White Paper | AX Series

SharePoint Performance Optimization

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1 INTRODUCTION

In 2009, Microsoft introduced SharePoint 2010, which is a content- and document-collaboration platform designed to facilitate the sharing of content throughout an enterprise environment. SharePoint’s technology has been designed to replace the public folder and file server concept that has been used for a long time within Windows environments. SharePoint 2010 offers significant advances in terms of media support, a user-friendly interface, management (Service-oriented architecture [SOA] Support), social networking, record/auditing management, and search.

Today’s enterprise environments require fast and resilient application software. Content- and document-collaboration applications provide employees with the ability to work efficiently, thus increasing productivity in the workplace environment. Users demand access to the latest information, with the lowest access time. Simplifying user upload and download of documents can contribute to an effective document management solution by easing accessibility. In addition, service reliability and high uptime contribute to a productive work environment.

Using an application delivery controller (ADC), Information Systems professionals can increase user productivity with a faster application, while also reducing the computational and budget resources needed to provide mission critical applications.

2 EXECUTIVE OVERVIEW

The A10 Networks AX Series ADC accelerates and optimizes Microsoft SharePoint 2010 deployments. The AX Series offers features such as SSL Offload, TCP Connection Reuse, RAM Caching and HTTP Compression that improve the capabilities of a SharePoint solution.

The charts below provide performance data when the AX Series optimization and acceleration features are enabled. The SharePoint 2010 server CPU, disk and network processes were monitored to illustrate the dramatic performance improvements.

Figure 1: CPU performance & security performance chart
Microsoft SharePoint 2010 Performance Optimization

Figure 2: Disk performance & security performance chart

Figure 3: Network performance & security performance chart

Note: The section Optimization and Security Test Results defines Baseline, Standard and Optimized.

Benefits Summary: AX Series with SharePoint 2010 Servers

- Technique: Optimize performance by reducing the CPU utilization rate of the SharePoint back-end web server.
  - Benefit: Reduced server farm and infrastructure requirements, and associated cost.
- Improve client experience by leveraging the AX application acceleration features.
  - Benefit: Increased user productivity and/or improved customer experience.
- Help customers to rapidly scale SharePoint environments and also increase performance on the server.
  - Benefit: Ability to handle unpredictable traffic spikes and standard traffic growth.
### 3 SSL OFFLOAD

Most of today’s enterprise solution deployments require that data must be encrypted using SSL before packets are transmitted over a network. The AX Series SSL Offload feature reduces server overhead by offloading the decryption of encrypted packets from clients. The SSL processes can create a significant strain and limit the overall capacity of a backend server if the SSL offload is directly performed by the SharePoint servers.

The SSL offload tests conducted by A10 Networks indicate that there is a significant CPU relief when SSL traffic is offloaded to the AX Series. Using the AX Series as an SSL Offload appliance reduces the load of a SharePoint server by up to 75 percent.

![Figure 4: AX SSL Offload overview](image)

To ensure that the load balancer delivers optimal performance, the AX Series appliance has dedicated on-board or multi-SSL ASICs (varies per AX Series model) that provide high performance SSL encryption/decryption capabilities. These ASICs feature industry-leading Cavium NITROX® Security Processor chipsets. For maximum security performance, the AX Series ADC can support SSL key sizes of 512, 1024, 2048, and 4096 bits. For additional information on configuring and implementing the SSL Offload feature, refer to the SharePoint 2010 Server Deployment Guide. Figure 5 displays the number of SSL sessions handled by the AX Series device. These numbers represent current SSL connections and the total number of SSL requests on the SSL modules. These SSL operations are performed by the server itself if the SSL transactions are not offloaded.
Figure 5: SSL Statistics window showing SSL sessions offloaded from SharePoint web server to AX device

4 CONNECTION REUSE

The AX Series Connection Reuse feature reduces the overhead associated with setting up TCP connections, by establishing persistent TCP connections with SharePoint web servers and then reusing those connections for future TCP requests. This feature offers a significant benefit as it reuses existing TCP connections rather than opening new connections for every single client. The connection reuse feature terminates all client connections on the AX device, maintains persistent connections to the SharePoint servers, and sends all client requests on the same persistent connections. Figure 6 depicts a setup without connection reuse.

Figure 6: Non-connection reuse setup with multiple TCP connections to the backend servers

Note: Web browsers keep their TCP connections open even when all objects have been loaded.
Figure 7: Connection Reuse setup

The connection reuse feature significantly increases the responsiveness of the SharePoint web servers. This results in better SharePoint web server performance and in improved scalability for production infrastructures.

To verify that connection reuse is working properly, navigate to Monitor > Service > SLB > Virtual Servers within the AX GUI (Figure 8). To see the benefits of the connection reuse feature, you must have multiple concurrent users connecting to the SharePoint web servers. To verify connection reuse is working properly, compare the total current connections of the VIP to the real servers’ current connections. To validate connection reuse is working, verify that the real server’s current connections are less than the current connections to the VIP.

