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*Environmental Systems Research Institute, Inc.*

# **ArcIMS/ArcGIS Server Performance and Scalability with Windows 2003 64-Bit**

## **Enterprise Systems Lab Test Report**

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## Test Objective

With the significant changes in the Windows Operating System and the movement to the 64-Bit architecture, memory utilization and allowable memory capacity has increased. This has moved many people to ask the question, what will this do for processor intensive 32-Bit applications such as ArcIMS or ArcGIS Server? According to Microsoft, most 32-Bit applications will function properly with enhanced security and possibly even more efficient by allowing 32-Bit applications to operate in the extended virtual memory space. This report will provide relative performance information for ArcIMS Image/ArcMap services and ArcGIS Server in both the 32 and 64-Bit Windows environments.

## Test Hypothesis

ArcIMS Image, ArcMap Server services and ArcGIS Server will provide slightly better performance (5% perhaps) relative to a similar 32-Bit configuration due to memory related efficiencies available in the x64 architecture.

## Test Hardware and Software Configuration

**Table 1**  
**ArcIMS Server Configuration**

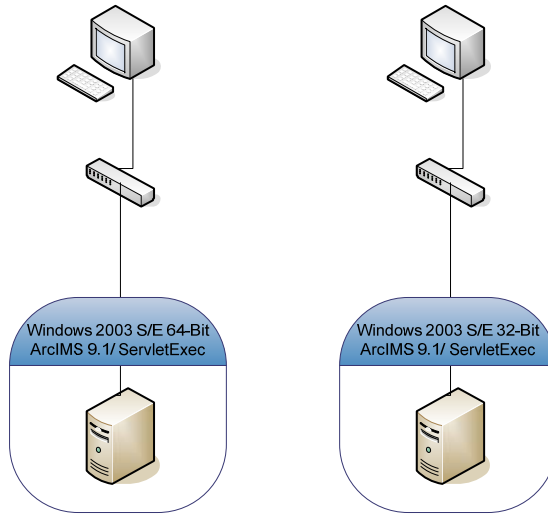
Configuration Item	Configuration
Make and Model	HP DL380 G4
Operating System	Windows Server 2003 32-Bit SP1/Windows Server 2003 64-Bit
Number of CPUs & Type	Two Dual Core Intel Xeon 2.8 GHz 2x2 MB L2 Cache
Memory	2 GB
SPECint_rate2000	59.2
Software	ArcIMS 9.1, ServletExec 5.0, IIS 6.0

**Table 2**  
**ArcGIS Server Configuration**

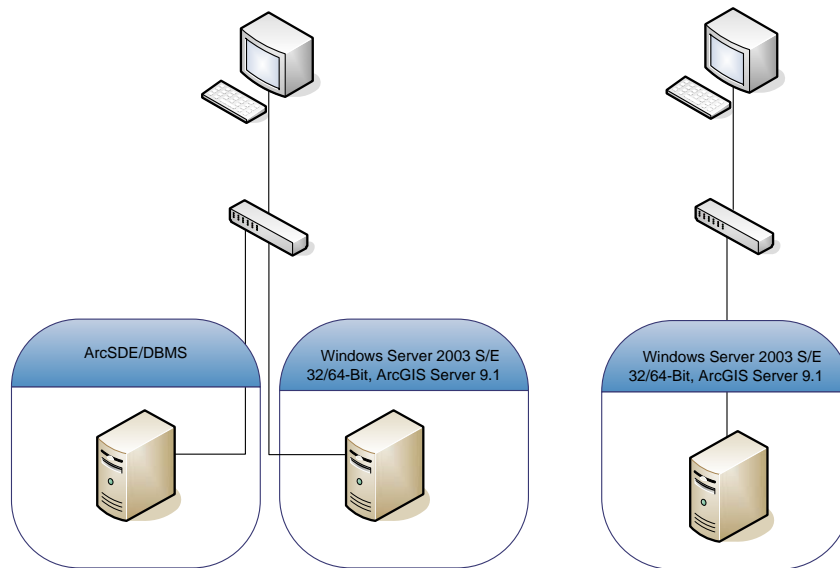
Configuration Item	Configuration
Make and Model	HP DL380 G4
Operating System	Windows Server 2003 32-Bit SP1/Windows Server 2003 64-Bit
Number of CPUs & Type	Two Dual Core Intel Xeon 2.8 GHz 2x2 MB L2 Cache
Memory	2 GB
SPECint_rate2000	59.2
Software	ArcGIS Server 9.1 SP1, IIS 6.0

