AMD server with a SPECint_rate2000 of 20.8, the following predictions can be made.

Dual processor/single core 2.6 GHz AMD server: SPECint_rate2000 = 39.2

$39.2 / 20.8 = 1.88$ or 88% improvement in throughput (capacity)

Dual processor/dual core 2.2 GHz AMD server: SPECint_rate2000 = 67.6

$67.6 / 20.8 = 3.25$ or 225% improvement in throughput (capacity)

Note that since the core speed of the 2.2 GHz server is slower than the baseline 2.6 GHz, performance, or user response time, will be slightly slower for that server, at least when comparing the same requests to available core ratios. For example, two concurrent requests running against the dual processor 2.6 will have faster response time relative to four concurrent requests running against the dual processor/dual core 2.2.

Test Hardware and Software Configuration

The description of the test servers are presented below in Figures 1 and 2.

Figure 1
Single Core Test Configuration

Configuration Item	Configuration
Make and Model	HP BL25p
Operating System	Windows Server 2003, SP1
Number of CPUs & Type	Two AMD Opteron Single Core 2.6 GHz 1 MB Cache
Memory	4 GB
SPECint_rate2000	39.2
Software	ArcIMS 9.1

NOTE: The 2.6 GHz server was booted with a single processor to establish the baseline.

Figure 2
Dual Core Test Configuration

Configuration Item	Configuration
Make and Model	HP BL25p
Operating System	Windows Server 2003, SP1
Number of CPUs & Type	Two AMD Opteron Dual Core 2.2 GHz 1 MB Cache
Memory	4 GB
SPECint_rate2000	67.6
Software	ArcIMS 9.1

Test Data and Tools

The test data descriptions are presented in Figure 3.

Figure 3
Test Data Description

Layer	Data Type	Feature Type	Features
Fire Hydrants	Shapefile	Point	8,070
Schools	Shapefile	Point	171
Roads	Shapefile	Line	22,739
Train Routes	Shapefile	Line	164
Freeways	Shapefile	Line	81
Parcels	Shapefile	Polygon	114,111
Parks	Shapefile	Polygon	432
Lakes	Shapefile	Polygon	21
Zip Codes	Shapefile	Polygon	23
Raster	TIFF Raster	8-bit	NA
		Total	145,812

Test Plan

Execute ArcIMS Image Service web load tests using vector/raster configuration against both servers. A scale up approach will be used to show both CPU utilization and throughput during different levels of user utilization to illustrate that the underlying core technology will perform as an individual CPU and to establish the capacity comparisons based on the predictions.

Test Results and Analysis

Figure 4 depicts predicted vs. measured throughput. The results show that the dual processor 2.6 GHz server reached near maximum capacity and measured web transaction throughput came in very close to the predicted values relative to the baseline server. The dual processor/dual core 2.2 GHz server throughput results also lined up well with the prediction. This demonstrates how the SPEC integer benchmarks can be used for predicting server capacity. In addition to the baseline single processor 2.6 GHz configuration, a single core 2.2 GHz configuration, which is the dual processor/dual core system booted with a single core, is also included as an additional data point.