Figure 8: Connection reuse statistics showing over 90% reduction of TCP connections
5 RAM CACHING

RAM Caching is a standard feature of the AX Series ADC in which static and dynamic HTTP/HTTPS objects are stored in the AX Series’ random-access memory (RAM). The HTTP objects are cached during the initial HTTP request, and subsequent client requests for these same objects are then processed by the AX Series. All cached objects requested by SharePoint clients are delivered directly from the AX RAM cache, thus offloading these object requests from the SharePoint servers. The AX RAM caching feature reduces object requests and associated CPU processing on the backend servers and reduces the number of connections needed between the AX Series and the SharePoint servers. This provides faster client download for HTTP/HTTPS objects and improves SharePoint web server scalability. RAM caching also cuts down on the time required to transfer HTTP/HTTPS objects, such as SharePoint images, JavaScript and CSS style sheets.

By default, the AX Series RAM caching feature is well tuned to optimize the Microsoft SharePoint 2010 application. RAM caching is compliant with caching specifications described in RFC 2616 (HTTP/1.1), and the feature can be configured to support HTTP Codes 200, 203, 300, 301, 302, and 410.

Figure 9: AX Series RAM caching feature

Figure 10 below displays the statistics, which are based on cached hits served by the AX Series device.

Figure 10: Cache details statistics window, showing over 70% of objects served from the RAM cache
Figure 11 lists and shows statistics for the HTTP objects cached in the AX Series’ RAM cache.

![Statistics for Cache Objects](image)

**Figure 11: Statistics for cached objects**

Taking a single object example, such as the "/Siteassets/SitePages/Home/img_9415.jpg" (262744 bytes) jpg file, if this file is accessed by 500 SharePoint users, the total bandwidth saved from cache hits would be 125 MB.
6 HTTP COMPRESSION

HTTP Compression is a bandwidth-optimization feature included in the AX Series ADC. The feature provides compression for HTTP/HTTPS objects within the SharePoint web servers. This causes client requests to use less bandwidth, which results in faster client downloads for HTTP/HTTPS objects. Compressed objects are sent to the clients in text-based formats (such as CCS, HTML, or JS), or they are sent in application formats (such as .ppt, .doc, .xls or .pdf).

Figure 12: HTTP Compression

Objects that have already been compressed, such as .jpeg, .mpeg, and .mp3 files, can be further compressed. The AX Series offers various compression levels ranging from 1-9. Level 1 compression offers the lowest compression ratio and level 9 offers the highest compression ratio. Higher compression ratios result in smaller file sizes.

The table below shows sample compression ratios from various file types using level 1 compression.

<table>
<thead>
<tr>
<th>File Type</th>
<th>File Size KB</th>
<th>Outbound KB</th>
<th>*Output Compression %</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>.doc</td>
<td>11798</td>
<td>4198</td>
<td>64</td>
<td>1:3</td>
</tr>
<tr>
<td>.ppt</td>
<td>42081</td>
<td>39321</td>
<td>7</td>
<td>1:1.07</td>
</tr>
<tr>
<td>.pdf</td>
<td>25269</td>
<td>24678</td>
<td>2</td>
<td>1:1.02</td>
</tr>
<tr>
<td>.html</td>
<td>37650</td>
<td>308</td>
<td>99</td>
<td>1:122</td>
</tr>
<tr>
<td>.xml</td>
<td>37650</td>
<td>308</td>
<td>99</td>
<td>1:122</td>
</tr>
<tr>
<td>.txt</td>
<td>38148</td>
<td>312</td>
<td>99</td>
<td>1:122</td>
</tr>
<tr>
<td>.xls</td>
<td>21778</td>
<td>6348</td>
<td>71</td>
<td>1:3</td>
</tr>
<tr>
<td>.jsp</td>
<td>1024</td>
<td>64.3</td>
<td>94</td>
<td>1:16</td>
</tr>
<tr>
<td>.css</td>
<td>20</td>
<td>5.6</td>
<td>72</td>
<td>1:4</td>
</tr>
</tbody>
</table>

*(Outbound KB/files size*100)-100

Figure 13: Compression based on file type, showing over 99% compression for some file types

Statistics in Figure 14 show the benefits of using AX Series HTTP compression. Note that the amount of data was reduced from 37.3 MB to only 312.3 KB.
7 OPTIMIZATION AND SECURITY TEST RESULTS

This section provides the results of the SharePoint security and optimization testing. The tests demonstrate the performance advantages provided by the AX Series SSL Offload, RAM Caching, Connection Reuse, and HTTP Compression features. The tests were performed using two (2) SharePoint 2010 web servers load balanced by an AX Series. Test results for each feature are shown with three (3) types of measurements:

- **Baseline** – Measurement taken at the start of the performance test. All SharePoint services are running but with no traffic load (no clients accessing the SharePoint web servers).