**Note 1:** With the 64-Bit architecture ASP.NET 1.1 will not run by default. Microsoft has published a knowledge base article that outlines how to enable the different ASP.NET versions for 64-Bit. <http://support.microsoft.com/kb/894435/en-us>

**Figure 1**  
**ArcIMS Scalability (Local Data)**



**Figure 2**  
**ArcGIS Server (Local and ArcSDE Data)**



**Note 2:** Server platform used for testing was Multi booted for windows 32 and 64-Bit environments

## Test Data and Tools

**Table 3**  
**Local Small Shapefile Test Data Description**

Layer	Data Type	Feature Type	Features
Fire Hydrants	Shapefile Layer	Point	8,069
Schools	Shapefile Layer	Point	170
Roads	Shapefile Layer	Line	22,738
Train Routes	Shapefile Layer	Line	163
Freeways	Shapefile Layer	Line	80
Parcels	Shapefile Layer	Polygon	26,624
Parks	Shapefile Layer	Polygon	431
Lakes	Shapefile Layer	Polygon	20
Zip Codes	Shapefile Layer	Polygon	22
BW Raster	TIFF Raster	8-bit	NA
		Total	58,317

**Table 4**  
**Local Large Shapefile Test Data Description**

Layer	Data Type	Feature Type	Features
Fire Hydrants	Shapefile Layer	Point	23,585
Schools	Shapefile Layer	Point	1,091
Roads	Shapefile Layer	Line	145,027
Train Routes	Shapefile Layer	Line	387
Freeways	Shapefile Layer	Line	275
Parcels	Shapefile Layer	Polygon	783,159
Parks	Shapefile Layer	Polygon	5,239
Lakes	Shapefile Layer	Polygon	704
Zip Codes	Shapefile Layer	Polygon	106
BW Raster	TIFF Raster	8-bit	NA
		Total	959,573

**Table 5**  
**ArcSDE Test Data Description**

Layer	Data Type	Feature Type	Features
Fire Hydrants	ArcSDE Simple Layer	Point	23,585
Schools	ArcSDE Simple Layer	Point	1,091
Roads	ArcSDE Simple Layer	Line	145,027
Train Routes	ArcSDE Simple Layer	Line	387
Freeways	ArcSDE Simple Layer	Line	275
Parcels	ArcSDE Simple Layer	Polygon	783,159
Parks	ArcSDE Simple Layer	Polygon	5,239
Lakes	ArcSDE Simple Layer	Polygon	704
Zip Codes	ArcSDE Simple Layer	Polygon	106
Raster	ArcSDE Raster	8-bit, JPEG Q=50	NA
		Total	959,573

Microsoft Application Center Test (ACT) was used to provide user web loads and performance monitor was used to capture performance data.

## Test Plan

### ArcIMS Image Service Scalability

Using ACT, perform a 5 minute test with 1 thread and 1 concurrent browser connection. This test will be repeated using 2, 3, 4, 6, 8, 10 and 12 threads and browser connections. This test is designed to determine peak utilization of each physical CPU and therefore maximize server throughput. All tests will be performed against a mixed vector and raster local data set with hyper-threading disabled.

### ArcIMS Image and ArcMap Services Performance Comparison Test

Execute ArcIMS ArcMap Service web load tests (hyper-threading disabled) using local vector/raster data. A total of 10 Spatial Server threads will be used to ensure server saturation.