Figure 4
Throughput Predicted vs. Measured

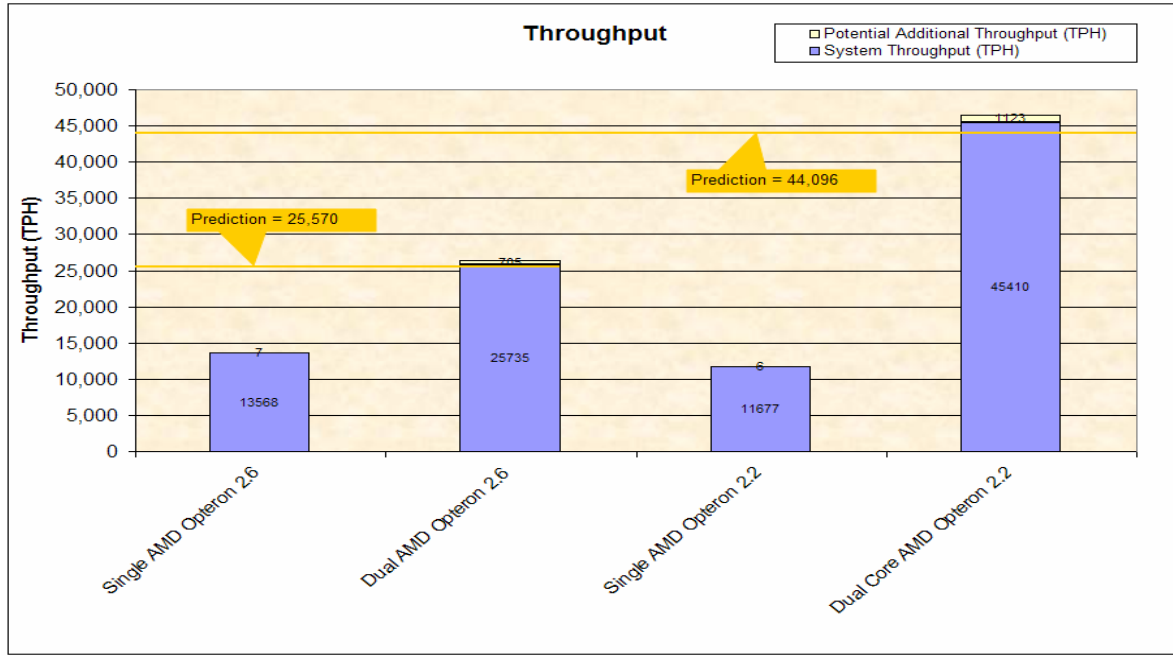


Figure 5 shows CPU utilization. Both servers were nearly maximized for all tests to