- **Standard** – Measurement taken on two (2) SharePoint web servers with no AX Series optimization or security features applied.

- **Optimized** – Measurement taken on two (2) SharePoint web servers with AX Series optimization and security feature(s) applied.

![Detailed sample compression statistics, showing over 99% compression](image)
7.1 SSL OFFLOAD

Figure 15: SSL Offload CPU Performance, showing more than 50% reduction in CPU usage

In the SSL Offload CPU measurement chart above, the AX Series significantly reduces CPU load on the SharePoint web servers when SSL decryption is offloaded to the AX Series.

Note: The above diagram and subsequent diagrams may have values (such as the "baseline" above) that may not be visible due to the value being zero or close to zero.

7.2 RAM CACHING

Figure 16: RAM Cache Network Performance, showing reduction up to 100%

In the RAM Caching network measurement charts above, the AX Series greatly reduces network traffic to the SharePoint web servers by locally caching SharePoint content on the AX RAM Cache and serving the
content directly from the AX cache to clients. (To make the traffic easily visible on the optimized chart, its scale is reduced to one-tenth that of the standard chart.)

7.3 HTTP CONNECTION REUSE

![Chart showing reduction in TCP connections](image)

*Figure 17: HTTP Connection Reuse Performance Chart, showing ~60% or more reduction in TCP connections (max connections to be opened can be configured to be higher or lower)*

In the charts above, the Standard TCP Connection chart shows a total load of approximately 250 connections on one (1) SharePoint web server. When HTTP Connection Reuse is enabled on the AX Series, HTTP connections to the SharePoint web servers are reduced. Even more significantly, TCP connections to the SharePoint web servers are reduced by half.
7.4 HTTP COMPRESSION

Figure 18a: HTTP Compression CPU performance chart, showing more than 60% reduction in CPU usage

Figure 18b: CPU utilization reduction is the main benefit of HTTP Compression

The above diagram shows the network traffic between the AX Series and the SharePoint server. Interestingly, we can see a slight network improvement. Load time to the client will also be improved, which is not covered in this document.

The HTTP Compression standard and optimized charts above demonstrate a drop in network traffic when compression-enabled files are accessed by SharePoint users. While the reduction in network load is not as dramatic as in the tests for other optimization features, the standard chart does indicate an overall reduction in network traffic when HTTP Compression is enabled. Results of HTTP Compression testing will vary depending on the files that are accessed by SharePoint users.
Full optimization with all tested AX Series features running concurrently (SSL Offload, HTTP Compression, Connection Reuse, and RAM Caching)

In the culmination of our testing of the AX features for SharePoint optimization, we enabled all the features together. As shown by the charts below, the test resulted in significant differences in CPU, Disk, and network load on the SharePoint web servers.

Figure 19: Full Optimization Performance Charts showing dramatic CPU, disk and network optimization of around ~80%
8 CONCLUSION

By using the AX Series device to optimize and load balance SharePoint Web Front End (WFE) Servers, one can receive the following key advantages:

- Obtain high availability for SharePoint Servers, thus preventing website failure and ensuring that users can access the applications.
- Distribute client traffic seamlessly across multiple SharePoint WFE Servers to improve site scalability.
- Support higher connection throughput and faster end user response times, and reduce WFE CPU utilization by initiating SSL offload, HTTP Compression, RAM Caching and Connection Reuse.
- Improve site performance and reliability to end users.

About AX Series

A10 Networks’ AX Series is the industry's best price/performance advanced traffic manager – helping enterprises and ISPs maximize application availability through a high-performance and scalable Web Application Delivery platform. The AX Series' Advanced Core Operating System (ACOS) architecture has garnered the company numerous awards and is revolutionary by market standards due to its scalable symmetrical multiprocessing (SSMP), shared memory architecture. AX Series includes an optimized multi-CPU architecture built from the ground up that leaps ahead of the competition in terms of performance, scalability, and reliability. For more information, visit: www.a10networks.com/products/axseries

About A10 Networks

A10 Networks was founded in 2004 with a mission to provide innovative networking and security solutions. A10 Networks makes high-performance products that help organizations accelerate, optimize and secure their applications. A10 Networks is headquartered in Silicon Valley with offices in the United States, United Kingdom, France, The Netherlands, Germany, Brazil, Japan, China, Korea, Taiwan, Hong Kong, Malaysia and Singapore. For more information, visit: www.a10networks.com
The graphics below are the actual screenshots from the SharePoint testing. No data was changed in previous examples, but scales were adjusted for ease of viewing and comparative tests are shown on one chart.

**SSL Offload**

**Baseline**

**Standard**

**Optimized**

**RAM Caching**

**Baseline**

**Standard**

**Optimized**
HTTP Connection Reuse

Baseline Standard Optimized

HTTP Compression

Baseline Standard Optimized
Full Optimization

Baseline  Standard  Optimized