### ArcGIS Server Performance Comparison Test

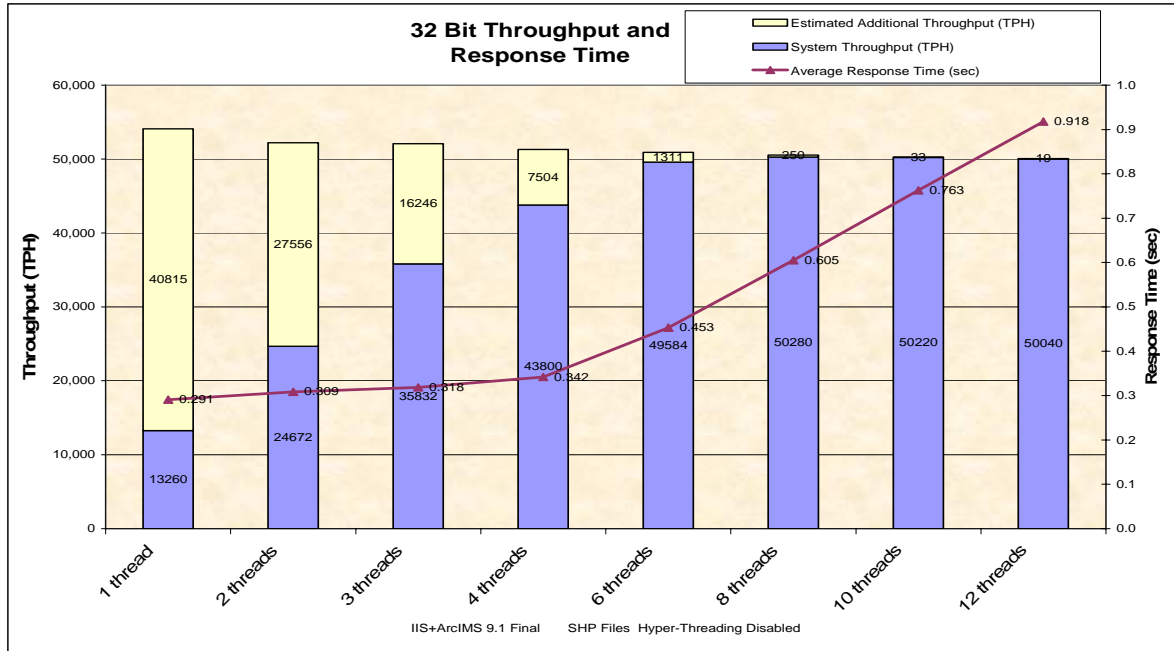
Execute ArcGIS Server web load tests (hyper-threading disabled) using both local small and large file based data and ArcSDE vector/raster data. A total of 8 ArcSOC Server threads will be used to ensure server saturation.