demonstrate maximum throughput. No CPU bottlenecks were observed.

Figure 5
CPU Utilization

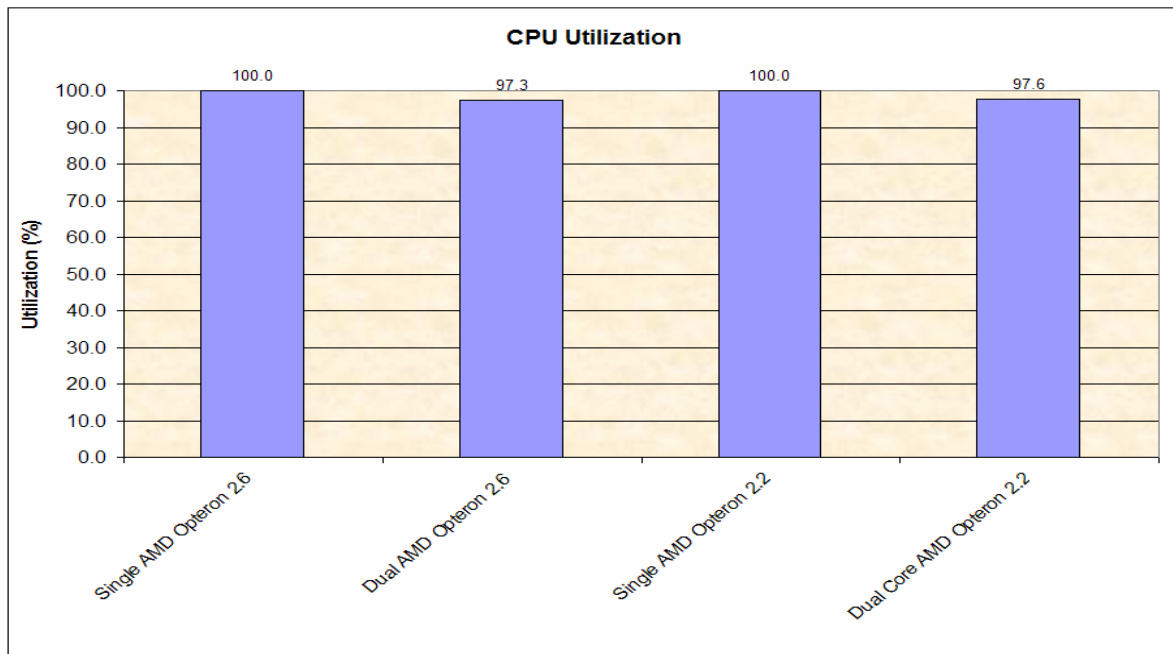
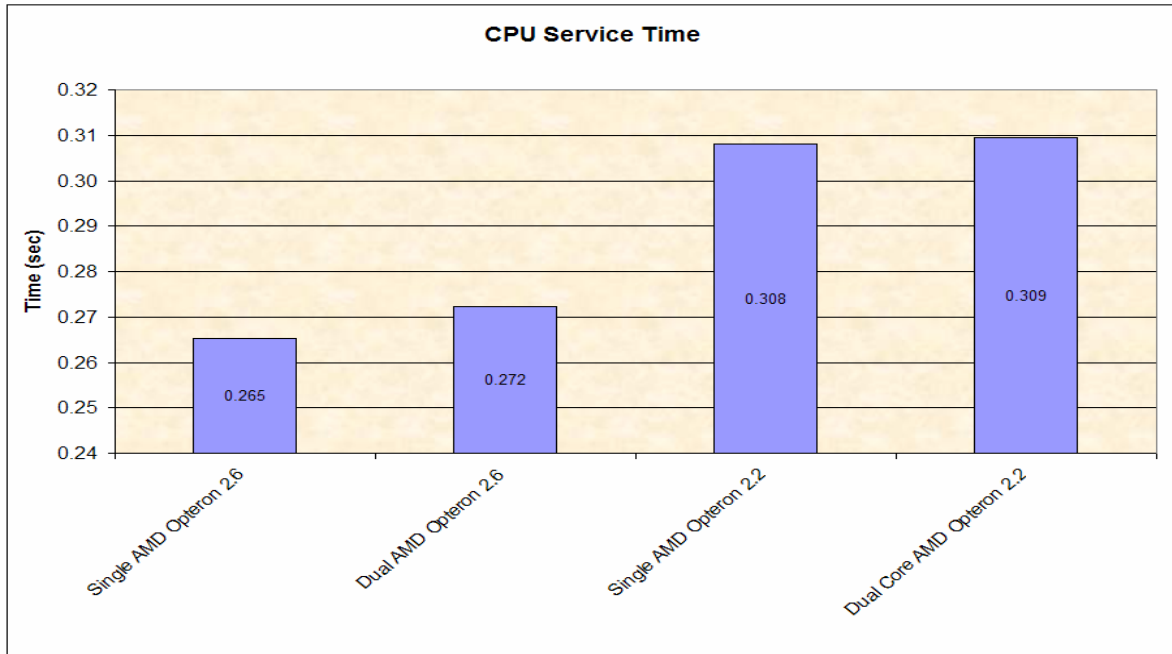