## Test Results and Analysis

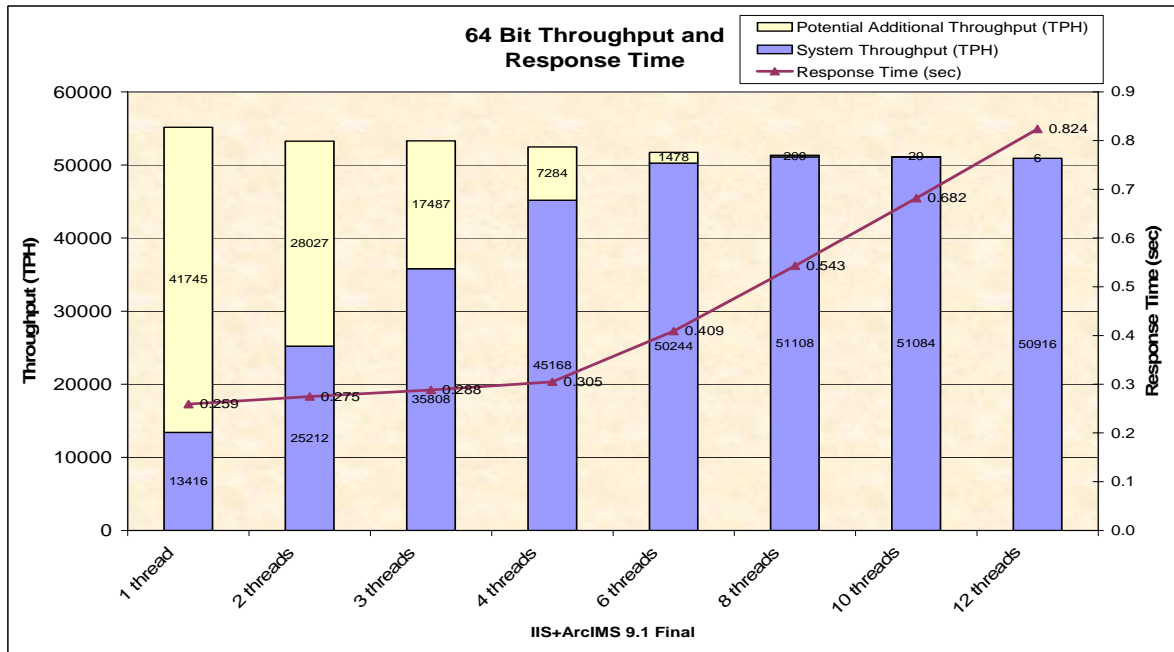
### ArcIMS Image Service Scalability

When referencing throughput vs. response time (Figures 3 and 4) the margin between Windows 2003 Server 32 and 64-Bit operating systems was minor but, there was a noticeable increase in throughput and a subsequent decrease in response time for 64-Bit. The increase is shown at the 4 thread mark indicating one thread per CPU. Overall, 64-Bit configuration average throughput increase was 1.6% relative to the 32-Bit configuration.

**Figure 3**  
**32-Bit ArcIMS Image Service Scale Out Results**

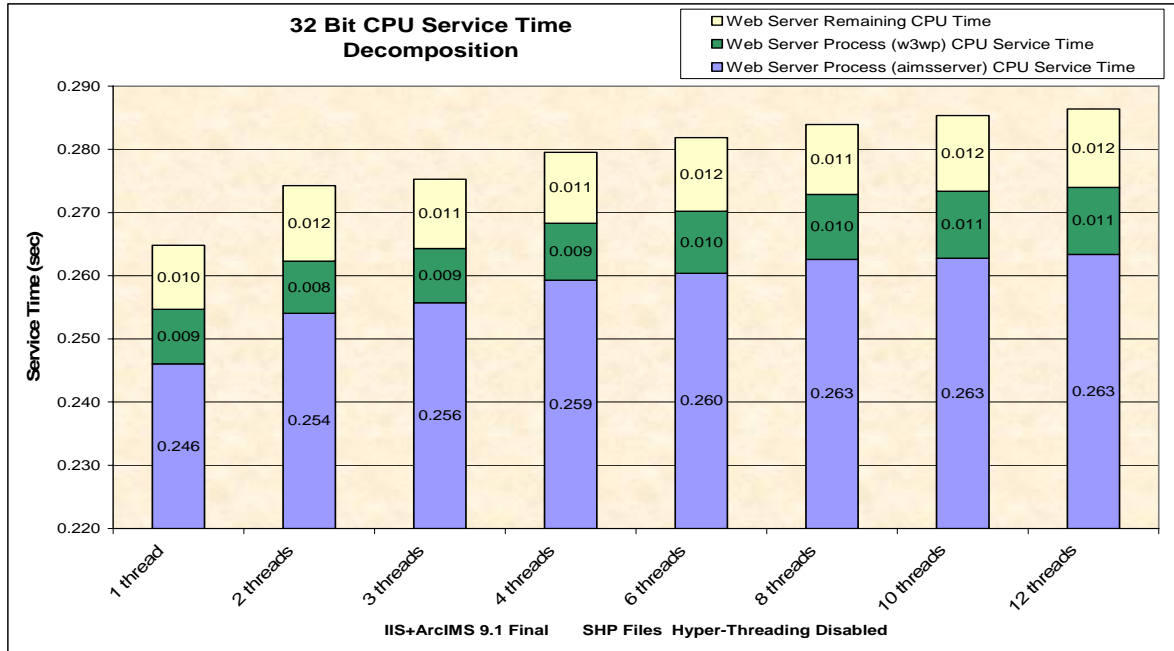


**Figure 4**  
**64-Bit ArcIMS Image Service Scale Out Results**

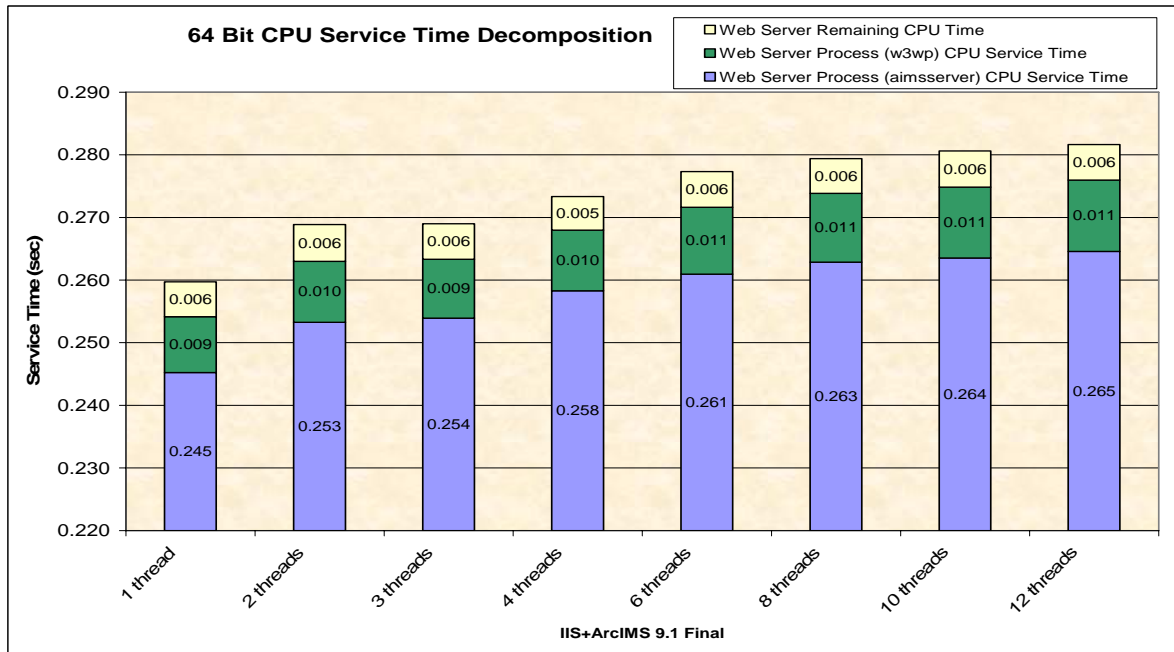


Comparing service time decompositions (Figures 5 and 6) the decrease in total CPU service time is proportional to the increase in throughput and the decrease in response time and is probably caused by the increase in virtual memory space. The Spatial Server process still requires the same amount of CPU cycles to process the map request under both architectures but the 64-Bit architecture allows for more efficient system level processing due to memory efficiency gains resulting in a slight boost in overall capacity and performance.