Figure 6 depicts CPU service which is the core metric for determining capacity. Looking at the dual core relative to the single core, the service time was slightly larger as expected because core speed is approximately .4 GHz slower in terms of CPU speed.

Figure 6
CPU Service Time



Figures 7 and 8 illustrate capacity while referencing response time for both AMD Dual 2.6 GHz and AMD Dual Core 2.2 GHz using the scale up method.

Figure 7
Throughput and Response Time Dual Processor 2.6 GHz

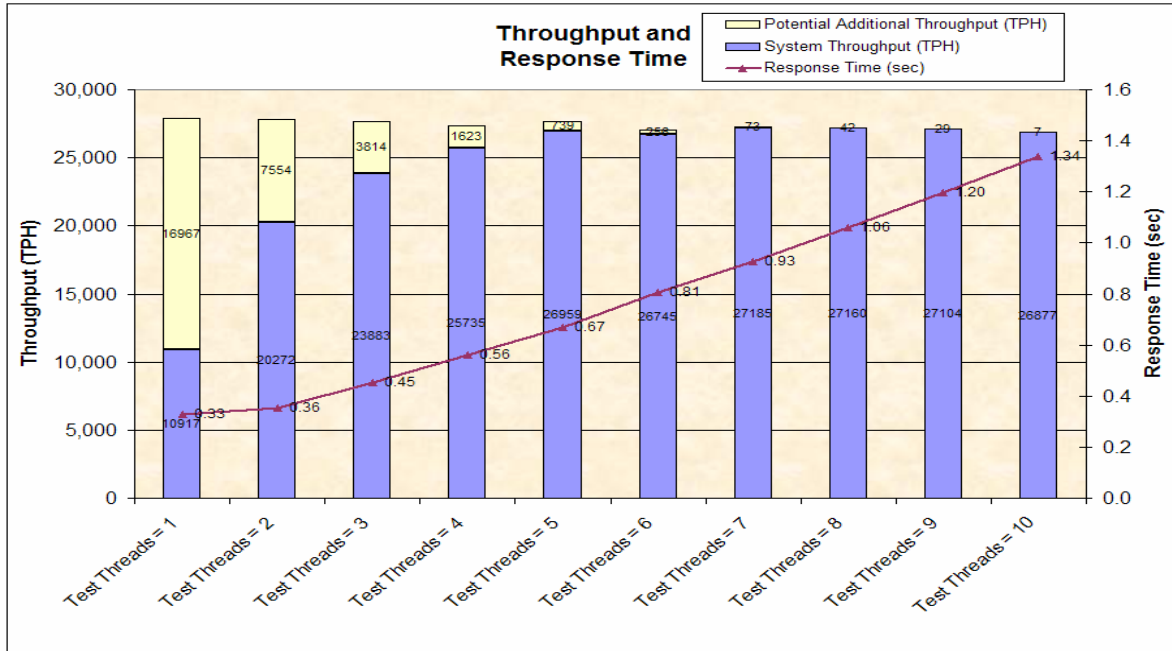
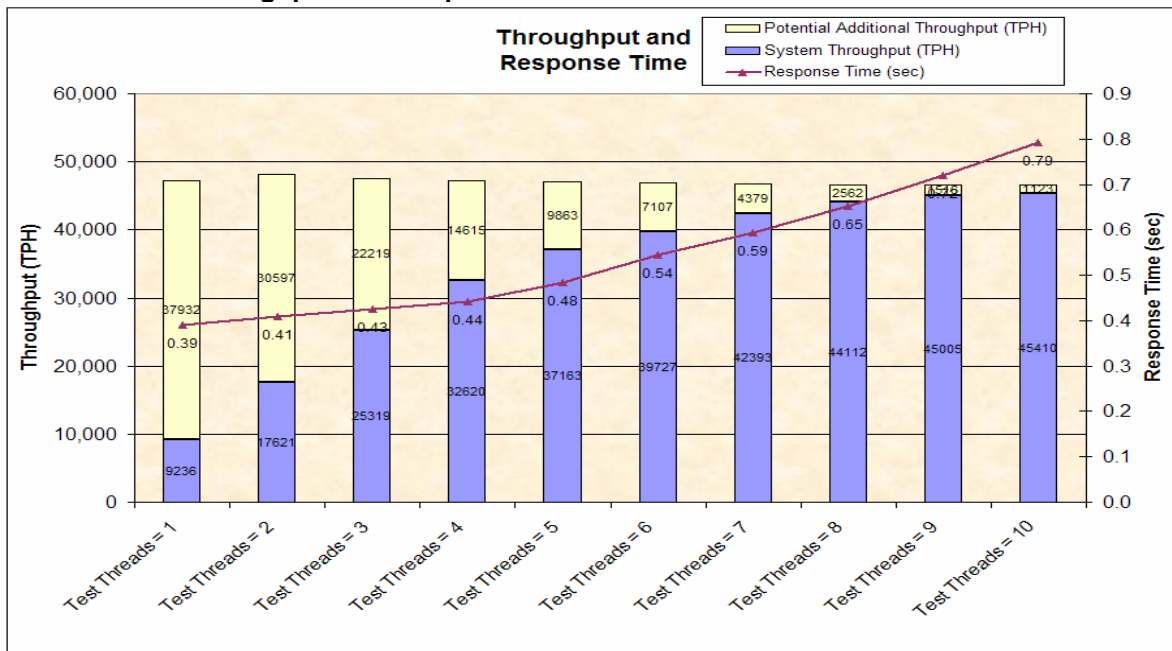


Figure 8
Throughput and Response Time Dual Processor/Core 2.2 GHz



Conclusions

The single core vs. dual core results showed that the SPEC integer benchmarks continue to be a good estimator of expected performance and capacity when used to extrapolate from a known baseline. The benchmark results predicted that relative to the baseline, the dual processor server would provide nearly double (88%) the capacity and the dual processor/dual core server would provide over three times (225%) the capacity, and this is what was observed. With the tested configuration, the 2.2 GHz core speed resulted in slightly less performance for individual requests as expected. These results show that HP AMD servers perform as expected using ESRI capacity planning methods.

Configuration Support

It is important to realize that for enterprise configurations such as the one described in this report, ESRI Support will typically be limited to supporting only the ESRI software components (ArcIMS, ArcSDE, etc.). ESRI Support strives to provide the best assistance possible, but problems or questions regarding third-party applications and components may require you to contact the support services provided by the respective vendor.

ESRI offers ongoing, dedicated assistance with the design and/or implementation of an enterprise configuration through our Professional Services Department. Professional Services staff has real-world experience with enterprise configurations, as well as expert knowledge of ESRI resources. To learn more about what ESRI Professional Services can offer your organization, please see the contact information posted at <http://www.esri.com/consulting/contact.html>.