**Figure 5**  
**32-Bit ArcIMS Image Service CPU Service Time**



**Figure 6**  
**64-Bit ArcIMS Image Service CPU Service Time**

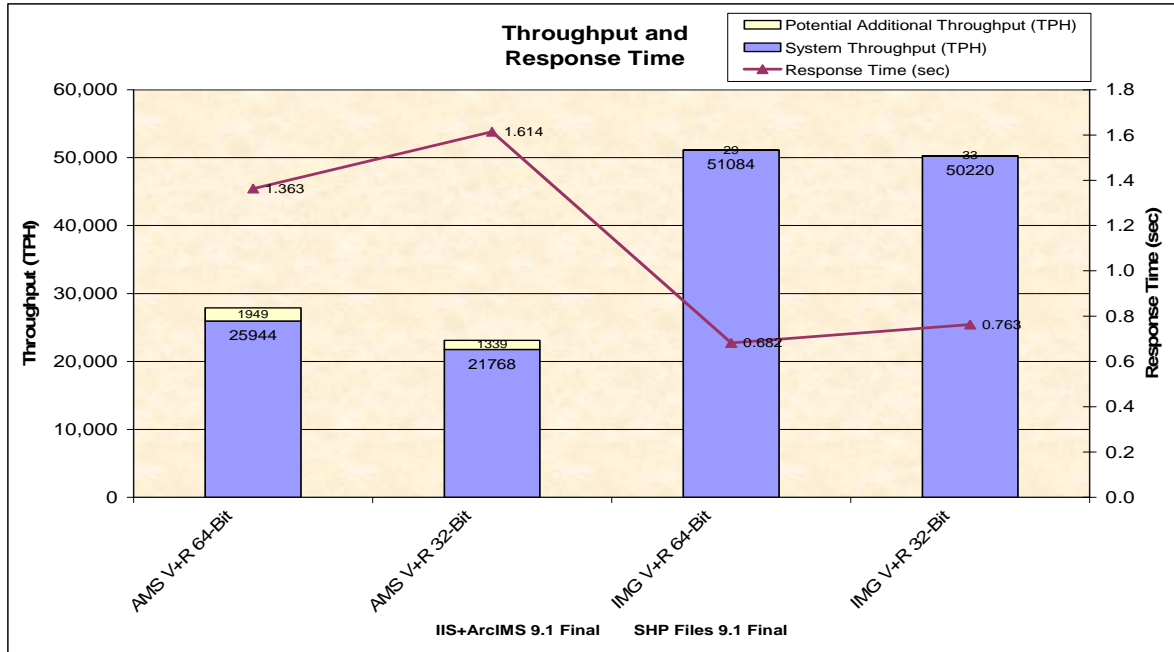


ArcIMS Image and ArcMap Services Performance Comparison Test

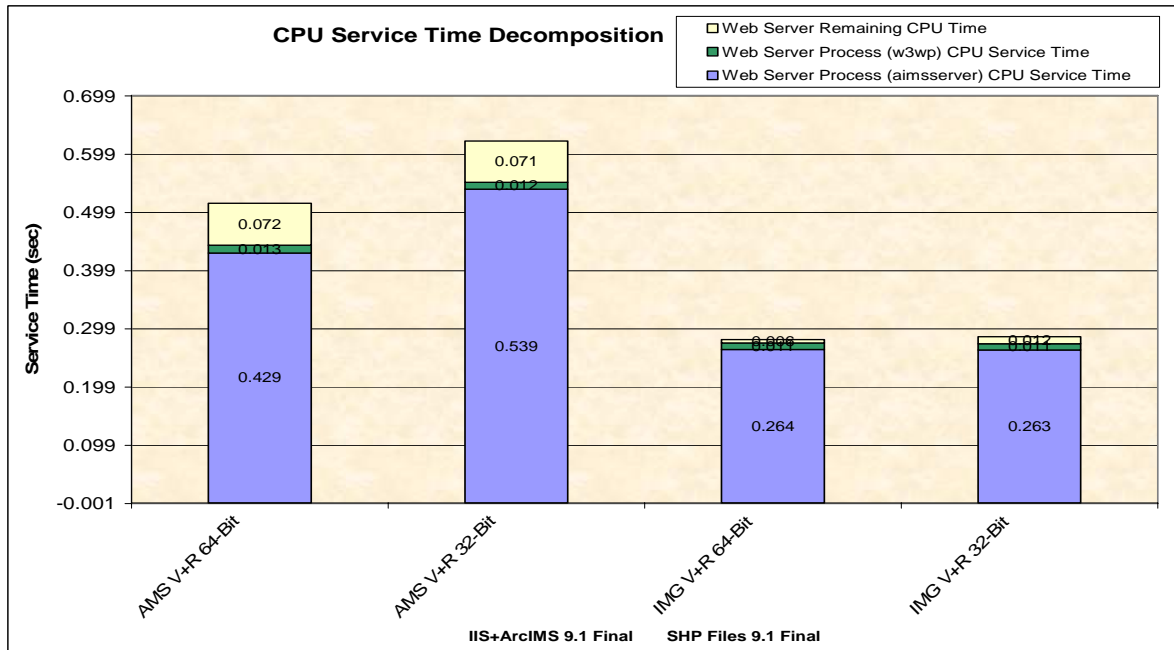
Comparing differences in ArcIMS Image and ArcMap Server services, throughput vs. response time (Figure 7) and service time (Figure 8), the margin between operating environments for Image service is very small (1.6% throughput difference). However, the difference with the ArcMap Server service is significantly different at 19.2%. Unlike the ArcIMS Image tests where

Spatial Server service times were nearly the same, the service time for the ArcMap Server Spatial Service process was quite different and attributed to the performance differences.

**Figure 7**  
**Image and ArcMap Service Comparison**



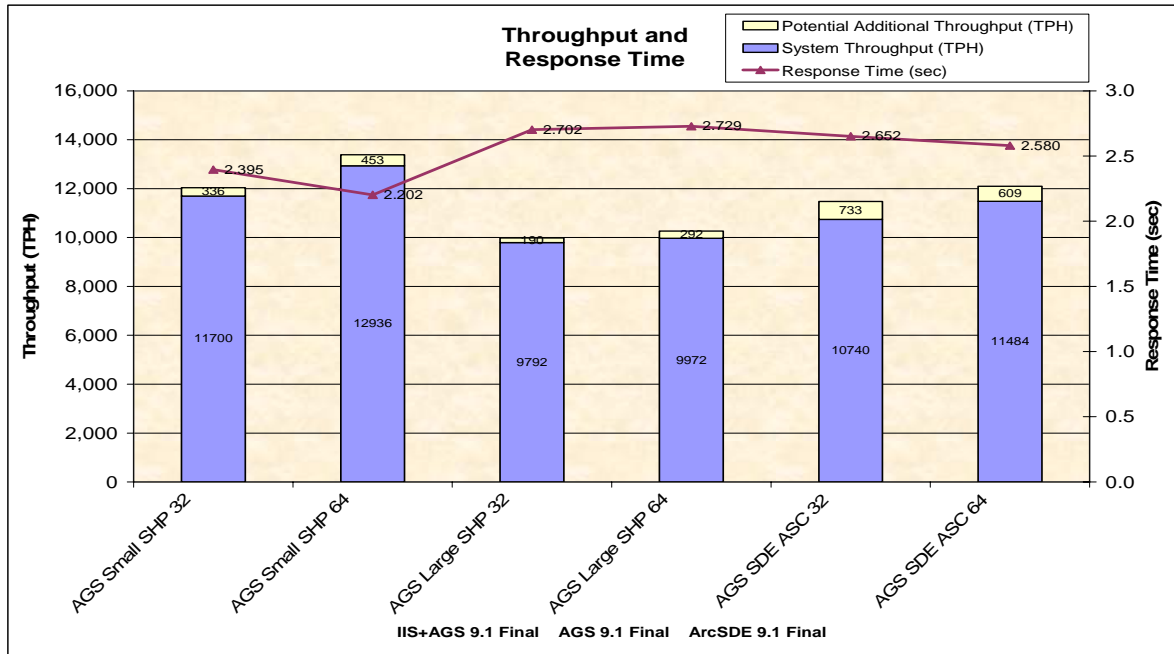
**Figure 8**  
**Image and ArcMap Service Comparison**



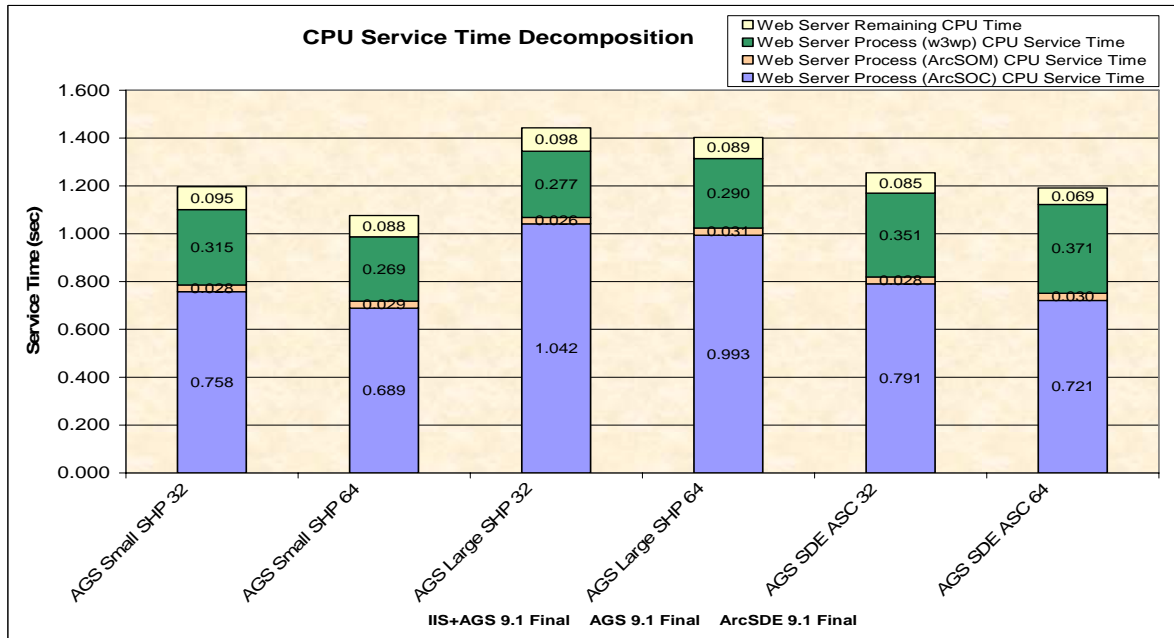
ArcGIS Server Performance Comparison Test

Performance gains for ArcGIS Server in the 64-Bit operating environment have shown most improvement with the small local data set with 10.1% increase in throughput vs. response time (Figure 9) and a subsequent decrease in service time (Figure 10) of 10.2%. This follows similar patterns shown by ArcIMS ArcMap results (Figures 7 and 8). This is probably caused by a gain in memory efficiency related to managing and processing the COM objects used with ArcGIS Server services.

**Figure 9**  
**ArcGIS Server 32 and 64 Bit Comparison**



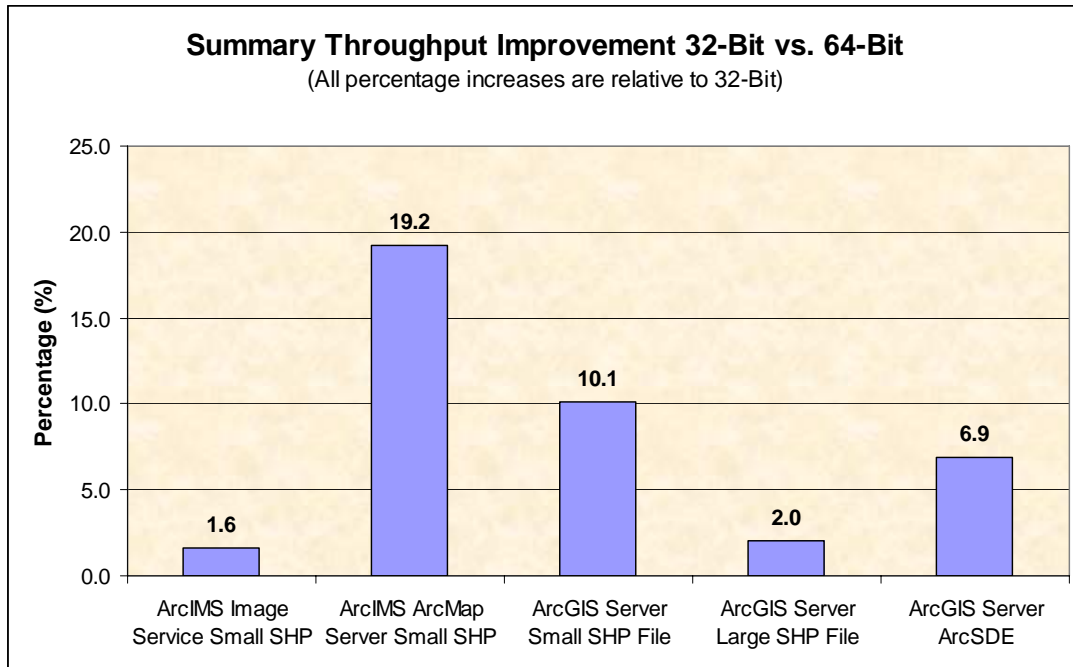
**Figure 10**  
**ArcGIS Server 32 and 64 Bit Comparison**



## Conclusions

Though mileage varied, all tests showed some gain in throughput capacity for the 64-bit architecture and are summarized in Figure 11.

**Figure 11**  
**Summary Throughput Improvement**



The noticeable improvements with most of the ArcGIS based services is thought to be related to gains in memory management related to COM processing. The testing showed that ArcIMS Image, ArcMap Server services, and ArcGIS Server services performed as expected or better in a 64-Bit environment and no problems were encountered.

## 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.

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